# ONONDAGA LAKE AMBIENT MONITORING PROGRAM

## 2007 Annual Report
## Appendices 1-13

FINAL
Revised April 2009


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# LIST OF APPENDICES

# APPENDIX 1: METHODS

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Onondaga County Department of
WATER ENVIRONMENT PROTECTION

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April 16, 2007

James E. Burke, P.E.
Environmental Engineer 3
Regional Water Manager
NYSDEC – Division of Water, Region 7
615 Erie Boulevard West
Syracuse, New York 13204-2400

**Re: Year 2007 Ambient Monitoring Program (Final - April 2007)**

Mr. Burke:

Please find enclosed a copy of OCDWEP's response to the review comments received from Dr. John Ferrante (via e-mail dated March 14, 2007), and for your approval a copy of the revised 2007 Ambient Monitoring Program (final version dated April 2007), which reflects the modifications.

I want to take this opportunity to thank you for the NYSDEC's review and constructive comments. Should you have any questions, please contact me or Joseph J. Mastriano.

Sincerely,

RANDY R. OTT, P.E.
Commissioner

JS/ncs

cc ltr only:
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**OCDWEP Response to Review Comments: Dr. John G. Ferrante for NYSDEC**
**Proposed Year 2007 Ambient Monitoring Program; OCDWEP - February, 2007**

**YEAR 2007 ONONDAGA LAKE AMBIENT MONITORING PROGRAM**

**Comment #1:** **Pg. 1, paragraph 5: "reduced species" should be "reduced chemical species", last line should read – Class B and C waters of Onondaga Lake and its tributaries.**

Response #1: Agree. Changed.

**Comment #2:** **Pg. 4, footnote: AMP targets river flows of <500 cfs for low flow events, the QEA model defines 7Q10 flow as 350 cfs, yet because of paucity of data at this flow actually uses 700 cfs for calibration. Are there any implications from this disparity?**

Response #2: QEA's value of 7Q10 (350 cfs) was computed at the time the river model was being developed. The 700 cfs value refers to the model-data comparisons used to demonstrate the model's performance under low flow conditions -- see Figures ES-4, 8-1, and 8-2 of the Phase 2 River Model Report. There were very few sampling events at or below the calculated 7Q10 flow, which is why the criteria of flow being less than 700 cfs for 7 days prior to sampling was used for the purposes of the low-flow model-data comparison shown in the figures. However, it is important to recognize that the river model was not calibrated only to a flow of 700 cfs -- the model is a dynamic calculation that was calibrated to data collected over the entire growing season (May to November), for each year from 1994 through 2000. Thus, it simulates both the low and high flow periods within these years. Most of the data were collected under low flow conditions, and the model was shown to provide a good representation of those data (e.g., see Figures 8-7 through 8-30 of the Phase 2 River Model Report).

The AMP targets low flow to capture critical conditions (e.g., lower DO's). However, since the model can simulate any flow conditions, the use of 500 cfs for the AMP target has no implications for the model. When the model is validated to data from 2001-2007, the measured river flows will be input to the model, and its predictions will be compared to the AMP data that were collected from those years, regardless of the flow conditions. For the purposes of consistency and comparability with previous years' data, we would recommend continuing the river sampling program without modification.

**Comment #3:** **Pg. 5, foot note 5: Cross reference Attachment 3, Table 1 for specific information on aerial photography.**

Response #3: Table 1 (Attachment 3) Summary of Year 2007 Onondaga Lake Macrophyte Assessment Program is similar to Appendix K (Onondaga Lake Macrophyte Assessment Program) which is already referenced in footnote 5. No change.

**Comment #4:** **Pg. 7, Appendix C, site #1: Was this site referred to as "State Fair Blvd." in past documents?**

Response #4: The site has been referred to as "Tributary 5A @ State Fair Blvd." in this and past AMP documents.

**Comment #5:** **Pg. 8, Appendix C: Why is this portion of the table empty?**
Response #5: This portion of the table primarily references the parameters for the biweekly and quarterly Quality Assurance/Quality Control blanks collected as part of the Tributary sampling program. There are no designated sampling sites associated with the QC blanks; consequently there are no checks in this portion of the table.

**Comment #6:** **Pg. 10, Appendix D: Zooplankton samples are vertical tows but this table indicates a discrete sample at 15 meters.**
Response #6: Table revised to reflect a 15 meter vertical net haul and UML Zooplankton sample.

**Comment #7:** **Pg. 11, Appendix D: How is the composite sample for Chlorophyll-*a* collected? Is it a tube sample or composited samples from discrete depths?**
Response #7: As noted in Pg.18, Quality Assurance Project Plan, Chlorophyll-*a* samples are collected as depth-integrated tube samples through the UML of the water column and photic zone (2 x Secchi depth) composites. A ¾" tygon tubing is used as the sample collection device.

**Comment #8:** **Pg. 12, Appendix E: Zooplankton (same as comment #6).**
Response #8: Please refer to Response #6.

**Comment #9:** **Pg. 13, Appendix E: Footnote 1: The issue of empirical data to substantiate this statement has come up a number of times. Is there a report or set of analyses that can be used to support this? See also Pg. 16, footnote #1.**
Response #9: These data will be examined in detail and results summarized in the 2006 AMP Report. Dr. Walker's presentation at the March 20, 2007, OLTAC/Water Quality Workgroup meeting included data analysis in context of comparable data at the Lake South Deep station and Onondaga Lake Outlet at 12 feet sampling locations, indicating the entire axis of the lake is well mixed.

**Comment #10:** **Pg. 14, Appendix F, footnote 2: What is the meaning of "...but above thermocline composites."?**
Response #10: Edited text to clarify as follows: "Chlorophyll-*a* composite samples will be collected as Upper Mixed Layer (UML) and photic zone (2 x Secchi Disk Transparency), but above thermocline."

**Comment #11:** **Pg. 17, Appendix H, FIELD DATA: Units should be included for all parameters and placed in parentheses.**
Response #11: Agree. Added units for the parameters Underwater Illumination Profile and Secchi Disk Transparency.

## QUALITY ASSURANCE PROGRAM PLAN FOR THE 2007 WATER QUALITY MONITORING PROGRAM (ATTACHMENT 1)

| | |
|---|---|
| **Comment #1:** | **Pg. 3, second statement from bottom: Study results for basin similarities.** |
| Response #1: | Please reference Response #9 above. |
| **Comment #2:** | **Pg. 4, D: No mentions is made here for the July, August and September river sampling – should it be included?** |
| Response #2: | Page 5 references the samples will be collected for laboratory analysis in accordance with Appendix H of the Year 2007 AMP. |
| **Comment #3:** | **Pg. 16, v.: What does the last sentence mean?** |
| Response #3: | The last sentence "The sample crew incorporates as much of this procedure as possible given the nature of the field effort", refers to the sampling challenges during adverse weather conditions of high winds, rain, etc. This will be edited to reference field conditions during the sampling event : "The sample crew incorporates as much of this procedure as possible given the field conditions during the sampling event" |
| **Comment #4:** | **Pg. 22, Bullet 3: Move the first sentence into the paragraph after the description of the discrete depths.** |
| Response #4: | Revised accordingly. |
| **Comment #5:** | **Pg 23, line 1: How are these tributaries sampled if not using a depth-integrated sampling technique?** |
| Response #5: | Added reference in text to Attachment A (Tributary Field Sampling Procedures). |
| **Comment #6:** | **Pg. 23, Note: Change wording to – "A dedicated dunker with silicone end seals will be utilized for the trace metals quarterly sampling events"** |
| Response #6: | Agree. Changed accordingly. |
| **Comment #7:** | **Pg 24, C: Spell out C-O-C and C-O-A first time.** |
| Response #7: | Agree. Spelled out. |
| **Comment #8:** | **Pg. 71 #15: The description of sampling of the spring should include a Step after Step 2 that states that after reversing the pump the initial water should be discarded before a composite is collected. This would eliminate the dilution from the deionized water first drawn into the tube.** |
| Response #8: | Agree. Added step. |

## QUALITY ASSURANCE PROGRAM PLAN FOR THE 2007 ONONDAGA LAKE FISH SAMPLING PROGRAM (ATTACHMENT 2)

| | |
|---|---|
| **Comment #1:** | **Pg. 8: This table is confusing. Please clarify through reformatting, etc.** |
| Response #1: | The table was added to aid our technician's in verifying the depth of the sampler in order to eliminate the need to calculate the vertical depth using the cosine of the angle and the cable length. The table is intended to provide a range of typical angles and cable lengths encountered during this event to |

achieve the desired vertical depth. However, the leading paragraph in Section 3.1.2, Step 5 has been modified to the following: *"Measure the angle of the cable from vertical (the optimal angle range should be between 55-60) using the WildCo clinometer, and record the angle measurement on the field data sheet. Using the "Angle of Cable Measured" (between 55-60) and the "Length of Cable" let out (typically 10 meters as measured from the water surface), verify on the following chart that the "Proper Vertical Depth" of the sampler has been achieved (optimum depth of 5.0 to 5.5 meters):"*

**Comment #2:** **Pg. 9, Section 3.1.5: Spell out HCBF.**
Response #2: Agree. Spelled out.

**Comment #3:** **Pg. 10: Please include the net characteristics: length, height, and mesh size somewhere in this discussion.**
Response #3: Added to Section 4.1 - (seine dimensions - 50' x 4' x 1/4").

**Comment #4:** **Pg. 17, Step 11: Is there a "standard" place on fish from which scales should be removed? If so it should be included in this discussion.**
Response #4: Added the following text to Section 6.1.2, Step 11, *"On spiny-rayed species, including but not limited to largemouth bass, smallmouth bass, bluegill, pumpkinseed, white perch, walleye, yellow perch and black crappie, scales will be removed from left side of the body below the lateral line, near the tip of the depressed left pectoral fin. On soft-rayed species, including trout and salmon, scales will be removed from the middle region of the body above the lateral line, beneath the posterior end of the dorsal fin on the left side".*

**Comment #5:** **Pg. 22, Section 10.0: Should the NYSDEC approval be included in this discussion?**
Response #5 At the end of this section, added the following text, *"The original QAPP, and subsequent revisions, have been reviewed by the NYSDEC, revised by OCDWEP as requested, and approved by the NYSDEC prior to implementation."* This statement has also been added to Section 6 of Attachment 3 - QAPP for the Macrophyte Assessment Program.

# YEAR 2007

# ONONDAGA LAKE

# AMBIENT MONITORING PROGRAM

Onondaga County
Department of Water Environment Protection
Syracuse, New York

April 2007

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**APPENDIX A**

# 2007 Non-Event Water Quality & Biological Sampling Schedule (April 2007 - March 2008)

| DATE /DAY | PROGRAM | EVENT | APPENDIX |
|---|---|---|---|
| **April 2007** | | | |
| April 3/Tuesday | Tributary | Quarterly Extended | C |
| April 10/Tuesday | Onondaga Lake | Double Lake (South & North Deep) | D |
| April 17/Tuesday | Tributary | Biweekly | C |
| April 24/Tuesday | Onondaga Lake | Lake South Deep | D |
| **May 2007** | | | |
| May 1/Tuesday | Tributary | Biweekly | C |
| May 8/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| May 14/Monday | Onondaga Lake | Lake Special Weekly | F |
| May 15/Tuesday | Tributary | Biweekly | C |
| May 22/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| May 29/Tuesday | Onondaga Lake | Lake Special Weekly | F |
| May 30/Wednesday | Tributary | Biweekly | C |
| **June 2007** | | | |
| June 5/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| June 11/Monday | Onondaga Lake | Lake Special Weekly | F |
| June 12/Tuesday | Tributary | Quarterly Extended | C |
| June 19/Tuesday | Onondaga Lake | Double Lake (South & North Deep) (w/Lake Special Weekly) | D & F |
| June 25/Monday | Onondaga Lake | Lake Special Weekly | F |
| June 26/Tuesday | Tributary | Biweekly | C |
| **July 2007** | | | |
| July 3/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| July 9/Monday | Onondaga Lake | Lake Special Weekly | F |
| July 10/Tuesday | Tributary | Biweekly | C |
| July 12/Thursday | River* | Monthly | H |
| July 17/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| July 23/Monday | Onondaga Lake | Lake Special Weekly | F |
| July 24/Tuesday | Tributary | Biweekly | C |
| July 31/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| **August 2007** | | | |
| August 2/Thursday | River* | Monthly | H |
| August 6/Monday | Onondaga Lake | Lake Special Weekly | F |
| August 7/Tuesday | Tributary | Biweekly | C |
| August 14/Tuesday | Onondaga Lake | Lake South Deep w/Lake Special Weekly | D & F |
| August 20/Monday | Onondaga Lake | Lake Special Weekly | F |
| August 22/Tuesday | Tributary | Biweekly | C |
| August 28/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |

<u>**APPENDIX A (Continued)**</u>

## 2007 Non-Event Water Quality & Biological Sampling Schedule (April 2007 - March 2008)

| DATE /DAY | PROGRAM | EVENT | APPENDIX |
|---|---|---|---|
| **September 2007** | | | |
| September 4/Tuesday | Onondaga Lake | Lake Special Weekly | F |
| September 5/Wednesday | Tributary | Biweekly | C |
| September 11/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| September 13/Thursday | River* | Monthly | H |
| September 17/Monday | Onondaga Lake | Lake Special Weekly | F |
| September 18/Tuesday | Tributary | Quarterly Extended | C |
| September 25/Tuesday | Onondaga Lake | Double Lake (South & North Deep) w/Lake Special Weekly | D & F |
| **October 2007** | | | |
| October 2/Tuesday | Tributary | Biweekly | C |
| October 9/Tuesday | Onondaga Lake | Lake South Deep | D |
| October 16/Tuesday | Tributary | Biweekly | C |
| October 23/Tuesday | Onondaga Lake | Lake South Deep | D |
| October 30/Tuesday | Tributary | Biweekly | C |
| **November 2007** | | | |
| November 7/Wednesday | Onondaga Lake | Lake South Deep | E |
| November 13/Tuesday | Tributary | Quarterly Extended | C |
| November 20/Tuesday | Onondaga Lake | Double Lake (South & North Deep) | D |
| November 27/Tuesday | Tributary | Biweekly | C |
| **December 2007** | | | |
| December 4/Tuesday | Onondaga Lake | Lake South Deep | D |
| December 11/Tuesday | Tributary | Biweekly | C |
| December 26/Wednesday | Tributary | Biweekly | C |
| **January 2008** | | | |
| January 2/Wednesday | Onondaga Lake | Winter** | E |
| January 8/Tuesday | Tributary | Biweekly | C |
| January 22/Tuesday | Tributary | Biweekly | C |
| **February 2008** | | | |
| February 6/Tuesday | Tributary | Biweekly | C |
| February 12/Tuesday | Onondaga Lake | Winter** | E |
| February 20/Wednesday | Tributary | Biweekly | C |
| **March 2008** | | | |
| March 4/Tuesday | Tributary | Biweekly | C |
| March 11/Tuesday | Onondaga Lake | Winter** | E |
| March 18/Tuesday | Tributary | Biweekly | C |

*** River sampling events to target low flows (at or less than 500 cfs at Baldwinsville). Sampling event dates may be altered.**
**** Lake Winter dates are tentative and will depend on weather conditions/extent of ice cover on lake.**

## APPENDIX A (Continued)

# Non-Event Water Quality & Biological Sampling Schedule (April 2007 - March 2008)

| DATE /DAY | PROGRAM | EVENT | APPENDIX |
|---|---|---|---|
| **April 2007** | | | |
| Week of April 23rd [1] | Fish Community | Pelagic Larval | J |
| **May 2007** | | | |
| Week of May 7th | Fish Community | Pelagic Larval | J |
| Week of May 21st | Fish Community | Pelagic Larval | J |
| Week of May 21st [2] | Fish Community | Electrofishing | J |
| Week of May 28th [3] | Fish Community | Adult Fish Profundal Zone (Gill Nets) | J |
| **June 2007** | | | |
| Week of June 4th | Fish Community | Pelagic Larval | J |
| Week of June 4th [4] | Fish Community | Nesting Survey | J |
| Week of June 18th | Fish Community | Pelagic Larval | J |
| Week of June 25th | Fish Community | Juvenile Seines | J |
| **July 2007** | | | |
| Month of July [5] | Macrophyte | Field Species Verification | K |
| Week of July 2nd | Fish Community | Pelagic Larval | J |
| Week of July 16th | Fish Community | Juvenile Seines | J |
| Week of July 16th | Fish Community | Pelagic Larval | J |
| Week of July 30th | Fish Community | Pelagic Larval | J |
| **August 2007** | | | |
| Week of August 6th | Fish Community | Juvenile Seines | J |
| Week of August 20th | Fish Community | Juvenile Seines | J |
| **September 2007** | | | |
| Week of September 10th | Fish Community | Juvenile Seines | J |
| Week of September 17th [2] | Fish Community | Electrofishing | J |
| Week of September 24th [3] | Fish Community | Adult Fish-Profundal Zone (Gill Nets) | J |
| **October 2007** | | | |
| Week of October 8th | Fish Community | Juvenile Seines | J |

[1]Pelagic Larval sampling events will begin in April when the water temperatures are 7-8°C; all events are weather dependent.
[2]Electrofishing events are night events; dependent on weather conditions and water temperatures of 15-20°C; (Tentative back-up sampling set for Week of May 28th/Sept 24th)
[3]Gill Nets are done during the day within one week of littoral electrofishing; (Tentative back-up events week of June 4th/Oct 1st).
[4]Nesting Survey event occurs once in June depending on water temperatures of 15-20°C, clarity, and peak spawning of select gamefish.
[5]Field Species Verification will take place within one week of Aerial Photography; Aerial photography is dependent upon water clarity (approximately >2.5 meters Secchi disk transparency) and weather (wind and cloud cover/rain).
**NOTE - Macroalgae Are Surveyed Each Time Lake Weekly Or Lake Is Scheduled (Appendix K).**

## APPENDIX B

# 2007 Event-Based Water Quality Sampling Schedule

*Ambient Monitoring Program*
*Onondaga County, New York*

| PROGRAM/EVENT(S) | FREQUENCY | PARAMETERS | LOCATIONS |
|---|---|---|---|
| **I. ONONDAGA LAKE TRIBUTARIES**<br><br>1. High-Flow | Minimum 5 times/year. | APPENDIX C | All Tributary Monitoring Sites. |
| **II. ONONDAGA LAKE**<br><br>1. Winter | Once per month January, February, March (Weather Permitting). | APPENDIX E | North or South Deep (sampling station depends on extent of ice cover). |
| 2. Fall Monitoring | Weekly sampling and field data more frequently. | APPENDIX G | Onondaga Lake |
| **III. RIVER MONITORING**<br><br>1. Annual River Monitoring Program | Three times per year. Once per month July-September. (Target Low-flows). | APPENDIX H | 1 River Monitoring Station. |

**APPENDIX C**

# 2007 Tributary Sampling Program

*Ambient Monitoring Program*
*Onondaga County, New York*

Sampling site numbers correspond to the following sites:

| | |
|---|---|
| 1 | Nine Mile Creek at Lakeland (Route 48) |
| 2a | Harbor Brook at Hiawatha Blvd. |
| 2b | Harbor Brook at Velasko Road |
| 3a | Onondaga Creek at Kirkpatrick Street |
| 3b | Onondaga Creek at Dorwin Avenue |
| 3c | Onondaga Creek at Spencer Street |
| 4 | Ley Creek at Park Street |
| 5 | Tributary 5A at State Fair Boulevard[1] |
| 6 | Metro Effluent[2] |
| 7 | Allied East Flume |
| 8a | Onondaga Lake Outlet at Long Branch Road - 2 feet (0.61 meters) |
| 8b | Onondaga Lake Outlet at Long Branch Road - 12 feet (3.66 meters) |
| 9 | Bloody Brook at Onondaga Lake Parkway[5] |
| 10 | Sawmill Creek at Onondaga Lake Recreational Trail[6] |
| 11 | Onondaga Creek Salt Spring (Spence-patrick Spring wellpoint)[7] |

| PARAMETER/ FREQUENCY | SAMPLING SITES | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2a | 2b | 3a | 3b | 3c | 4 | 5 | 6 | 7 | 8a | 8b | 9 | 10 | 11 |
| Cd, Cr, Cu, Ni, Pb, Hg, Zn, As, K/ Quarterly | X | X | X | X | X | X[4] | X | X | X | X | X | X | X | X | X[7] |
| CN/ Quarterly | X | X | X | X | X | | X | X | X | X | X | X | X | X | |
| Ca, Na, Mg, Mn, Fe/ Biweekly | X | X | X | X | X | X[4] | X | X | X | X | X | X | X | X | X[7] |
| TP, SRP, TDP/ Biweekly | X | X | X | X | X | | X | X | X | X | X | X | X | X | |
| $BOD_5$, TSS, TDS, Cl, $SiO_2$, $SO_4$, TOC, TOC-F, TIC, Turbidity/ Biweekly | X | X | X | X | X | X[4] | X | X | X | X | X | X | X | X | X[7] |
| TKN, $NH_3$-N, $NO_3$, $NO_2$, Org-N/ Biweekly | X | X | X | X | X | | X | X | X | X | X | X | X | X | |
| ALK-T/ Biweekly | X | X | X | X | X | X[4] | X | X | X | X | X | X | X | X | X[7] |
| Fecal Coliform/ Biweekly | X | X | X | X | X | | X | X | X | X | [3] | | X | X | |

## APPENDIX C (Continued)

## 2007 Tributary Sampling Program

| PARAMETER/ FREQUENCY | 1 | 2a | 2b | 3a | 3b | 3c | 4 | 5 | 6 | 7 | 8a | 8b | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chlorophyll-*a* | | | | | | | | | | | X | X | | | |
| In-situ: pH, Temperature, Salinity, Conductivity, Redox Potential, Dissolved Oxygen/ Biweekly | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X[7] |
| Equipment Blank 1 – Dunker-Churn (Churn A) BOD5, TSS, TOC, TDS, TOC-F, TIC, $SO_4$, $NO_3$, $NO_2$, TP, Cl, $SiO_2$, $NH_3$-N, TKN, Org-N, Na, Ca, Mg, Mn, Fe, SRP, TDP, ALK-T, Turbidity/ Biweekly | | | | | | | | | | | | | | | |
| Equipment Blank 1 – Dunker-Churn (Churn A) BOD5, TSS, TOC, TDS, TOC-F, TIC, $SO_4$, $NO_3$, $NO_2$, TP, Cl, $SiO_2$, $NH_3$-N, TKN, Org-N, Na, Ca, Mg, Mn, Fe, As, Cd, Cr, Cu, Hg, K, Ni, Pb, Zn, SRP, TDP, CN, ALK-T, Turbidity/ Quarterly | | | | | | | | | | | | | | | |
| Equipment Blank 2 – Churn (Churn B) $BOD_5$, TSS, TOC, TDS, TOC-F, TIC, $SO_4$, $NO_3$, $NO_2$, TP, Cl, $SiO_2$, $NH_3$-N, TKN, Org-N, Na, Ca, Mg, Mn, Fe, SRP, TDP, ALK-T, Turbidity/ Biweekly | | | | | | | | | | | | | | | |
| Equipment Blank 2 – Churn (Churn B) $BOD_5$, TSS, TOC, TDS, TOC-F, TIC, $SO_4$, $NO_3$, $NO_2$, TP, Cl, $SiO_2$, $NH_3$-N, TKN, Org-N, Na, Ca, Mg, Mn, Fe, As, Cd, Cr, Cu, Hg, K, Ni, Pb, Zn, SRP, TDP, CN, ALK-T, Turbidity/ Quarterly | | | | | | | | | | | | | | | |

# 2007 Tributary Sampling Program

[1]Tributary 5A flow will also be monitored quarterly (during the Extended Tributary sampling events, which includes the quarterly and biweekly parameters).
[2] Metro Effluent sampled biweekly for all parameters. If any flow is bypassed on tributary sampling date, this water is sampled for the same parameters as all other tributaries.
[3] The Fecal Coliform sample will be collected at the surface (0m) for the Lake Outlet sampling site.
[4] Includes only the parameters K, Ca, Na, Mg, Cl, $SO_4$.
[5] Bloody Brook at Onondaga Lake Parkway will be sampled only during high flow events (four per year) for all the extended parameters.
[6] Sawmill Creek at Onondaga Lake Recreational Trail will be sampled only during high flow events (four per year) for all the extended parameters.
[7] Includes the parameters Cl, Ca, Na, Mg, K, $SO_4$, Fe, Mn, Alk-T, pH, Temperature, D.O., Redox, Salinity, Conductivity. Sampling to be conducted on a quarterly basis.

Note: A minimum of 5 tributary sampling events will be conducted for predetermined high flow conditions [defined as one standard deviation above the long-term monthly mean flow value based on the USGS gage height at Onondaga Creek (Spencer Street site)].

# APPENDIX D

## 2007 Onondaga Lake Sampling Program

Ambient Monitoring Program

*Onondaga County, New York*

| | METERS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **0** | **3** | **6** | **9** | **12** | **15** | **18** | **FREQUENCY[1]** |
| | UML[2] | | | LWL[2] | | | | |
| Cd, Cr, Cu, Ni, Pb, Se, Zn, As, K | Composite | | | Composite | | | | Quarterly |
| Hg[3] | | X | | | | | X | April, August, October (post-turnover) |
| Ca, Na, Mg, Mn, Fe | Composite | | | Composite | | | | Biweekly |
| Cl, $SO_4$ | Composite | | | Composite | | | | Biweekly |
| TS, TSS, VSS, TVS, TDS, $SiO_2$, TOC, TOC-F, TIC | X | | X | | X | | X | Biweekly |
| Turbidity | Composite | | | | | | | Biweekly |
| $BOD_5$ | Composite | | | Composite | | | | Biweekly |
| TP[4], SRP, TDP | X | X | X | X | X | X | X | Biweekly |
| $NO_3$, $NO_2$ | Composite | | | Composite | | | | Biweekly |
| TKN, $NH_3$-N, Org-N, F-TKN | X | X | X | X | X | X | X | Biweekly |
| ALK-T | Composite | | | Composite | | | | Biweekly |
| Fecal Coliform, E. Coli | X | | | | | | | Biweekly |
| CHLOR-A[5], PHAEO-A | Composite | | | | | | | Biweekly |
| Sulfide[6] | | | | | X | X | X | Biweekly |
| Temperature, pH, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential | Measured every half-meter from 0- to 18-meter depth | | | | | | | Biweekly |
| Underwater Illumination profile, Secchi Disk Transparency | Recorded at each site | | | | | | | Biweekly |
| Phytoplankton[7] | Composite | | | | | | | |
| Zooplankton[8] | Composite | | | | X | | | |
| Equipment Blank 1 – Pump<br>TS, TSS, VSS, TVS, TDS, $SiO_2$, TOC, TOC-F, TIC, TP, SRP, TDP, TKN, $NH_3$-N, Org-N, F-TKN | | | | | | | | Biweekly |

## APPENDIX D (Continued)
# 2007 Onondaga Lake Sampling Program

| | | |
|---|---|---|
| Equipment Blank 2 – Dunker-Churn<br>(Churn Blank)<br>Ca, Na, Mg, Mn, Fe, Cl, $SO_4$, $NO_3$, $BOD_5$, $NO_2$, ALK-T, Turbidity | | Biweekly |
| Equipment Blank 2 – Dunker-Churn<br>(Churn Blank)<br>Cd, Cr, Cu, Ni, Pb, Se, Zn, As, K, Ca, Na, Mg, Mn, Fe, Cl, $SO_4$, $NO_3$, $NO_2$, ALK-T | | Quarterly |

[1] Samples are taken at the South Deep Station, which is representative of the lake conditions. Additional quarterly sampling is conducted at the North Deep Station (during Double Lake sampling events).

[2] Please note that "UML" (Upper Mixed Layer) and "LWL" (Lower Water Layer) composite samples collected during the sampling events will be made by mixing samples from each depth according to the following field protocol:

(a) Late fall, winter, and early spring (October 1 – May 31) when the lake waters are not strongly stratified.
   i. The default UML during this period of the year is 0, 3, 6m.
   ii. The default LWL during this period of the year is defined as 9, 12, 15 and 18m.

(b) Summer stratification period (June 1 – September 30)
   i. The UML composite shall always include samples collected at 0 and 3 m depths. Inclusion of water collected at 6 m in the composite shall be evaluated based on the temperature profiles measured during the sampling event.
   ii. The composite sample of the LWL will typically include water collected at depths of 12, 15 and 18 m during this period. The inclusion of the 12 m depth in the composite of the lower waters should be reviewed during each sampling event. Because the 9m depth is consistently in the metalimnion during this period, water from this depth will not be included in either composite sample.

[3] Hg - Special low-level Hg (total and methyl Hg analysis by Contract Laboratory) at the Lake South and North Deep stations. A duplicate sample will be collected at the 18m depth at the South and North Deep station during each sampling event. Also, a separate equipment rinseate blank will be collected for special low-level Hg analysis.

[4] A "Special" TP 500 ml sample to be collected during the South Deep biweekly sampling events at 1m depth between June 1 - September 30, 2007.

[5] Chlorophyll-*a* samples will be collected as UML and photic zone (2 x Secchi Disk Transparency, but above thermocline) composite. Duplicate Chlorophyll-*a* samples will be collected monthly at the Lake South Deep station (May – September 2007) for the photic zone samples.

[6] Sampling of sulfides only if anoxic conditions are determined through the YSI profile (to be completed prior to sampling).

[7] Frequency of Phytoplankton samples will be:

South Deep station: biweekly from April - November and monthly January, February, March, December.

[8] Zooplankton will be collected as a net tow through the UML and as a 15 meter vertical net haul.
Frequency of Zooplankton samples will be:
South Deep station: biweekly from April - November and monthly January, February, March, December.
North Deep station: quarterly (during the Double lake sampling events).

**APPENDIX E**

# 2007 Onondaga Lake Winter Sampling Program

*Ambient Monitoring Program*

*Onondaga County, New York*

| | METERS | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PARAMETER** | **0** | **3** | **6** | **9** | **12** | **15** | **18** | **FREQUENCY**[1] |
| Ca, Na, Mg, Mn, Fe, Hardness | Composite[2] | | | Composite[2] | | | | |
| Cl, $SO_4$ | Composite | | | Composite | | | | |
| TS, TSS, VSS, TVS, TDS, $SiO_2$, TOC, TOC-F, TIC | X | | X | | X | | X | |
| Turbidity | Composite | | | | | | | |
| $BOD_5$ | Composite | | | Composite | | | | |
| TP, SRP, TDP | X | X | X | X | X | X | X | |
| TKN, $NH_3$-N, Org-N, F-TKN | X | X | X | X | X | X | X | |
| $NO_3$, $NO_2$ | Composite | | | Composite | | | | |
| ALK-T | Composite | | | Composite | | | | |
| CHLOR-A[3], PHAEO-A | Composite | | | | | | | |
| Fecal Coliform, E. Coli | X | | | | | | | |
| Sulfide[4] | | | | | X | X | X | |
| Temperature, pH, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential | Measured every half-meter from 0-to 18-meter depth | | | | | | | |
| Underwater Illumination profile, Secchi Disk Transparency | Recorded at site | | | | | | | |
| Phytoplankton | Composite | | | | | | | |
| Zooplankton [5] | Composite | | | X | | | | |
| Equipment Blank 1 – Pump<br>TS, TSS, VSS, TVS, TDS, SiO2, TOC, TOC-F, TIC, TP, SRP, TDP, TKN, NH3-N, F-TKN | | | | | | | | |
| Equipment Blank 2 – Dunker-Churn (Churn Blank)<br>Ca, Na, Mg, Mn, Fe, Cl, $SO_4$, BOD5, $NO_3$, $NO_2$, ALK-T, Turbidity | | | | | | | | |

## 2007 Onondaga Lake Winter Sampling Program

[1] Samples are taken at the South Deep Station, which is representative of the lake conditions. Sampling will be conducted at North Deep Station if sampling during ice cover.
Frequency is once per month during January, February, and March (as weather allows).

[2] As the lake waters are not strongly stratified in the winter:
- i) The default UML during this period of the year is 0, 3, 6 m.
- ii) The default LWL during this period of the year is defined as 9, 12, 15 and 18 m.

Composites are made by mixing samples from each depth.

[3] Chlorophyll-*a* samples will be collected as an UML tube and photic zone (2 x Secchi Disk Transparency) composite.

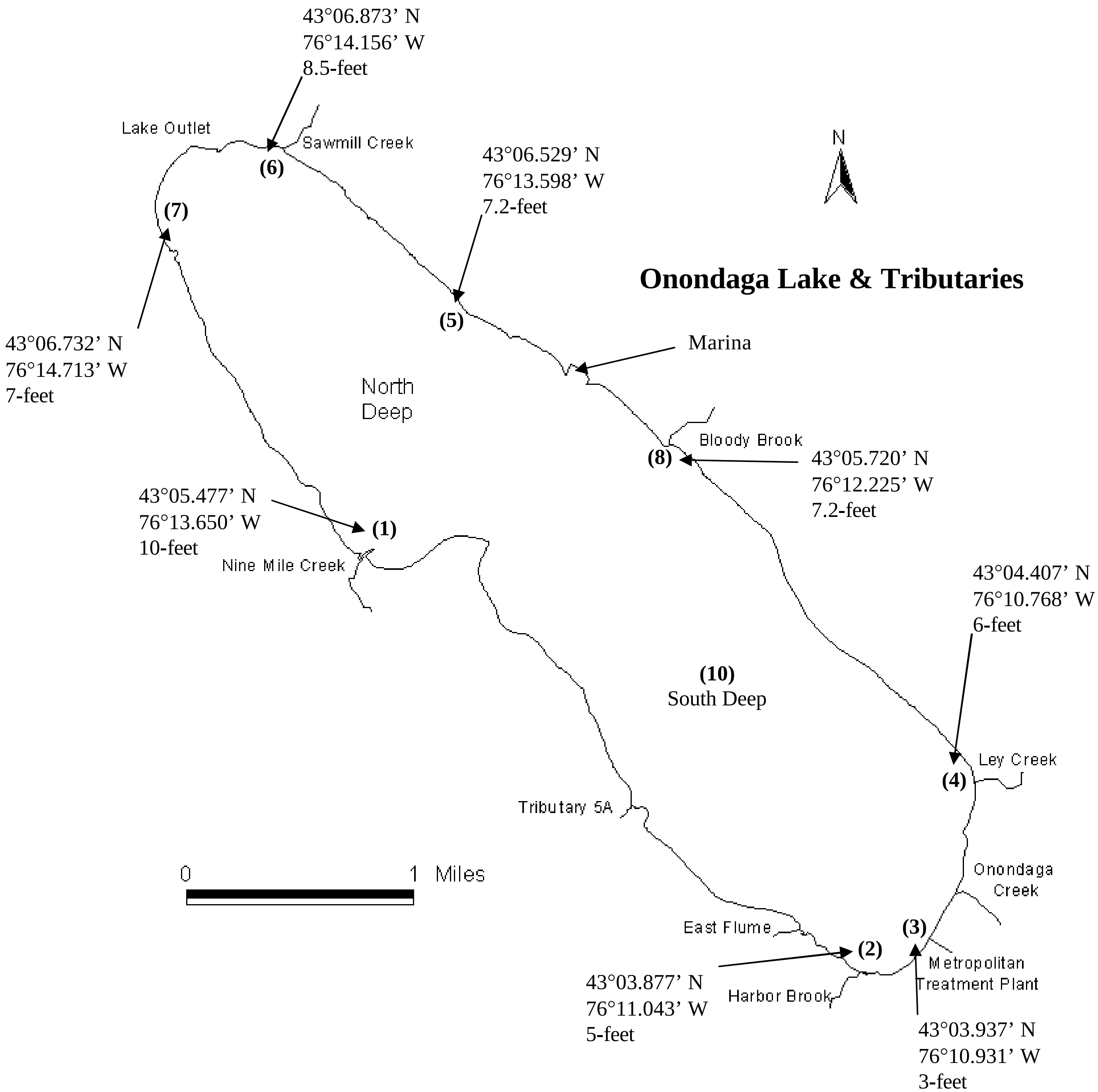
[4] Sampling of sulfides only if anoxic conditions are determined through the YSI profile (to be completed prior to sampling).

[5] Zooplankton will be collected as a net tow through the UML and as a 15 meter vertical net haul when lake is ice free. When sampling over ice for a qualitative assessment, a special zooplankton sample will be collected using an 8 inch diameter net (with 80 um mesh through the UML and poured into a 1-liter container and preserved according to the Field Preservation Guide).

# APPENDIX F
# 2007 Onondaga Lake Special Weekly Sampling Program
*Ambient Monitoring Program*
*Onondaga County, New York*

| PARAMETERS | FREQUENCY | LOCATIONS |
|---|---|---|
| Fecal Coliform<br>E. Coli<br>Turbidity<br>Secchi Disk Transparency[2]<br>Temperature | Weekly sampling<br>May – September. | Onondaga Lake (Near shore sites)[1]<br>(See Figure 1)<br>GPS Coordinates:<br>Site 1 – 43° 05.477’ N<br>76° 13.650’ W<br>Site 2 – 43° 03.877’ N<br>76° 11.043’ W<br>Site 3 – 43° 03.937’ N<br>76° 10.931’ W<br>Site 4 – 43° 04.407’ N<br>76° 10.768’ W<br>Site 5 – 43° 06.529’ N<br>76° 13.598’ W<br>Site 6 – 43° 06.873’ N<br>76° 14.156’ W<br>Site 7 – 43° 06.732’ N<br>76° 14.713’ W<br>Site 8 – 43° 05.720’ N<br>76° 12.225’ W<br>Site 9 – 43° 04.880’ N<br>76° 12.620’W |
| Chlorophyll-*a*[2]<br>Fecal Coliforms<br>E. Coli<br>Turbidity<br>Secchi Disk Transparency<br>In-situ field data (measured every<br>half-meter from<br>0- to 18-meter depth) :<br>pH, Temperature, Salinity, Conductivity, Dissolved Oxygen, Oxidation-Reduction Potential | Weekly sampling<br>May – September. | Onondaga Lake South Deep station –Site 10<br>43° 04.670’ N<br>76° 11.880’ W |

[1] The nearshore sampling stations are standardized to water depths of 4-5 feet of water. Samples will be collected from the water surface (<1m).
[2] Chlorophyll-*a* composite samples will be collected as Upper Mixed Layer (UML) and photic zone (2 x Secchi Disk Transparency), but above thermocline.




*Near Shore Sampling Coordinates & Depths*

Figure 1 Onondaga Lake Near Shore Sampling Locations

<u>APPENDIX G</u>

# 2007 Onondaga Lake Fall Turnover Sampling Program

*Ambient Monitoring Program*

*Onondaga County, New York*

| PARAMETER | METERS 0 | 3 | 6 | 9 | 12 | 15 | 18 | FREQUENCY |
|---|---|---|---|---|---|---|---|---|
| Cl, $NO_3^*$, $NO_2^*$ | Composite | | | Composite | | | | Weekly[1] (During Fall Turnover) |
| TDS, $SiO_2$ | X | | X | | X | | X | |
| TP, SRP, TDP | Composite | | | Composite | | | | |
| $NH_3$-N*, TKN*, F-TKN | Composite | | | Composite | | | | |
| ALK-T | X | | X | | X | | X | |
| CHLOR-A[2] | Composite | | | | | | | |
| Temperature, pH, Dissolved Oxygen, Specific Conductance, Salinity, Redox Potential | Measured every half-meter from 0- to 18-meter depth | | | | | | | More frequently[3]. Every effort made to collect daily profiles during the first three days of fall mixing. |
| Secchi Disk Transparency | | | | | | | | During each event. |
| Equipment Blank 1 - Pump<br>TDS, $SiO_2$, ALK-T | | | | | | | | Weekly (during Fall Turnover) |
| Equipment Blank 2 - Dunker-Churn (Churn Blank) - Cl, $NO_3$, $NO_2$, TP, SRP, TDP, $NH_3$-N, TKN, F-TKN | | | | | | | | Weekly (during Fall Turnover) |

[1] Samples are taken at the South Deep Station, which is representative of the lake conditions.

[2] Chlorophyll-*a* samples will be collected as both UML (upper mixed layer) and photic zone (2 x Secchi Disk Transparency) composites.

[3] In addition, YSI field data will also be collected at the mouth of Onondaga Lake Tributaries (including Sawmill, Bloody Brook, East Flume, Tributary 5A, Ley Creek, Onondaga Creek, Harbor Brook, Ninemile Creek, Metro Outfall), North Deep station and Onondaga Lake Outlet once during turnover.

Samples will be collected for the parameters $NO_3$, $NO_2$, $NH_3$-N, TKN and F-TKN weekly during October 15 - November 15.

**APPENDIX H**

# 2007 River Sampling Program

*Ambient Monitoring Program*
*Onondaga County, New York*

Buoy Location: Seneca River: Buoy # 316 (43° 07.249’ N Latitude, 76° 14.938’ W Longitude)
Frequency: Monthly sampling event from July – September 2007

The following table summarizes the field data to be collected typically at 15-minute intervals over a 24-hour period at Buoy 316 by installing two (2) YSI data-loggers (one in the upper and one in the lower waters) during the monthly sampling events from July through September 2007.

| FIELD DATA* | FREQUENCY/TIMING |
|---|---|
| pH, S.U. | Monthly (July – September) |
| Specific Conductance, mS/cm | Target low stream flows. |
| Temperature, Deg C | |
| Dissolved Oxygen, mg/l | |
| Salinity, ppt | |
| Oxidation-Reduction Potential, mV (ORP) | |
| Underwater Illumination Profile ($\mu mols^{-1}m^{-2}$) | |
| Secchi Disk Transparency (m) | |

# 2007 River Sampling Program

The following table summarizes the parameters for analysis. One set of samples will be collected at 2 depths for Buoy 316 (1-meter below the water surface and 1-meter above the river sediments) during the 24-hour period, during each of the monthly sampling events from July – September 2007.

| Analytical parameters | | |
|---|---|---|
| **PARAMETER** | **NO. OF SAMPLES PER EVENT (2 SAMPLES)[3]** | **FREQUENCY/TIMING[4]** |
| TOC | 2 | Monthly (July – September)<br>Target low stream flows. |
| TDC | 2 | |
| TKN | 2 | |
| $NO_2$ | 2 | |
| $NH_3$ | 2 | |
| F-TKN | 2 | |
| $NO_3$ | 2 | |
| Chlorophyll-*a*[1] | 2 | |
| SRP | 2 | |
| TDP | 2 | |
| TP | 2 | |
| TSS | 2 | |
| Cl | 2 | |
| $BOD_5$[2] | 2 | |
| Turbidity | 2 | |
| Equipment Blank 1 – Dunker-Churn<br>TOC, TDC, TKN, $NO_2$, $NH_3$, F-TKN, $NO_3$, SRP, TDP, TP, TSS, Cl, $BOD_5$, Turbidity | | Monthly |

# 2007 River Sampling Program

[1] Chlorophyll-*a* will be collected at Buoy 316 from the 2 depths (1-meter below the water surface and 1-meter above the river sediments) during each of the sampling events.
[2] $BOD_5$ will be field composited from the 2 depths for the buoy location (1-meter below the water surface and 1-meter above the river sediments for one composite sample for analysis) during each of the sampling events.
[3] Field duplicates will be collected at Buoy 316 (1-meter below the water surface and 1-meter above the river sediments) during each of the monthly sampling events for each parameter.
[4] In addition, special River samples will be collected one meter below the surface once per year during the River sampling event at Buoy 316 (Seneca River), Buoy 260 (Seneca River) and Buoy 182 (Oneida River) for the following parameters (using a standard analytical method with the lowest acceptable detection limits):

Metals: Ag, As, Cd, Cr, Cu, Fe, Hg, Pb, Ni, Se, Mo and Zn
TKN, Phenols, T-Cyanide, Bis (2-Ethylhexyl) Phthalate, and Di-N-Octyl Phthalate

**APPENDIX I**

# 2007 Water Quality Monitoring Programs

## Summary of Modifications

**Appendix A: Year 2007 Non-Event Sampling Schedule (April 2007 - March 2008)**

As required by Appendix D of the Amended Consent Judgment, included is an annual sampling schedule for the 2007 non-event related sampling, specifying dates, locations, and parameters.

**Appendix B: Year 2007 Event-Based Sampling Schedule**

The monitoring program for event related sampling specifies the number of annual activities. In the event of a need to alter the schedule due to unforeseeable circumstances, NYSDEC and ASLF shall be notified *via fax only* as soon as practicable prior to the event.

**Appendix C: Year 2007 Tributary Sampling Program**

*Modification:*

- No change.

**Appendix D: Year 2007 Onondaga Lake Sampling Program**

*Modification:*

- Footnote 7: Phytoplankton
  Deleted North Deep station quarterly sampling (during the Double Lake sampling events), as there were no differences from the South Deep station sample (based on Dr. William Walker's statistical framework update).

**Appendix E: Year 2007 Onondaga Lake Winter Sampling Program**

*Modification:*

- No change.

**Appendix F: Year 2007 Onondaga Lake Special Weekly Sampling Program**

*Modification:*

- No change.

**Appendix G: Year 2007 Onondaga Lake Fall Turnover Sampling Schedule**

*Modification:*

- No change.

**Appendix H: Year 2007 River Monitoring Program**

*Modification:*

- No change.

# APPENDIX J

## 2007 Onondaga Lake Fish Community Sampling Plan

*Ambient Monitoring Program*
*Onondaga County, New York*

| Component | Methodology/Gear | Sampling Objectives | Location and Number of Samples | Timing | Changes |
|---|---|---|---|---|---|
| **Pelagic Larvae** | Modified double oblique Miller high-speed trawl, with flow meter attached, collected during the day in the pelagic zone. | Determine species richness. | - 4 double oblique tows in each basin (North and South) per event.<br>-Tows will sample water depths from the surface to 5.5 meters.<br>-Total No. of events =8<br>-Total No. of samples =64 | -Daytime<br>-Bi-weekly.<br>-April (when water temps. are 7-8 ºC) through end of July. | -No Change from previous year. |
| **Juvenile Fish** | 50' x 4' x 1/4" bag seine swept into shore in the littoral zone. | Determine community structure and species richness. | -5 strata with 3 sites in each strata and 1 sweep at each site.<br>-No. of Sites = 15<br>-Total No. of events = 6<br>-Total No. of samples = 90 | -Daytime<br>-Every 3 weeks.<br>-July - October. | -No Change from previous year. |
| **Nesting Fish** | Lake wide nest survey. | Document spatial distribution and species composition | -Entire perimeter of lake divided into 24 equal length sections.<br>-Total No. of events = 1<br>-Total No. of samples = 24 | -Once in June when water temperature is between 15° and 20 °C. | -No Change from previous year. |
| **Adult Fish- Littoral Zone** | Boat mounted electrofisher in the littoral zone at night. | Determine community structure, species richness, CPUE, and relative abundance. | -Entire perimeter of lake shocked in 24 contiguous transects.<br>-Alternating all-fish/gamefish transects.<br>-Total No. of events = 2<br>-Total No. of samples = 48 | -Night-time.<br>-Twice per year; Spring and Fall.<br>-Spring and Fall.<br>-Water temp. between 15º and 21 ºC. | -No Change from previous year. |
| **Adult Fish- Profundal Zone** | Experimental gill nets of standard NYSDEC dimensions. | Determine community structure, and species richness. | -One net per strata.<br>-Nets set on bottom, parallel to shore at a water depth of 4-5m for two hours.<br>-Total No. of events = 2<br>-Total No. of samples = 10 | -During the day.<br>-Twice per year, within one week of littoral electrofishing. | -No Change from previous year. |
| **Angler Census** | Angler diary program and bass tournament surveys. | Determine catch rates, species composition. Attitudes and opinions over the AMP. | -Recruit diary participants at fish & game clubs and fishing organizations.<br>-Tournaments will be surveyed at time of weigh-in. | -Issued annually and collected at end of fishing season (fall).<br>-Tournament schedule TBA | -No Change from previous year. |

**APPENDIX K**

## 2007 Onondaga Lake Macrophyte Assessment Program

*Ambient Monitoring Program*
*Onondaga County, New York*

| Component | Methodology/Gear | Sampling Objectives | Location and Number of Samples | Timing | Change |
|---|---|---|---|---|---|
| **Onondaga Lake Aerial Photography** | Program utilizes plane with belly mounted 9x9 camera.<br><br>60% forward overlap, 30% side overlap. | Determine annual percent of littoral zone with macrophytes. | -Three (3) flight lines full lake coverage. | -June or July when water clarity is approximately 3-meters on the secchi disk.<br>-Early morning or early evening with low sun angle. | -No change from previous year. |
| **Field Species Verification of Aerial Photography** | Visual identification. | Determine species. | -Two (2) sites in each of the five (5) strata for a total of ten (10) sites. | -Within 1 week of the aerial photos. | -No change from previous year. |
| **Macroalgae** | At nine (9) near shore locations using a laser range finder to estimate distance from shore and visual percent cover estimate. | Document percent cover and annual proliferation of littoral zone macroalgae. | -Survey once per week at nine (9) near shore buoy locations. | -May through September. | - No change from previous year. |

**ATTACHMENT 1**

# QUALITY ASSURANCE PROGRAM PLAN
# FOR THE 2007 WATER QUALITY MONITORING PROGRAM

# AMBIENT MONITORING PROGRAM

Prepared for the NYSDEC

by:

**Onondaga County**
**Department of Water Environment Protection**

July 1998 (Original)
February 2003 (Revision)
June 2003 (Revision)
March 2004 (Revision)
March 2005 (Revision)
April 2006 (Revision)
February 2007 (Revision)

# QUALITY ASSURANCE PROGRAM PLAN

YEAR 2007 WATER QUALITY MONITORING PROGRAM
(AMBIENT MONITORING PROGRAM)
*Onondaga County*
*Syracuse, New York*
TABLE OF CONTENTS

# I. PROGRAM DESCRIPTION

Onondaga Lake is an urban lake located in Onondaga County, New York. The lake has several natural tributaries and receives overflow from combined sewers in the City of Syracuse, treated effluent from the Metropolitan Syracuse Wastewater Treatment Plant (Metro) as well as non-point runoff from a mix of urban, residential, and agricultural areas.

Onondaga Lake is located immediately northwest of the City of Syracuse in Onondaga County, New York, USA (43° 06’ 54” N, 76° 14’ 34” W). The outlet of Onondaga Lake flows into the Seneca River, which joins with the Oswego River which eventually flows into Lake Ontario. The Onondaga Lake drainage basin encompasses approximately 700 $km^2$ and with exception of 2 $km^2$ in Cortland County lies almost entirely in Onondaga County. The tributary drainage basins include six natural sub-basins: Ninemile Creek, Harbor Brook, Onondaga Creek, Ley Creek, Bloody Brook, and Sawmill Creek. Although much of the lake watershed is agricultural, the lake itself is surrounded by urban and suburban development.

Since 1968, the water quality of Onondaga Lake and its tributaries have been monitored to meet the objectives of assessing: trophic status, compliance with New York State ambient water quality standards and guidance values, external loading of pollutants to Onondaga Lake through its tributaries, and trends in water quality in response to major pollutant abatement activities at Metro and the CSOs.

The annual lake monitoring program was originally implemented to comply with a special federal grant condition for the major upgrade of the Metro facility completed in the early 1970s. The scope of the annual monitoring program has expanded over the years in response to the enhanced understanding of the complex interactions between pollutant inputs and lake response. In 1998, the monitoring program was modified to provide specific data and information needed to assess the effectiveness of another round of improvements to the wastewater collection and treatment system. The Year 2007 Onondaga Lake Ambient Monitoring Program (AMP) is designed to determine whether planned controls on point and nonpoint source pollution loading will be sufficient to bring the lake, the lake tributaries, and a segment of the Seneca River into compliance with state and federal standards.

Trophic status of the lake will be assessed by monitoring Secchi disk transparency, major nutrient concentrations, chlorophyll-*a*, phytoplankton abundance and species composition, zooplankton species composition and abundance, the fish community, hypolimnetic dissolved oxygen, and accumulation of reduced species.

Compliance of the lake and tributary waters with the New York State ambient water quality standards will be evaluated. The lake is Class B and Class C; tributaries are Classes B, C, or C (T). Numerical standards exist for dissolved oxygen, ammonia, nitrite, and nitrate nitrogen, bacteria, pH, dissolved solids, and a large number of other organic and inorganic parameters. Narrative standards are in effect for several water quality parameters of Class B and C waters (including Onondaga Lake and its tributaries).”

As detailed in Section 703.2 of the New York State Environmental Conservation Law, parameters regulated by a narrative standard include:

| | | |
|---|---|---|
| Taste-, color-, and toxic and other deleterious substances | AA, A, B, C, D, SA, SB, SC, I, SD, A-Special, GA, GSA, GSB | None in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages. |
| Turbidity | AA, A, B, C, D, SA, SB, SC, I, SD | No increase that will cause a substantial visible contrast to natural conditions. |
| Suspended, colloidal and settleable solids | AA, A, B, C, D, SA, SB, SC, I, SD, A-Special | None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages. |
| Oil and floating substances | AA, A, B, C, D, SA, SB, SC, I, SD, A-Special | No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease. |
| Phosphorus and nitrogen | AA, A, B, C, D, SA, SB, SC, I, SD, A-Special | None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages. |
| Thermal discharges | AA, A, B, C, D, SA, SB, SC, I, SD, A-Special | See Part 704 of the NYS ECL |

External annual loadings (concentration and flow) to Onondaga Lake through its tributary streams of oxygen demanding materials, sediments, bacteria, metals, dissolved salts, plant nutrients are monitored. Monitoring is conducted throughout the year and the program is designed to capture high flow and storm events along with baseline conditions. These data are also used for general surveillance to evaluate compliance with the County's pretreatment program. The trends in Onondaga Lake and Tributary water quality over time and in response to major reductions in point source loadings will be assessed through statistical evaluations of the long-term data set developed for this system. An annual report summarizing the results of the current year's data acquisition program and the statistical analyses of trends in external loading and lake response is prepared each year. Data are archived in a database.

The annual Onondaga Lake Monitoring program was expanded in 1994 to include water quality sampling at key locations in the Seneca/Oneida/Oswego river system. The purpose of the County's river monitoring program is to define ambient water quality conditions in the River system, between Cross Lake and Three Rivers, determine compliance with the water quality standards, evaluate the assimilative capacity of the Seneca River, and identify the impacts of the Baldwinsville Seneca-Knolls WWTP, Wetzel Road WWTP, Oak Orchard WWTP and the Onondaga Lake Outlet on River water quality.

In January 1998, Onondaga County signed an Amended Consent Judgment (ACJ) committing to a phased 15-year program of upgrades and improvements to the County's wastewater collection and treatment system. The County's long-term monitoring program was evaluated and modified to ensure that the data collected would be adequate to evaluate the response of the lake, streams, and river to the planned improvements to the Combined Sewer Overflows (CSOs) and Metro. This process of evaluation and modification was a collaborative effort of Onondaga County, its technical advisors, New York State Department of Environmental Conservation (NYSDEC), the Environmental Protection Agency (EPA), and Atlantic States Legal Foundation (ASLF). Modifications were made to focus the monitoring program on a series of hypotheses related to the effectiveness of the County's improvements to the wastewater collection and treatment system. A revised monitoring program, known as the Ambient Monitoring Program (AMP) was initiated in August 1998.

The effectiveness of the improvements to the County's wastewater system can be measured in terms of (1) compliance with water quality standards and guidance values, and (2) restoration of a balanced ecological community of plants and animals. A significant change in the annual monitoring program was the greatly expanded focus on the biology of the aquatic system including the status of the fish community, macroinvertebrates, rooted aquatic plants, algae, and zooplankton, in addition to tracking the physical and chemical variables.

## II. TECHNICAL DESIGN

The monitoring program described above discusses the full matrix of water quality issues and parameters of concern to Onondaga County.

### A. INTRODUCTION

The Onondaga County Department of Water Environment Protection (OCDWEP) has monitored the water quality of Onondaga Lake and its tributaries since 1970.

Refer to Appendix A Year 2007 Water Quality Program-Ambient Monitoring Program (non-event sampling schedule).

Water samples for analysis will be collected and analyzed according to EPA requirements for Water Planning and Management (40 CFR 136, 1991 or latest version) and EPA 600/4-82-029. Sampling and analysis will be consistent with New York State's Environmental Laboratory Approval Program (ELAP). The OCDWEP Environmental Laboratory is certified by New York State (ELAP #10191) and the National Environmental Laboratory Accreditation Conference (NELAC).

### B. ONONDAGA LAKE

Onondaga Lake will be sampled from April through November according to the calendar included in Appendix A Year 2007 Ambient Monitoring Program (non-event sampling schedule). The parameters to be sampled and their schedules are also detailed.

Samples will be collected from the locations identified as "South Deep" and "North Deep" stations. The exact sampling location will be at the mooring buoys deployed at the South and North Deep stations as listed below.

The coordinates of the monitoring stations are as follows:

| | | |
|---|---|---|
| South Deep: | 43° 04.670' N | Latitude |
| | 76° 11.880' W | Longitude |
| North Deep: | 43° 05.930' N | Latitude |
| | 76° 13.730' W | Longitude |

Studies have shown that sampling from these basins will reflect the condition of the remainder of the lake.

In-situ data for pH, Dissolved Oxygen (DO), Temperature, Specific Conductance, and Oxidation-

Reduction Potential (ORP) will be collected at half-meter intervals throughout the water column using either a YSI 600 or a YSI 6600 in-situ monitoring sonde. Calibration and instrument calibration drift checks will be conducted before and after each sampling event.

Samples will be collected using a submersible pump and a Wildco Beta sampler, depending on the sample parameter. However, samples of bacteria will be collected in sterile containers. When pumping, sufficient time will be allowed in order to evacuate the pump lines of all previous samples. In addition, all sample containers will be rinsed with sample water, unless they are pre-preserved. Composite samples will be collected on a volumetric basis (i.e., the proportions of samples collected at the series of depths are composited equally using a Wildco Beta sampler). Compositing will be accomplished using a sample-splitting churn. Samples will be thoroughly mixed and poured-off from the churn. All sampling equipment used on Onondaga Lake is dedicated for this purpose only.

Other field data to be collected include Secchi disk transparency and light availability. Light availability data are collected at 20-cm intervals from the water surface to a depth at which light is 1% of surface illumination, as noted during the sampling event, using a LiCor datalogger.

In addition to the above, OCDWEP partially funds the gauging stations on Onondaga Lake and its tributaries in conjunction with the United States Geological Survey. Flow data are used to calculate loading rates.

## C. TRIBUTARIES

Onondaga Lake tributaries are sampled throughout the year, according to the calendar included as Appendix A Year 2007 Ambient Monitoring Program (non-event sampling schedule). The parameters to be sampled and their schedules are detailed in Appendix C Year 2007 Ambient Monitoring Program (Tributary Sampling Program).

In-situ data for pH, Dissolved Oxygen, Temperature, Specific Conductance, and Oxidation-Reduction Potential will be collected using a YSI sonde. Calibration and calibration drift checks will be conducted before and after each sampling event.

Tributary samples will be collected using the depth-integrated sampling technique from each location, except for at the Allied East Flume, Sawmill Creek, Onondaga Lake Outlet, Harbor Brook at Hiawatha Boulevard, and Ley Creek monitoring sites. The Allied East Flume, Bloody Brook and Sawmill Creek samples are taken as described in Attachment A, sections 9, 13, and 14, respectively. A vertical Kemmerer Bottle sampler will be used at the Onondaga Lake Outlet, Harbor Brook at Hiawatha Boulevard, and Ley Creek monitoring sites. Samplers and sample containers are rinsed prior to dispensing sample water for analysis into the sample containers. Bacteria samples will be collected in sterile containers. All sampling equipment used on the tributaries is dedicated for this purpose. Stage gauge measurements will be taken to record the water surface elevation during each sampling event.

## D. RIVER

River samples will be collected using grab techniques from Buoy 316. A Beta sampler will be utilized for sample collection. Samplers and sample containers are rinsed prior to dispensing sample water for analysis into the sample containers.

The station will be sampled for analytical parameters at 1-meter below the water surface and 1-meter above the channel bottom in order to evaluate density stratification effects on water quality.

Measurements taken during the sampling events will also include vertical profiles of the field parameters to define possible stratification. In-situ data for pH, Dissolved Oxygen, Temperature, Specific Conductance, and Oxidation-Reduction Potential will be collected at half-meter intervals throughout the water column using a YSI sonde. Calibration and calibration drift checks will be conducted before and after each sampling event. Samples will be collected for laboratory analysis in accordance with Appendix H of the Year 2007 Ambient Monitoring Program.

## III. PROGRAM ORGANIZATION AND RESPONSIBILITY

The responsibilities and qualifications of the key Program Team members are discussed below. Members of this Team have the experience and capabilities to conduct all aspects of the program and to effectively interact and communicate with NYSDEC staff.

### A. RESPONSIBILITIES AND QUALIFICATIONS

**Mr. Joseph J. Mastriano, Program Manager**

Joseph J. Mastriano will serve as Program Manager and will be responsible for the management of program activities. Mr. Mastriano will be responsible for monitoring program budgetary control, coordinating field activities and lab analysis, coordinating and overseeing the work of program sub-contractors including report preparation.

Mr. Mastriano has over 28 years experience in the field of water and wastewater resources and has been intimately involved in several projects related to Onondaga Lake. Specifically, Mr. Mastriano has:

- Conducted field monitoring of Onondaga Lake and its tributaries from May 1978 until Spring 1985.
- Served as the Department's primary contact responsible for coordinating departmental efforts associated with Dr. William Walker's compilation and validation of the 24-year database.
- Designed and administered special studies to determine the effects of atypical conditions on receiving water. Examples of these efforts include: monitoring conducted in response to failures in the collection/treatment system infrastructure, and monitoring the effect of wet weather conditions on the lake and its tributaries.

Other examples of Mr. Mastriano's work experience include:

- Administration of the County's industrial pretreatment and other source control programs including: review and approval of treatment system design, permitting, monitoring, enforcement, and cost recovery activities.
- Serves as the County's primary on-call contact for directing the response to uncontrolled discharge of materials to the sanitary sewer system and those sections of lake tributaries maintained by the County.
- Administration of special studies conducted by the County including projects such as tracer/dye studies of lake tributaries, the collection system, and treatment plant unit processes; and studies to evaluate the source, effect and fate of materials entering the wastewater treatment system.

**Mr. Michael R. Gena, Laboratory Director**

Mr. Michael Gena will be responsible for the general administration of the analytical elements of the program. He will assist other members of the team on analytical issues and ensure compliance with proper analytical protocol. He will also ensure dissemination of analytical results in a timely and efficient manner to facilitate completion of schedule work tasks. Mr. Gena's administrative and analytical experiences span a period of over 35 years. Twenty-nine years of this experience has been direct involvement with the Onondaga Lake and Tributary Monitoring Program. Representative examples of Mr. Gena's experience include:

- Responsibility for the collection and analyses of surface and potable waters for the New York State Department Of Health Central New York Regional Laboratory.

- Responsibility for analyses of surface waters, wastewaters, and solid/hazardous wastes utilized in a variety of programs conducted by the Department of Water Environment Protection.

- Laboratory Director for Water Environment Protection responsible for administration of analytical service and compliance with mandated QA/QC. Responsibilities include operation of lab facility and general supervision of 23 analytical chemists and technical personnel.

**Ms. Jeanne C. Powers, Sanitary Engineer III**

Ms. Powers has worked as a Sanitary Engineer for the County since 1987. She has supervised field technician and engineering staff in several process control engineering related projects. Ms. Powers will be responsible for overall monitoring program supervision, budgetary control, coordinating and overseeing the work of program sub-contractors. In addition, she has administered day-to-day activities of the County's annual Onondaga Lake monitoring program from 1995 to the present, including contract administration.

**Ms. Janaki Suryadevara, Sanitary Engineer II**

Ms. Suryadevara has worked as a Sanitary Engineer for the County since 1993. Ms. Suryadevara coordinates the County’s water quality programs and will be responsible for scheduling the Onondaga Lake, tributary and river sampling events and developing QA/QC procedures for sample collection.

Ms. Suryadevara will be responsible for coordinating the review and preparation of the Annual Lake Ambient Monitoring Program Report, oversight and design of the field program, coordinating field and laboratory efforts, and for supervision of the technician staff performing field sampling.

**Mr. David Snyder, P.E., Sanitary Engineer II**

Mr. Snyder coordinates the County’s biological monitoring programs, which include monitoring of the fishery, macroinvertebrates, macrophytes, and zebra mussels on Onondaga Lake, its tributary streams and the Three Rivers system. He is also responsible for biological program design and implementation.

**Mr. Antonio D. Deskins, Sanitary Engineer I**

Mr. Deskins will be responsible for the initial data review, compilation and maintenance of the database. Mr. Deskins also participates in Lake/Tributary/River sampling events and performs field audits as necessary. Mr. Deskins’ computer skills are utilized in evaluating and presenting AMP field/analytical data and in generation of the Annual Lake Ambient Monitoring Program Report.

Mr. Deskins will also utilize his data-processing experience in order to maintain the AMP databases and produce the tabular and graphical summaries, which are necessary to analyze trends and tributary loading computations.

## Onondaga Lake Technical Advisory Committee (OLTAC):

In addition to the team referenced above, the County will utilize a Technical Advisory Group composed of experts in several disciplines to discuss results and implications of the annual program. Current members, their areas of technical expertise, affiliation, and addresses are as follows:

1. Dr. Raymond Canale - Water Quality Modeling
   EnginComp Software, Inc.
   710 S.W. Monitou Trail
   Lake Leelanau, MI 49653

2. Dr. Charles T. Driscoll - Aquatic Chemistry
   Department of Civil and Environmental Engineering
   220 Hinds Hall
   Syracuse University
   Syracuse, NY 13244

3. Dr. James Hassett - Engineering Hydrology; Water Pollution Engineering; Water Quality Modeling
   SUNY College of Environmental Science and Forestry (ESF)
   122 Bray Hall
   Syracuse, NY 13210

4. Dr. Edward L. Mills - Aquatic Food Web; Zebra Mussel Dynamics
   Cornell University Biological Field Station
   900 Shackelton Point Road
   Bridgeport, N.Y. 13030-9747

5. Dr. Elizabeth Moran - Limnology
   EcoLogic, LLC.
   Atwell Mill Annex, Suite S-2
   132 ½ Albany Street
   Cazenovia, N.Y. 13035

6. Dr. Lars Rudstam - Fisheries
   Cornell University Biological Field Station
   900 Shackelton Point Road
   Bridgeport, N.Y. 13030-9747

7. Dr. Kenton Stewart - Physical Limnology
   University of Buffalo
   199 Crown Royal Drive
   Williamsville, N.Y. 14221

8. Dr. William Walker, Jr. - Limnological and Statistical Modeling
   1127 Lowell Road
   Concord, MA 01742

**B. SAMPLING SCHEDULE**

## 2007 Non-Event Water Quality Sampling Schedule (April 2007 - March 2008)

| DATE /DAY | PROGRAM | EVENT | APPENDIX |
|---|---|---|---|
| **April 2007** | | | |
| April 3/Tuesday | Tributary | Quarterly Extended | C |
| April 10/Tuesday | Onondaga Lake | Double Lake (South & North Deep) | D |
| April 17/Tuesday | Tributary | Biweekly | C |
| April 24/Tuesday | Onondaga Lake | Lake South Deep | D |
| **May 2007** | | | |
| May 1/Tuesday | Tributary | Biweekly | C |
| May 8/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| May 14/Monday | Onondaga Lake | Lake Special Weekly | F |
| May 15/Tuesday | Tributary | Biweekly | C |
| May 22/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| May 29/Tuesday | Onondaga Lake | Lake Special Weekly | F |
| May 30/Wednesday | Tributary | Biweekly | C |
| **June 2007** | | | |
| June 5/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| June 11/Monday | Onondaga Lake | Lake Special Weekly | F |
| June 12/Tuesday | Tributary | Quarterly Extended | C |
| June 19/Tuesday | Onondaga Lake | Double Lake (South & North Deep) (w/Lake Special Weekly) | D & F |
| June 25/Monday | Onondaga Lake | Lake Special Weekly | F |
| June 26/Tuesday | Tributary | Biweekly | C |
| **July 2007** | | | |
| July 3/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| July 9/Monday | Onondaga Lake | Lake Special Weekly | F |
| July 10/Tuesday | Tributary | Biweekly | C |
| July 12/Thursday | River* | Monthly | H |
| July 17/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| July 23/Monday | Onondaga Lake | Lake Special Weekly | F |
| July 24/Tuesday | Tributary | Biweekly | C |
| July 31/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| **August 2007** | | | |
| August 2/Thursday | River* | Monthly | H |
| August 6/Monday | Onondaga Lake | Lake Special Weekly | F |
| August 7/Tuesday | Tributary | Biweekly | C |
| August 14/Tuesday | Onondaga Lake | Lake South Deep w/Lake Special Weekly | D & F |
| August 20/Monday | Onondaga Lake | Lake Special Weekly | F |
| August 22/Tuesday | Tributary | Biweekly | C |

## 2007 Non-Event Water Quality (Continued)
## Sampling Schedule (April 2007 - March 2008)

| DATE /DAY | PROGRAM | EVENT | APPENDIX |
|---|---|---|---|
| August 28/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| **September 2007** | | | |
| September 4/Tuesday | Onondaga Lake | Lake Special Weekly | F |
| September 5/Wednesday | Tributary | Biweekly | C |
| September 11/Tuesday | Onondaga Lake | Lake South Deep (w/Lake Special Weekly) | D & F |
| September 13/Thursday | River* | Monthly | H |
| September 17/Monday | Onondaga Lake | Lake Special Weekly | F |
| September 18/Tuesday | Tributary | Quarterly Extended | C |
| September 25/Tuesday | Onondaga Lake | Double Lake (South & North Deep) w/Lake Special Weekly | D & F |
| **October 2007** | | | |
| October 2/Tuesday | Tributary | Biweekly | C |
| October 9/Tuesday | Onondaga Lake | Lake South Deep | D |
| October 16/Tuesday | Tributary | Biweekly | C |
| October 23/Tuesday | Onondaga Lake | Lake South Deep | D |
| October 30/Tuesday | Tributary | Biweekly | C |
| **November 2007** | | | |
| November 7/Wednesday | Onondaga Lake | Lake South Deep | E |
| November 13/Tuesday | Tributary | Quarterly Extended | C |
| November 20/Tuesday | Onondaga Lake | Double Lake (South & North Deep) | D |
| November 27/Tuesday | Tributary | Biweekly | C |
| **December 2007** | | | |
| December 4/Tuesday | Onondaga Lake | Lake South Deep | D |
| December 11/Tuesday | Tributary | Biweekly | C |
| December 26/Wednesday | Tributary | Biweekly | C |
| **January 2008** | | | |
| January 2/Wednesday | Onondaga Lake | Winter** | E |
| January 8/Tuesday | Tributary | Biweekly | C |
| January 22/Tuesday | Tributary | Biweekly | C |
| **February 2008** | | | |
| February 5/Tuesday | Tributary | Biweekly | C |
| February 12/Tuesday | Onondaga Lake | Winter** | E |
| February 20/Wednesday | Tributary | Biweekly | C |
| **March 2008** | | | |
| March 4/Tuesday | Tributary | Biweekly | C |
| March 11/Tuesday | Onondaga Lake | Winter** | E |
| March 18/Tuesday | Tributary | Biweekly | C |

*** River sampling events to target low flows (at or less than 500 cfs at Baldwinsville). Sampling event dates may be altered.**
**** Lake Winter dates are tentative and will depend on weather conditions/extent of ice cover on lake.**

## C. DATA VALIDATION

1. Results of laboratory analyses are submitted to the program team members Janaki Suryadevara and Antonio Deskins within four weeks of collection.

2. Interim product: monthly data summaries (paper and diskette) will be compiled with codes flagging any limitations to data usability identified during the data validation process. Data validation will occur within four weeks of receipt of laboratory data.

## D. DATA SUMMARIES

Data summaries: within three months of receipt of a complete set of validated data, a data summary will be compiled.

1. Calculate means, medians and averages of lake data.

2. Compare measured lake concentration to ambient water quality standards.

3. Calculate means, medians of concentrations of tributary water quality data.

4. Compare measured tributary concentration to compliance with ambient water quality standards.

## E. ANNUAL REPORT PREPARATION

The “draft” report will be compiled within five months of receipt of complete set of validated data.

Annual Results -

1. Tables of Year 2007 results (concentrations and loads in lake and tributaries).

2. Statistical comparisons of Year 2007 results to the long-term data set.

Trend Analysis -

3. The trend analysis for the tributary and lake data, which is an important step in tracking progress towards lake restoration, using the most recent ten years of data, will be completed. The standard methodology developed by Dr. William Walker, Jr. will be used to apply the seasonal Kendall test to the lake datasets.

Compliance -

4. The report will include a section on the water quality conditions and compliance with the ambient water quality standards for the water body segment measured in the tributaries, Onondaga Lake, and the Seneca River. The report will include a summary analysis of the Metro discharge with the SPDES permit.

Loading -

5. External loading of materials to the lake will be calculated once USGS discharge records are received. In mid-2004, Dr. William Walker, Jr. refined his program used to estimate loading to Onondaga Lake. The improved estimation technique, called “Method 5”, was developed in conjunction with the compilation of the OCDWEP long-term integrated water quality database and supporting software. The new technique was developed to support estimation of daily loads, to support development of monthly and seasonal lake mass balances, and to improve the accuracy and precision of the annual load estimates. Method 5 differs from AUTOFLUX Method 2 in several ways. Data are stratified by flow regime (similar to AUTOFLUX Method 2) and are also stratified by season using a multiple regression technique. Conditions during the unmonitored period are projected using a residual interpolation method that includes a flow derivative term.

Lower Trophic Levels -

6. Phytoplankton identification and enumeration will be completed and key findings of the lower trophic levels analysis will be evaluated and included as part of the integrated assessment of water quality conditions and ecosystem response.

7. Zooplankton density, species composition, size, and biomass will be determined and evaluated.

## IV. FIELD SAMPLE COLLECTION & PRESERVATION

A. Field sampling techniques are consistent with those described in the following U.S. Government publications:

1. EPA 600/4-82-029 (September 1982)

2. 40 CFR 136 (March 1991)

3. EPA 821-R-95-034 (Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Criteria Levels).

B. Field QC consists of replicates and equipment rinsate blanks as specified in ELAP protocol.

C. Sample preservation requirements:

Due to the variety of possible sample types, only generalizations can be made. Preservatives are added in compliance with the analytical protocols (reference Table 2, Attachment C – Analytical Methodologies). Analysis begins as soon as possible. A complete chain-of-custody record is maintained on each sample to provide a history of sample handling from collection to analysis.

Table 1 indicates the criteria for sample collection and preservation. All samples are aqueous.

| TABLE 1 - SAMPLE COLLECTION AND PRESERVATION | | | | |
|---|---|---|---|---|
| **ANALYTE** | **VOLUME** | **CONTAINER** | **PRESERVATION** | **MAXIMUM HOLDING TIME** |
| ***Biological*** | | | | |
| Coli, Fecal | 125ml | P | Cool 4$^o$ C | 6 Hrs. |
| E. Coli | 125ml | P | Cool 4$^o$ C | 6 Hrs. |
| | | | | |
| Chlorophyll a | 2000ml | P | Cool 4 $^o$ C | |
| Phaeophytin a | 2000ml | P | Cool 4 $^o$ C | |
| | | | | |
| Phytoplankton | 500ml | P | Lugol's solution, Cool 4 $^o$ C | |
| Zooplankton | 1000ml | P | Ethanol (70% by Volume), Cool 4 $^o$ C | |
| ***Inorganic Tests*** | | | | |
| Biochemical Oxygen Demand | 1/2 Gallon | P | Cool 4 $^o$ C | 48 Hrs. |
| | | | | |
| Cyanide, Total | 1000ml | P | Cool 4 $^o$ C, NaOH to pH > 12, 0.6g ascorbic acid | 14 Days |
| Kjeldahl and Organic Nitrogen | 1000ml | P | Cool 4 $^o$ C, $H_2SO_4$ to pH < 2 | 28 Days |
| Total Phosphorus | 1000ml | P | Cool 4 $^o$ C, $H_2SO_4$ to pH < 2 | 28 Days |
| Soluble Reactive Phosphorus | 125ml | P | Cool 4 $^o$ C | 24 Hrs. |
| Total Dissolved Phosphorus | 125ml | P | Cool 4 $^o$ C, $H_2SO_4$ to pH < 2 | 24 Hrs. |
| ***All Metals*** | | | | |
| Arsenic | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Cadmium | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Calcium | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Chromium (GFA) | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Copper | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Iron | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Lead (GFA) | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Magnesium | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Manganese | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Nickel | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Potassium | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Sodium | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Selenium | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |

| TABLE 1 - SAMPLE COLLECTION AND PRESERVATION | | | | |
|---|---|---|---|---|
| **ANALYTE** | **VOLUME** | **CONTAINER** | **PRESERVATION** | **MAXIMUM HOLDING TIME** |
| Zinc | 1000ml | P | $HNO_3$ to pH<2 | 6 Months |
| Mercury | 1000ml | P | $HNO_3$ to pH<2 | 28 Days |
| Organic Carbon, Total | 1/2 Gallon | P | Analyze within 24 hours or Cool 4 °C $H_3PO_4$ to pH < 2 | 28 Days |
| Organic Carbon, Filtered Total | 1/2 Gallon | P | Analyze within 24 hours or Cool 4 ° C $H_3PO_4$ to pH < 2 | 28 Days |
| Inorganic Carbon, Total | 1/2 Gallon | P | Cool 4 °C | 48 Hours |
| Phenols | 1000ml | G | Cool 4 °C, $H_2SO_4$ to pH < 2 | 28 Days |
| Solids, Total | 1/2 Gallon | P | Cool 4 °C | 7 Days |
| Solids, Total Suspended | 1/2 Gallon | P | Cool 4 °C | 7 Days |
| Solids, Total Volatile | 1/2 Gallon | P | Cool 4 °C | 7 Days |
| Solids, Total Suspended | 1/2 Gallon | P | Cool 4 °C | 7 Days |
| Volatile | 1/2 Gallon | P | Cool 4 °C | 7 Days |
| Solids, Total Dissolved | 1/2 Gallon | P | Cool 4 °C | 7 Days |
| Silica | 1/2 Gallon | P | Cool 4 °C | 28 Days |
| Sulfate | 1/2 Gallon | P | Cool 4 °C | 28 Days |
| Sulfide | 300ml | G | Cool 4 °C, add zinc acetate plus sodium hydroxide to pH > 9 | 7 Days |
| ***Specials*** | | | | |
| T-Alkalinity | 500ml | P | Cool 4 °C (no air bubbles present) | 14 Days |

All samples are aqueous.
Containers: P = Plastic; G = Glass

## V. FIELD SAMPLING PROCEDURES

### A. ONONDAGA LAKE

#### 1. Metals

i. Samples are collected as grabs and composited volumetrically.

ii. The Wildco Beta sampler is used for sample collection. The sampler is rinsed in lake water prior to use in order to ensure cleanliness. Samples are mixed in a churn, which has also been rinsed in lake water. The sample bottle is rinsed with the composite sample prior to pouring-off from the churn into the one-liter plastic bottle, and filled to the shoulder.

iii. Parameters to be analyzed biweekly include:

Ca, Na, Mg, Mn, Fe

iv. Parameters to be analyzed quarterly include:

Cd, Cr, Cu, Ni, Pb, Se, Zn, As, K

v. Quarterly metals samples will be collected using modified trace metals sampling techniques for sample collection. This sampling methodology is described in EPA Method 1669 (Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria). The sample crew incorporates as much of this procedure as possible given the field conditions during the sampling event.

vi. All samples are preserved by adding Nitric Acid to pH < 2, and cooling to 4°C.

#### 2. Mercury

i. Special samples for Total and Methyl Mercury will be collected at 3m and 18m depths in 500-ml Teflon bottles using the "clean hands-dirty hands" technique for sample collection. The Teflon® Dunker used shall be pre-cleaned and stored in accordance with the procedures contained in the OCDWEP SOP titled "Onondaga Lake Freshwater Sampling Preparation", document number 00077. Use of the Teflon® Dunker will be in accordance with the procedures contained in the OCDWEP SOP titled "Tributary Sampling Procedures", document number 00082. The dirty hands sampling technician will be responsible for handling the Teflon® Dunker and pouring the sample. The clean hands sampling technician shall only touch the sample container and cap.

ii. A separate equipment rinseate blank for the Teflon Dunker will be collected for special low-level mercury analysis.

iii. A field blank will also be collected at the sampling site, prior to sample collection. This will consist of reagent water, supplied by the contract laboratory, processed through the sampling device.

iv. The analysis of samples for the determination of Total Mercury will be achieved by Cold Vapor Atomic Fluorescence (CVAFS) Spectrometry. The methodology is described by Fitzgerald and Gill (1979), Bloom and Crecelius (1983), Gill and Fitzgerald (1985); Bloom and Fitzgerald (1988), Method 1631 (USEPA, 1995).

**3. Conventionals**

i. "Conventional" discrete samples are collected at 0m, 6m, 12m, and 18m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water collected from the appropriate depth prior to filling.

iii. One gallon plastic or gallon sample bottles are filled to the shoulder and then cooled to 4°C (no further preservation is required).

iv. "Conventional" parameters include:

TS, TSS, TDS, VSS, TVS, $SiO_2$, TOC, TOC-F, TIC

v. A second "conventional" composite sample for both the upper mixed layer (UML) and the lower water layer (LWL) is collected as grabs and composited volumetrically. (See Page 22 - **Composite Sample collection**).

vi. The Wildco Beta sampler is used for sample collection. The sampler is rinsed in lake water prior to use in order to ensure cleanliness. Samples are mixed in a churn, which has also been rinsed in lake water. The sample bottle is rinsed with the composite sample prior to pouring-off from the churn into the half-gallon plastic sample bottles filled to the shoulder and then cooled to 4°C (no further preservation is required).

vii. Composite Parameters include:

$BOD_5$, $NO_2$, $NO_3$, Cl, $SO_4$, Turbidity (UML only).

**4. Soluble Reactive Phosphorus (SRP)**

i. SRP samples are collected at 0m, 3m, 6m, 9m, 12m, 15m, 18m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water at the appropriate depth prior to filling.

iii. The sample will be filtered on site.

iv. Collect sample in a new disposable container.

v. Place a previously washed 0.45-micron filter into filter apparatus.

vi. Filter sample into the SRP container (250-ml plastic disposable) leaving a small airspace.

vii. Discard filter and rinse apparatus.

NOTE: When sample turbidity prevents using one filter to fill container; remove clogged filter, replace with another washed filter and continue filtration. Under extreme conditions of algal density (i.e., when filter clogs yielding less than 20 ml filtrate) sample may be pre-filtered using a washed glass-microfiber filter, and filtered into a clean container before final filtration with a 0.45 micron filter.

viii. The 250-ml plastic disposable sample bottles are then cooled to 4°C (no further preservation is required).

**5. Total Dissolved Phosphorus (TDP)**

i. TDP samples are collected at 0m, 3m, 6m, 9m, 12m, 15m, 18m depths using a submersible pump.

ii. The pump is allowed to flow freely for a minimum of two minutes prior to filling sample bottles in order to evacuate the hoses of all previous samples. Sample bottles are also rinsed with lake water at the appropriate depth prior to filling.

iii. The sample will be filtered on site.

iv. Collect sample in new disposable container.

v. Place a previously washed 0.45-micron filter into filter apparatus.

vi. Filter sample into the TDP container (250-ml plastic disposable) leaving a small airspace.

vii. Discard filter and rinse apparatus.

NOTE: When sample turbidity prevents using one filter to fill container; remove clogged filter, replace with another washed filter and continue filtration. Under extreme conditions of algal density (i.e., when filter clogs yielding less than 20 ml filtrate), sample may be pre-filtered using a washed glass-microfiber filter, and filtered into a clean container before final filtration with a 0.45 micron filter.

viii. Preservation: Adjust pH < 2 with $H_2SO_4$.

ix. The 250-ml plastic disposable sample bottles are then cooled to 4°C.

**6. Chlorophyll-*a***

i. Chlorophyll-*a* samples are collected as depth-integrated tube samples through the UML of the water column and photic zone (2 x Secchi depth,) composites. A 3/4" tygon tubing is used as the sample collection device.

ii. Samples are analyzed for chlorophyll-*a* and phaeophytin-*a* content.

Equipment Requirements: 3/4" Tygon Tube compositing apparatus
Chlorophyll Bottles
YSI Unit
Secchi disc

Bottle Requirements: (2) 2 liter Amber Bottles

iii. Record 0.5 meter depth readings until the UML are determined (Step 1). Record a Secchi Disc Reading (Step 2). Lower the tube sampler to the determined UML depth (Step 3). Place a stopper in the end of the tube (Step 4). Rinse the sample bottle with the sample water and pour out (Step 5). Repeat Steps 3 and 4 pull the tube from the water and pour the entire tube contents into the dedicated carboy. Repeat tube composites until sufficient volume is collected. Use only a full tube composite. Thoroughly mix sample prior to pouring off into container.

Note: The UML composite depth shall be determined by the temperature profile. Should no distinct thermocline be present, 0, 3, 6 meters in depth is the UML default. Collect a composite sample down through the determined UML layer.

**7. Net Haul**

i. A net haul sample is obtained for zooplankton analysis.

Equipment Requirements: 0.5 Meter Wildco Beta Plankton Net with 80 um mesh 80 um sieve and Mechanical flowmeter (RIGO Type 5571-A)

Bottle Requirements: (2) 1000-ml bottles
(4) 500 ml containers of 95% Ethanol/Alka-Seltzer

Collect 2 separate samples: Sample 1 = 0-15 Meters
Sample 2 = UML

ii. Record the flowmeter dials, and place the net into the water to allow the sample bucket to fill with water. Allow the net to sink to a depth of 15 meters. Draw the net to the surface at a rate of 0.5 meter per second or less and record the final flowmeter dials. Carefully wash all the residual sample clinging to the net into the quick disconnect bucket. Filter as much water as possible. Pour the entire sample into the 80 um sieve and filter further until you have a slurry of sample. Pour the entire sample into the 1000-ml plastic jar and rinse any residual into the jar with wash bottle. Place a quarter tablet of Alka-Seltzer into the jar and wait for zooplankton movement to stop. Add 70% by volume of 95% reagent grade non-denatured ethanol. (More ethanol is better.) Example: 150-ml sample requires 350-ml ethanol. Repeat the procedure for the sample to be collected at the UML depth. Record the UML depth and flowmeter reading on

the chain of custody form.

An "efficiency" reading will be recorded two times per year. This will entail performing a vertical tow with a netless ring and flowmeter at a known depth (Note: a netless ring will be kept in the boat at all times). This will also ensure that the depth being sampled is accurately being sampled by the net tow. Extreme caution should be used for samples collected during conditions of strong winds and high current, to minimize the error in the flowmeter readings and to prevent the net from floating to the surface.

Refer to the flowmeter Standard Operating Procedure (SOP) for flowmeter operation and calibration checks.

Note: The UML composite depth shall be determined by the temperature profile. Should no distinct thermocline be present, use 0, 3, and 6 meters in depth as the UML default.

**8. Phytoplankton**

i. Phytoplankton samples are obtained by OCDWEP for analysis.

| | |
|---|---|
| Equipment Requirements: | (1) 500 ml Bottle<br>Dedicated Carboy<br>3/4” Tygon Tube<br>Secchi Disk<br>YSI Unit |
| Sampling Requirements: | UML Composite |

ii. Record 0.5-meter temperature readings with the YSI unit until the UML is determined. Record a Secchi Disk Reading. The UML composite sample is collected using the tube composite sampler.

iii. Preserve the samples with enough Lugols Solution to turn the sample iodine color (maroon in Color), approximately 5 to 7 mls. per 100-mls of sample.
Note: The UML composite depth shall be determined by the temperature profile. Should no distinct thermocline profile be present, use 0-6 meters in depth as the UML default.

**9. Sulfide**

i. Samples for analysis of sulfide ion content are collected from 12m, 15m, 18m depths only when anoxic conditions are present at these depths. The Wildco Beta sampler is used in order to ensure minimum mixing and air entrainment into the sample.

ii. Samples are poured from the Wildco Beta sampler into a rinsed Boston round clear glass jar (8-oz capacity) with a conical insert screw closure and low-density polyethylene poly-seal liner. Samples are poured down the side of the bottle to minimize turbulence. The bottle is filled to the top and then stopped, being careful not to enclose any air bubbles.

iii. Preservation: 2 ml of Zn acetate is added to the bottle prior to the addition of sample. After sample addition, pH is adjusted to >9 with NaOH, container is topped off with sample to exclude air from the container, then cooled to 4°C.

**10. TKN, $NH_3$-N & TP**

i. Samples are collected in one liter disposable plastic bottles from 0m, 3m, 6m, 9m, 12m, 15m, and 18m depths. Samples are collected via the submersible pump, in a manner consistent with that described above for "conventionals."

ii. Determine $Cl_2$ residual with a LaMotte Test Kit. If $Cl_2$ residual is measured, add 30% Sodium Thiosulfate drop-wise; 1 drop/1 ppm $Cl_2$, then add 1 drop excess.

iii. Preservation: Adjust pH < 2 with $H_2SO_4$, cool to 4°C.

Example: $Cl_2$ measures 2.5 ppm - add 4 drops Sodium Thiosulfate - then $H_2SO_4$ to pH 1.5 - 2.0.

iv. Org-N results are calculated by subtracting the results of analyses of samples for Total Kjeldahl Nitrogen (TKN) and Ammonia Nitrogen ($NH_3$-N).

v. This sample will also be analyzed for Total Phosphorus (TP).

**11. T-Alk**

i. T-Alk samples are to be analyzed for Total Alkalinity as $CaCO_3$.

ii. T-Alk samples are collected as UML and LWL composites as described above for metals samples.

iii. T-Alk samples are poured-off from the churn into a rinsed 500-ml plastic bottle. The bottle is carefully stopped in order to exclude air and then cooled to 4°C.

**12. Fecal Coliform**

i. A Fecal Coliform sample is collected at 0m. Two sterile 125-ml plastic containers will be used.

The first container will be filled from the source (at 0m). The second container (disposable), pre-preserved with Sodium Thiosulfate crystals will be filled from the first container leaving a small airspace to enable the sample to be shaken, and then cooled to 4°C. This is the sample to be delivered to the laboratory for analysis. Samples will be checked for residual chlorine using a LaMotte "DPD Chlorine Test Kit."
***Sample volumes for this parameter are crucial. Fill the bottle to just above the shoulder of the bottle leaving a small (approximately 2.5 cm) airspace to enable sample to be shaken. Do no allow the water to rise above the threads of the bottle. Samples will be analyzed for E. Coli and Fecal Coliform.

**Composite Sample collection:**

The "UML" (Upper Mixed Layer) and "LWL" (Lower Water Layer) composite samples collected during the sampling events will be made by mixing samples from discrete depths according to the following field protocol:

(a) Late fall, winter, and early spring (October 1 - May 31) when the lake waters are not strongly stratified.

i. The default UML during this period of the year is 0, 3, 6-m.

ii. The default LWL during this period of the year is defined as 9, 12, 15, and 18-m.

(b) Summer stratification period (June 1 - September 30)

i. The UML composite shall always include samples collected at 0 and 3-m depths. Inclusion of water collected at 6 m in the composite shall be evaluated based on the temperature profiles measured during the sampling event.

ii. The composite sample of the LWL will typically include water collected at depths of 12, 15, and 18-m during this period. The inclusion of the 12-m depth in the composite of the lower waters should be reviewed during each sampling event. Because the 9-m depth is consistently in the metalimnion (or "transition zone") during this period, water from this depth will not be included in either composite sample.

- The Thermocline is the area at which the temperature gradient is steepest during the summer; usually this gradient must be at least 1°C per meter. A rule of thumb is that the Thermocline exhibits a temperature change of approximately 1°C per meter.

- Record the field YSI profile to define depths of UML, Transition zone, and LWL prior to composite sample collection.

- Once the Thermocline depth is determined, samples are collected as grabs from the discrete sample depths, 0m, 3m, 6m, 9m, 12m, 15m, and 18m depths using a Wildco Beta sampling device. The Thermocline depth should not be included with either composite sample (UML or LWL). The Wildco Beta sampler is rinsed in lake water prior to use in order to ensure cleanliness. Samples are mixed in a churn, which has also been rinsed in lake water. The sample bottle is rinsed with the composite sampler prior to pouring-off from the churn into the sample bottle.

## B. ONONDAGA LAKE TRIBUTARIES

The procedures used for the collection of samples from Onondaga Lake Tributaries are as follows:

1. All tributaries are sampled using the depth-integrated sampling technique, except the

   Allied East Flume, Sawmill Creek and Bloody Brook monitoring stations. For streams with low velocity and depositional conditions, the vertical kemmerer bottle sampler is used (Ley Creek @ Park Street and Harbor Brook @ Hiawatha Boulevard sampling sites) – Refer to Attachment A - Tributary Field Sampling Procedures.

2. The Onondaga Lake Outlet is sampled at depths of 2 feet and 12 feet using the Kemmerer tube-sampling device from mid-channel. The sample for Fecal Coliform will be collected from mid-channel at the surface.

3. All sample bottles are rinsed in sample water prior to filling, and preserved according to the instructions detailed above.

   Depending on the depth of water at each station, a suspended (deep water) or hand-held sampler (wadeable) may be used. The depth-integrated sampling device is designed to accumulate a water-sediment sample from a stream vertical at such a rate that the velocity in the nozzle is nearly identical with the stream velocity. Judgment will be used to select the number and location of transects. The sampling procedures for this monitoring program will follow the protocol outlined in the New York State DEC Division of Water Bureau of Watershed Assessment & Research Program Plan for Rotating Intensive Basin Studies Water Quality Section (1997-1998). Procedures by sampling site are outlined in Attachment A.

   **NOTE: A dedicated dunker with only silicone end seals will be utilized for the trace metals quarterly sampling events.**

### C. RIVER

1. The River samples are collected using a rinsed Wildco Beta sampler at 1 meter below the water surface and 1 meter above the sediment at each of the buoy stations.

2. All sample bottles are rinsed in sample water prior to filling, and preserved according to the instructions detailed above.

## VI. QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

### A. FIELD DUPLICATES

1. One field duplicate will be collected by using a separate sample collected for each parameter analyzed for Onondaga Lake, its tributaries, and the Seneca River. These are collected as separate samples taken from the same site at the same time. These provide a check on sampling equipment and precision techniques.

2. For Onondaga Lake, all field duplicates will be collected at the 6m sampling depth except for F. Coli (0m), and Sulfide (15m).

3. For the Onondaga Lake Tributaries, the sampling site for field duplicate sample collection is rotated for the different sampling events.

4. For the Seneca River, two field duplicates will be collected at Buoy 316 during each sampling event (at the 1-meter below the water surface and 1-meter above the river

sediment depths).

## B. EQUIPMENT RINSEATE BLANKS

1. Equipment rinseate blanks will be collected for the submersible pump and churn used on Onondaga Lake. Blank samples will be collected prior to collecting water quality samples from Onondaga Lake and analyzed for all parameters. This schedule complies with the minimum frequency of one field blank per 20 samples.

2. Equipment rinseate blanks will be collected for the churn and dunker used for the Onondaga Lake Tributaries and analyzed for all parameters. Blank samples will be collected prior to the collection of water quality samples from any of the tributaries. This schedule also complies with the minimum frequency of one field blank per 20 samples.

## C. SAMPLE CONTAINERS:

1. The containers currently used for metals are certified as Class 3000 bottles washed under EPA protocol "C". In addition to receiving a Certificate of Analysis for each bottle lot, all pre-cleaned sample containers will be checked by our laboratory by lot to insure that they are clean. This will be performed by delivering a minimum of (1) one, but as many as five (5), randomly selected containers from each lot received by the OCDWEP Lab. These containers will be empty with an appropriate label, Chain -Of-Custody form and copy of the sample container lot Certificate-Of-Analysis. The laboratory will fill the container with deionized water, preserve the sample with nitric acid and analyze it immediately for total cadmium, chromium, copper, nickel, lead, zinc, arsenic, mercury, manganese, and iron. All results must be less than or equal to the Minimal Reportable Limit (MRL). If the results meet this criteria, the sample containers in the lot will be released for use in AMP sampling events. If results do not meet this criteria, an additional sample container will be checked for each container that failed. If these results meet the criteria, the sample containers in the lot will be released for use in AMP sampling events. If there is a second failure, the sample containers in the lot will not be used for AMP sampling events.

2. Each sampling event (Lake or Tributary), will use containers from one specific lot (i.e., sample containers from different lots will not be mixed during each sampling event). The sample lot # will be recorded on the C-O-C forms for the respective samples), to insure this.

## VII. SAMPLE CUSTODY

### A. FIELD SAMPLE CUSTODY

When samples are delivered to the OCDWEP Laboratory for analysis following sample collection, the original C-O-C forms are submitted to the Laboratory.

For samples sent to a contract laboratory for analysis, three copies of an Engineering and Laboratory Services (ELS) Contract Laboratory C-O-C form will be used. The original C-O-C form will be maintained by the OCDWEP Laboratory, two copies will be shipped to the contract laboratory with the samples, for analysis. The contract laboratory will retain one copy and return a signed copy to the OCDWEP laboratory.

Attachment B is a typical example of a C-OC form. The "Remarks" area is used to record specific considerations associated with sample acquisition such as sample type, container type, sample preservation methods, and analyses to be performed. The original copy of this record follows the samples to the laboratory. The laboratory maintains the completed original and also scans the record into a computer.

### B. LABORATORY SAMPLE CUSTODY

The field team leader notifies the laboratory of upcoming field sampling activities and the subsequent transfer of samples to the laboratory. This notification will include information concerning the number and type of samples to be delivered as well as the anticipated date and time of arrival.

The laboratory sample program meets the following criteria:

1. The laboratory has designated a sample custodian who is responsible for maintaining custody of the samples and for maintaining all associated records documenting that custody.

2. Upon receipt of the samples, the custodian will check the original chain-of-custody documents and compare them with the labeled contents of each sample container for correctness and traceability. The pH of preserved samples is checked at the time of sample receipt. The sample custodian signs the chain-of-custody record and records the date and time received.

3. Care is exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact the field team leader as part of the corrective action process. A qualitative assessment of each sample container is performed to note any anomalies, such as broken or leaking bottles. This assessment is recorded as part of the incoming chain-of-custody procedure.

4. The samples are stored in a secured area at a temperature of approximately 4°C until analyses are to commence.

5. A laboratory chain-of-custody record accompanies the sample or sample fraction through

final analysis for control. These forms are scanned by the lab into the computer (Adobe PDF format) and placed in a centrally located directory.

6. A copy of the chain-of-custody form will accompany the laboratory report and will become a permanent part of the program records.

## C. FINAL EVIDENCE FILES

Final evidence files include all originals of laboratory reports and are maintained under documented control in a secure area.

A sample or an evidence file is under custody if:

- it is in your possession;
- it is in your view, after being in your possession;
- it was in your possession and you placed it in a secure area; and
- It is in a designated secure area.

## VIII. FIELD EQUIPMENT CALIBRATION PROCEDURES/MAINTENANCE

### A. YSI SONDES

1. Calibration procedures for the YSI 600 & 6600, which are used to monitor water quality parameters in Onondaga Lake, are included as Attachments D through F. Calibration data including the date of calibration, the results of calibration, the technician's initials, and the results of the post-use instrument calibration for drift checks are maintained in a bound notebook.

2. The YSI units (sondes) are calibrated no more than 24-hours prior to each day of use. The units and all calibration solutions are allowed to stabilize overnight. Calibration is typically performed in the morning before use. A calibration check is performed after use to ensure that calibration drift is acceptable.

3. Temperature calibration is set by the factory and, reportedly, does not require frequent recalibration.

4. Depth is calibrated in air, just above the water surface, as 0 meters. Depth calibration is verified by taped markings on the sonde data cables.

5. Preventative Maintenance:
   i. Dissolved oxygen membranes are checked and replaced as needed after each use.

   ii. The pH reference probe and the temperature probes are cleaned with alcohol and a cotton swab after each use.

   iii. The pH probe reference solution is replaced once per month. The Teflon septum for the pH probe is replaced when it is needed.

   iv. The sondes are stored clean and dry in a case in order to prevent physical damage.

   v. Watertight connectors are lubricated when necessary in order to ensure a waterproof connection, which will prevent faulty readings.

### B. SECCHI DISK

1. Taped depth markings for the Secchi disk are calibrated annually.

### C. UNDERWATER ILLUMINATION

1. Data on Light attenuation are collected at 20-cm intervals from water surface to the depth at which light is 1% of surface illumination, as noted during the sampling event, using a LiCor datalogger, to provide sufficient detail.

## D. WILDCO BETA SAMPLE TUBES

1. The Wildco Beta sample tubes are cleaned in tap water after each use. Prior to use, the tubes are rinsed in Onondaga Lake water.

2. Depth markings are calibrated annually.

## E. SUBMERSIBLE PUMP

1. The submersible pump is cleaned using tap water after each use. Prior to use, the pump and hoses are rinsed in Onondaga Lake water.

2. Hoses for the submersible pumps are replaced annually or as needed.

3. Depth markings are calibrated annually.

# IX. ANALYTICAL PROCEDURES

## A. INTRODUCTION

Appropriate use of analytical data generated under the great range of analytical conditions encountered in environmental analyses requires reliance on the quality control practices incorporated in the methods and procedures used by the Onondaga County Department of Water Environment Protection Environmental Laboratory (OCDWEP). Attachment C lists the methodologies utilized for the analysis of water quality samples from the Onondaga Lake Monitoring Program. As a participating member of the New York State Department of Health Environmental Laboratory Approval Program (ELAP), this laboratory uses only those methods and equipment certified by NYS to generate data. Inaccuracies can result from many causes, including unanticipated matrix effects, equipment malfunctions, and operator error. Therefore, the QA/QC aspects of this laboratory are indispensable. The data acquired from QA/QC procedures is used to estimate and evaluate the information content of analytical data and to determine the necessity of corrective action procedures. The means used to estimate information content are also an important part of the ELAP program to which we adhere.

This section defines the QA/QC procedures and components that are mandatory in the performance of analysis performed by the OCDWEP laboratory, and indicates the QA/QC information which must be generated with the analytical data.

## B. CHEMICALS AND REAGENTS

### 1. Reagent grade water

1. Reagent grade water in the OCDWEP environmental laboratory consists of DI water purified by means of mixed bed deionization. The processed water is required to attain a minimum resistivity of 10 mSiemen. A final pass through another mixed bed deionization filter at point of use maintains the highest quality possible (18 mS output). Actual Conductivity is determined daily. The date, conductivity @ 25°C, and analyst's initials are recorded in a tabular format in a bound notebook.

2. To monitor the quality of reagent grade water for bacteriological use, the following tests are performed:

**TABLE III - REAGENT GRADE WATER TESTS**

| Parameter | Frequency | Acceptable |
|---|---|---|
| Free Residual Chlorine | Monthly | None acceptable |
| Standard Plate Count | Monthly | <500 colonies/ml |
| Heavy Metals (Pb,Cd,Cu,Cr,Ni,Zn) | Yearly | <0.05 mg/l per metal<br><0.1 mg/l total |
| Suitability Test | Yearly | Ratio between 0.8-3.0 |

**2. Reagents**

Only American Chemical Society (ACS) grade or better chemicals are used. Chemicals are discarded within manufacturer's expiration date or 3 years, whichever comes first. Date of receipt is recorded on each container.

**3. Standard Solutions/Titrants**

Anhydrous reagent chemicals are oven dried @ 100-105°C for at least 2 hours. Standard solutions or titrants not prepared from a primary standard are standardized against a primary standard at the frequency specified by the method or every 6 months if no frequency is specified. Standard solutions or titrants are not kept longer than 1 year. The date prepared and the expiration date appear on the container, along with title of standard or titrant, concentration, and preparer's initials. In a bound notebook, the preparation date, title of solution, concentration, manufacturer and lot number of reagent grade chemical(s) used, quantity prepared, expiration date, preparer's signature and, if appropriate, drying times & temperatures, tare and net weight, citation of preparation of primary standard, standardization titers and calculations are recorded.

**4. Bench or Shelf Reagents**

These are non-standardized solutions prepared by laboratory personnel. All of the pertinent information listed for standard solutions is recorded on both bottle label and in a bound notebook.

## C. MICROBIOLOGY: CHEMICALS AND REAGENTS

**1. Bacteriological Media**

Dehydrated media is discarded within six months when opened and stored in a dessicator, or within manufacturer’s expiration date, if unopened. If opened, each new lot is compared to an existing lot that has been found acceptable. The date, name of media, lot #'s of control and test media, results of comparison, and analyst's initials are recorded in a tabular format in a bound notebook. On each bottle of media, dates of receipt and opening and discard date are recorded. Media is prepared according to method instructions. Sterilized glassware is used in the preparation of media. Date, name of medium, gross, tare, and net weights, volumes used, quantity prepared, pH of finished medium, and preparer's initials are recorded.

**2. Autoclaving**

The appropriate sterilization times @ 121°C and a pressure of 15-pounds per square inch for various materials are determined as follows:

| | |
|---|---|
| Membrane filters and pads | 10 min. |
| Carbohydrate containing media (Lauryl tryptose, BGB broth, etc.) | 15 min. |
| Contaminated material, discarded cultures | 45 min. |
| Membrane filter assemblies (wrapped to include all glass/plastic ware used to filter samples) | 45 min. |
| Dilution water in screw-cap bottles | 30 min. |
| Rinse water (200-1000-ml) | ≥ 30 min. |

**3. Bacti Glassware**

Every batch of glassware is checked after washing for detergent with 4-5 drops of bromthymol blue indicator, added to 4-ml of final rinse water from randomly chosen items of glassware; a neutral indication allows glassware use. The date, description of glassware, indicator reaction and analyst's initials are recorded in a tabular format in a bound notebook.

Each batch of sterilized bacti sample bottles is checked for sterility by aseptically adding 25-ml of tryptic soy broth into a randomly chosen sample bottle. After 24 hrs. of incubation @ 35°C +/- .5°C, the sample is checked for growth. The date, batch identifier, turbidity check, disposition of the batch, and analyst's initials are recorded in tabular form in a bound notebook.

**4. Prepared Media Shelf Life**

The following table indicates the holding times for bacteriological media prepared in advance:

**TABLE IV - HOLDING TIMES BACTERIOLOGICAL MEDIA**

| Medium | Holding Time |
|---|---|
| MF Agar in screw-caps flasks | @ 4°C 96 Hrs. |
| Broth in capped tubes | @ Room Temperature for 3-months |
| Poured agar plates with tight-fitting Covers in sealed plastic bags | 2 Weeks @ 4°C |

**5. Membrane Filter Sterility Blanks**

a. The sterility of each lot number of membranes is verified by checking for growth after 1 membrane is placed in 50-ml of tryptic soy broth for 24 hrs. @ 35°C+/- 0.5°C incubation. The date, lot number, check for turbidity, and analysts initials are recorded.

b. At the beginning and end of each membrane filter series, a sterility check is performed. The date, # of samples analyzed during run, counts for blanks and analyst's initials are recorded in a tabular format in a bound notebook.

**6. Negative and Positive Controls**

a. Prior to the first use of a medium, each prepared, ready-to-use lot of medium and each batch of medium prepared in the laboratory shall be tested. Tests will consist of using at least one pure culture of a known positive reaction and at least one negative culture control, as appropriate to the method.

## D. CALCULATIONS AND CHARTS

### 1. Reference Sample

A chart is constructed as follows:

a. The measured values and dates of analysis of the reference sample are tabulated;

b. When at least 20 reference samples have been tabulated, compute the mean: x;

c. Using the mean, compute the standard deviation (SD), as in the following example using the formula:

$$SD = \sqrt{\frac{\Sigma (x - \overline{x})^2}{N-1}}$$

Where: x = the measured value of an individual reference sample

$\overline{x}$ = the mean of the measured values

$N$ = the number of data points

$(x - \overline{x})^2$ = the sum of the squares of all the differences of the mean and measured values.

Example

| | Date | X | $(X - \bar{X})$ | | $(X - \bar{X})^2$ | |
|---|---|---|---|---|---|---|
| 1. | 4-25-96 | 207 | (207 - 207 = 0) | 0 | (0 x 0 = 0) | 0 |
| 2. | 5-03-96 | 214 | (214 - 207 = +7) | +7 | (7 x 7 = 49) | 49 |
| 3. | 5-10-96 | 200 | (200 - 207 = -7) | -7 | (7 x 7 = 49) | 49 |
| 4. | 5-17-96 | 210 | (210 - 207 = +3) | +3 | (3 x 3 = 9) | 9 |
| 5. | 6-10-96 | 219 | (219 - 207 = +12) | +12 | (12 x 12 = 144) 144 | |
| 6. | 6-10-96 | 190 | (190 - 207 = -17) | -17 | (17 x 17 = 289) 289 | |
| 7. | 6-18-96 | 203 | etc. | -4 | etc. | 16 |
| 8. | 6-27-96 | 210 | " | +3 | " | 9 |
| 9. | 7-03-96 | 204 | " | -3 | " | 9 |
| 10. | 7-11-96 | 207 | " | 0 | “ | 0 |
| 11. | 7-19-96 | 207 | " | 0 | " | 0 |
| 12. | 8-01-96 | 201 | “ | -6 | “ | 36 |
| 13. | 8-10-96 | 204 | “ | -3 | “ | 9 |
| 14. | 8-17-96 | 200 | “ | -7 | “ | 49 |
| 15. | 8-27-96 | 221 | “ | +14 | " | 196 |
| 16. | 9-03-96 | 205 | " | -2 | " | 4 |
| 17. | 9-11-96 | 210 | " | +3 | " | 9 |
| 18. | 9-20-96 | 201 | “ | -6 | “ | 36 |
| 19. | 9-30-96 | 217 | " | +10 | “ | 100 |
| 20. | 10-10-96 | 210 | “ | +3 | “ | 9 |
| N=20 | | Total X = 4140 | | | | = 1022 |

Example

$N = 20$

$\Sigma (X - \bar{X})^2 = 1022$

$SD = \sqrt{(X - \bar{X})^2 / N\text{-}1}$

$SD = \sqrt{1022 / 19}$

SD= 7.33

**2. Determine the warning limits**

Determine the warning limits (WL), and the control limits (CL) as in the following example using the formulas:

$WL = \bar{X} \pm 2SD$

$CL = \bar{X} \pm 3SD$

Where $\bar{X}$ = the previously computed mean

SD = the standard deviation

WL = 207± (2 x 7.33)

The warning limits (WL) in the example, are 221.66 for the upper warning limit and 192.34 for the lower warning limit.

CL = 207± (3 x 7.33)

The control limits (CL) in the example are 228.99 for the upper control limit and 185.01 for the lower control limit.

### **3. Construct a control chart**

Construct a control chart as done below for the example. The measured values of the reference samples are then plotted in the chart.


### **4. Percent Recovery**

The percent recovery, P is calculated as follows:

P = 100 (M - B)/T

Where: T = the target value, i.e. the known concentration of analyte spiked into the sample aliquot.

M = the measured concentration of analyte in the spiked sample aliquot.

B = the background concentration of the unspiked sample aliquot.

The percent recovery data are used to construct a control chart with control limits with acceptance limits as follows:

a. The percent recoveries and analysis dates of the spiked samples are tabulated.

b. When a minimum of five percent recoveries have been tabulated, compute P (the mean percent recovery).

c. Compute SD, the standard deviation (see section on reference standard for example).

**5. Surrogate Standard**

The percent recovery, P, is calculated as follows:

$P = 100\ (M/T)$

Where: $M$ = the measured value

$T$ = the target value, (i.e. the known value of surrogate spiked into the sample)

A tabulation of percent recoveries is maintained for each surrogate. The tabulation includes the analysis date, the percent recovery and the control limits for P. Control limits, using a minimum of 5 data points for each surrogate standard are calculated as follows:

$CL = X \pm 3SD$

Where: $CL$ = the control limits

$X$ = the mean percent recovery

$SD$ = the standard deviation (see section on reference standard for example)

Compute WL, the warning limits, and CL, the control limits as follows:

$WL = X \pm 2SD$

$CL = X \pm 3SD$

The computed limits are recorded on the tabulation or control chart.

**6. Duplicate Analysis**

The difference (i.e. range) between duplicate analyses is determined as follows:

$R$ = the difference (or range)

$X_1$ = the greater of the measured values

$X_2$ = the lower of the measured values

A tabulation of duplicates is maintained for each analyte listing dates of analysis, $X_1$, $X_2$, R, and the acceptance limit for R. The acceptance limit is established using the following equation:

$UCL = 3.27\ R$

Where: $UCL$ = the acceptance limit

$R$ = the average range for a minimum of 5 sets of duplicates in a specified concentration range.

## X. LABORATORY CALIBRATION/EQUIPMENT MAINTENANCE PROCEDURES

### A. LABORATORY EQUIPMENT

**1. Analytical Balance**

a. Analytical balances are serviced and calibrated internally by a qualified service organization 1/year and a dated certification sticker is provided.

b. Analytical balances are checked daily in two ranges with Class S weights. The ranges selected reflect the routine use of the balance. For example, the analytical balance used principally for evaporating dishes and aluminum dishes would need Class S weights having target values of bracketing the expected weights of the dishes. The date, target reading, actual reading, and analyst's initials are recorded in a bound notebook.

**2. pH meter**

pH meters are calibrated daily using standard buffers and a two point calibration. This consists of creating a slope using standard pH buffers of pH 4.0 and 10.0. The slope is then checked using a standard buffer of pH 7.0, with an acceptable reading of + /- 0.05 pH units. The date, pH buffer target values, set points, actual readings, and analyst's initials are recorded in a tabular format in a bound notebook.

**3. Conductivity meter and cell**

a. The conductivity cell constant is determined annually using a 0.01-M potassium chloride solution. The date, resistance readings, average resistance, temperature, calculations, and analyst's initials are recorded in a bound notebook.

b. The conductivity meter and cell is calibrated daily with a 0.001 M potassium chloride solution. An acceptable reading is +/- 20% of target value. The date, target value, actual reading, temperature, and analyst's initials are recorded in a tabular format in a bound notebook.

**4. Dissolved Oxygen Meter**

The dissolved oxygen meter and probe is calibrated daily using air calibration. The calibration is checked against the Winkler method. This consists of filling two bottles with aerated distilled water; checking the DO value of each bottle using the calibrated DO meter, and then determining the DO value of each bottle using the Winkler method. The DO values of the two methods are then compared. The dates, titers, DO values, average DO, and analyst's initials are recorded in a tabular format in a bound notebook.

**5. Turbidimeters**

The turbidimeter is calibrated per manufacturer's recommendation using a certified secondary gelex standard with each use. The date, target and observed values, and the analyst's initials are recorded in a tabular format in a bound notebook.

**6. Thermometers**

a. The OCDWEP environmental laboratory possesses an NIST (National Institute of Standardized Temperature) traceable, factory-certified thermometer, which is checked at the various temperatures required by a variety of analytical requirements. Correction factors and adjustments to correction factors, new correction factors and analysts initials are recorded in a tabular format in a bound notebook.

b. Each working thermometer has a dedicated use, and is calibrated annually at the temperature of interest using the NBS thermometer. The date, thermometer designation, calibration temperature, correction factor, and the analyst's initials are recorded in a bound notebook.

**7. Refrigerators**

Laboratory refrigerators maintain a temperature of 1° to 5°C. These temperatures are checked once daily. An NIST certified thermometer with 1°C graduations is used. The date, times, temperature readings and analyst's initials are recorded in tabular format in a bound notebook.

**8. BOD Incubator**

The BOD Incubator maintains a temperature of 20°, +/- 1°C. Temperature readings are taken twice a day. This thermometer has graduations of 0.2°C. The same data is recorded as for refrigerators.

**9. Bacteriological Incubators**

a. The air bath incubators maintain a temperature of 35°+/- 0.5°C. A thermometer with graduations of 0.1°C is used. Temperatures are taken twice a day and the same data is recorded.

b. The water bath incubator maintains a temperature of 44.5°+/- 0.2°C. A thermometer with graduations of 0.1°C is used. The same temperature reading schedule and data recording is used as for the air bath incubator.

**10. Ovens**

Ovens are maintained at the target temperature of interest during use. Temperatures are checked at the beginning and end of each use. A dedicated thermometer with graduations of 1°C is used. The date, target temperature, time and temperature at the start and end of each cycle, oven use, and analysts initials are recorded in a tabular format in a bound format.

**11. Autoclave**

Autoclave maintains sterilization temperature and pressure during the sterilization cycle and completes the entire cycle within 45 minutes when a 10-12 min. sterilization period is used. A separate calibrated thermometer is used in combination with a sterilization indicator. The date, time material is placed in autoclave, time of sterilization period, time material was removed, description of sterilized material and analyst's initials are recorded.

**12. Automated Ion Analyzer**

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

**13. Atomic Absorption Spectrophotometer**

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

**14. Inductively Coupled Plasma (ICP) Spectrophotometer**

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

**15. TOC Analyzer**

For instruments at this level of sophistication, the procedures for ensuring correct analytical results are too lengthy for this manual, and the USEPA/ELAP instructions should be followed for specific information. Good general laboratory procedures (GLP) are followed in the daily operation of this instrument; including, but not limited to:

a. Daily calibration for each analyte of interest.

b. Instrument blank for each analyte.

c. Method blank, duplicates, spikes, reference, and check standards are utilized daily for each analyte.

## B. LABORATORY QUALITY CONTROL DOCUMENTATION REQUIREMENTS

### 1. Standard Curves

Standard curves are prepared as specified in QA/QC manuals. All standard curves are dated and labeled with method, analyte, standard concentrations, and instrument responses.

A best-fit, straight line is drawn on graphed curves: the axis is labeled. The correlation coefficient is calculated. An acceptable correlation coefficient is 0.995 or greater.

Instrument response for samples is less than the highest standard. The lowest standard is near the detection limit.

If a specific method does not provide guidance in the preparation of a standard curve, the following guidelines are followed. For manual colorimetric methods, a blank and five standards that lie on the linear portion of the curve are used. A new curve is prepared each time an analysis is run. At each use, the curve is checked with a blank and a high standard. The high standard selected is greater than the expected sample concentrations. For automated colorimetric methods, a blank and a minimum of five standards are used. A new curve is prepared for each run. Instrument response is checked with a QC reference sample after each 10 samples. Low level standards are freshly prepared for each run.

### 2. Method Blank

A method blank consists of laboratory-pure water, which is processed and analyzed as if it were a sample. A method blank is run daily or with each batch of samples. Samples are related to the method blank by means of a date or batch identifier. Where applicable, the blank is calculated as a sample and a tabulation of blank results for each analyte with the date run and its appropriate acceptance criteria is maintained. Acceptance criteria for a method blank is a result less than the MRL only.

### 3. Instrument Blank

An instrument blank consists of laboratory water, which is analyzed without adding reagents, filtering, etc. It is used for instrument set-up and no readings are recorded.

### 4. Trip Blank - Special

Trip blanks are required when analyzing volatile compounds in water. A trip blank is a sample of laboratory-pure water contained in a sample bottle appropriate to the analyte to be determined.

Trip blanks are present but unopened at the sampling site and shipped to the laboratory with the environmental samples taken. A trip blank is included with samples collected at each sampling site. The trip blank is analyzed only when samples from a specific sampling site are positive for the analyte of interest. If reportable levels of the analyses of interest are demonstrated to have contaminated the field blank, resampling is required.

**5. Reference Sample**

A reference sample is prepared by spiking a known amount of analyte into an appropriate solvent. The concentrate or quality control sample is preferably obtained from an external source. When necessary, a sample prepared in-house is prepared independently of the calibration standard. A reference sample is analyzed with every tenth sample or monthly samples if fewer than ten samples per month are analyzed. Environmental samples are tied to the reference standard by means of a date or batch identifier.

Data generated by the analysis of reference standard are used to construct a control chart and control limits established. Instructions for constructing a control chart and computing limits are to be found later in this section.

Should a result fall outside the control limits, the analysis is out of control and immediate action is taken to determine the cause of the outlying result. Data generated on the same day as the outlying result are regarded as unreliable and the analyses repeated after corrective action has been taken and the procedure is back in control.

A new control chart with freshly computed control limits is generated annually. The last 20 reference standard data points for the previous year are used to compute the new control limits.

**6. Spiked Recovery**

Spiked recovery for an environmental sample is determined by dividing the sample into two aliquots. The first aliquot is analyzed as usual. The second aliquot is spiked with a known concentration of the analyte of interest. The spike should be approximately 10 times the method's standard deviation (at the level of interest). A spiked environmental sample is analyzed when appropriate at a frequency of 1 spiked sample for every 20 samples or 1 spiked sample per month if fewer than 20 samples per month are analyzed. Samples are related to the spiked recovery date by means of a date or batch identifier.

Data generated by the analysis of spiked samples are used to calculate the percent recovery. The percent recovery data is used to construct a control chart and tabulation and limits established. Instructions for constructing a chart or tabulation and computing limits are to be found later in this section.

A new control chart of tabulation, the analysis is regarded as out of control and immediate action is taken to determine the cause of the outlying result. Data generated on the same day as the outlying result are regarded as unreliable and the analysis repeated after corrective action has been taken and the procedure is back in control. A new control chart or tabulation with freshly computed limits is generated annually. The last 20 data points for the previous year are used to compute the new limits.

**7. Duplicate Analysis**

A duplicate analysis is required only when a sample yields a positive result. A minimum of 10 percent of all positive samples for a given analyte is analyzed in duplicate. The range between the duplicates is tabulated and acceptance limits established. Instructions for the tabulation and the computation of limits are to be found later in this section.

A new tabulation with a freshly computed acceptance limit is generated annually. The last 20 data points for the previous year are used to compute the acceptable control limits.

**8. External QA/QC**

In as much as the OCDWEP laboratory is a NYSDOH-ELAP certified laboratory, it is also National Environmental Laboratory Accreditation Conference (NELAC) certified, and is obligated to follow all of the criteria for maintaining this certification under the auspices of the ELAP program. Part of this program consists of a biannual inspection by a NYS Laboratory Inspector, who spends one or more days at each facility checking all aspects of the operation. In addition, performance evaluations are conducted twice per year. This consists of unknown samples sent to the laboratory to be analyzed and the results reported back to ELAP. The laboratory is required to submit results for each parameter that we are certified for, including bacteriology, metals, nutrients, etc.

The USEPA also uses the results from this program to satisfy the requirements of the SPDES permit program that regulates the various wastewater treatment plants in the OCDWEP system.

**9. Internal QA/QC**

In addition to the above, the OCDWEP laboratory conducts an internal QA/QC program consisting of unknowns that are generated periodically by the OCDWEP staff and given to technicians as “typical” samples, occurring without the analysts' knowledge. The object of this is to ensure that “typical” samples are analyzed using the same care as the “official” samples.

## C. LABORATORY QUALITY CONTROL REQUIRED - BY PARAMETER

| **Inorganic Analytes** | | |
|---|---|---|
| **Sub-Category or Analytical Group** | **QC Measure Record Acquired** | **Frequency** |
| **Demand/Residue** | | |
| BOD | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| COD and TOC | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 20th sample or monthly if less than 20 samples per month are analyzed. |
| | Duplicates Tabulation* Of all positive samples | On positive samples only, a minimum of 10% of all samples. |
| **Mineral** | | |
| Alkalinity and Hardness | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| All other analyses except pH | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 20th sample or monthly if less than 20 samples per month are analyzed. |
| | Duplicates Tabulation* | On positive samples only, a minimum of 10% of all samples. |

| Sub-Category or Analytical Group | QC Measure Record Acquired | Frequency |
|---|---|---|
| **Nutrient** | | |
| All nutrient analyses | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 20th sample or monthly if less than 20 samples per month are analyzed. |
| | Duplicates Tabulation* | On positive samples only, a minimum of 10% of all samples. |
| **Wastewater Metals** | | |
| ICP (same as Flame) | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Duplicates Tabulation* | On positive samples only, a minimum of 10% of all samples. |
| Flame or Colorimetric Method | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Duplicates Tabulation* | On positive samples only, a minimum of 10% of all samples. |
| Furnace Method | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Post only if Dupes are ±15%. |
| | Duplicates Tabulation* | Double matrix spiked every 10th sample. |
| Mercury (FIMS) | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Post only if Dupes are ±15%. |
| | Duplicates Tabulation* | Double matrix spiked every 10th sample. |

| Sub-Category or Analytical Group | QC Measure Record Acquired | Frequency |
|---|---|---|
| **Miscellaneous Analytes** | | |
| Oil & Grease | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| Cyanide, Phenols, and Silica | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 20th sample or monthly if less than 20 samples per month are analyzed. |
| | Duplicates Tabulation* | On positive samples only, a minimum of 10% of all samples. |
| **Organic Analytes** | | |
| **Organic Purgeables** | | |
| Priority Pollutants by GC | Laboratory Blank Tabulation* | Daily or with each batch run. |
| | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Surrogate Standard Tabulation* | All samples. |
| **Organic Extractables** | | |
| Priority Pollutants and Pesticides by GC | Laboratory Blank Tabulation* | Daily or with each batch run. |
| | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |

| **Sub-Category or Analytical Group** | **QC Measure Record Acquired** | **Frequency** |
|---|---|---|
| | | |
| | Spiked Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Surrogate Standard Tabulation* | All samples. |
| **Solid Waste Metals** | | |
| All Methods | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Duplicates Tabulation* | On positive samples only, a minimum of 10% of all samples. |
| **All Other Analytes** | | |
| Inorganic | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Spiked Sample Chart* | Every 20th sample or monthly if less than 20 samples per month are analyzed. |
| | Duplicates Tabulation* | On positive samples only, a minimum of 10% of all samples. |

| Sub-Category or Analytical Group | QC Measure Record Acquired | Frequency |
|---|---|---|
| **All Other Analytes** | | |
| Organic | Laboratory Blank Tabulation* | Daily or with each batch run. |
| | Duplicates Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Reference Sample Chart* | Every 10th sample or monthly if less than 10 samples per month are analyzed. |
| | Matrix Check | Daily or with each batch run. |

## XI. PROGRAM ASSESSMENTS

OCDWEP has designed several means of assessing whether the goals of the data acquisition program are being met. Both the field and laboratory components of the Ambient Monitoring Program will be assessed on an ongoing basis, with formal checkpoints each month.

The program team reviews the workplan with key field and laboratory personnel. An annual calendar is put together, noting field sampling days. Weekly coordination meetings are held with field and laboratory personnel in attendance. Any significant activities or problems identified in either the field or laboratory component of the program are discussed. A formal list of action items is kept from these weekly meetings.

Data are received from the laboratory on a monthly basis and are reviewed. Charge balances (summing the milliequivalent of the major anions and cations) of the inorganic data are performed to screen for data quality. Relative percent difference between field replicates is calculated.

A field audit will be conducted during the Year 2007 monitoring season. Members of the project team will accompany the field sampling team and observe sample collection and field data acquisition. A formal report of the field assessment will be maintained in the OCDWEP lake files. A laboratory audit will also be scheduled. The procedures for sample handling and analysis will be evaluated whether the criteria defined in the workplan are being consistently implemented.

## XII. DATA QUALITY ASSESSMENT

Choices made in design of the sampling program (spatial and temporal), field sampling procedures, laboratory procedures, and data evaluation and interpretation can greatly influence the ability to draw conclusions. In this section, we describe the quantitative and qualitative decisions made to ensure that the data quality is adequate to meet the needs of this program. Data quality will be assessed using EPA's 40 CFR 30.503 standard criteria; precision, accuracy, representativeness, completeness, and comparability. In addition, a field audit will be performed to assess field procedures and sample handling. QA/QC methods for field and analytical procedures are those mandated by the New York State Department of Health Environmental Laboratory Approval Program (ELAP).

### A. PRECISION

The plan to monitor and control the precision and accuracy of analytical measurements is described in the section on analytical procedures. Precision of field samples will be assessed through a program of field replicate analyses: one replicate per sample delivery group, or twenty samples. For routine lake and tributary monitoring, one sampling depth (lake) and station (tributary) will be sampled in duplicate for the complete suite of parameters.

### B. ACCURACY

Accuracy, or how close the reported concentrations of concern are to “true” values, can be difficult to assess. The laboratory analytical program describes how this data quality indicator is monitored through a program of audit samples. A second approach Onondaga County has implemented is a validation program, using an outside expert in limnology and statistics to audit the results. The data validation program cannot be a final arbiter of what values in a data set are true, but it can help test for outliers and systematic differences between researchers that warrant further investigation. In addition, ELAP Laboratories require proficiency samples.

### C. REPRESENTATIVENESS

Representativeness refers to the degree to which the samples acquired reflect the nature of the underlying population. Any monitoring program relies on the results of a limited number of samples drawn from a much larger underlying population to provide information regarding the nature of that larger population. The sampling program described in this document has been designed to accommodate the known temporal and spatial variability of the lake and its tributaries. Onondaga Lakes undergoes thermal stratification.

This requires both temporal and spatial adjustments to the annual monitoring program. Water quality analyses and data manipulation reflects the nature of the lake's stratification. Samples are taken at 3m intervals that span the thermal regime. Upper Mixed Layer (UML) results are separated from the Lower Water Layer (LWL) results in the calculations of annual and growing season (5/15 - 9/15) means and medians. Trends in concentrations during both the mixed and stratified periods are calculated. The primary sampling station in the Year 2007 Monitoring Program is a point in the southern lake basin (South deep). This station has been sampled throughout the 36 years of lake monitoring. Four times each year, Onondaga County monitors a second station (designated North Deep) to determine whether water quality results differ. Tributary monitoring is on a bi-weekly basis. Judgment will be used to select the number and location of transects to collect water samples in the tributaries. Samples of the Lake Outlet are obtained at 2-feet and 12-feet depths to accommodate the density stratification that has been documented to occur in the Seneca River under low-flow conditions.

## D. COMPARABILITY

Documentation of procedures and results of the monitoring program have been maintained by OCDWEP since 1968. Our goal is for data generated during the Year 2007 program to be comparable to the historical data. To meet this goal, we are committed to fully documenting the sampling and analytical procedures used, including any special modifications necessary to maximize precision, accuracy, or sensitivity in the lake water matrix.

## E. COMPLETENESS

We are fortunate to have an extensive database of Onondaga Lake water quality to provide guidance regarding optimal sampling design with respect to variability of the measured parameters. An analysis of the reduction on the coefficient of variation achieved by different sampling strategies for the lake indicates that a monthly sampling program is adequate for most parameters (Walker 1992). Other parameters associated with short-term fluctuations in algal populations such as Chlorophyll-*a* require more frequent (weekly) monitoring from May through September.

Non-parametric statistics has been selected to indicate trends in water quality over time. The seasonal Kendall test allows us to differentiate seasonal variations within years from changes between years. The non-parametric statistics will maintain their power even with occasional missing values. Our goal for Year 2007 is to complete and validate 100% of the planned samples.

## F. FIELD AUDIT

A technical advisor, to assess the field procedures and sample handling will perform an annual field audit. The audit findings and recommendations will be forwarded to the NYSDEC and also included in the annual monitoring report.

## G. EQUIPMENT RINSATE BLANKS

Wildco Beta Dunker, Churn, and Pump QA/QC equipment rinsate blanks will be collected for each of the AMP sampling events, as appropriate.

## XIII. DATA REVIEW AND VALIDATION

Data will be screened for both technical defensibility (were procedures followed, were the laboratory control limits for precision and accuracy observed and usability, are the sample results sufficient to allow inferences regarding the nature of the underlying population?). Both of these criteria are important to meet the objectives of the lake-monitoring program.

Technical defensibility includes evaluation of the following:

a. Internal laboratory quality control: blanks, spikes, replicates, and standard curves;

b. Chain-of-custody complete; and

c. Holding times for all parameters met in accordance with analytical method.

Data usability includes evaluation of the following:

a. Charge balance of major anions and cations;

b. Results of field replicates; and

c. Statistical evaluation of outliers.

## XIV. DOCUMENTATION

### A. FIELD AND LABORATORY DATA

Field and laboratory data are stored both on the Laboratory Information Management System (LIMS) and on paper copy to be filed at OCDWEP. Data may be retrieved at any time from either of these sources.

### B. LABORATORY REPORTS

Samples are delivered to the laboratory along with chain of custody forms on the date of sampling. YSI sondes' field data are delivered to the laboratory by the next day. Laboratory reports are finalized and delivered to the program manager and field supervisor within 30 days of the sample date.

### C. PRELIMINARY DATA VALIDATION

Preliminary data validation is performed within 30 days of receipt of final laboratory data.

### D. TREND ANALYSIS

Statistical trend analysis of the data will be performed. The non-parametric seasonal Kendall test will be performed on the lake and tributary data to test for long-term trends and changes in lake water quality in response to the major reductions in external loading.

### E. ANNUAL TRIBUTARY LOADS

The flow-weighted concentrations of the constituents will be summarized. Dr. Walker's refined program used to estimate loading to Onondaga Lake will be used. The improved estimation technique, called "Method 5", was developed in conjunction with the compilation of the OCDWEP long-term integrated water quality data base and supporting software. The new technique was developed to support estimation of daily loads, to support development of monthly and seasonal lake mass balances, and to improve the accuracy and precision of the annual load estimates. Method 5 differs from AUTOFLUX Method 2 in several ways. Data are stratified by flow regime (similar to AUTOFLUX Method 2) and are also stratified by season using a multiple regression technique. Conditions during the unmonitored period are projected using a residual interpolation method that includes a flow derivative term.

### F. ANNUAL REPORT

At the end of the monitoring year, data are compiled and manipulated into a report of analyses computation and evaluation of the ambient monitoring program.

## XV. QAPP – SUMMARY OF REVISIONS

1. Page 9 & 10: Update of Appendix A (Year April 2007-March 2008 Non-Event Based Water Quality Sampling Schedule).
2. Page 11: Data Summaries – Deleted calculations of the lake volume averaged data summary.
3. Page 14: Table 1 (Sample Collection and Preservation) – Deleted parameter Enterococci.
4. Page 23: No storm-event program in 2007.
5. Page 24: Deleted reference to equipment rinseate blanks for the storm event monitoring program.
6. Page 50: Section XI (Program Assessments) – Changed monthly coordination meetings to weekly.
7. Page 75: Attachment C (Analytical Methodologies List) - Updated to reflect 2006 Minimal Reporting Limit (MRL), accuracy, and precision values.

# Attachments

# ATTACHMENT A:

# Tributary Field Sampling Procedures

**1. Ninemile Creek Rt. 48 Bridge Sampling Procedures**

| | |
|---|---|
| Equipment Requirements: | Bridge Crane and Bomb Sampler |
| | Sample Compositing Churn |
| | Coli Sampler |
| | In-situ parameters - See YSI Standard Operating Procedure (SOP). |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals) |
| | (1) ½-gallon plastic (t-Cn) |
| | (1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP) |
| | (1) ½-gallon plastic (conv) |
| | (1) 500-ml boston round plastic (t-alk) |
| | (2) 125-ml sterile plastic (coli) |
| | (2) 250-ml round plastic (srp/tdp) |

Step 1: Divide the stream into 5 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 5 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage reading on the Chain-of-Custody and record all field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

**2. Onondaga Creek at Dorwin Avenue Sampling Procedures**

| | |
|---|---|
| Equipment Requirements: | Bridge Crane and Bomb Sampler<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Divide the stream into 5 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 5 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage readings on the Chain-of-Custody and record field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

**3. Onondaga Creek at Spencer Street Sampling Procedures**

| | |
|---|---|
| Equipment Requirements: | Bridge Crane and Bomb Sampler<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk) |

Step 1: Divide the stream into 5 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 5 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

## 4. Onondaga Creek at Kirkpatrick Street Sampling Procedures

| | |
|---|---|
| Equipment Requirements: | Bridge Crane and Bomb Sampler<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Divide the stream into 5 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 5 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage readings on the Chain-of-Custody and record field observations on the field sheets.

**5. Harbor Brook at Velasko Road Sampling Procedures**

| | |
|---|---|
| Equipment Requirements: | Hand Held Depth Integrated Sampler<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Divide the stream into 3 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and orient the nozzle to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 3 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets.

**6. Harbor Brook at Hiawatha Boulevard Sampling Procedure**

| | |
|---|---|
| Equipment Requirements: | Vertical Kemmerer Bottle Sampler<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Divide the stream into 3 equal transects.

Step 2: Set the sampler and lower the sampler into the water until fully submerged.

Step 3: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with water samples.

Step 4: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 5: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 6: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 7: Place samples on ice.

Step 8: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 9: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

**7. Ley Creek at Park Street Sampling Procedure**

| | |
|---|---|
| Equipment Requirements: | Vertical Kemmerer Bottle Sampler<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Divide the stream into 3 equal transects.

Step 2: Set the sampler and lower the sampler into the water until fully submerged.

Step 3: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with water samples.

Step 4: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 5: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 6: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 7: Place samples on ice.

Step 8: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 9: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets. Should the gage house not be accessible, provisional readings may be taken from the USGS Internet site.

**8. Tributary 5A Sampling Procedures**

| | |
|---|---|
| Equipment Requirements: | Hand Held Depth Integrated Sampler<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Divide the stream into 3 equal transects.

Step 2: Locate the area in the stream with the highest velocity.

Step 3: Lower the sampler to the water surface and allow the sampler to orient to the stream flow direction. Lower and raise the sampler at a rate of 1 foot per second. Record the number of repetitions (Dips) to fill 75% of the sample bottle. Be careful not to disturb the stream bottom.

Step 4: Pour the water sample into the churn and rinse out the churn thoroughly.

Step 5: Perform the same number of trips and dips at all 3 transect locations. Record the number of trips that will be needed to collect sufficient sample volume and the amount of water needed to keep the churn wet.

Step 6: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 7: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 8: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 9: Place samples on ice.

Step 10: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 11: Record sample information on the Chain-of-Custody and record field observations on the field sheets.

**9. East Flume Sampling Procedure**

| | |
|---|---|
| Equipment Requirements: | 1-Quart glass jar<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Use a 1-Qt. glass jar at the V-notch weir, collect samples off the downside of the weir.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12 (1-qt) grab samples.

Step 3: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI. Place sonde just behind v-notch weir.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheets.

**10. Metro Effluent Sampling Procedure**

| | |
|---|---|
| Equipment Requirements: | 1-Quart glass grab jar<br>Sample Compositing Churn<br>Coli Sampler<br>Bucket (for sonde use) |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Use a 1-Qt. glass jar in a grab polyethylene sampling apparatus on a rope. Collect sample from the Final Effluent (IC#789) Grab location.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12 (1-qt.) grab samples.

Step 3: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI. Place sonde in a sample bucket/sample compositing churn.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheets.

## 11. Lake Outlet Sampling Procedure

Equipment Requirements:
- Vertical Kemmerer Bottle Sampler (Dunker)
- Coli Sampler
- Sample Compositing Churn
- In-situ parameters - See - YSI SOP

Bottle Requirements:

| **Lake Outlet 2-ft.** | **Lake Outlet 12-ft.** |
|---|---|
| (1) 1-L plastic pre-cleaned (metals) | (1) 1-L plastic pre-cleaned (metals) |
| (1) 500-ml boston round plastic (t-alk) | (1) 500-ml boston rnd. plastic (t-alk) |
| (1) 125-ml plastic (coli) | (1) ½-gallon plastic (t-Cn) |
| (2) 250-ml round plastic (srp/tdp) | (2) 250-ml round plastic (srp/tdp) |
| (1) ½-gallon plastic (t-Cn) | (1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP) |
| (1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP) | |
| (1) 2 liter amber bottle (Chlorophyll-*a*) | (1) 2 liter amber bottle (Chlorophyll-*a*) |

Step 1: Locate the sampling location at mid-channel.

Step 2: Collect one sample from the required sampling depth to rinse the churn.

Step 3: Collect three samples at a depth of 2 feet and deposit the samples in the Churn.

Step 4: Fill the required bottles from the Churn.

Step 5: Repeat steps 2, 3 and 4 for the 12-foot sample. If a field duplicate is required at either location, collect that sample using the same protocol. Rinse the Churn with water from the corresponding depth prior to sampling.

Step 6: Preserve the samples as per Section IV (Table 1-Sample Collection and Preservation).

Step 7: Place the samples on ice.

Step 8: Collect field data with the YSI. The sonde should be placed at mid-channel. In-situ data will be recorded at .5 meter increments and at .6 m and 3.7 m.

Step 9: Record sample information on Section IV (Table 1-Sample Collection and Preservation) and record all field observations on the field sheets.

NOTE: The sampling site has been moved to the downstream site of the one-lane pedestrian bridge.

**12. Metro Bypass Sampling Procedure**

| | |
|---|---|
| Equipment Requirements: | 1-Quart glass grab jar<br>Sample Compositing Churn<br>Coli Sampler |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Use a 1-Qt. glass jar in a grab can on a rope. Collect samples from the Metro Bypass sampling location and pour into a dedicated carboy.

Step 2: Ensure sample is completely mixed prior to pouring sample from the carboy into the sample containers.

Step 3: The Field Sheet will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI. Place sonde in a sample bucket.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheets.

**13. Bloody Brook at Onondaga Lake Parkway Sampling Procedure**

| | |
|---|---|
| Equipment Requirements: | 1-Quart glass jar<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Use a 1 Qt. glass jar in a grab can on a rope. Collect sample from the Blood Brook Creek bridge grab location.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12-15 (1qt.) grab samples.

Step 3: Fill the required bottles from the churn. The Chain-of-Custody form will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Chain-of-Custody and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI.

Step 8: Record sample information on the Chain-of-Custody and record field observations on the field sheet. Record the USGS Staff Gage Reading.

**14. Sawmill Creek at Onondaga Lake Recreational Path Sampling Procedure**

| | |
|---|---|
| Equipment Requirements: | 1-Quart glass jar<br>Sample Compositing Churn<br>Coli Sampler<br>In-situ parameters - See YSI SOP |
| Bottle Requirements: | (1) 1-L plastic pre-cleaned (metals)<br>(1) ½-gallon plastic (t-Cn)<br>(1) 1-L white plastic pre-cleaned (TKN, $NH_3$-N, TP)<br>(1) ½-gallon plastic (conv)<br>(1) 500-ml boston round plastic (t-alk)<br>(2) 125-ml sterile plastic (coli)<br>(2) 250-ml round plastic (srp/tdp) |

Step 1: Use a 1-Qt. glass jar at the downstream side of the Path, dip jar into stream flow as near to center of stream as possible, to collect samples.

Step 2: Pour the water sample into the churn and rinse out the churn thoroughly. Fill the churn with 12 (1-qt) grab samples.

Step 3: Fill the required bottles from the Churn. The Field Sheet will specify what bottles need to be filled for that event.

Step 4: Collect a Coliform sample as per the Coliform Sampling Procedure.

Step 5: Preserve samples as per Section IV (Table 1-Sample Collection and Preservation) and check samples for the appropriate pH.

Step 6: Place samples on ice.

Step 7: Collect field data with the YSI. Place sonde at mid-channel and mid-depth.

Step 8: Record sample information and USGS stage gage reading on the Chain-of-Custody and record field observations on the field sheets.

## 15. Onondaga Creek Salt Spring (Spence-Patrick Spring Well Point) Sampling Procedure

Location: East Side of Onondaga Creek between Spencer and Kirkpatrick Streets

Equipment Requirements:
- Gallon jug deionized water
- Sample Compositing Carboy
- Portable Pump with NiCd Battery
- In-situ parameters - See YSI 600 SOP

Bottle Requirements:
- (1) 1 L plastic pre-cleaned (metals)
- (1) gallon plastic (conv)
- (1) 500ml boston round plastic (t-alk)

Step 1: Unhook the sampling tube attached to the tree located at the sampling site. The sampling site is along the bank between Spencer St. and Kirkpatrick St. (that is, the right bank of Onondaga Creek if facing in the direction of Onondaga Lake). Place the sampling tube in the one gallon jug of deionized water.

Step 2: Turn the pump to reverse. Pump the deionized water into the sampling line and discard the rinse water.

Step 3: Turn the dial to pump “forward”. Pump the sample water into a carboy to composite.

Step 4: Be sure to pump up enough volume to fill the sample containers and to get an in-situ YSI reading. The YSI probes need to be covered completely to get an accurate reading.

Step 5: Swirl the carboy and pour off the sample containers.

Step 6: Preserve samples as per Section IV (Table 2 – Sample Collection and Preservation and check the samples for the appropriate pH.

Step 7: Place samples on ice.

Step 8: Collect field data with the YSI 600. The YSI can be placed in the sampling carboy provided all the sample containers have been filled.

Step 9: Record sample information on the Chain of Custody and record field observations on the field sheet.

# ATTACHMENT B:

## Chain-Of-Custody Form (Example)

# CHAIN OF CUSTODY RECORD

**SAMPLE#**

| ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION<br>Engineering and Laboratory Services Division<br>(Revision: JUNE 2006– COC_62006Dbaseportraitmod.DOC ) | Project Name | |
|---|---|---|
| | IC/FC # | |
| | Sewer#/WCode | |
| **Origin of Sample (i.e., Name of Industry, Treatment Plant, Hauler, etc.)** | Invoice # | |
| | DEC Permit | |
| | Req by: | |

| CATEGORY: | AMP | IND | TP | WHC | SPECIAL | QA/QC |
|---|---|---|---|---|---|---|

**CONTRACT LABORATORY List Name:**

| Start Date | End Date | P'UP Date | Start Time | End Time | SAMP TYPE | BOTTLE # | Container TYPE | Ini tial | Preserved? Yes | Preserved? No | SAMPLE NOTES (Lab) Receipt Temp |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
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| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

| | | | Field pH | | Meter # | | | Chlorine Residual | |
|---|---|---|---|---|---|---|---|---|---|
| Bottles/Comp | | Aliquot/Bottle | | | Sample Interval | | | Refrigerated/ Iced | Yes / No |

| Preservation Checklist | Oxidizer Present? | | Oxidizer Removed? | | PreKit# | FLOW (Date/time) > 1. | 2. |
|---|---|---|---|---|---|---|---|
| | Yes | No | Yes | No | Initials | 2nd Reading | |
| NH3-N | | | | | | 1st Reading | |
| TKN | | | | | | TOTAL | |
| Color Interfer? | | | If yes, added [ ] Na Thio | | | *UNITS* | |

MATRIX: Solid WasWater SurWater PotWater | Remarks (sample/collection details)

SPLIT WITH (Name/Title/Date):

PARAMETERS AS LISTED IN ANNUAL SCHEDULE? YES NO → If NO, List Sample Parameters below:

**CHAIN OF CUSTODY (Print Name, Signature, Title, Date of Possession)**

1.

2.

3.

4.

5.

6.

**Attachments included? YES / NO If yes, list pages: Page**

# ATTACHMENT C:

## Analytical Methodologies

# ANALYTICAL PROCEDURES FOR WATER QUALITY ANALYSES
# 2006 AMBIENT MONITORING PROGRAM

| Parameter | Code | Methods * | Minimum Reportable Limit (mg/L) | Accuracy (%) | Precision (%) |
|---|---|---|---|---|---|
| Bio Oxy Demand 5-day | BOD5 | 2:(5210) | 2.0 | 97.5 | 15.0 |
| Carbon. Bio Oxy Demand 5-day | CBOD5 | 2:(5210 B) | 2.0 | 96.0 | 11.0 |
| Total Alk as CaCO3 | ALK-T | 1:(310.1) | 1.0 | 98.0 | 1.6 |
| | | | | | |
| Total Organic Carbon | TOC | 1:(415.1) | 0.5 | 93.5 | 4.1 |
| Total Organic Carbon - Filtered | TOC-F | 1:(415.1) | 0.5 | | |
| Total Inorganic Carbon | TIC | 1:(415.1) | 0.5 | 98.3 | 3.2 |
| | | | | | |
| Total Kjeldahl Nitrogen as N | TKN | 3:(10-107-06-2-D) | 0.15 | 93.6 | 4.2 |
| Ammonia Nitrogen as N | NH3-N | 3:(10-107-06-1-B) | 0.05 | 99.3 | 4.8 |
| Organic Nitrogen as N | ORG-N | 3:(10-107-06-2-D) | 0.05 | | |
| Nitrate as N | NO3 | 3:(10-107-04-1-B) | 0.01 | 102.2 | 4.4 |
| Nitrite as N | NO2 | 3:(10-107-04-1-B) | 0.01 | 97.2 | 1.3 |
| | | | | | |
| Total Phosphorus (Manual)** | TP | 1:(365.2) | 0.003 | 96.9 | 5.1 |
| Total Phosphorus | TP | 3:(10-115-01-1-E) | 0.01 | 91.9 | 2.8 |
| Total Dissolved Phosphorus | TDP | 1:(365.2) | 0.003 | 96.9 | 5.1 |
| Soluble Reactive Phosphorus | SRP (OP) | 1:(365.2) | 0.003 | 99.3 | 2.1 |
| | | | | | |
| Silica | SiO2 | 1:(370.1) | 0.2 | 98.6 | 5.3 |
| Sulfates | SO4 | 1:(375.4) | 10.0 | 103.8 | 7.5 |
| Total Sulfides | S= | 1:(376.1) | 0.2 | | |
| | | | | | |
| Total Solids | TS | 1:(160.3) | 1.0 | | |
| Total Volatile Solids | TVS | 1:(160.4) | 1.0 | | |
| Total Suspended Solids | TSS | 1:(160.2) | 1.0 | | |
| Total Volatile Suspended Solids | VSS | 1:(160.4) | 1.0 | | |
| Total Dissolved Solids | TDS | 1:(160.1) | 1.0 | 100.4 | 19.0 |
| | | | | | |
| Arsenic - furnace | As - GFA | 4:(200.9) | 0.002 | 96.3 | 5.3 |
| Total Cadmium | Cd - GFA | 4:(200.9) | 0.0008 | 104.2 | 3.7 |
| Total Calcium | Ca | 1:(215.1) | 1.0 | 103.6 | 1.8 |
| Total Chromium | Cr | 4:(200.7) | 0.010(0.0025)* | 96.0 | 3.0 |
| Chloride | Cl | 3:(10-117-07-1-B) | 2.0 | 99.9 | 1.5 |
| Residual Chlorine | CL2 RES | 1:(330.4) | 0.1 | | |
| Total Copper | Cu | 4:(200.7) | 0.0125(0.0031)* | 98.2 | 2.8 |

# ANALYTICAL PROCEDURES FOR WATER QUALITY ANALYSES
# 2006 AMBIENT MONITORING PROGRAM
# (CONTINUED)

| Parameter | Code | Methods * | Minimum Reportable Limit (mg/L) | Accuracy (%) | Precision (%) |
|---|---|---|---|---|---|
| Chlorinated Cyanide | CN-CL2 | 3:(10-204-00-1-A) | 0.005 | | |
| Total Cyanide | CN-T | 3:(10-201-00-1-A) | 0.005 | 95.6 | 11.2 |
| Total Iron | Fe | 4:(200.7) | 0.05 | 100.7 | 5.9 |
| Total Lead - furnace | Pb - GFA | 4:(200.9) | 0.002 | 100.6 | 4.4 |
| Total Magnesium | Mg | 1:(242.1) | 0.1 | 103.2 | 2.1 |
| Total Manganese | Mn | 4:(200.7) | 0.025 | 100.3 | 5.6 |
| Total Mercury (Cold Vapor) | Hg | 1:(245.2) | 0.00002 | 103.3 | 4.2 |
| Selenium - furnace | Se - GFA | 4:(200.9) | 0.002 | 101.8 | 5.3 |
| Total Sodium | Na | 1:(273.1) | 3.0 | 103.6 | 3.6 |
| Total Nickel | Ni | 4:(200.7) | 0.015(0.00375)* | 95.8 | 2.8 |
| Potassium | K | 1:(258.1) | 0.020 | 101.4 | 2.8 |
| Total Silver | Ag | 4:(200.7) | 0.0125 | 97.0 | 3.1 |
| Total Zinc | Zn | 4:(200.7) | 0.025(0.00625)* | 94.5 | 3.2 |
| | | | | | |
| Conductivity | COND | 2:(2510B) | - | | |
| Dissolved Oxygen - Field | DO - Field | 1:(360.1) | 0.1 | | |
| Dissolved Oxygen - Lab | DO - Lab | 1:(360.1) | - | | |
| Dissolved Oxygen - Winkler | DO - Winkler | 1:(360.2) | - | | |
| pH | pH | 1:(150.1) | - | | |
| Temperature | TEMP | 1:(170.1) | - | | |
| | | | | | |
| Phenol | PHENOL | 3:(10-210-00-1-B) | 0.015 | 102.8 | 14.1 |
| Phaeophytin *a* | PHEO-A | 2:(10200 H.2) | 0.0002 | | |
| Chlorophyll *a* | CHLOR-A | 2:(10200 H.2) | 0.0002 | | |
| | | | | | |
| Enterococci | ECOCCI-MF | 5:(1600) | 2.0 (cells/100 ml) | | |
| E. Coliform | ECOLI-MF | 2:(9213 D) | 2.0 (cells/100 ml) | | |
| Fecal Coliform | FCOLI-MF | 2:(9222 D) | 2.0 (cells/100 ml) | | |

Methods listed are applicable for all matrices of water, wastewater, and surface waters.

* Indicates method has a lower level of detection due to sample concentration

**Started in August 2000 for all AMP samples.

1: Indicates USEPA Methods for Chemical Analysis of Water and Waste 1979
2: Indicates Standard Methods (18th Edition)
3: Indicates Lachat Instruments QuickChem Methods: Approved for use by USEPA - NYSDOH - ELAP
4: Indicates USEPA "Methods for the Determination of Metals in Environmental Samples" Supplement 1, May 1994
5: USEPA Microbiological Methods Manual 1996

# ATTACHMENT D:

# YSI 600/6600 Calibration Procedures

**YSI 600 & 6600 Calibration**

The YSI 600 & 6600 sonde units are calibrated in the OCDWEP Laboratory located at the Henry Clay Boulevard Facility (HCBF). All calibration solutions e.g. ($20^0$C DI water; pH buffers 7,10; Conductivity KCl buffers 0.01N & 0.02N) are purchased and supplied with a certificate of analysis and stored in the laboratory. The YSI 600 & 6600 are calibrated no more than 24 hours prior to use on the day that it is used in the field. Post-calibration checks are conducted after use, on the same day, on all calibrated parameters. All calibration records are maintained in a bound book.

**Dissolved Oxygen (DO) Calibration**

1. Transport the YSI 600 or 6600 along with the 650 MDS to OCDWEP Lab. Place the sonde unit (with attached weighted probe guard) into the 20° C DI water bucket, which can be found in the $20^0$C walk-in incubator room. Allow the unit to stabilize in the bucket for 10 minutes. During this time, the pH buffers and conductivity buffers can be obtained in the cabinet located in the ELS Field Staging Room. Also, obtain a large wash bottle of DI water for rinses.

2. Record the current barometric pressure (from the MDS 650). Record the mm of Hg value in the bound calibration notebook.

3. The DI water in the bucket should be well stirred, and the YSI 600 or 6600 should be temperature stabilized before proceeding with DO calibration.

4. Once stable, record in the calibration log book the DO and temperature value on the display unit. Collect two Winkler bottle DO samples from the DI water bucket, and turn these samples over to the laboratory technician responsible for DO analysis.

5. The DO concentration is determined in each of the two bottles using the Winkler method. Record each result and the average value of the two DO concentrations in the calibration logbook.

6. If the concentration results of the two bottles, using the Winkler method, are greater than 0.2 ppm different, the DO concentrations should be determined again.

7. If the "average Winkler DO" value is not within five-hundredths (0.05) of the value on the display unit, then it is necessary to calibrate the YSI 600 or 6600, using the "average Winkler DO" value.

8. Select **"Sonde Menu,"** then **"Calibrate,"** then **"DO %"** on the display unit. Enter the calculated barometric pressure **"mm/Hg."** The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed DO value as the initial reading. Then select "enter"; the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". For calibration to a DO Winkler value, select **"DO mg/L"**, enter the average Winkler DO value. The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed DO value as the initial reading. Then select "enter"; the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The DO is now calibrated.

9. After use in the field, conduct the post-calibration procedure repeating steps 1 through 5 as listed above. The difference between the displayed DO value recorded in the log book and the "average Winkler DO" is the drift, which should be recorded in the log book.

**pH Calibration**

1. Remove the weighted probe guard from the sonde unit and screw on the calibration cup. Rinse the cup with DI water. Thoroughly mix the container of pH 6 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 6 buffer, then fill the cup with the buffer until all probes are submerged. Allow the readings to stabilize for approximately 90 seconds.

2. Select **“Sonde Menu,”** then **“Calibrate,”** then **“pH,”** then **"2 point cal"** on the display unit. Enter the first pH buffer for calibration (pH 6.00). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed pH value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter".

3. Rinse the cup with DI water. Thoroughly mix the container of pH 10 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 10 buffer, then fill the cup with the buffer until all probes are submerged. Allow the readings to stabilize for approximately 90 seconds.

4. Next, enter the second pH buffer for calibration (pH 10.00). The display will then return to the data display screen, with the option “**calibrate**” highlighted. Record the displayed pH value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value as the calibrated pH in the logbook. The display will show “**continue**” highlighted, select "enter" to continue with options.

5. Next, put the display unit in run mode. Rinse the cup with DI water. Thoroughly mix the container of pH 7.00 buffer, making sure the solution is dated, and fresh. Rinse the probes in the calibration cup with pH 7.00 buffer, then fill the cup with the buffer. All probes should be submerged. Allow the readings to stabilize for approximately 90 seconds. Record the value on the display unit. This value should be recorded in the logbook as the check value. (Target value +/- 0.05 Standard Units)

6. After use in the field, conduct the post-calibration procedure by repeating steps 1 and 3. The displayed value should be recorded as the “after use” value. The difference between the “after use” value and the “calibrated” value is the drift. Record this value in the logbook.

**Conductivity Calibration**

1. Rinse the calibration cup twice with DI water, then once with the 0.02N KCl solution. Fill the calibration cup with the 0.02N KCl solution such that the conductivity block is fully submerged. Tap the sonde unit to dislodge any possible air bubbles.

2. Select **“Sonde Menu,”** then **“Calibrate,”** then **“conductivity,”** then **"sp. cond.”** Enter the value 2.76 mS/cm for calibration of (0.02N KCl). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed sp.cond. value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run.”**

3. Rinse the calibration cup twice with DI water, then once with the 0.01N KCl solution. Fill the calibration cup with the 0.01N KCl solution such that the entire conductivity block is fully submerged. Tap the sonde unit to dislodge any possible air bubbles.

4. Record the displayed conductivity value in the logbook as the “initial reading”.

5. After use in the field, conduct the post-calibration procedure by repeating steps 1 and 3. The displayed value for each solution should be recorded as the “after use” value. The difference between the “after use” value and the “calibrated value” (for 0.02N KCl) and “initial value” (for 0.01N KCl) should be recorded as the drift.

**Depth Calibration**

1. Calibration of depth should occur in the field, immediately prior to use. Suspend the sonde unit by holding the cable, such that the probes are just above the water surface. Select **“Sonde Menu,”** then **“Calibrate”**, then **“Pressure-ABS”** on the display unit. Enter the calibrated value (0.0 meters). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Select "enter", the calibration will stabilize and be completed. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run.”**

**Battery Voltage Evaluation**

1. Internal battery voltage is shown on the display unit. Batteries are replaced when the battery voltage indicator is down to 1/4 charge. Replace with four C cell batteries.

**Temperature Calibration**

1. The temperature sensor is factory calibrated.

2. Quarterly calibration checks are performed by the OCDWEP Lab.

**ORP Calibration**

The ORP sensor is factory calibrated. However, it is possible to calibrate or check the sensor using a standard Zobel’s solution. This calibration will be done quarterly.

2. Rinse the calibration cup twice with DI water, then once with the Zobel's solution. Fill the calibration cup with the Zobel's solution such that the ORP probe is fully submerged.

3. Select **“Sonde Menu,”** then **“Calibrate,”** then **“ORP”**. Record the temperature of the unit and enter the correct value for Zobel's solution which corresponds to the temperature value (See instrument manual for table). The display will then return to the data display screen, with the option **"calibrate"** highlighted. Record the displayed ORP value as the initial reading. Then select "enter", the calibration will stabilize and be completed. Record the new displayed value in the logbook as the calibrated value. Select the highlighted option **"continue"** by pressing "enter". The display will then continue with options. Advance to **"sonde run.”**

**Turbidity Calibration (6600 Sondes Only)**

1. The Turbidity sensor is calibrated as needed for each use. A three- point calibration is performed at the office or in the field.

2. Rinse the calibration cup twice with DI water. (Note: Presence of air can cause erroneous readings. DI water should be allowed to stand prior to calibration.)

3. Carefully fill the calibration cup with DI water by pouring the DI water gently onto the side of the

calibration chamber to reduce air bubbles. Place the calibration cup/chamber with a black cover on the countertop. Approximately two to three inches of water will be sufficient.

4. Carefully place the sonde on top of the calibration cup. Loosely screw the cap on. Be sure that the sonde is stable and not going to fall over.

5. Select **"Sonde Menu"**, then **"Calibrate".** Scroll down to select **"Optic T-Turbidity".** Press Enter. Scroll to" **3- point calibration**". Press the "enter" key.

6. At this point, press the ESC and Enter key simultaneously. The screen will then ask if you want to **Uncal**. Select yes. The display will return to the calibration value screen.

7. The display will then ask for a calibration value, enter 0.0. Press the "enter" key. The unit will stabilize and display "Calibrate" and "Clean Optics". Scroll to "**clean optics**". When complete, scroll to "**calibrate**". When the display is stable, press the enter key. Unit will display "**Continue**" and press the enter key.

8. Rinse the calibration cup with 10 NTU standard. Check the expiration date on the standard prior to use. (**NOTE:** If you are limited on standard volume, the probes must be clean and dry prior to immersing in the standard.) Fill calibration cup with 10 NTU standard. Pour the standard gently onto the side of the calibration cup to prevent air bubbles. Be sure to use the black chamber cover. The standard should not be shaken or agitated. Again the sonde is placed on top of the chamber loosely. Follow the keypad instructions. The black turbidity probes are 6136 probes. The 10 NTU standard is adjusted to a value of 11.2 NTU . If the turbidity probe is gray in color the NTU standard value would be 10.0. Enter the second point **11.2** value. Press the "enter "key.

9. Rinse the calibration cup with 100 NTU standard. Check the expiration date on the standard prior to use.

10. Fill calibration cup with 100 NTU standard. Follow the keypad instructions. Again if the turbidity probe is black, it is a 6136 probe and the 100 NTU standard value is adjusted to 123 NTU. Enter third point **123** value. Press the "Enter" key.

10. Calibration is complete. Press **ESC** to go back to main screen.

**Chlorophyll (Total) Calibration (6600 Sondes Only)**

1. The Chlorophyll sensor is calibrated as needed for each use. A single point calibration is done at the office or in the field. Allow distilled water to stand to due air bubbles prior to calibration.

3. Rinse the calibration cup twice with DI water. Fill the calibration cup by pouring slowly onto the side of the calibration cup to reduce air bubbles. Be sure to use the black colored cap. Set the cup on the bench top and the sonde on top of the chamber loosely. Be careful that the sonde is secure enough not to fall over.

4. Select **"Sonde Menu"**, then scroll to **"Calibrate"**. Select "**Optic-C Chlorophyll**" and press the enter key. Select "**Fluor zero**" and press the "enter" key**.**

5. The display will then prompt you to enter a calibration value, type in **0.0** and press the "enter" key.

5. Unit will stabilize. Display will highlight "**Calibrate**" or "Clean Optics". Select "**Calibrate**". When stable, press the "enter "key on the keypad. The calibration is complete. Press "**Esc"** key to go back to the main menu.

# ATTACHMENT E:

# YSI 600/6600 Maintenance Procedures

## YSI 600 & 6600 Maintenance

### General Maintenance

1. After use, the YSI 600 / YSI 6600 units are stored clean and dry in the Field Support Staging room at the HCBF. Batteries are replaced on the 650 MDS when the battery voltage indicator is down to 1/4 charge. Replace with four C cell batteries.

2. The cable is cleaned and recoiled, clean and lubricate the rubber connectors. Store the sonde unit with ~ 1 inch of tap water in storage cup.

3. Check the Dissolved Oxygen (DO) membrane after each use and replace as needed. Avoid over stretching the membrane, invert sonde unit several times, check for trapped air bubbles under the membrane.

4. Rinse pH bulb with tap water to remove any film or debris. If good readings are not established, soak the probe in a dishwashing liquid solution for 10-15 minutes. A cotton swab can be used gently to clean the bulb, if needed.

### Quarterly Maintenance

1. If the sonde does not have a good response time, soak the pH electrode in a 1:1 HCl solution for 30 - 60 minutes. Remove and rinse the electrode with water. If biological contamination is present soak the probe in a 1 to 1 dilution of chlorine bleach. Then rinse the probe in clean tap water for one hour, swirl occasionally.

2. Clean the Conductivity block and electrodes with a dishwashing liquid solution.

3. Maintain the ORP sensor in the same manner as the pH probe.

4. The depth sensor port should be inspected for blockages or build-ups of mineral or biological matter. A syringe can be used to flush out the ports with tap water.

5. The temperature sensor is factory set and requires no calibration, however, it should be checked against a certified laboratory thermometer quarterly. Wipe down the temperature sensor with a clean cloth.

6. The function of the Redox (ORP) sensor can be checked quarterly against a standard Zobel's solution.

### Special Maintenance on the 6600 Sonde Units

1. The Chlorophyll optical sensor should be cleaned, as needed, using the attached wiper mechanism. The wiper should be changed as needed.

2. The Turbidity optical sensor should be cleaned, as needed, using the attached wiper mechanism. The wiper should be changed as needed.

# ATTACHMENT F:

# YSI 600/6600 Operation Procedures

## YSI 600 & 6600 Operation

### Tributary Field Sampling

**1.** Transport the YSI 600 or 6600 sonde unit along with the 650 MDS in the carry case, with the storage cap secured. Be sure to keep the cable coiled neatly and secure the unit such that it does not slide in the cab of the vehicle. When using the unit in the field, set the case on a plastic crate, keeping it off the ground and clean.

**2.** Before lowering the sonde unit, attach the weighted probe guard. Throughout the day, and in between sampling sites, the probe guard may be removed and the storage cup is replaced.

**3.** Lower the sonde unit into the stream at mid-stream & mid-depth. This method should be used at all sampling locations except for the following sites. At the **Lake Outlet** sampling site collect a mid-channel profile along the bridge, obtain readings at half-meter increments and at 0.6 meters and 3.7 meters (corresponding to the sample depths of 2' and 12'). At **East Flume** sampling site, lay the sonde unit in front of the v-notch weir.

**4.** When securing the sonde unit cable to a railing be sure not to overly bend it, as that could damage the coaxial **cable**.

**5.** Log the data after approximately 2 minutes or when the readings appear stable. Record data by: selecting **"sonde run"** from the 650 Main Menu, then **select "log one sample"** from the 650 column, selecting **"enter"**. Choose a file name and select **"ok."** The display will tell you that the sample is logged. Note that the sonde unit will take longer to stabilize in cold weather.

### Lake Sampling

**1.** Transport the YSI 600 or 6600 sonde unit along with the 650 MDS in the carry case, with the storage cap secured to the sonde unit. Be sure to keep the cable coiled neatly and secure the unit such that it does not slide in the cab of the vehicle.

**2.** Before lowering the sonde unit, attach the weighted probe guard. Throughout the day, and in between sampling sites, the probe guard may be removed and the storage cup is replaced.

**3.** Record data at every 0.5 meter increment, starting at the surface to the bottom. Log the data after approximately 2 minutes or when **the** readings appear stable. To record data for the event select **"sonde run"** from the 650 Main Menu, then **select "log one sample"** from the 650 column, selecting **"enter"**. Choose a file name and select **"ok."** The display will tell you that the sample is logged. Note that the sonde unit will take longer to stabilize in cold weather.

### River Sampling

**1.** Transport the YSI 600/6600 sonde unit along with the 650 MDS in the carry case, with the storage cap secured to the sonde unit. Be sure to keep the cable coiled neatly and secure the unit such that it does not slide in the cab of the vehicle. When using the unit in the field, set the case on a plastic crate if possible, keeping it off the deck of the boat.

**2.** Before lowering the sonde unit, attach the weighted probe guard. Throughout the day it is advisable to keep the sonde unit in a tub of river water. This allows for quicker usage and reduces the need for frequent removal of the probe guard.

**3.** Record data at every 0.5 meter increment, starting at the surface to the bottom. Be sure to log a data reading at 1 meter below the surface and 1 meter above the bottom, to correspond to water sample collection depths. Record the data after approximately 2 minutes or when the readings appear stable. Record data as described above.

**Data Download**

**1.** Connect the YSI 650 display unit to the interface cable on the designated computer. Turn the YSI 650-display unit on.

**2.** On the computer; access **EcoWatch** from the Windows menu, by selecting the icon.

**3.** On the YSI 650 select **"file"** from the main menu, then select **"upload to PC,"** then choose the file you wish to transfer.

**4.** On the computer select the **"sonde icon on the tool bar,"** the file transfer status will be displayed on the computer. After the file has been transferred select **"file"**, then **"open"** from the main tool bar and choose the file you wish to open. The new file will be opened in the EcoWatch software and can now be exported as a text file. In the file menu system on the computer, select **"export"**, then **"CDF/WMF."** Now give the file to be exported a text file name, such as: 05-22-02, in the Q:\AMP\2007\Tribs\Biweekly\ directory. Select **"export"** on the computer. The transfer will be completed.

**5.** Open *Excel* from the Windows menu, open Q:\AMP\2007\Tribs\Biweekly\ then choose the file type as **"All Files,"** then selected text file e.g. 05-22-02. In order to import this file into *Excel* two options must be **selected**. The first drop down box selection should be **"delimited"**, then choose **"Next"**, the second drop down box selection should be **"comma"**, be sure to click off **"tab"**, then choose **"finish"**.

**6.** Save the file in *Excel*. Select **"Save as"**. For a lake file save as: Q:\AMP\2007\Lake\Biweekly\05-22-02SD. Be sure to select the **"File Type"** as **"Microsoft Excel Workbook."** Open *Excel* from the Windows menu and open the desired file. Manipulate the data to fit the data format.

**ATTACHMENT 2**

# QUALITY ASSURANCE PROGRAM PLAN

## FOR THE 2007 ONONDAGA LAKE FISH SAMPLING PROGRAM

AMBIENT MONITORING PROGRAM

Prepared for the NYSDEC


Prepared by:

**Ichthyological Associates, Inc** (Original Document)

**Ecologic, LLC** (Original Document and Revisions)

**Onondaga County**
**Department Of Water Environment Protection** (Revisions)


April 2007

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## 1.0 INTRODUCTION/PURPOSE

As part of the Onondaga Lake Ambient Monitoring Program the Onondaga County Department of Water Environment Protection has prepared a Quality Assurance Program Plan (QAPP) for the Onondaga Lake Fish Sampling Program for 2007. This document provides written documentation of the QAPP associated with a baseline fisheries investigation that was initiated in 2000, and subsequent revision or modifications to the program.

The County's long-term monitoring program includes assessment of physical, chemical, and biological attributes of the aquatic resource. The baseline Onondaga Lake Fisheries Monitoring Program and on going studies are expected to address the goal of the *Ambient Monitoring Program* to assess progress towards "swimmable and fishable" conditions in Onondaga Lake by monitoring fish reproductive success and changes in the structure of the fish community.

### Background

The Onondaga Lake Fish Program was developed in consultation with expert technical advisors in limnology, engineering, statistics, and fisheries. The 2007 lake fisheries program is summarized in Table 1.

### Development of the QAPP

OCDDS, Ichthyological Associates, Inc. (IA), and EcoLogic, LLC (EcoLogic) staff met on August 15, 2000 to review the schedule and services to be provided for the AMP. Following those discussions, IA/EcoLogic began a series of meetings with OCDDS technical staff to document procedures used for the Onondaga Lake 2000 Fisheries AMP. The meetings included interviews of OCDDS staff involved in each aspect of the program. Following initial interviews IA/EcoLogic staff observed field collections of ongoing program and reviewed data entry requirements for each program. Following the initial interviews and review of the *Onondaga County Ambient Monitoring Program: Year 2000 Onondaga Lake Fish Sampling Program* (EcoLogic 2000), IA/EcoLogic prepared the initial draft of the QAPP for review and comment by the OCDDS. In 2002, OCDDS name was changed to the Onondaga County Department of Water Environment Protection (OCDWEP). The April 2007 revision of the QAPP was completed by OCDWEP.

The purpose of the QAPP is to mesh field collection procedures and data requirements into a comprehensive document that provides a template for field, laboratory, and data management methods. The QAPP is meant to supplement in-house training of OCDWEP technicians and provide a framework from which trained staff can conduct consistent field surveys. The QAPP is considered to be a living document. That is, as changes are made in the Onondaga Lake Fisheries AMP, revisions will be made to the QAPP to reflect those changes.

Changes or revisions to the QAPP may include:

- intensity of the sampling program;
- incorporation of new elements to the program, or deletion of specific;
- revisions and improvements to methodologies; and
- incorporation of new methodologies into the program.

Thus the QAPP will serve multiple purposes. It will provide annual documentation of Standard Operating Procedures (SOPs), although more formal and detailed SOPs have developed for in-house training and documentation purposes. It will provide a framework of data forms designed to ensure collection and entry of data, and provide a framework for training of OCDWEP's staff via consistent mentoring by more senior, experienced staff through the structure of the QAPP.

The QAPP has been divided into chapters, with each chapter represents a major field component of the AMP. Each chapter provides a purpose and description of the component, the procedures for sampling that component, appropriate data sheets, maps, and descriptions of stations and station codes. Only minor clarifications were made to the QAPP, and no major program modifications were incorporated in to the 2007 monitoring season.

**Table 1. Summary of Year 2007 Onondaga Lake Fish Community AMP Sampling Plan.**

| Component | Methodology/Gear | Sampling Objectives | Location and Number of Samples | Timing | Changes |
|---|---|---|---|---|---|
| **Pelagic Larvae** | Modified double oblique Miller high-speed trawl, with flow meter attached, collected during the day in the pelagic zone. | Determine species richness. | - 4 double oblique tows in each basin (North and South) per event.<br>-Tows will sample water depths from the surface to 5.5 meters.<br>-Total No. of events =8<br>-Total No. of samples =64 | -Daytime<br>-Bi-weekly.<br>-April (when water temps. are 7-8 ºC) through end of July. | -No Change from previous year. |
| **Juvenile Fish** | 50’ x 4’ x 1/4” bag seine swept into shore in the littoral zone. | Determine community structure and species richness. | -5 strata with 3 sites in each strata and 1 sweep at each site.<br>-No. of Sites = 15<br>-Total No. of events = 6<br>-Total No. of samples = 90 | -Daytime<br>-Every 3 weeks.<br>-July - October. | -No Change from previous year. |
| **Nesting Fish** | Lake wide nest survey. | Document spatial distribution and species composition | -Entire perimeter of lake divided into 24 equal length sections.<br>-Total No. of events = 1<br>-Total No. of samples = 24 | -Once in June when water temperature is between 15° and 20 °C. | -No Change from previous year. |
| **Adult Fish-Littoral Zone** | Boat mounted electrofisher in the littoral zone at night. | Determine community structure, species richness, CPUE, and relative abundance. | -Entire perimeter of lake shocked in 24 contiguous transects.<br>-Alternating all-fish/gamefish transects.<br>-Total No. of events = 2<br>-Total No. of samples = 48 | -Night-time.<br>-Twice per year; Spring and Fall.<br>-Spring and Fall.<br>-Water temp. between 15º and 21 ºC. | -No Change from previous year. |
| **Adult Fish-Profundal Zone** | Experimental gill nets of standard NYSDEC dimensions. | Determine community structure, and species richness. | -One net per strata.<br>-Nets set on bottom, parallel to shore at a water depth of 4-5m for two hours.<br>-Total No. of events = 2<br>-Total No. of samples = 10 | -During the day.<br>-Twice per year, within one week of littoral electrofishing. | -No Change from previous year. |
| **Angler Census** | Angler diary program and bass tournament surveys. | Determine catch rates, species composition. Attitudes and opinions over the AMP. | -Recruit diary participants at fish & game clubs and fishing organizations.<br>-Tournaments will be surveyed at time of weigh-in. | -Issued annually and collected at end of fishing season (fall).<br>-Tournament schedule TBA | -No Change from previous year. |

## 2.0 STAFF TRAINING

The OCDWEP has approached the AMP under the self-monitoring element that is central to the Federal Clean Water Act. OCDWEP has acquired a staff with a wide range of academic education supplemented by experience gained by working for state fisheries agencies, universities, and environmental consulting and research firms. This staff of scientists and technicians are supported by maintenance and operation personnel that provide the skills to build, construct, maintain, and modify gear needed to conduct the fisheries surveys. This expertise allows the OCDWEP to successfully train and mentor qualified individuals to provide a high level of quality to the data of the fisheries program. As with any long-term monitoring program, individuals will advance in their careers, retire, or move to new locations. This matriculation will require periodic in-house training of new individuals. The QAPP is integral to this training. Its use and understanding will provide each individual with an easy to understand document to ensure day-to-day and year-to-year consistency of the Onondaga Lake Fish Sampling Program.

In addition to the QAPP and SOPs, the County's Consultant, Ecologic LLC, conducts annual audits for each biological monitoring component. The audits are intended to ensure that the field technicians conducted their work in a professional manner and comply with the procedures outlined in the QAPP and SOPs. In addition, the audits determine if any observation would jeopardize the quality of the data (technique, field logs, training, etc.). The biological monitoring components to be audited annually includes the pelagic larvae, juvenile seining, adult electrofishing, and adult gill nets.

Thus the use of the QAPP in conjunction with the formal Standard Operating Procedures (SOPs) and external audits for the biological monitoring program activities, the *Onondaga County Ambient Monitoring Program: Year 2007 Onondaga Lake Fish Sampling Program*, and subsequent programs will provide OCDWEP with a successful fisheries assessment program.

## 3.0 PELAGIC LARVAE – Miller High Speed/Modified Double Oblique Tow

### 3.1 Procedures

Pelagic larvae will be collected using the Miller High Speed/Modified Double Oblique Tow during eight (8) sampling events occurring biweekly from April (water temp. between 7 and 8°C) through the end of July. One (1) sample will be collected from each of eight (8) transects (four (4) in the north basin and four (4) in the south basin) in Onondaga Lake during each sampling event.

#### 3.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet, and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Print labels and pre-label sample jars.

Step 5. Check calibration of water quality (WQ) meter.

Step 6. Review weather reports for sampling feasibility.

#### 3.1.2 Field:

Step 1. Proceed to (north basin or south basin) predetermined locations using the Global Positioning System (GPS). These locations were determined and set at the beginning of the 2002 sampling season. Collect water quality data from 0 to 6 meters, in 0.5 meter intervals, using a pre-calibrated water quality meter. Log the depth and water quality data on the meter (all data will be downloaded at the end of the day). Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

Step 2. Proceed to the first transect (refer to Appendix A1) and record transect number, date, time, and actual GPS coordinates on the field data sheets.

Step 3. Attach one (1) sampling rig to the crane and record starting flow meter reading. Thoroughly inspect the net, collection chamber mesh, cable, connections and all hardware prior to deployment at each location. Any repairs or replacements must be completed prior to deployment.

Step 4. Place the boat in forward gear and accelerate to 3 miles per hour. Pay out sufficient cable to achieve the correct depth of 5.5 meters (this is the last meter mark on cable). The direction of the travel shall be in a straight line heading in a northwest to southeasterly direction (or southeast to northeasterly direction depending on the transect or influence of the sun glare on visual contact with the cable marks).

Step 5. When the correct depth is achieved, accelerate the boat to approximately 5 or 6 miles per hour. Pay out additional cable to maintain a proper depth of 5-5.5 meters. Confirm the actual depth via the following method:

Measure the angle of the cable from vertical (the optimal angle range should be between 55°- 60°) using the WildCo clinometer, and record the angle measurement on the field data sheet. Using the "Angle of Cable Measured" (between 55°- 60°) and the "Length of Cable" let out (typically 10 meters as measured from the water surface), verify on the following chart that the "Proper Vertical Depth" of the sampler has been achieved (optimum depth of 5.0 to 5.5 meters):

<table>
<tr><th colspan="2" rowspan="2">Angle of Cable Measured from the Vertical (Degree)</th><th colspan="2">Proper Vertical Depth (Meters)</th><th rowspan="2"></th></tr>
<tr><th>5.0</th><th>5.5</th></tr>
<tr><td></td><td>53</td><td>8.3</td><td>9.1</td><td rowspan="10">Length of cable measured from the water surface to the sampler (meters)</td></tr>
<tr><td></td><td>54</td><td>8.5</td><td>9.4</td></tr>
<tr><td rowspan="6">Optimal Range</td><td>55</td><td>8.7</td><td>9.6</td></tr>
<tr><td>56</td><td>8.9</td><td>9.8</td></tr>
<tr><td>57</td><td>9.1</td><td>10.1</td></tr>
<tr><td>58</td><td>9.4</td><td>10.4</td></tr>
<tr><td>59</td><td>9.7</td><td>10.7</td></tr>
<tr><td>60</td><td>10.0</td><td>11</td></tr>
<tr><td></td><td>61</td><td>10.3</td><td>11.3</td></tr>
<tr><td></td><td>62</td><td>10.7</td><td>11.7</td></tr>
</table>

Step 6. Once a depth of 5-5.5 meters is obtained tow the sampler at a consistent speed (approximately 5 or 6 miles per hour) for 25 seconds heading northeast to southwest or vice versa.

Step 7. After 25 seconds has elapsed, begin retrieving the sampler until the next meter mark is visible and continue towing at that depth for 25 seconds. Repeat this procedure at each individual meter depth on the cable until the 1 meter mark is visible, at which time reduce boat speed to idle and retrieve the sampler. After retrieval, thoroughly inspect the net and collection chamber mesh for any tears that may have compromised the sample. If the sample has been compromised, the location will need to be resampled/repeated.

Step 8. Record ending flow meter reading on the field data sheet, and rinse the inside of the sampler and the net into the sampling bucket with the wash down pump or pump sprayer. Decant as much water as possible. Remove the sampling bucket and pour the contents into the pre-labeled sample jar. Rinse the remaining sample into the jar using tap water from a squirt bottle. Preserve the sample with 10% buffered formalin, filling the jar below the shoulder (wear Nitrile gloves and goggles during this operation).

Step 9. Fill out chain of custody form, and place the sample and Chain of Custody in a clip board box (or equivalent) for safekeeping.

Step 10. Repeat the above process four (4) times in each basin.

### 3.1.3 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

Step 4. Download water quality data.

### 3.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

### 3.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet.
- Facility code/station description.
- List of fish species codes/names (identification will be completed in the HCBF Biology laboratory location).
- Sample labels.
- Chain-of-custody forms (as appropriate).

Appendix A1 contains examples of the station data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in pelagic larvae sampling.

## 4.0 LITTORAL YOUNG-OF-YEAR (YOY)/JUVENILE FISH – BAG SEINE

### 4.1 Procedures

Littoral YOY/juvenile fish will be collected using a bag seine (seine dimension - 50' x 4' x 1/4") approximately every three (3) weeks from July to October, resulting in a total of six (6) sampling events. Three (3) randomly selected sites within each of five (5) strata encompassing the littoral zone of the lake were selected in 2000 and are revisited for each sampling event. These sites are physically marked on the shoreline and their coordinates documented with a GPS unit. One (1) sample will be collected at each sampling site for a total of fifteen (15) samples collected from Onondaga Lake during each sampling event.

#### 4.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Check calibration of water quality (WQ) meter.

Step 5. Review weather reports for sampling feasibility.

#### 4.1.2 Field:

Step 1. Proceed to appropriate station and record WQ meter number, facility code/location, date, time, and WQ data at the near surface. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

Step 2. Stretch the seine out on shore and remove any material lodged in the mesh. Check for holes and repair if necessary.

Step 3. Bring net to the marked site location. (Note: Sites have been previously selected and marked by OCDWEP staff).

Step 4. Walk one end of the seine off shore until full length of net is deployed perpendicular to the shoreline.

Step 5. Check the bag section of the seine to make sure it is fully deployed and not tangled.

Step 6. With one person holding the in-shore brail stationary, a second person sweeps the offshore brail to shore. A third person walks behind the bag end of the seine to dislodge the seine if it becomes stuck. A sample will be rejected if the leadline of the seine must be lifted or the seine must be fully stopped in order to dislodge the snag.

In this case, the site will be returned to later during the sampling event to collect the sample.

Step 7. As the offshore brail approaches shore, the two brails will be worked together, and the seine will be beached while being careful to maintain the integrity of the bag section of the seine and keeping the leadline on bottom.

Step 8. Immediately upon retrieval of the seine all fish will be picked and placed in holding tanks. Care shall be taken to sort through captured debris (algae mats and macrophytes) in order to retrieve all fish. In the event adult fish are captured, they should be identified to species, counted, released back into the lake, and noted as such on the data forms. Representative adult bass and other selected game fish should be tagged with a numbered floy tag, measured and sampled for scales (scales are only collected in the fall) prior to release. The tag number, scale envelope number, and other related information should be recorded on the appropriate data form.

Step 9. Stretch the seine out on shore and remove any material lodged in the mesh. Check for holes and repair if necessary.

Step 10. Stretch out seine to dry while processing samples.

Step 11. A minimum of 30 random individuals in each life stage (YOY and juvenile) and species should be measured (total length in mm). Remaining fish should be mass-counted based on life stage (YOY, juvenile, adult). YOY sunfish should be grouped as "*Lepomis* sp." All other individuals should be identified to species. All fish should be returned to the lake after completing measurements.

Unknown species should be noted as such on the data forms by number (for example *Unknown Species No.1* and *Unknown Species No. 2*) and placed in a formalin-filled, labeled jar and identified later in the laboratory.

Step 12. Review data sheets for completeness before proceeding to next station.

### 4.1.3 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

### 4.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

#### 4.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet.
- Bulk fish data sheet.
- Individual fish data sheet.
- Map showing location of sampling stations.
- Facility code/station description.
- List of fish species codes/names.
- Sample labels.
- Scale envelopes.

Appendix A2 contains examples of the station data sheet, individual fish data sheet, bulk fish data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in sampling littoral YOY and juvenile fish.

## 5.0 NESTING SURVEY

### 5.1 Procedures

Nesting survey transects were determined in 2000 by dividing the lake's littoral zone into twenty-four (24) approximately equal length transects that encompass the entire perimeter of the lake. These transects are utilized for each annual event, and these are the same transects used for the adult fish boat electrofishing events. The beginning and ends of each transect are designated by GPS coordinates. Fish nests will be identified when possible and counted along these transects that are parallel to the shoreline. Date of the survey will be determined based on the time of year (June), water temperature (between 15 and 20ºC), water clarity (ability to see bottom in 2 m of water), weather conditions (sunny and calm), and observations of peak spawning activities of select gamefish.

#### 5.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of program.

Step 2. Determine if bluegill, pumpkinseed and largemouth bass appear to be near peak spawn (typically observed during other lake sampling events).

Step 3. Determine if water visibility is at least 2 m (based on secchi disc readings).

Step 4. Assemble: field data sheet packet and equipment.

Step 5. Examine equipment for needed repairs.

Step 6. Check calibration of water quality (WQ) meter.

Step 7. Review weather reports for sampling feasibility.

#### 5.1.2 Field:

Step 1. Proceed to appropriate transect and position boat at its start in 1 m of water. Record WQ meter number, facility code/location, date, time, and WQ data at the near surface. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

Step 2. Post one technician on the bow of the boat with polarized glasses. This technician will serve as nest spotter. Position a second technician in the center of the boat. This technician will serve as the data recorder. A third technician serves as the boat driver.

Step 3. Start boat and proceed parallel to shore keeping the boat in 1 m of water at all times. Speed of travel will be dependent on the nest spotters and nest density.

Step 4. The technician on the bow will count and report to the data recorder all nests observed, and when possible identify species on the nest. The observer shall report nest counts to the recorder every five (5) to ten (10) fish nest observed. An alternative method is to utilize a mechanical handheld counter.

Step 5. The driver will stop the boat at the end of the transect.

Step 6. Review data sheets for completeness before proceeding to next transect.

Step 7. Bring the boat to the beginning of the next transect and repeat steps 1 through 6.

### 5.1.3 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

### 5.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

### 5.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet.
- Map showing location of sampling stations.
- Facility code/station description.
- List of fish species codes/names.

Appendix A3 contains examples of the station data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names (located on station data sheet) appropriate for use in conducting a nest survey.

## 6.0 ADULT FISH – BOAT ELECTROFISHING

### 6.1 Procedures

Boat electrofishing stations were determined in 2000 by dividing the lake's littoral zone into twenty-four (24) approximately equal length transects that encompass the entire perimeter of the lake. These transects are utilized for each sampling event. The beginning and ends of each transect are designated by GPS coordinates. Transects are divided into alternating all-fish/gamefish samples (odd number transects are always all fish and even numbered transects are always game fish only). In "all-fish" transects all species are netted, while in "gamefish only" transects only those species designated as gamefish by the County are netted (see attached list). Time spent electrofishing at each transect will be recorded during each sampling event to allow for standardization of catch per unit effort.

Boat electrofishing is conducted for two (2) sampling events, in the Spring and in the Fall based on surface water temperatures between 15 and 21° C. During each sampling event, fish will be collected during the night along the twenty-four (24) transects distributed around the perimeter of the lake, resulting in collection of a total of forty-eight (48) boat electrofishing samples/transects for the year (24 all-fish and 24 gamefish).

#### 6.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Check calibration of water quality (WQ) meter.

Step 5. Review weather reports for sampling feasibility.

Step 6. Notify Onondaga County Sheriff's Office and the OCDWEP Metro Board operator of proposed night sampling event.

#### 6.1.2 Field:

Step 1. Proceed to predetermined transect location and record facility code/location, date, time, and WQ data taken at near surface depth. Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP.

This event will require four technicians, two (2) will collect fish with nets at the front of the electrofishing boat, one (1) will be the data recorder, and one (1) will drive and operate the generator/pulsator.

Step 2. Determine if transect is for all fish or game fish (odd number transects are all fish and even numbered transects are game fish).

Step 3. Record start of sample data: time of day, starting seconds on pulsator, and actual GPS coordinates.

Step 4. Place boat into forward gear at idle speed. Start the generator, activate electrofisher and begin collection of fish. The two netting technicians will maintain the foot pedal, that activates the electrofisher, in the "on" position for the entire transect. For gamefish transects any fish that resembles one of the gamefish species should be boated. If the fish is identified as being a non-gamefish species while still in the net it may be immediately released.

For all-fish transects, an attempt should be made to collect all fish encountered, with the exception of common carp, or gizzard shad and alewives occurring in large schools or quantities incapable of boarding. The quantity of common carp within netting distance shall be counted (or estimated if in large numbers) and noted as a count (or estimate) in the bulk fish section of the field sheet.

Gizzard shad and alewives occurring in large schools or un-boardable quantities may be estimated without actually collecting each fish (this will minimize catch mortality and will prevent under estimating significant quantities of "missed/non-boarded" fish. However, these "missed/non-boarded" fish shall be noted in the bulk fish section of the field sheet as an "estimate". Gizzard shad and alewives that are boarded, but are in excess of the 30 individuals initially counted and measured, shall be individually counted (not measured) and noted in the bulk fish section of the field sheets as a "count". Because of the difficulty in differentiating small shad and alewives from one another, if a school of small clupeids (shad/alewives) is encountered, a sample of the school should be netted, brought on board and identified. After positive identification the number of fish in the school can be estimated.

For all other species, missed fish shall be estimated, and recorded in the bulk fish section of the field sheets as an "estimate". Since the two netting technicians will be maintaining a mental tally of "missed/non-boarded" fish, this data should be recorded immediate following the completion of each transect to minimize loss of semi-quantifiable data.

Step 5. Record electrofisher data: voltage, amps, and pulse width. Monitor settings and displays throughout the transect.

Step 6. Maintain the boat electrofisher on course approximately parallel with the shore in one meter of water at approximately idle speed (the motor tilt will need to be adjusted to maintain appropriate speed). The boat may be slowed down in order to try and capture a rare fish that is initially missed by the netters. However, all attempt should be made to keep the boat moving slowly forward in approximately one meter of water for the majority of the transect.

**Note:** All attempts are made to maintain the monitoring depth of one (1) meter. However, the natural variation of the depth contours or abrupt drop offs (natural or man-made) may result in short periods of shallower or deeper monitoring.

Step 7. When the end of the transect is reached, turn off electrofisher unit, and return boat to neutral.

Step 8. Record time, GPS coordinates, and miscellaneous collection notes (missed/non-boarded fish, estimates, counts, etc.)

Step 9. Proceed to approximately the mid-transect location to work up collected fish.

Step 10. Fish whose numbers were estimated should be entered in the bulk fish section of the field form first to prevent omissions.

Then, collected fish should be identified to species, measured for length (nearest mm), and, for the fall samples only, measured for weight (nearest gram).

**Note: Individual fish weighing less than 100 grams will be weighed on the small scale.**

If the small scale will not stabilize, multiple fish of the same species and size range may be bulk weighed and divided by the total number of fish to establish a relative weight (e.g. weigh all alewife between 140 mm and 160 mm – divide total weight of all alewife weighed by total number of alewife to establish a relative weight for each of the individual alewife). These weights shall be noted in the comment section of the individual fish data sheet as a “bulk weight”.

For samples in which small to moderate numbers of fish are collected (less than 30), all fish should be measured. In samples in which high numbers (greater than 30) of one or more species are collected, random sub-samples of the abundant species will be measured, and the remaining individuals of those species need only be counted and listed in the bulk fish data sheet. This will result in some samples having both individual fish data and bulk fish data. Fish not measured individually should be mass-counted based on life stage (YOY, juvenile, adult). Unknown species should be noted as such on the data forms by number (for example unknown species 1 and unknown species 2) and placed in a formalin-filled, labeled jar and identified later.

Step 11. Representative adult bass and other selected game fish should be tagged with a numbered floy tag and sampled for scales (fall only) prior to release. In addition, during the fall, select species (bluegill, pumkinseed, white perch, yellow perch, and gizzard shad) shall also be randomly sampled for scales prior to release.

On spiny-rayed species, including but not limited to largemouth bass, smallmouth bass, bluegill, pumpkinseed, white perch, walleye, yellow perch and black crappie, scales will be removed from left side of the body below the lateral line, near the tip of the depressed left pectoral fin. On soft-rayed species, including trout and salmon, scales will be removed from the middle region of the body above the lateral line, beneath the posterior end of the dorsal fin on the left side.

Fish that are tagged should appear to be in good health and not overly stressed from the capture experience. The tag number, scale envelope number, and other related information should be recorded on the appropriate data form. Any recaptured fish shall be recorded on the individual field sheet data form, and evaluated to determine the need for a replacement tag.

Step 12. Review data sheets for completeness before proceeding to next station.

### 6.1.3 End of Sample Day

Step 1. Notify Metro Board of safe return from field.

Step 2. Review field notes for completeness and QAPP sign offs.

Step 3. Submit original data sheets and field notes for duplication.

Step 4. Write down needed equipment repairs and report to supervisor.

### 6.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

### 6.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet.
- Bulk fish data sheet.
- Individual fish data sheet.
- Map showing location of sampling stations.
- Facility code/station description.
- List of fish species codes/names.
- Sample labels.
- Scale envelopes.

Appendix A4 contains examples of the station data sheet, individual fish data sheet, bulk fish data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in sampling littoral adult fish.

## 7.0 ADULT FISH – Littoral-Profundal (Fixed Deep Water) Gill Net Sampling

### 7.1 Procedures

Gill net sampling will be conducted during two (2) sampling events, in Spring and Fall within one (1) week of the electrofishing events. During day-time hours, one (1) net will be randomly set in each of the five (5) strata (refer to Appendix A5). The nets will be set for two (2) hours on the lake bottom in 4 to 5 meters of water, resulting in collection of a total of ten (10) samples/sets during the year.

#### 7.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: field data sheet packet and equipment.

Step 3. Examine equipment for needed repairs.

Step 4. Check calibration of water quality (WQ) meter.

Step 5. Review weather reports for sampling feasibility.

#### 7.1.2 Field (Gill Net Setting):

Step 1. Proceed to a random monitoring location within one (1) of the five (5) stratums.

Step 2. Upon arrival locate 5 meters depth of water with depth finder and collect water quality data from 0 to 5 meters in 0.5 meter intervals. Log the depth and water quality data on the meter (all data will be downloaded at the end of the day). Standard water quality parameters include temperature, Dissolved Oxygen (percent saturation and concentration), salinity, conductivity, pH, and ORP. Record the GPS coordinates on the field data sheet.

Step 3. Rig gill net with appropriate anchors and buoys.

Step 4. Bring the boat parallel to shore in 5 meters of water (turn the boat into the prevailing wind if possible).

Step 5. With one technician on the bow of the boat lower the leading anchor to the bottom and pay out the net as the boat is slowly reversed. Pay out the net by handling the float-line and shaking out or spreading the mesh as the boat reverses to assure net deploys.

Step 6. After the full length if the gill net is set out, stretch the net as taut as possible, and drop the trailing anchor.

Step 7. Allow for two hours to elapse before retrieval.

### 7.1.3 Field (Gill Net Retrieval):

Step 1. Pull in the downwind buoy and anchor, and remove them from the net. Grasping the lead and floatlines together, slowly bring in the net.

Step 2. As fish are encountered remove them as fast as possible and place in a live well. Under ideal conditions and a light catch, the fish may be removed from the net as it is being retrieved. When large catches are encountered, remove only gamefish, all other fish can be removed after net is retrieved at a location secluded from public viewing.

Step 3. Record data on catch using the appropriate field forms, recording the following information:

- Species identification.
- Length (mm) total length.
- Weight (gram - fall sample only).
- Scale samples (only in fall samples on all bass).
- Condition of fish (dead or alive).
- Tag all game fish if healthy and record tag number.

Step 4. Repeat all steps (7.1.2 and 7.1.3) for the other four (4) locations.

### 7.1.4 End of Sample Day

Step 1. Review field notes for completeness and QAPP sign offs.

Step 2 Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

Step 4. Download water quality data.

### 7.1.5 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

### 7.1.6 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet
- Bulk fish
- Individual fish
- Map showing location of sampling stations
- Facility code/station description
- List of fish species codes/names
- Sample labels
- Scale envelopes

Appendix A5 contains examples of the station data sheet, individual fish data sheet, bulk fish data sheet, map of sampling stations, list of facility codes/station description, and list of species codes/names appropriate for use in sampling pelagic adult fish.

## 8.0 DEFORMITIES, EROSIONS, LESIONS, TUMORS, FUNGAL INFECTIONS, AND MALIGNANCIES (DELTFM) MONITORING

Tracking of DELTFM parameters will be conducted in conjunction with all fisheries sampling activities with the exception of larval fish sampling and the adult fish nesting survey. DELTFM parameters will be recorded for only individual juvenile fish (not the bulk counts). All captured fish will be screened for any visible abnormalities. The abnormalities will be recorded on the corresponding data sheet. The technicians will be required to record the following abnormalities on the data sheets:

**D**eformities **–** Any distorted form of the fishes anatomy.
**E**rosions **–** Wear marks, scares, or scrapes.
**L**esions **–** Visible sores, or wounds.
**T**umors **–** A localized swelling of tissue on or in the body that has no physical function.
**F**ungal Infections **–** Any visible fungal growth on the fish.
**M**alignancies **–** A growth that could be cancerous. (use field judgement).

## 9.0 RECREATIONAL FISHERY – ANGLER DIARY

Angler diaries will continue to be used to assess the recreational fishery of Onondaga Lake. Angler catch rate and species composition of the catch, as well as angler attitude and opinions will be assessed. Potential anglers for participation in the angler diary program will be solicited at various fishing tournaments and through local sportsman organizations. The OCDWEP angler diary program uses record keeping forms similar to those used by the New York State Department of Environmental Conservation in their angler diary program.

## 10.0 CHRONOLOGY OF QAPP

The QAPP for the Onondaga Lake Fish Sampling Program is a living document in that it will be periodically updated to reflect changes in the monitoring program that are instituted to improve the efficiency of data collection, focus on a particular aspect of the fish community, or narrow or expand the scope of investigation. The periodic updating of the QAPP will provide a written record of sampling procedures over the entire life of the Onondaga Lake Fish Sampling Program. This April 2007 version of the QAPP is the sixth version/issue of the document.

The first version (Initial Draft) was submitted to OCDWEP on October 18, 2000 for review and comment by OCDWEP staff. Following review of the Initial Draft by OCDWEP, a meeting was held between IA and OCDWEP in which comments on the Initial Draft were provided. These comments, along with information gathered during data analysis and report preparation for the 2000 fish sampling program were incorporated into a second version of the document submitted to OCDWEP in July 2001. Annual revisions to the QAPP have incorporated various changes made to the fisheries assessment program.

The original QAPP, and subsequent revisions, have been reviewed by the NYSDEC, revised by OCDWEP as requested, and approved by the NYSDEC prior to implementation.

## 11.0 LITERATURE CITED

EcoLogic, LLC. *Onondaga County Ambient Monitoring Program: Year 2000 Onondaga Lake Fish Sampling Program. Prepared for Onondaga County Department of Drainage and Sanitation, Syracuse, NY. EcoLogic, LLC., Cazenovia, NY.*

OCDWEP *SOP For Fish Scale Age and Growth Determination (DOC No. BIO-001)*

OCDWEP *SOP For Larval Fish Identification (DOC No. BIO-002)*

OCDWEP *SOP For Fish Tagging (DOC No. BIO-003)*

OCDWEP *SOP For Littoral-Profundal Zone Fixed Deep Water Gill Net Sampling (DOC No. BIO-006)*

OCDWEP *SOP For Littoral Zone Electrofishing (DOC No. BIO-007)*

OCDWEP *SOP For Littoral Zone Young-Of-Year and Juvenile Fish Bag Seine (DOC No. BIO-008)*

OCDWEP *SOP For Fish Nesting Survey (DOC No. BIO-009)*

OCDWEP *SOP For Pelagic Larvae Sampling – Miller High Speed/Modified Double Oblique Tow (DOC No. BIO-010)*

# APPENDIX A1:

## Field Data Packet For Pelagic Larvae Sampling

### Facility Code and Station Description

| Facility Code | Site Abbreviation | Site Description |
|---|---|---|
| 2700 | NBMHT1 | North Basin Miller High Speed Trawl 1 |
| 2701 | NBMHT2 | North Basin Miller High Speed Trawl 2 |
| 2702 | NBMHT3 | North Basin Miller High Speed Trawl 3 |
| 2703 | NBMHT4 | North Basin Miller High Speed Trawl 4 |
| 2704 | SBMHT1 | South Basin Miller High Speed Trawl 1 |
| 2705 | SBMHT2 | South Basin Miller High Speed Trawl 2 |
| 2706 | SBMHT3 | South Basin Miller High Speed Trawl 3 |
| 2707 | SBMHT4 | South Basin Miller High Speed Trawl 4 |

# PELAGIC LARVAE -- MILLER TRAWL
## Modified Double Oblique Tow

**Date:** ____________ **Basin:** ____________

**Crew:** ____________ **Site Abbreviation:** ____________

**Time Start:** (trawl) ______ **End:** (trawl) ______ **Bottle No:** ____________

**GPS:** North: $43^o$ ______ ***(Start)*** West: $76^o$ ______ **Fac. Code:** ______ **Preserv.Y/N** ______

North: $43^o$ ______ ***(End)*** West: $76^o$ ______ **# of Bottles:** ______ **Compass Brg:** ______

**Flow Meter Start:** ______ **Flow End:** ______ **Cable Angle:** ______ **At** ______ **Meters**

**Total Trawl Time:** ______ *(min:sec)* **Avg Speed:** ______ *(mph)*

---

*Field Observations - Only Enter One (1) Option*

**Weather:** ____________
*OVercast PartlyCloudy HaZy CLear RAining SNowing*

**Wind:** ______ **from:** ______
*0-5mph 5-10 10-15 >15* *N,SE,SSE, etc.*

**Water Quality Profile Taken?** *Yes / No*

**Waves:** *Calm / Swells / Whitecaps*

**Water Clarity:** *Poor / Moderate / Good*

**Significant Rainfall in the Last 48 Hours?** *Yes / No*

**Comments:** *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

| Meters | Cable Angle | Meters | Cable Angle |
|---|---|---|---|
| 10 | | 5 | |
| 9 | | 4 | |
| 8 | | 3 | |
| 7 | | 2 | |
| 6 | | 1 | |

**Data Validity Classification:** *Good / Conditional / Invalid*

**# of Attached Data Sheets:** Bulk Fish ______ Larval Fish ______ (During Biology Lab ID)
C of C ______

**Date Sorted:** ______ **QA/QC Date:** ______
**Initials:** ______ **Initials:** ______

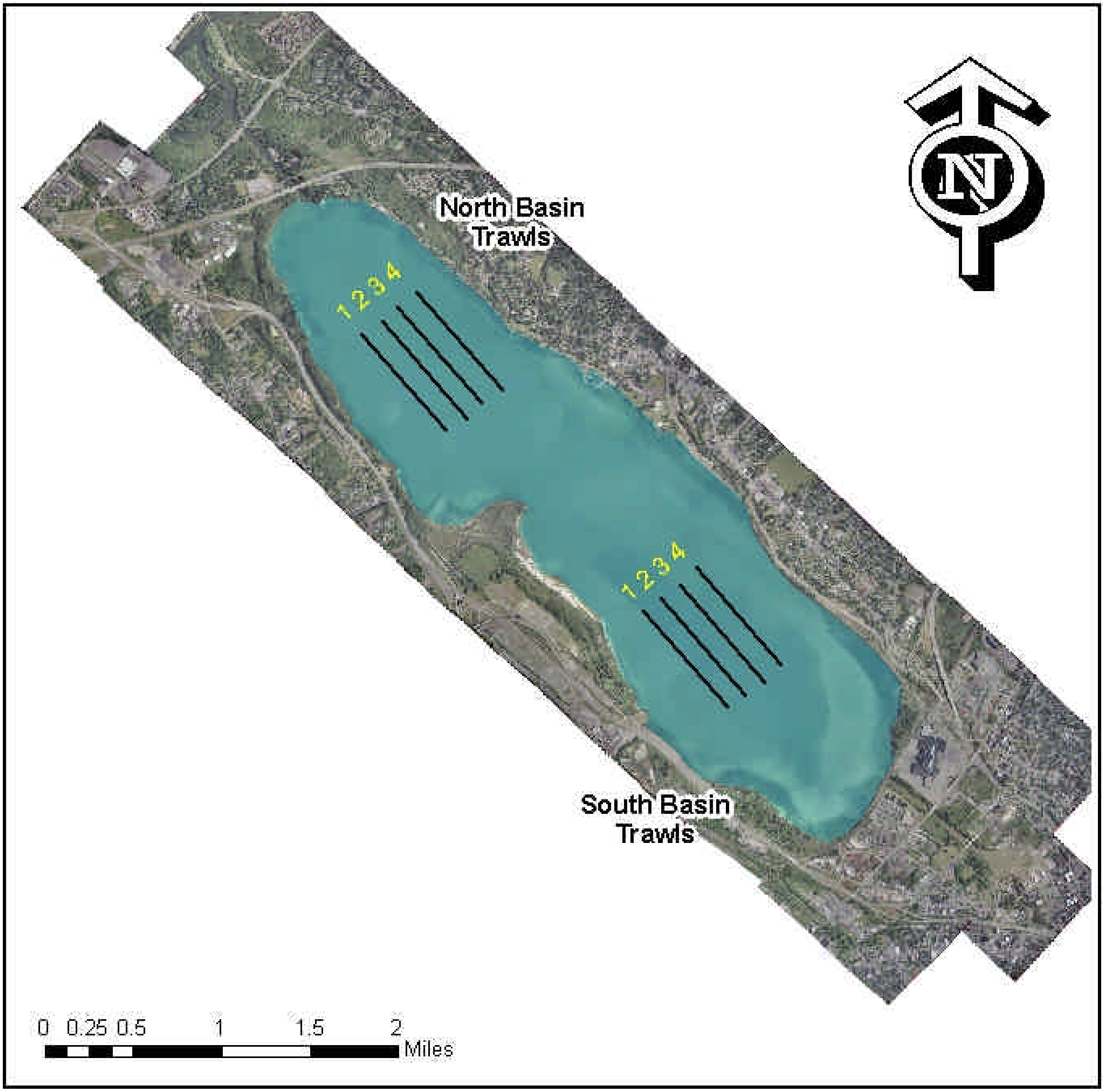
---

**QAPP Signoffs (Initital and Date):**
Field: ______ Office: ______ Data Entry: ______

---

# Species Codes and Common Names

| Species Code | Common Name | Species Code | Common Name | Species Code | Common Name |
|---|---|---|---|---|---|
| 0 | No Catch | 390 | Spottail shiner | 576 | White bass |
| 207 | Sea lamprey | 394 | Spotfin Shiner | 576.1 | Temperate Basses |
| 268 | Longnose gar | 396 | Redfin shiner | 591 | Rock bass |
| 271 | Bowfin | 397.1 | Notropis sp. | 595 | Green sunfish |
| 276 | American eel | 400 | Bluntnose minnow | 596 | Pumpkinseed |
| 285 | Blueback Herring | 401 | Fathead minnow | 598 | Bluegill |
| 289 | Alewife | 401.1 | Pimephalus sp. | 599.1 | Lepomis sp. |
| 290.1 | Blueback and/or Alewife | 403 | Longnose dace | 600 | Smallmouth bass |
| 294 | Gizzard shad | 406 | Creek chub | 601 | Largemouth bass |
| 297.1 | Herring Family (Cluepeidae) | 407 | Fallfish | 601.1 | Black Bass (SM or LM) |
| 326 | Rainbow trout | 408.1 | Semotilus sp. | 602 | White crappie |
| 327 | Atlantic salmon | 409.1 | Minnow Family (Cyprinadae) | 603 | Black crappie |
| 328 | Brown trout | 419 | White sucker | 603.1 | Crappie (White or Black) |
| 329 | Brook trout | 423 | Northern hog sucker | 603.2 | Sunfish Family (Centrarchidae) |
| 329.1 | Tiger Trout (hybrid) | 432 | Shorthead redhorse | 613 | Johnny darter |
| 332 | Splake | 433.1 | Suckers (Catostomidae) | 614 | Tesselated darter |
| 332.1 | Trout Family (Salmonidae) | 443 | Yellow bullhead | 616.1 | Ethostoma sp. |
| 335 | Rainbow smelt | 444 | Brown bullhead | 617 | Yellow perch |
| 340 | Central mudminnow | 444.1 | Bullhead (species unknown) | 618 | Logperch |
| 347 | Northern pike | 445 | Channel catfish | 624.1 | Darter (not YPerch) |
| 349 | Chain pickerel | 450.1 | Freshwater Catfish | 626 | Walleye |
| 350 | Tiger muskellunge | 461 | Trout perch | 628.1 | Perch Family (Percidae) |
| 350.1 | Pike Family (Esocidae) | 493 | Burbot | 700 | Freshwater drum |
| 365 | Carp | 531 | Banded killifish | 970 | NS (Bullhead sunfish, etc) |
| 377 | Golden shiner | 545 | Brook Silverside | 999 | SPECIES UNKNOWN |
| 381 | Emerald shiner | 561 | Brook stickleback | | |
| 385 | Common shiner | 575 | White perch | | |





Trawl Tow Sites

# LOCATION OF PELAGIC LARVAL TRAWL SITES ON ONONDAGA LAKE

# APPENDIX A2:

## Field Data Packet For Littoral YOY/Juvenile Fish Sampling

### Facility Code and Station Description

| Facility Code | Site Abbreviation | Site Description |
|---|---|---|
| 2581 | ST1JS1R1 | Stratum 1 Juvenile Seine Site 1 |
| 2584 | ST1JS2R1 | Stratum 1 Juvenile Seine Site 2 |
| 2587 | ST1JS3R1 | Stratum 1 Juvenile Seine Site 3 |
| 2590 | ST2JS1R1 | Stratum 2 Juvenile Seine Site 1 |
| 2593 | ST2JS2R1 | Stratum 2 Juvenile Seine Site 2 |
| 2596 | ST2JS3R1 | Stratum 2 Juvenile Seine Site 3 |
| 2599 | ST3JS1R1 | Stratum 3 Juvenile Seine Site 1 |
| 2602 | ST3JS2R1 | Stratum 3 Juvenile Seine Site 2 |
| 2605 | ST3JS3R1 | Stratum 3 Juvenile Seine Site 3 |
| 2608 | ST4JS1R1 | Stratum 4 Juvenile Seine Site 1 |
| 2611 | ST4JS2R1 | Stratum 4 Juvenile Seine Site 2 |
| 2614 | ST4JS3R1 | Stratum 4 Juvenile Seine Site 3 |
| 2617 | ST5JS1R1 | Stratum 5 Juvenile Seine Site 1 |
| 2620 | ST5JS2R1 | Stratum 5 Juvenile Seine Site 2 |
| 2623 | ST5JS3R1 | Stratum 5 Juvenile Seine Site 3 |

# LITTORAL JUVENILES -- BAG SEINE

**Date:** ____________ **Stratum:** ____________
**Crew:** ____________ **Site:** ____________
**Time Start:** ________ (Start Seining) **Time End:** ________ (Processing Fish) **Facility Code:** ____________

**GPS** North: 43° ________ West: 76° ________ *(decimal minutes)*

*Field Observations - Only Enter One (1) Option*

**Weather:** ____________
*OVercast PartlyCloudy HaZy CLear RAining SNowing*

**Waves:** *Calm / Swells / Whitecaps*
**Water Clarity:** *Poor / Moderate / Good*

**Wind:** ________ **from:** ________
*0-5mph 5-10 10-15 >15* *N,SE,SSE, etc.*

**Significant Rainfall in the Last 48 Hours?** *Yes / No*

***Habitat and Substrate Observations - Include Only The Actual Physical Area Seined.***

**Habitat:** Vegetation ________ Pct cover ________ Structure ______ Pct ______
*Emergent Submerged Algae Debris None* *overhead Veg. Rocks Logs Dropoff Manmade*
*Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%*

**Substrate:** *VeGetated Plant Debris MuD SIlt SAnd* Type ______ Pct ______
*GRavel CObble BOulder BedRock CLay* Type ______ Pct ______
*ONcolites WasteBed ConcreTe MarL UNknown* Type ______ Pct ______
*Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%*

**Water Quality:**

| *Depth(m)* | *Temp('C)* | *DO(mg/l)* | *DO(%Sat)* | *Cond* | *pH* | *Redox* |
|---|---|---|---|---|---|---|
| | | | | | | |

**Average Depth (m):** ________ **Shoreline Length (m)** ________

**Comments:** *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

______________________________
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______________________________
______________________________
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**Data Validity Classification:** *Good / Conditional / Invalid*
**# of Attached Data Sheets:** Bulk Fish ________ Indiv. Fish ______

**QAPP Signoffs (Initital and Date):**
Field: ____________ Office: ____________ Data Entry: ____________

*Onondaga County Department of Water Environment Protection*
*Onondaga Lake Fisheries Assessment Program*



# INDIVIDUAL FISH DATA SHEET

**Date:** __________ **Program/GearType:** __________
**Facility Code:** __________ **Location/Site:** __________
(Include Facility Codes for all samples on data sheet)

| Facility Code | Species Code | Common Name | Stage *(A,J,Y)* | Length *(mm)* | Weight *(grams)* | Scale # | Tag # | *Is fish Dead?* | DELTFM *Codes* | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
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**QAPP Signoffs (Initital and Date):**
Field: __________ Office: __________ Data Entry: __________

*Onondaga County Department of Water Environment Protection*
*Onondaga Lake Fisheries Assessment Program*

**Page** _______ **of** _______

# BULK CATCH DATA SHEET

***(Record Individual Fish > Initial 30 Count, and Non-Boarded Estimates and/or Counts)***

**Date:** ______________ **Program/GearType:** ____________________

**Facility Code:** ______________________________ **Location/Site:** ____________________

(Include Facility Codes for all samples on data sheet)

| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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| **Total Fish:** | | | | | | | |
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| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
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| **Total Fish:** | | | | | | | |
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| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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| **Total Fish:** | | | | | | | |
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**QAPP Signoffs (Initital and Date):**

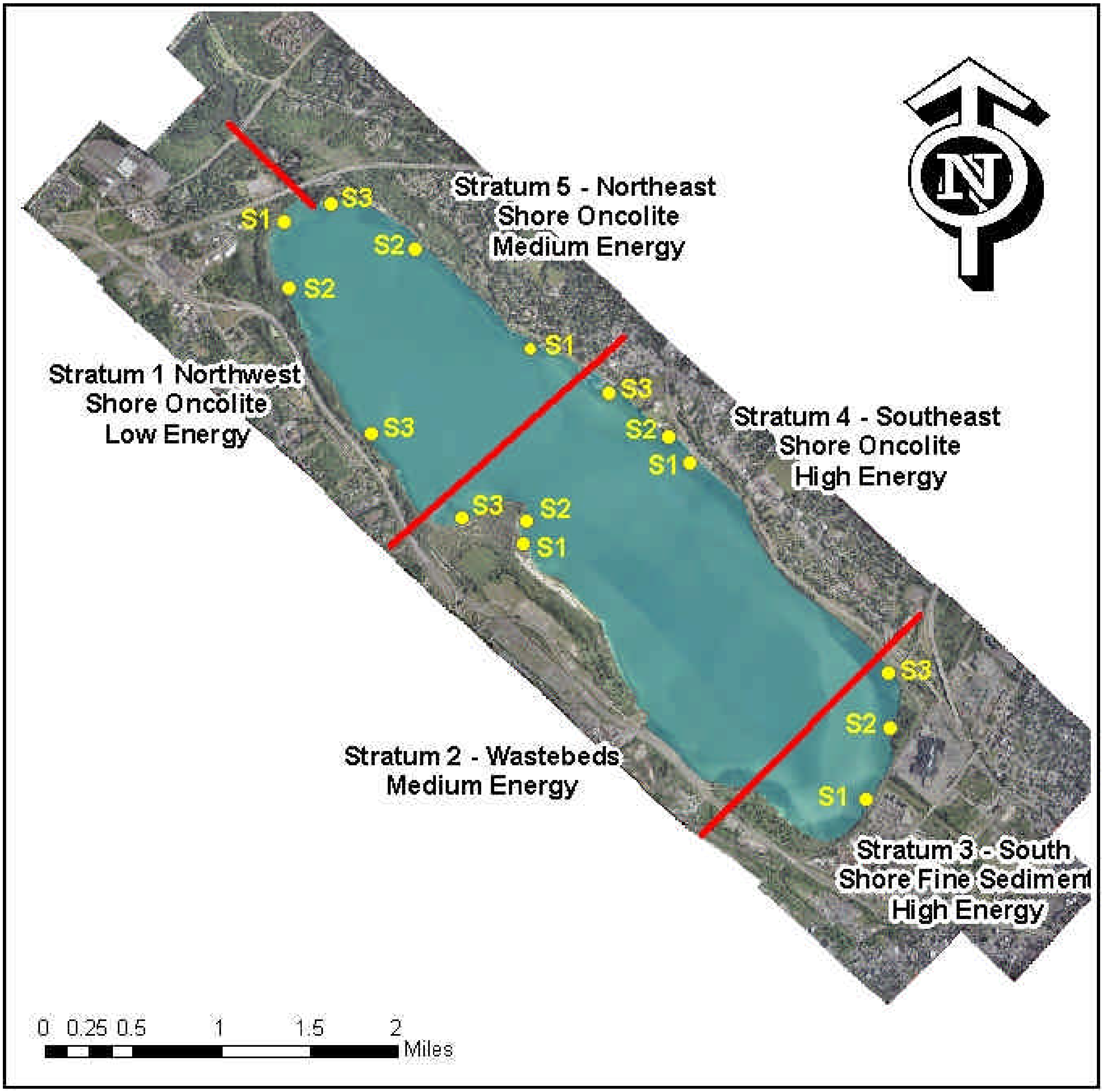
Field: ______________ Office: ____________________ Data Entry: ____________________

*** All fish with obvious DELTFM parameters must be listed on the individual fish data form.**

*Revised by OCDWEP 2/2006*

Species Codes and Common Names

| Species Code | Common Name | Species Code | Common Name | Species Code | Common Name |
|---|---|---|---|---|---|
| 0 | No Catch | 390 | Spottail shiner | 576 | White bass |
| 207 | Sea lamprey | 394 | Spotfin Shiner | 576.1 | Temperate Basses |
| 268 | Longnose gar | 396 | Redfin shiner | 591 | Rock bass |
| 271 | Bowfin | 397.1 | Notropis sp. | 595 | Green sunfish |
| 276 | American eel | 400 | Bluntnose minnow | 596 | Pumpkinseed |
| 285 | Blueback Herring | 401 | Fathead minnow | 598 | Bluegill |
| 289 | Alewife | 401.1 | Pimephalus sp. | 599.1 | Lepomis sp. |
| 290.1 | Blueback and/or Alewife | 403 | Longnose dace | 600 | Smallmouth bass |
| 294 | Gizzard shad | 406 | Creek chub | 601 | Largemouth bass |
| 297.1 | Herring Family (Cluepeidae) | 407 | Fallfish | 601.1 | Black Bass (SM or LM) |
| 326 | Rainbow trout | 408.1 | Semotilus sp. | 602 | White crappie |
| 327 | Atlantic salmon | 409.1 | Minnow Family (Cyprinadae) | 603 | Black crappie |
| 328 | Brown trout | 419 | White sucker | 603.1 | Crappie (White or Black) |
| 329 | Brook trout | 423 | Northern hog sucker | 603.2 | Sunfish Family (Centrarchidae) |
| 329.1 | Tiger Trout (hybrid) | 432 | Shorthead redhorse | 613 | Johnny darter |
| 332 | Splake | 433.1 | Suckers (Catostomidae) | 614 | Tesselated darter |
| 332.1 | Trout Family (Salmonidae) | 443 | Yellow bullhead | 616.1 | Ethostoma sp. |
| 335 | Rainbow smelt | 444 | Brown bullhead | 617 | Yellow perch |
| 340 | Central mudminnow | 444.1 | Bullhead (species unknown) | 618 | Logperch |
| 347 | Northern pike | 445 | Channel catfish | 624.1 | Darter (not YPerch) |
| 349 | Chain pickerel | 450.1 | Freshwater Catfish | 626 | Walleye |
| 350 | Tiger muskellunge | 461 | Trout perch | 628.1 | Perch Family (Percidae) |
| 350.1 | Pike Family (Esocidae) | 493 | Burbot | 700 | Freshwater drum |
| 365 | Carp | 531 | Banded killifish | 970 | NS (Bullhead sunfish, etc) |
| 377 | Golden shiner | 545 | Brook Silverside | 999 | SPECIES UNKNOWN |
| 381 | Emerald shiner | 561 | Brook stickleback | | |
| 385 | Common shiner | 575 | White perch | | |





Seine Sites

Stratum Border

# LOCATION OF YOY-JUVENILE SEINE SITES ON ONONDAGA LAKE

# APPENDIX A3:

## Field Data Packet For Nesting Surveys

### Facility Code and Station Description

| Facility Code | Site Abbreviation | Site Description |
|---|---|---|
| 2626 | NS1 | Nesting Survey Transect 1 |
| 2627 | NS2 | Nesting Survey Transect 2 |
| 2628 | NS3 | Nesting Survey Transect 3 |
| 2629 | NS4 | Nesting Survey Transect 4 |
| 2630 | NS5 | Nesting Survey Transect 5 |
| 2631 | NS6 | Nesting Survey Transect 6 |
| 2632 | NS7 | Nesting Survey Transect 7 |
| 2633 | NS8 | Nesting Survey Transect 8 |
| 2634 | NS9 | Nesting Survey Transect 9 |
| 2635 | NS10 | Nesting Survey Transect 10 |
| 2636 | NS11 | Nesting Survey Transect 11 |
| 2637 | NS12 | Nesting Survey Transect 12 |
| 2638 | NS13 | Nesting Survey Transect 13 |
| 2639 | NS14 | Nesting Survey Transect 14 |
| 2640 | NS15 | Nesting Survey Transect 15 |
| 2641 | NS16 | Nesting Survey Transect 16 |
| 2642 | NS17 | Nesting Survey Transect 17 |
| 2643 | NS18 | Nesting Survey Transect 18 |
| 2644 | NS19 | Nesting Survey Transect 19 |
| 2645 | NS20 | Nesting Survey Transect 20 |
| 2646 | NS21 | Nesting Survey Transect 21 |
| 2647 | NS22 | Nesting Survey Transect 22 |
| 2648 | NS23 | Nesting Survey Transect 23 |
| 2649 | NS24 | Nesting Survey Transect 24 |

# NEST SURVEY COVER SHEET

**Date:** ______________ **Transect:** ______________
**Crew:** ______________ **Facility Code:** ______________
**Time Start:** ________ **End:** ________ **Observer:** ______________

*Field Observations - Only Enter One (1) Option*

**GPS:** *Starting Coordinates* North: 43° ________ West: 76° ________ *(decimal minutes)*
*Ending Coordinates* North: 43° ________ West: 76° ________ *(decimal minutes)*

**Weather:** ______________
*OVercast PartlyCloudy HaZy CLear RAining*

**Waves:** *Calm / Swells / Whitecaps*
**Water Clarity:** *Poor / Moderate / Good*

**Wind:** ________ **from:** ________
*0-5mph 5-10 10-15 >15* *N,SE,SSE, etc.*

**Significant Rainfall in the Last 48 Hours?**
*Yes / No*

**Habitat:** Vegetation ______ Pct cover ______ Structure ________ Pct ______
*Emergent Submerged Algae Debris* *overhead Veg. Rocks Logs Dropoff Manmade*
*Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%*

**Substrate:** *VeGetated Plant Debris MuD SIlt SAnd* Type ______ Pct ______
*GRavel CObble BOulder BedRock CLay* Type ______ Pct ______
*ONcolites WasteBed ConcreTe MarL UNknown* Type ______ Pct ______
*Pct Cover Codes: N=none 0=1-5% 1=6-25% 2=26-50% 3=51-90% 4=>90%*

**Water Quality:**

| *Depth(m)* | *Temp('C)* | *DO(mg/l)* | *DO(%Sat)* | *Cond* | *pH* | *Redox* |
|---|---|---|---|---|---|---|
| | | | | | | |

**Comments:** *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

______________________________________________

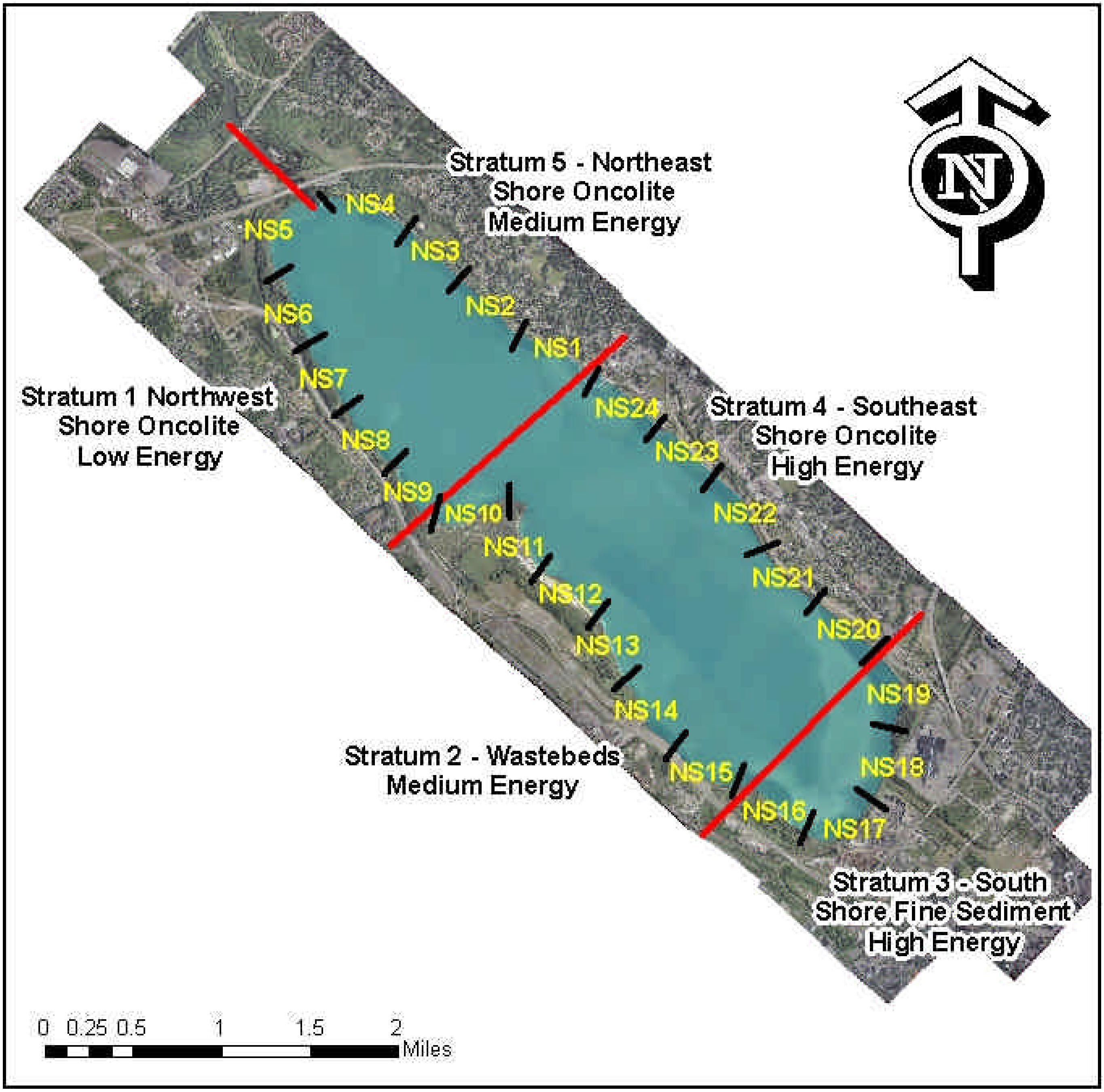
______________________________________________

**NUMBER OF NESTS OBSERVED**

| SppCode | Common Name | Field Marks | #Nests |
|---|---|---|---|
| 999 | UNKNOWN | | |
| 596 | Pumpkinseed | | |
| 598 | Bluegill | | |
| 599.1 | Lepomis. sp. | | |
| 600 | Smallmouth Bass | | |
| 601 | Largemouth Bass | | |
| 601.1 | Black Bass | | |
| 444.1 | Bullhead | | |
| | | | |
| | | | |
| | | **Total No. of Nests Observed:** | |

**Data Validity Class:** *Good / Conditional / Invalid*

**QAPP Signoffs (Initital and Date):**
Field: ____________ Office: ____________ Data Entry: ____________





Transect Border


Stratum Border

# LOCATION OF NESTING SURVEY TRANSECTS IN ONONDAGA LAKE

APPENDIX A4:

# Field Data Packet For Littoral Adult Fish Sampling (Electrofishing)

## Facility Code and Station Description

| Facility Code | Site Abbreviation | Site Description |
|---|---|---|
| 2676 | EF1 | Electrofishing Transect 1 |
| 2677 | EF2 | Electrofishing Transect 2 |
| 2678 | EF3 | Electrofishing Transect 3 |
| 2679 | EF4 | Electrofishing Transect 4 |
| 2680 | EF5 | Electrofishing Transect 5 |
| 2681 | EF6 | Electrofishing Transect 6 |
| 2682 | EF7 | Electrofishing Transect 7 |
| 2683 | EF8 | Electrofishing Transect 8 |
| 2684 | EF9 | Electrofishing Transect 9 |
| 2685 | EF10 | Electrofishing Transect 10 |
| 2686 | EF11 | Electrofishing Transect 11 |
| 2687 | EF12 | Electrofishing Transect 12 |
| 2688 | EF13 | Electrofishing Transect 13 |
| 2689 | EF14 | Electrofishing Transect 14 |
| 2690 | EF15 | Electrofishing Transect 15 |
| 2691 | EF16 | Electrofishing Transect 16 |
| 2692 | EF17 | Electrofishing Transect 17 |
| 2693 | EF18 | Electrofishing Transect 18 |
| 2694 | EF19 | Electrofishing Transect 19 |
| 2695 | EF20 | Electrofishing Transect 20 |
| 2696 | EF21 | Electrofishing Transect 21 |
| 2697 | EF22 | Electrofishing Transect 22 |
| 2698 | EF23 | Electrofishing Transect 23 |
| 2699 | EF24 | Electrofishing Transect 24 |

# LITTORAL ADULTS -- BOAT ELECTROFISHER

**Date:** __________________ **Transect:** __________________
**Crew:** __________________ **Facility Code:** __________________

**Start**
**Time :** __________________
**GPS:** North: 43° ________ West: 76° ________

**End**
**Time:** __________________
**GPS:** North: 43° ________ West: 76° ________

*Field Observations - Only Enter One (1) Option*

**Weather:** __________________
*OVercast PartlyCloudy HaZy CLear RAining SNowing*

**Waves:** *Calm / Swells / Whitecaps*

**Water Clarity:** *Poor / Moderate / Good*

**Wind:** ________ **from:** ________
*0-5mph 5-10 10-15 >15* *N,S,E,W,SE,SW,NE,NW.*

**Significant Rainfall in the Last 48 Hours?**
*Yes / No*

**Water Quality:**

| Depth(m) | Temp('C) | DO(mg/l) | DO(%Sat) | Cond | pH | Redox |
|---|---|---|---|---|---|---|
| | | | | | | |

**Comments:** *(Gear Condition, Unusual Weather or Conditions, Equipment or Sampling Problems, etc.)*

______________________________________________
______________________________________________

## BULK CATCH DATA

-- Include Individual fish > initial 30 count, & non-boarded estimates and/or counts)

| Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|
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| | | **Total Catch:** | | | | |

**EF Settings:**

| | | | | | |
|---|---|---|---|---|---|
| **Sec. Start:** | | **Sec End:** | | **Total # Seconds:** | **(UnitEffort)** |
| **Pct Range:** | | **Amps:** | | **Avg. Speed:** | |
| **Frequency:** | | **Volts:** | | **Avg. Depth:** | |

**Data Validity Classification:** *Good / Conditional / Invalid*

**# of Attached Data Sheets:** Bulk Fish ________ Indiv. Fish ________

**QAPP Signoffs (Initital and Date):**

Field: ________________ Office: ________________ Data Entry: ________________

# INDIVIDUAL FISH DATA SHEET

**Date:** ____________ **Program/GearType:** ______________________________

**Facility Code:** ______________________ **Location/Site:** ______________________________

(Include Facility Codes for all samples on data sheet) ______________________________

| Facility Code | Species Code | Common Name | Stage *(A,J,Y)* | Length *(mm)* | Weight *(grams)* | Scale # | Tag # | *Is fish Dead?* | DELTFM *Codes* | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
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**QAPP Signoffs (Initital and Date):**

Field: ____________ Office: ______________ Data Entry: ________________

*Onondaga County Department of Water Environment Protection*
*Onondaga Lake Fisheries Assessment Program*

**Page** ________ **of** ________

# BULK CATCH DATA SHEET

***(Record Individual Fish > Initial 30 Count, and Non-Boarded Estimates and/or Counts)***

**Date:** ________________ **Program/GearType:** ________________________

**Facility Code:** ______________________________ **Location/Site:** ________________________
(Include Facility Codes for all samples on data sheet)

| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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| **Total Fish:** | | | | | | | |
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| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
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| **Total Fish:** | | | | | | | |
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| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
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| **Total Fish:** | | | | | | | |
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**QAPP Signoffs (Initital and Date):**

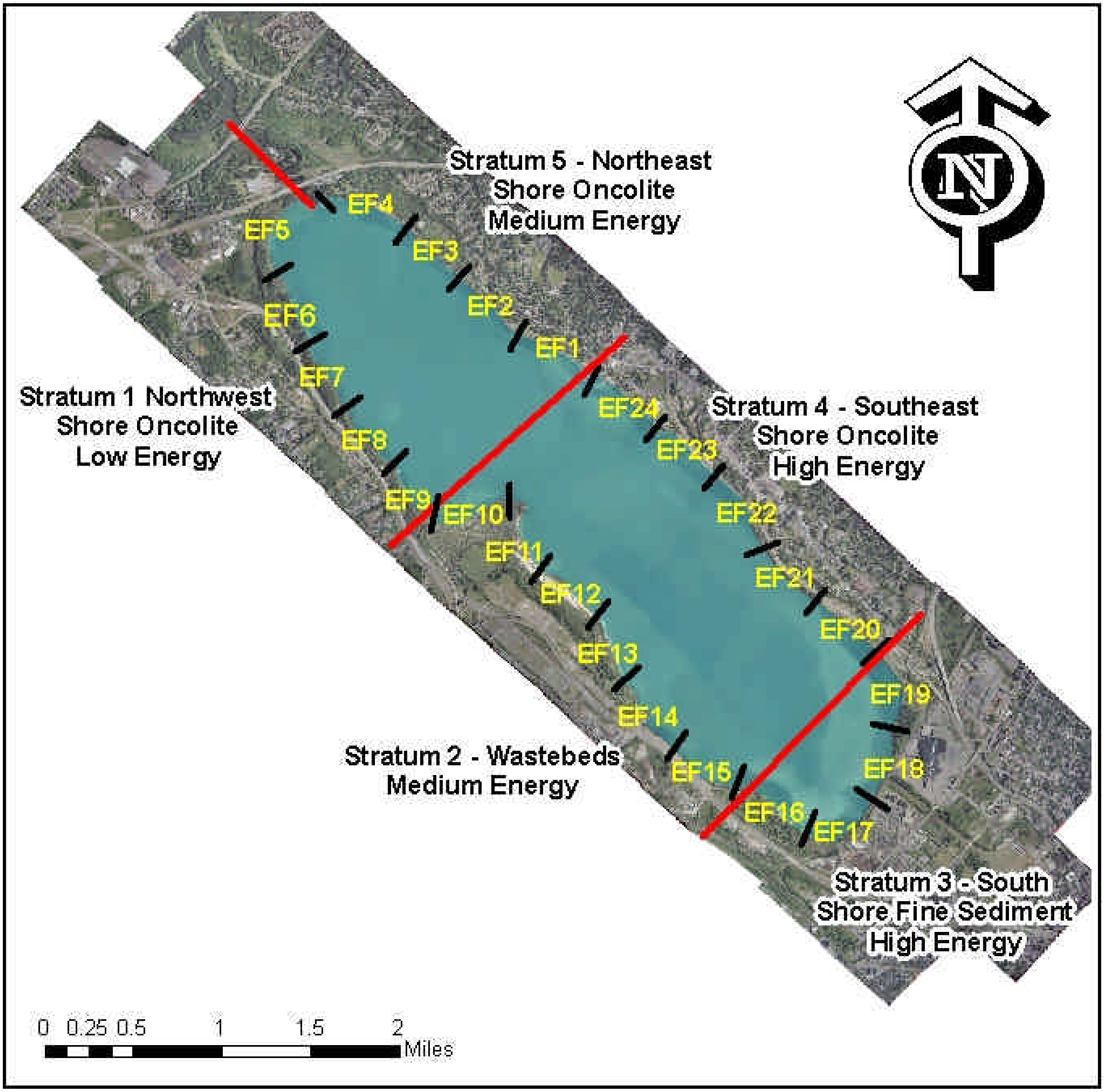
Field: ________________ Office: ________________________ Data Entry: ________________________

*** All fish with obvious DELTFM parameters must be listed on the individual fish data form.**

*Revised by OCDWEP 2/2006*

Species Codes and Common Names

| Species Code | Common Name | Species Code | Common Name | Species Code | Common Name |
|---|---|---|---|---|---|
| 0 | No Catch | 390 | Spottail shiner | 576 | White bass |
| 207 | Sea lamprey | 394 | Spotfin Shiner | 576.1 | Temperate Basses |
| 268 | Longnose gar | 396 | Redfin shiner | 591 | Rock bass |
| 271 | Bowfin | 397.1 | Notropis sp. | 595 | Green sunfish |
| 276 | American eel | 400 | Bluntnose minnow | 596 | Pumpkinseed |
| 285 | Blueback Herring | 401 | Fathead minnow | 598 | Bluegill |
| 289 | Alewife | 401.1 | Pimephalus sp. | 599.1 | Lepomis sp. |
| 290.1 | Blueback and/or Alewife | 403 | Longnose dace | 600 | Smallmouth bass |
| 294 | Gizzard shad | 406 | Creek chub | 601 | Largemouth bass |
| 297.1 | Herring Family (Cluepeidae) | 407 | Fallfish | 601.1 | Black Bass (SM or LM) |
| 326 | Rainbow trout | 408.1 | Semotilus sp. | 602 | White crappie |
| 327 | Atlantic salmon | 409.1 | Minnow Family (Cyprinadae) | 603 | Black crappie |
| 328 | Brown trout | 419 | White sucker | 603.1 | Crappie (White or Black) |
| 329 | Brook trout | 423 | Northern hog sucker | 603.2 | Sunfish Family (Centrarchidae) |
| 329.1 | Tiger Trout (hybrid) | 432 | Shorthead redhorse | 613 | Johnny darter |
| 332 | Splake | 433.1 | Suckers (Catostomidae) | 614 | Tesselated darter |
| 332.1 | Trout Family (Salmonidae) | 443 | Yellow bullhead | 616.1 | Ethostoma sp. |
| 335 | Rainbow smelt | 444 | Brown bullhead | 617 | Yellow perch |
| 340 | Central mudminnow | 444.1 | Bullhead (species unknown) | 618 | Logperch |
| 347 | Northern pike | 445 | Channel catfish | 624.1 | Darter (not YPerch) |
| 349 | Chain pickerel | 450.1 | Freshwater Catfish | 626 | Walleye |
| 350 | Tiger muskellunge | 461 | Trout perch | 628.1 | Perch Family (Percidae) |
| 350.1 | Pike Family (Esocidae) | 493 | Burbot | 700 | Freshwater drum |
| 365 | Carp | 531 | Banded killifish | 970 | NS (Bullhead sunfish, etc) |
| 377 | Golden shiner | 545 | Brook Silverside | 999 | SPECIES UNKNOWN |
| 381 | Emerald shiner | 561 | Brook stickleback | | |
| 385 | Common shiner | 575 | White perch | | |





# LOCATION OF ADULT ELECTROFISHING TRANSECTS IN ONONDAGA LAKE

# APPENDIX A5:

## Field Data Packet For Pelagic Adult Fish Sampling (Gill Nets)

Facility Code and Station Description

| Facility Code | Site Description |
|---|---|
| 2750 | Stratum 1 – Northwest Shore |
| 2756 | Stratum 2 – Wastebeds |
| 2762 | Stratum 3 – South Shore |
| 2768 | Stratum 4 – Southeast Shore |
| 2774 | Stratum 5 – Northeast Shore |

*Onondaga County Department of Water Environment Protection*
*Onondaga Lake Fish Monitoring Program*



# PELAGIC ADULTS -- GILL NET

**Haul Date:** ________________ **Basin:** ____ **Facility Code:** ______________________

| **Net Set** | **Net Hauled** |
|---|---|
| **Date:** ______________________ | **Date:** ______________________ |
| **Crew:** ______________________ | **Crew:** ______________________ |
| **Time:** ______________________ | **Time:** ______________________ |
| **GPS Position:** North: 43° ________ *(decimal minutes)* West: 76° ________ | **GPS Position:** North: 43° ________ *(decimal minutes)* West: 76° ________ |
| **Weather:** ______________________ *OVercast PartlyCloudy HaZy CLear RAining SNowing* | **Weather:** ______________________ *OVercast PartlyCloudy HaZy CLear RAining SNowing* |
| **Wind:** ________ *0-5mph 5-10 10-15 >15* **from:** ________ *N,SE,SSE, etc.* | **Wind:** ________ *0-5mph 5-10 10-15 >15* **from:** ________ *N,SE,SSE, etc.* |
| *For the Following Data, Circle the Appropriate Response* | *For the Following Data, Circle the Appropriate Response* |
| **Waves:** *Calm / Swells / Whitecaps* | **Waves:** *Calm / Swells / Whitecaps* |
| **Water Clarity:** *Poor / Moderate / Good* | **Water Clarity:** *Poor / Moderate / Good* |
| **Significant Rainfall in the Last 48 Hours?** *Yes / No* | **Significant Rainfall in the Last 48 Hours?** *Yes / No* |
| **Water Quality Profile Taken?** *Yes / No* | **Water Quality Profile Taken?** *Yes / No* |

**Comments:** *(Gear Condition, Unusual Weather, Predator Damage, Equipment or Sampling Problems, etc.)*

______________________________________________
______________________________________________
______________________________________________
______________________________________________
______________________________________________

**Is Net Intact Upon Recovery?** *Yes / No*

**Total # of Hours Fished (Unit Effort):** ________

**Data Validity Classification:** *Good / Conditional / Invalid*

**# of Attached Data Sheets:** BulkFish ________ Indiv. Fish ________

**QAPP Signoffs (Initital and Date):**

Field: ________________ Office: ________________ Data Entry: ________________

________________ ________________ ________________

*Onondaga County Department of Water Environment Protection*
*Onondaga Lake Fisheries Assessment Program*

**Page** _____ **of** ________________

# INDIVIDUAL FISH DATA SHEET

**Date:** ____________ **Program/GearType:** ______________________________
**Facility Code:** ______________________ **Location/Site:** ______________________________
(Include Facility Codes for all samples on data sheet) ______________________________

| Facility Code | Species Code | Common Name | Stage *(A,J,Y)* | Length *(mm)* | Weight *(grams)* | Scale # | Tag # | *Is fish Dead?* | DELTFM *Codes* | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
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**QAPP Signoffs (Initital and Date):**
Field: ____________ Office: ____________ Data Entry: ______________
____________ ____________ ______________

*Original Prepared for OCDWEP by Ichthyological Associates, Inc.* *Revised by OCDWEP 2/2006*

*Onondaga County Department of Water Environment Protection*
*Onondaga Lake Fisheries Assessment Program*

**Page** _______ **of** _______

# BULK CATCH DATA SHEET

***(Record Individual Fish > Initial 30 Count, and Non-Boarded Estimates and/or Counts)***

**Date:** ______________ **Program/GearType:** ______________

**Facility Code:** ______________ **Location/Site:** ______________

(Include Facility Codes for all samples on data sheet)

| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **Total Fish:** | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **Total Fish:** | | | | | | | |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |

| Facility Code | Species Code | Common Name | Stage *(A/J/Y)* | Total #Fish | Total Wt (g) | #Fish Dead | Count or Est? |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **Total Fish:** | | | | | | | |
| | | | | | | | |
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| | | | | | | | |
| | | | | | | | |

**QAPP Signoffs (Initital and Date):**

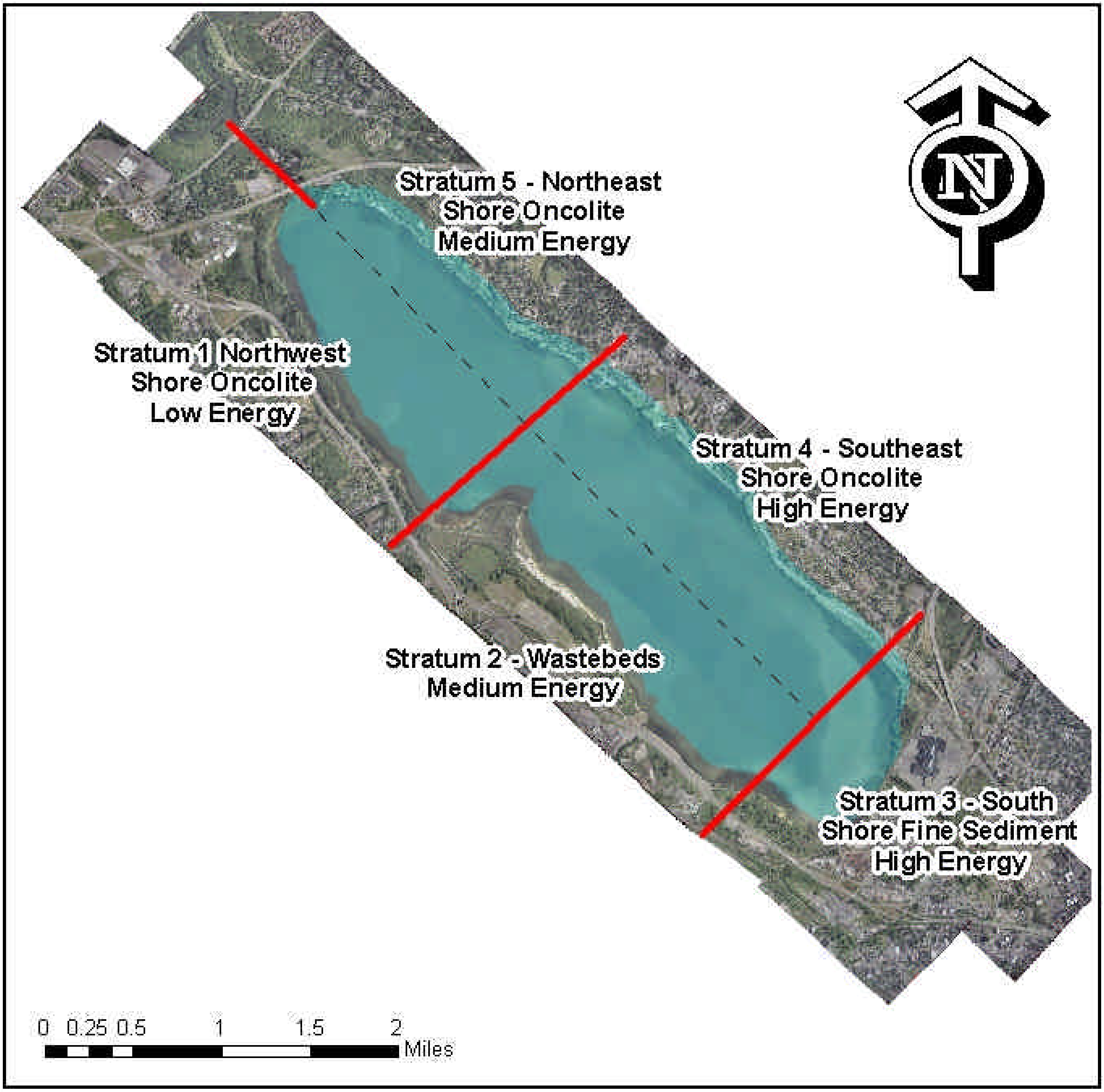
Field: ______________ Office: ______________ Data Entry: ______________

*** All fish with obvious DELTFM parameters must be listed on the individual fish data form.**

*Revised by OCDWEP 2/2006*

Species Codes and Common Names

| Species Code | Common Name | Species Code | Common Name | Species Code | Common Name |
|---|---|---|---|---|---|
| 0 | No Catch | 390 | Spottail shiner | 576 | White bass |
| 207 | Sea lamprey | 394 | Spotfin Shiner | 576.1 | Temperate Basses |
| 268 | Longnose gar | 396 | Redfin shiner | 591 | Rock bass |
| 271 | Bowfin | 397.1 | Notropis sp. | 595 | Green sunfish |
| 276 | American eel | 400 | Bluntnose minnow | 596 | Pumpkinseed |
| 285 | Blueback Herring | 401 | Fathead minnow | 598 | Bluegill |
| 289 | Alewife | 401.1 | Pimephalus sp. | 599.1 | Lepomis sp. |
| 290.1 | Blueback and/or Alewife | 403 | Longnose dace | 600 | Smallmouth bass |
| 294 | Gizzard shad | 406 | Creek chub | 601 | Largemouth bass |
| 297.1 | Herring Family (Cluepeidae) | 407 | Fallfish | 601.1 | Black Bass (SM or LM) |
| 326 | Rainbow trout | 408.1 | Semotilus sp. | 602 | White crappie |
| 327 | Atlantic salmon | 409.1 | Minnow Family (Cyprinadae) | 603 | Black crappie |
| 328 | Brown trout | 419 | White sucker | 603.1 | Crappie (White or Black) |
| 329 | Brook trout | 423 | Northern hog sucker | 603.2 | Sunfish Family (Centrarchidae) |
| 329.1 | Tiger Trout (hybrid) | 432 | Shorthead redhorse | 613 | Johnny darter |
| 332 | Splake | 433.1 | Suckers (Catostomidae) | 614 | Tesselated darter |
| 332.1 | Trout Family (Salmonidae) | 443 | Yellow bullhead | 616.1 | Ethostoma sp. |
| 335 | Rainbow smelt | 444 | Brown bullhead | 617 | Yellow perch |
| 340 | Central mudminnow | 444.1 | Bullhead (species unknown) | 618 | Logperch |
| 347 | Northern pike | 445 | Channel catfish | 624.1 | Darter (not YPerch) |
| 349 | Chain pickerel | 450.1 | Freshwater Catfish | 626 | Walleye |
| 350 | Tiger muskellunge | 461 | Trout perch | 628.1 | Perch Family (Percidae) |
| 350.1 | Pike Family (Esocidae) | 493 | Burbot | 700 | Freshwater drum |
| 365 | Carp | 531 | Banded killifish | 970 | NS (Bullhead sunfish, etc) |
| 377 | Golden shiner | 545 | Brook Silverside | 999 | SPECIES UNKNOWN |
| 381 | Emerald shiner | 561 | Brook stickleback | | |
| 385 | Common shiner | 575 | White perch | | |




Stratum Border

**Note:** One gill net is randomly placed in each of the five (5) strata at a depth of 4 to 5 Meters.

# LOCATION OF LITTORAL-PROFUNDAL GILL NET SETS IN ONONDAGA LAKE

# APPENDIX A6:

## Game Fish List

### Onondaga Lake Fisheries Assessment
### Game Fish List

| | |
|---|---|
| Largemouth bass | Smallmouth bass |
| Walleye | Black Crappie |
| White Crappie | Brown Bullhead |
| Yellow Bullhead | Channel catfish |
| Bluegill | All esocids (pike family) |
| Pumpkinseed | All salmonids (trout) |
| Yellow Perch | Rock bass |

**ATTACHMENT 3**

# QUALITY ASSURANCE PROGRAM PLAN

FOR THE 2007 ONONDAGA LAKE
MACROPHYTE ASSESSMENT PROGRAM

AMBIENT MONITORING PROGRAM

Prepared for the NYSDEC

Prepared by:

**Onondaga County**
**Department Of Water Environment Protection**

April 2007

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## 1.0 INTRODUCTION/PURPOSE

As part of the Onondaga Lake Ambient Monitoring Program the Onondaga County Department of Water Environment Protection has prepared a Quality Assurance Program Plan (QAPP) for the Onondaga Lake Macrophyte Assessment Program, 2007.

The County's long-term monitoring program includes assessment of physical, chemical, and biological attributes of the aquatic resource. The baseline Onondaga Lake Macrophyte Assessment Program and on going studies are expected to address the goal of the *Ambient Monitoring Program*.

### Background

The Macrophyte Assessment Program was developed in consultation with expert technical advisors in limnology. The 2007 lake macrophyte program is summarized in Table 1.

### Development of the QAPP

The purpose of the QAPP is to mesh field collection procedures and data requirements into a comprehensive document that provides a template for field, laboratory, and data management methods. The QAPP is meant to supplement in-house training of OCDWEP technicians and provide a framework from which trained staff can conduct consistent field surveys. The QAPP is considered to be a living document. That is, as changes are made in the Onondaga Lake Macrophyte Assessment Program, revisions will be made to the QAPP to reflect those changes. These may include changes to the:

- intensity of the sampling program;
- incorporation of new elements to the program, or deletion of specific;
- revisions and improvements to methodologies; and
- incorporation of new methodologies into the program.

Thus the QAPP will serve multiple purposes. It will provide documentation of standardized operations and procedures (SOPs), although more formal SOPs have been developed for in-house training and documentation purposes. It will provide a framework of data forms designed to ensure collection and entry of data, and provide a framework for training of OCDWEP's staff via consistent mentoring by more senior, experienced staff through the structure of the QAPP.

The QAPP has been divided into chapters. Each chapter represents a major field component of the AMP. Each chapter provides a purpose and description of the component, the procedures for sampling that component, appropriate data sheets, maps, and descriptions of stations and station codes. Only minor clarifications were made to the QAPP, and no major program modifications were incorporated in to the 2007 monitoring season.

**Table 1. Summary of year 2007 Onondaga Lake Macrophyte Assessment Program.**

| Component | Methodology/Gear | Sampling Objectives | Location and Number of Samples | Timing | Change |
|---|---|---|---|---|---|
| **Onondaga Lake Aerial Photography** | Program utilizes plane with belly mounted 9x9 camera.<br><br>60% forward overlap, 30% side overlap. | Determine annual percent of littoral zone with macrophytes. | -Three (3) flight lines full lake coverage. | -June or July when water clarity is approximately 3-meters on the secchi disk.<br>-Early morning or early evening with low sun angle. | -No change from previous year. |
| **Field Species Verification of Aerial Photography** | Visual identification. | Determine species. | -Two (2) sites in each of the five (5) strata for a total of ten (10) sites. | -Within 1 week of the aerial photos. | -No change from previous year. |
| **Macroalgae** | At nine (9) near shore locations using a laser range finder to estimate distance from shore and visual percent cover estimate. | Document percent cover and annual proliferation of littoral zone macroalgae. | -Survey once per week at nine (9) near shore buoy locations. | -May through September. | - No change from previous year. |

## 2.0 STAFF TRAINING

The OCDWEP has approached the AMP under the self-monitoring element that is central to the federal Clean Water Act. OCDWEP has acquired a staff with a wide range of academic education supplemented by experience gained by working for state agencies, universities, and environmental consulting and research firms. This staff of scientists and technicians are supported by maintenance and operation personnel that provide the skills to build, construct, maintain, and modify gear needed to conduct the surveys. This expertise allows the OCDWEP to successfully train and mentor qualified individuals to provide a high level of quality to the data of the macrophyte assessment program. As with any long-term monitoring program, individuals will advance in their careers, retire, or move to new locations. This matriculation will require periodic in-house training of new individuals. The QAPP is integral to this training. Its use and understanding will provide each individual with an easy to understand document to ensure day-to-day and year-to-year consistency of the Onondaga Lake Macrophyte Assessment Program.

In addition to the QAPP and SOPs, the County's Consultant, Ecologic LLC, conducts annual audits for macrophyte field verification component. The audit is intended to ensure that the field technicians conducted their work in a professional manner and comply with the procedures outlined in the QAPP and SOPs. In addition, the audits determine if any observation would jeopardize the quality of the data (technique, field logs, training, etc.).

Thus the use of the QAPP in conjunction with the formal Standard Operating Procedures (SOPs) and external audits for the biological monitoring program activities, the *Onondaga County Ambient Monitoring Program: Year 2007 Onondaga Lake Macrophyte Assessment Program* and subsequent programs will provide OCDWEP with a successful monitoring program.

## 3.0 AERIAL PHOTOGRAPHY

### 3.1 Procedures

Aerial photographs will be taken of Onondaga Lake on an annual basis utilizing a qualified contracted aerial photography firm. The aerial photographs must meet the following specifications:

- 1"=445' +/- scale.
- 3 flight lines (Must duplicate previous flight lines).
- 63 total exposures.
- 60% forward lap.
- 30% side lap.
- Formal titling of 63 exposure (*Onondaga Lake Macrophyte Survey – Date, Time, Scale, Flight Line and Exposure).*
- 2 sets of color contact prints.
- 1 set of black and white prints.

#### 3.1.1 Lake Macrophyte Growth Conditions

Step 1. Visually survey the macrophyte growth in the littoral zone from a boat during other lake sampling events (optimal time is usually Early July). Timing is critical; the aerial flight needs to be scheduled when macrophytes are approaching their peak, but before the lake macroalgae peaks (Usually late June to mid July).

**Note:** Prior to the aerial flight, large buoys (nearly 3ft diameter) will be positioned at the field verification locations for visual identification in the photos.

Step 2. Contact flight contractor to determine flight feasibility.

**Note:** These indicators are not always achieved due to turbidity, wind and other environmental factors. These are guidelines to determine the best possible conditions for aerial photographs.

#### 3.1.2 Pre-flight Planning and Coordination

Step 1. Review weekly secchi disc readings.

Step 2. Review weather report for the past week. No significant rainfall should be recorded for at least 48 hours prior to the flight.

Step 3. Review detailed weather report for the next few days. A clear day with low humidity and no haze needs to be targeted for the flight.

Step 4. Contact flight contractor as early as possible in the morning to confirm the flight. Usually this is done at 700 hours to allow the contractor travel time to shoot the photos during the period of low sun angle which is the period of 600 –1030 hours and 1630 – 2000 hours during this time of year.

### 3.2 Macrophyte Digitizing from Aerial Photos

Step 1. Geo referenced color Tiff images of the littoral zone are imported into an ArcView job file.

Step 2. The Tiff images are overlaid at a scale of 1:1,856 on a bathymetric map of Onondaga Lake. Digitizing should be carried out on the computer screen and areas perceived as macrophyte growth, based on color and texture, should be delineated.

Step 3. The perimeter of each macrophyte bed in the lake is outlined using the polygon feature of ArcView.

Step 4. In addition to macrophyte beds, nearshore areas that appear to have been dredged, piers, and other structures should be delineated and categorized separately from the macrophyte beds.

Step 5. ArcView will calculate the area of polygons in the file; this will be comparable to the area of the lake where macrophytes are present.

## 4.0 FIELD SPECIES VERIFICATION OF AERIAL PHOTOGRAPHY

### 4.1 Procedures

Field verification of macrophyte species present in Onondaga Lake will be conducted within one (1) week of the aerial flight. Two (2) samples will be collected from each of the five (5) strata for a total of ten (10) samples.

#### 4.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble: map and field sheets, equipment, and species key.

Step 3. Review weather reports for sampling feasibility.

#### 4.1.2 Field:

Step 1. Proceed to the first monitoring site. The following table summarizes the site description and coordinates for each sampling location.

| Site Description | Coordinates/Position |
|---|---|
| Onondaga Lake Site 1 | 43° 06.653' N, 76° 13.746' W |
| Onondaga Lake Site 2 | 43° 05.966' N, 76° 12.525' W |
| Onondaga Lake Site 3 | 43° 05.468' N, 76° 11.773' W |
| Onondaga Lake Site 4 | 43° 04.489' N, 76° 10.667' W |
| Onondaga Lake Site 5 | 43° 03.853' N, 76° 11.057' W |
| Onondaga Lake Site 6 | 43° 04.324' N, 76° 12.202' W |
| Onondaga Lake Site 7 | 43° 05.388' N, 76° 12.565' W |
| Onondaga Lake Site 8 | 43° 06.813' N, 76° 14.702' W |
| Onondaga Lake Site 9 | 43° 05.589' N, 76° 13.937' W |
| Onondaga Lake Site 10 | 43° 06.909' N, 76° 14.390' W |

Step 2. Upon arrival at site position the boat in approximately 1 to 1.5 meters of water, Then anchor the boat to secure the position.

Step 3. Confirm and record GPS location (the actual final position) and site number, then begin filling out the macrophyte field verification sheet (Figure 2).

Step 4. With rope or pole attached, position the meter-squared frame in the water and lower to bottom If dense beds of macrophytes are present use the rake to firmly ground the frame.

Step 5. Using the metal rake remove all macrophytes from the square meter area. If there are emergent or floating leafed macrophytes in the sample area, it may be necessary to pull them by hand in order to get them loose from the bottom. If large amounts of macroalgae are present the algae should be carefully pushed aside prior to collecting the sample, note presence of macroalgae and relative abundance on the datasheet in the comment section.

Step 6. As macrophytes are removed from the sample area place them in a tub filled with water.

Step 7. After removing all the macrophytes in the sample area, visually separate them into similar groups, placing each group into a separate 5-gallon bucket.

Step 8. Once all macrophytes are separated into groups, remove individual specimens from the 5-gallon buckets for identification. Spread the specimen out on a flat surface (top of a cooler) and identify it using a key. Record the identified species on the macrophyte field verification sheet. Continue to identify all remaining species of plants in this manner.

Step 9. Estimate percent cover of macrophytes from the area around the sample site in approximately a 5-meter radius around the boat. In addition, estimate the relative abundance for each species within the 5-meter radius.

**Note:** Determine and record if the species in the 5-meter radius represent the species around the boat (growth may be patchy). For example, the 1-square meter area may be primarily curly pondweed, but may have an elodea nearby within the 5-meter radius. These types of comments should be noted on the field data sheet.

**Note:** If a successful identification cannot be completed in the field, place the specimen in a plastic quart jar and fill with 10% buffered formalin for preservation. Use a separate generic name on the data sheet (such as Species a, b and so on) for each unidentified species, and estimate relative abundance for that species as you would for species identified in the field. The jar should be clearly marked with the following information:

- Date and time.
- Generic species name.
- Location.
- Field crew.
- Comments.

Step 10. Once all of the plants have been identified or preserved for further identification, and the field data sheet entries are complete, remove group of buoys. Then proceed to next station, and repeat Step 1 through 9.

### 4.1.3 End of Sample Day

Step 1. Review field notes for completeness.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs.

Step 4. Log any samples into the biological laboratory

### 4.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

### 4.1.5 Field Data Sheet Packet

Appendix B1 contains examples of the field verification data sheet and map of sampling stations.

## 5.0 MACROALGAE

### 5.1 Procedures

Annual macroalgae proliferation will be estimated on Onondaga Lake to determine the season percent cover within the littoral zone. This task will be coupled with the weekly lake near shore sampling. A total of nine (9) measurements will be collected weekly. Stakes with reflective discs will be placed on shore at the beginning of the field season. These stakes will be the bench mark to estimate the distance that the algae extends from shore.

#### 5.1.1 Pre-field:

Step 1. Review QAPP to determine overall needs of programs.

Step 2. Assemble field data sheets, laser range finder, and digital camera.

Step 3. Check batteries in laser range finder.

#### 5.1.2 Field:

Step 1. Proceed to site number, and position boat at its start at the outer edge of the algae mat, or in approximately 1 m of water if the algae mat does not extended beyond the 1 meter depth. The following table summarizes the coordinates of transects used in the macroalgae monitoring program in Onondaga Lake.

| Site # | Location | Buoy Coordinates | Shore Benchmark |
|---|---|---|---|
| Site 1 | Lake Nearshore (Nine Mile Creek) | 43° 05.477'N 76° 13.650'W | Point adjacent to Trib Mouth. |
| Site 2 | Lake Nearshore (Harbor Brook) | 43° 03.877'N 76° 11.043'W | 43° 03.77'N 76° 11.06'W |
| Site 3 | Lake Nearshore (Metro/Outfall) | 43° 03.923'N 76° 10.805'W | 43° 03.90'N 76° 10.85'W |
| Site 4 | Lake Nearshore (Ley Creek) | 43° 04.516'N 76° 10.592'W | 43° 04.52'N 76° 10.61'W |
| Site 5 | Lake Nearshore (Eastside) | 43° 06.529’N 76° 13.598'W | 43° 06.55'N 76° 13.58'W |
| Site 6 | Lake Nearshore (Willow Bay) | 43° 06.907'N 76° 14.167'W | 43° 06.90'N 76° 14.17'W |
| Site 7 | Lake Nearshore (Maple Bay) | 43° 06.732'N 76° 14.713'W | 43° 06.70'N 76° 14.83'W |
| Site 8 | Lake Nearshore (Bloody Brook) | 43° 05.720'N 76° 12.225'W | 43° 05.76'N 76° 12.11'W |
| Site 9 | Lake Nearshore (Wastebeds) | 43° 04.880'N 76° 12.620'W | NA |

Step 2. Using the laser range finder, aim at the shoreline stake with the reflective disc and record the distance on the field sheet. Record the approximate depth of water (in meters), and document each location with a digital picture.

Step 3. Estimate the percentage of the algae mat surface coverage along a straight visual line, approximately 2 meters wide, from the boat to the shoreline. If the algae mat is not large, or to distinguish between algae mats and emergent macrophytes, the boat may be moved towards shore to establish an accurate estimate. The laser range finder may be used to measure the inner and outer edge of any large algae mats to develop the estimate.

Step 4. The field data sheet should include a sketch of the algae mat formation from the boat to the shoreline, and include a description of the algae mats (e.g. some formation on emergent macrophytes, no mats present, primarily *Cladophora*, some blue-green algae present, etc.).

Step 5. Proceed to next station, and repeat steps 1 through 4.

### 5.1.3 End of Sample Day

Step 1. Review field notes for completeness.

Step 2. Submit original data sheets and field notes for duplication.

Step 3. Write down needed equipment repairs and report to supervisor.

Step 4. Download digital pictures.

### 5.1.4 End of Sample Event

Step 1. Log original data sheets/notes into OCDWEP Hardcopy File System.

Step 2. Submit duplicate copy of data sheets/notes for data entry.

### 5.1.5 Field Data Sheet Packet

The following items should be included in the field data sheet packet for this sampling activity.

- Station data sheet
- Map showing location of sampling stations
- Facility code/station description and coordinates

Appendix B2 contains examples of the station data sheet and map of sampling stations.

## 6.0 CHRONOLOGY OF QAPP

The QAPP for the Onondaga Macrophyte Assessment Program is a living document in that it will be periodically updated to reflect changes in the monitoring program that are instituted to improve the efficiency of data collection, focus on a particular aspect of the aquatic macrophytes. The periodic updating of the QAPP will provide a written record of sampling procedures over the entire life of the Onondaga Macrophyte Assessment Program. Annual revisions to the QAPP have incorporated various changes made to the macrophyte assessment program.

The original QAPP, and subsequent revisions, have been reviewed by the NYSDEC, revised by OCDWEP as requested, and approved by the NYSDEC prior to implementation.

## 7.0 LITERATURE CITED


OCDWEP *SOP For Macroalgae Survey (DOC No. BIO-011)*

OCDWEP *SOP For Macrophyte Field Verification of Aerial Photography (DOC No. BIO-012)*

# APPENDIX B1

## Field Data Packet for Macrophyte Species Verification of Aerial Photography

# MACROPHYTE FIELD VERIFICATION SHEET

**Date:** ________________

**GPS Coordinates:** N: 43° ____________________
W: 76° ____________________

**Crew:** ____________________________

**Site Number:** ____________________

**Weather:** ________________
*OVercast PartlyCloudy HaZy CLear RAining SNowing*

**Wind:** __________ **from:** ______________
*0-5mph 5-10 10-15 >15* *N,S,E,W,SE,SW,NE,NW.*

**Date of Aerial Photography:** ______________

**Depth of Water (Meters):** ______________

**Substrate Type:** ____________________
*Rock, logs, sand, silt, oncolites,solvay waste, etc.*

**Do the Species in the 1-meter$^2$ Represent the Species Found in the 5-meter Radius (Y/N)?** ___

**COMMENTS:**

| MACROPHYTE SPECIES IDENTIFICATION | | |
|---|---|---|
| Common Name | Scientific Name | Est. Percent Coverage (5-meter Radius) |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Samples Collected For Laboratory Identification* |
|---|
| * Preserve samples in 10% Buffered Formalin. |
| |
| |
| |

---

**Date:** ________________

**GPS Coordinates:** N: 43° ____________________
W: 76° ____________________

**Crew:** ____________________________

**Site Number:** ____________________

**Weather:** ________________
*OVercast PartlyCloudy HaZy CLear RAining SNowing*

**Wind:** __________ **from:** ______________
*0-5mph 5-10 10-15 >15* *N,S,E,W,SE,SW,NE,NW.*

**Date of Aerial Photography:** ______________

**Depth of Water (Meters):** ______________

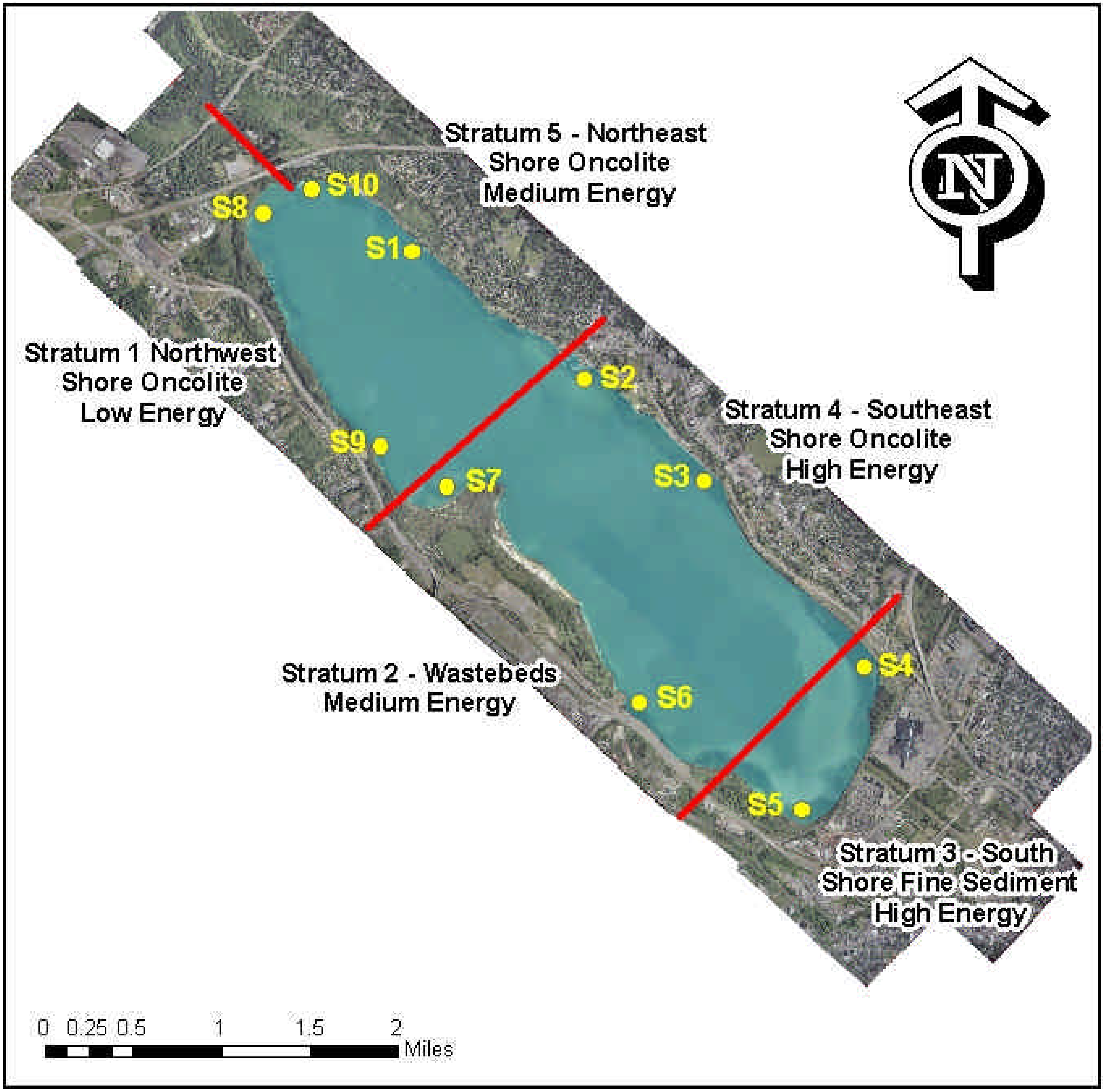
**Substrate Type:** ____________________
*Rock, logs, sand, silt, oncolites,solvay waste, etc.*

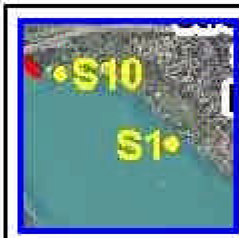
**Do the Species in the 1-meter$^2$ Represent the Species Found in the 5-meter Radius (Y/N)?** ___

**COMMENTS:**

| MACROPHYTE SPECIES IDENTIFICATION | | |
|---|---|---|
| Common Name | Scientific Name | Est. Percent Coverage (5-meter Radius) |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Samples Collected For Laboratory Identification* |
|---|
| * Preserve samples in 10% Buffered Formalin. |
| |
| |
| |




Verification Sites

Stratum Border

# SITES FOR FIELD SPECIES VERIFICATION OF AERIAL PHOTOGRAPHY ON ONONDAGA LAKE

# APPENDIX B2

## Field Data Packet for Macroalgae

Onondaga County Department of WATER ENVIRONMENT PROTECTION

# MACROALGAE FIELD SHEET - 2007

**Date:** ____________________

**Crew:** ____________________

**Near Shore Location:** ________________

**Weather:** ____________________
*OVercast PartlyCloudy HaZy CLear RAining SNowing*

**Wind:** __________ **from:** ________________
*0-5mph 5-10 10-15 >15* *N,S,E,W,SE,SW,NE,NW.*

**Are Shoreline Bench Marks Intact (Y/N)?** _____

**Check if Any Algae Samples Were Collected:** _____

**Depth of Water at Edge of Algal Mat (or Formation) in (Meters):**

| | | |
|---|---|---|
| | | |
| (Left side) | (Middle) | (Right Side) |

**Distance From Edge of Algal Mat (or Formation) To Shoreline Benchmark/Target (Meters):**

| | | |
|---|---|---|
| | | |
| (Left side) | (Middle) | (Right Side) |

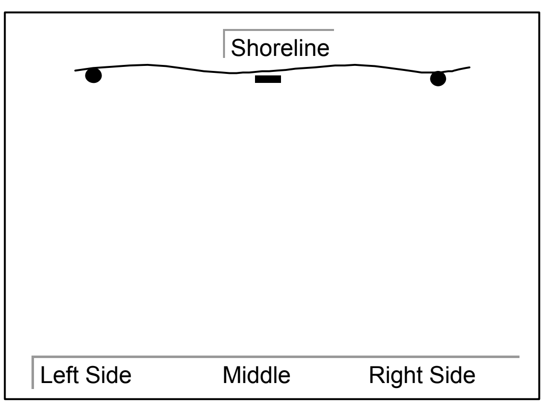
**Estimated Percent Cover (Range):**

| | | |
|---|---|---|
| | | |
| (Left side) | (Middle) | (Right Side) |

***Percent Cover Ranges:***
*0%, 1-20%, 21-40%, 41-60%, 61-80%, 81-100%*

**<u>COMMENTS:</u>**

**Algal Mat Sketch**




**Date:** ____________________

**Crew:** ____________________

**Near Shore Location:** ________________

**Weather:** ____________________
*OVercast PartlyCloudy HaZy CLear RAining SNowing*

**Wind:** __________ **from:** ________________
*0-5mph 5-10 10-15 >15* *N,S,E,W,SE,SW,NE,NW.*

**Are Shoreline Bench Marks Intact (Y/N)?** _____

**Check if Any Algae Samples Were Collected:** _____

**Depth of Water at Edge of Algal Mat (or Formation) in (Meters):**

| | | |
|---|---|---|
| | | |
| (Left side) | (Middle) | (Right Side) |

**Distance From Edge of Algal Mat (or Formation) To Shoreline Benchmark/Target (Meters):**

| | | |
|---|---|---|
| | | |
| (Left side) | (Middle) | (Right Side) |

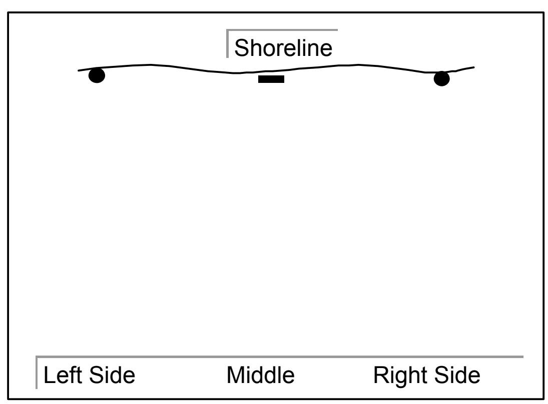
**Estimated Percent Cover (Range):**

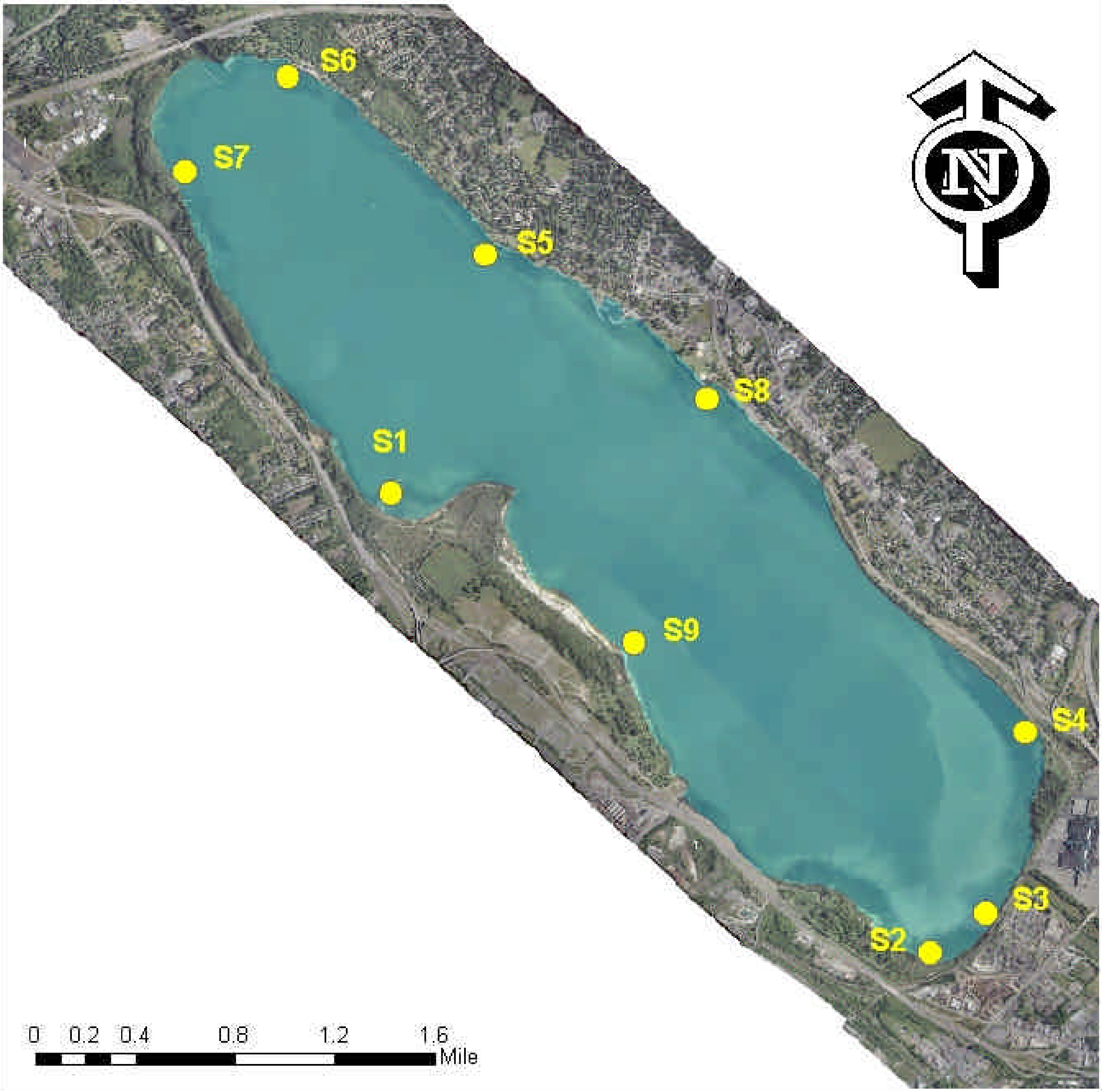
| | | |
|---|---|---|
| | | |
| (Left side) | (Middle) | (Right Side) |

***Percent Cover Ranges:***
*0%, 1-20%, 21-40%, 41-60%, 61-80%, 81-100%*

**<u>COMMENTS:</u>**

**Algal Mat Sketch**







Verification Sites

# SITES FOR MACROALGAE MONITORING ON ONONDAGA LAKE

# APPENDIX 2: QUALITY ASSURANCE/ QUALITY CONTROL REVIEW OF 2007 DATA

## LIST OF ATTACHMENTS:

**Overview**

The following analytical data quality review was conducted on the 2007 data in the Onondaga database (Onondaga.mdb) obtained from the County on February 25, 2008. The results of this review are summarized below, and detailed in the sections following.

Recommended actions have been taken as of the date of this report unless otherwise noted.

1. Rinsate and field blanks

   *31 samples were associated with 10 blanks that had detectable concentrations of BOD5, SRP, TKN or Turbidity. Recommended Action: These sample results should be qualified in the database for possible blank contamination. As of April 2007, the action taken was to flag the data "2" in the RESULT_FLAG field of the database, which means these results are not included in data queries.*

2. Field duplicates

   *Thirty-six duplicate results were associate with relative percent differences (RPDs) in excess of 20% and were submitted for re-evaluation to the laboratory; four data entry errors were identified by the laboratory, and the rest of the results were verified. No further action was required.*

3. Charge Balance summary

   *The laboratory re-evaluated the major cations and anions for 8 samples where charge balance exceeded 20%; high solids were cited as the source of interference in the balance calculation for most of the samples. No further action was required.*

4. Hardness calculation

   *The laboratory corrected two samples for which hardness, as calculated by EcoLogic using magnesium and calcium results from the database, did not match the hardness result reported in the database. No further action was required.*

5. Database non-detects check

   *The laboratory reviewed sample results (26 metals, 623 solids and 32 other parameters) for possible data entry errors in reporting results less than the MRL; two results were identified as data entry errors, the remainder were either adjusted higher due to sample dilution factors or were metals results from contract laboratory CES which used a different MRL. No further action was required for the 2007 data.*

   *Recommendation for the future: sort data by laboratory prior to initiating the MRL screening, request MRL from each laboratory.*

6. Verify parameters for limnological reasonableness

   *The laboratory verified the results for one sample where the total dissolved phosphorus reported was greater than the soluble reactive phosphorus result (10/30/07 Onondaga Creek at Kirkpatrick). Recommended Action: Both sample results should be flagged in database as estimated (N flag). This action has not been taken as of April 2007.*

   *The laboratory verified one sample result where the chlorophyll-a value seemed unusually high (09/11/07 at Lake South Deep, both Photic Zone and Tube Composite samples). No further action was required.*

7. Review for outliers

*In tributary data, several outliers were identified associated with extreme low or high flow conditions. The laboratory verified two tributary results (sulfate and pH) with results exceeding the screening protocol. No further action required.*

*In the lake data, one dissolved oxygen profile was identified as questionable. The profile was flagged by field personnel, and verified as erroneous by EcoLogic after comparing the data to results of that day's robotic monitoring devices. Data from this profile were deleted from the database. No further action required.*

8. Low-level mercury results

*QC limits were met, except for blank contamination confirmed for 04/10/07. The associated sample results had concentrations less than 5x the blank concentration. Recommended Action: Results should be flagged as potentially affected by blank contamination (N flag). As of April 2007, the action taken was to flag the data "2" in the RESULT_FLAG field of the database, which means these results are not included in data queries.*

## 1. Rinsate and field blanks

Blanks are designed to detect whether target analytes are present in the sampling equipment or are introduced during sampling (i.e. background contamination) or during analysis (i.e. laboratory contamination). "Rinsate" blanks are used to measure equipment contamination. "Field" blanks measure target compounds introduced during transport and field handling.

To conduct this analysis, four steps were taken:

- *Analytes of interest were identified.* Blanks in the database were screened for those with detectable concentrations of analytes. These analytes formed the basis of the rest of the evaluation.
- *Blanks were evaluated against QC thresholds.* Concentrations in the blanks were evaluated against the Minimum Reportable Limit (MRL) using the NELAC exceedance criterion (less than 2 times the MRL) and a threshold of less than 5 times the MRL.
- *Blanks were evaluated against field sample results.* Concentrations in the blanks were evaluated against the field sample and field duplicate concentrations to identify which samples may be affected by blank contamination.
- *Actions were identified.* Based on these evaluations, conclusions were drawn as to which results required qualification in the database due to blank contamination.

*Analytes of interest were identified.*

The blanks in the database were screened for detectable concentrations. Twelve parameters were detected in the blanks:

| | |
|---|---|
| Alkalinity (ALK-T) | Total dissolved solids (TDS) |
| Biochemical oxygen demand (BOD5) | Total Kjeldahl nitrogen (TKN) |
| Chloride | Total phosphorus (TP) |
| Organic nitrogen (ORG-N) | Total solids (TS) |
| Silica (SiO2) | Turbidity |
| Soluble reactive phosphorus (SRP) | Total volatile solids (TVS) |

There were blank detections for low-level mercury as well, and these are discussed in the low-level mercury section of this memorandum.

*Blanks were evaluated against QC thresholds.*

A value of twice the Minimum Reportable Limit (MRL) of the corresponding analytical method is used as a criterion to screen for potential presence of contamination in blanks (**Attachment 1**). Five parameters were detected at trace concentrations in blanks, less than twice the MRL.

***Parameters with blank concentrations <2x MRL***

| Parameter | Minimum Reportable Limit MRL | Minimum Reportable Limit 2x MRL | Blank Detections min – max (count) |
|---|---|---|---|
| BOD5 (mg/l) | 2 | 4 | 3 (1) |
| SiO2 (mg/l) | 0.2 | 0.4 | 0.26 (1) |
| SRP (mg/l) | 0.003 | 0.006 | 0.002 (1) |
| TKN (mg/l) | 0.15 | 0.30 | 0.15 – 0.2 (8) |
| TP (mg/l) | 0.003 | 0.006 | 0.003 – 0.003 (2) |

Another QC threshold is reported each year in the annual AMP QC report: detected concentrations greater that five times the MRL. Four of the twelve parameters had blank concentrations more than 5x the MRL, indicating possible issues with blank contamination:

***Parameters with blank concentrations >5x MRL:***

| Parameter | Minimum Reportable Limit MRL | Minimum Reportable Limit 5x MRL | Blank Detections min – max (count) |
|---|---|---|---|
| ALK-T (mg/l) | 1 | 5 | 6 – 9 (6) |
| TDS (mg/l) | 1 | 5 | 10 – 19 (5) |
| TS (mg/l) | 1 | 5 | 20 – 20 (1) |
| TVS (mg/l) | 1 | 5 | 15 – 15 (1) |

This analysis indicates that blank contamination is occasionally an issue for these four parameters. ALK-T blank contamination was investigated in 2005; container residue was identified as the source, so the laboratory switched to hand-rinsing of the alkalinity bottles. In 2006, 58% of the ALK-T blanks exhibited detectable concentrations; in 2007 41% of the blanks exhibited detectable concentrations. The presence of measurable alkalinity in laboratory water does not affect data usability.

*Blanks were evaluated against field sample results*

Sample and field duplicate analytical results for the twelve parameters detected in the blanks were also screened to identify those results potentially affected by blank contamination. For each of the twelve parameters detected in blanks, the minimum and maximum blank concentrations were identified and the number of blanks counted. Then, using sample and field duplicate results from the database, the minimums and maximums for each of the twelve parameters were identified. The maximum blank concentrations were compared with the minimum sample (or duplicate) concentrations to screen the data for possible contamination. Where the minimum sample (or duplicate) result was more than five times the maximum blank concentration, the sample results likely were not affected by blank contamination for that parameter. This condition was true for these seven parameters in samples (and duplicates) associated with the contaminated blanks:

***Parameters with sample results >5x blank concentration – samples likely not affected by blank contamination.***

| Parameter | Blank Detections min – max (count) | Sample/Duplicate Detections min – max |
|---|---|---|
| ALK-T (mg/l) | 1 – 9 (46) | 114 – 296 |
| Chloride (mg/l) | 2 – 2 (2) | 196 – 504 |
| SiO2 (mg/l) | 0.26 (1) | 3.63 - 11 |
| TDS (mg/l) | 10 – 19 (5) | 352 – 3,072 |
| TP (mg/l) | 0.003 – 0.003 (2) | 0.02 – 0.14 |
| TS (mg/l) | 20 – 20 (1) | 1,110 – 1,234 |
| TVS (mg/l) | 15 – 15 (1) | 94 – 170 |

For the remaining five parameters, the minimum sample (or duplicate) concentration was less than five times the maximum concentration detected in the blanks. As a result, these parameters warranted closer scrutiny for possible blank contamination:

***Parameters with sample results <5x blank concentration – samples possibly affected by blank contamination.***

| Parameter | Blank Detections min – max (count) | Sample/Duplicate Detections min – max |
|---|---|---|
| BOD5 (mg/l) | 3 – 3 (1) | 2 – 3 |
| ORG-N (mg/l) | 0.12 – 0.17 (113) | 0.1 – 4.5 |
| SRP (mg/l) | 0.002 – 0.002 (1) | 0.002 |
| TKN (mg/l) | 0.15 – 0.2 (8) | 0.18 – 9.39 |
| Turbidity (mg/l) | 0.16 – 0.48 (5) | 0.93 – 31.6 |

*Actions were identified*

Using both sets of criteria: blanks < twice the MRL and sample results > 5x blank concentrations – a QC matrix of actions was developed:

| | **Samples >5x Blanks** | **Samples <5x Blanks** |
|---|---|---|
| **Blanks < 2x MRL** | Samples not affected<br>***No action required*** | Samples may be affected<br>***Qualify samples*** |
| **Blanks > 2x MRL** | Samples not affected<br>***Investigate blanks*** | Samples may be affected<br>***Investigate blanks and qualify samples*** |

Using this matrix, the parameters detected in blanks were sorted to evaluate level of action required.

| | Samples >5x Blanks | Samples <5x Blanks |
|---|---|---|
| **Blanks < 2x MRL** | ***No action required:*** SiO2, TP | ***Qualify samples:*** BOD-5, SRP, TKN |
| **Blanks > 2x MRL** | ***Investigate blanks:*** ALK-T*, Chloride, TDS, TS, TVS | ***Investigate blanks and qualify samples:*** ORG-N**, Turbidity |

** ALK-T blank contamination, an issue first identified in 2005, has improved with efforts from the laboratory; however, the problem persists. Since sample results are generally more than an order of magnitude greater than the concentrations in the blanks, measureable alkalinity levels in the blanks does not affect the data usability.*

*** ORG-N is a calculated parameter (TKN minus ammonia as N) so the reported presence of organic N in rinsate samples reflects the variability in the measurements (i.e. precision) of TKN and ammonia as N. No further action is needed.*

The matrix indicates that some of the analytical results for BOD-5, SRP, TKN and Turbidity may be affected by blank contamination. The sample results associated with elevated blanks for these parameters are tabulated at the end of this memorandum (**Attachment 2**). These sample results should be qualified in the water quality database to denote the associated blank contamination.

## 2. Field duplicates

Field duplicates were evaluated using relative percent difference (RPD) of the results. RPDs greater than 20% are considered outside of quality control limits, following U.S. EPA guidance on data quality objectives (U.S. EPA 1994). In some cases, the RPDs are greater than 20% because concentrations are at or near the detection level.

Thirty-six duplicate results with RPDs exceeding 20% were re-evaluated by the laboratory. The laboratory confirmed the sample results for most of the duplicates, and identified four errors to be corrected in the database:

| Sample No. | Parameter | Error Description | Original RPD | RPD using corrected data |
|---|---|---|---|---|
| 2703998 | Potassium | result was <0.020 missed a dilution factor; corrected to <0.20 mg/L | 198% | 2.1% |
| 2712268 | NH3-N | result was 0.034 typo corrected to 0.34 mg/L | 163% | 1.3% |
| 2713288 | NH3-N | result was 0.045 typo; corrected to 0.45 mg/L | 176% | 1.7% |
| 2710488 | TKN | result was 2.63 typo; corrected to 1.20 mg/L | 67% | 2.3% |

*NH3-N = ammonia as nitrogen; TKN = total Kjeldahl nitrogen*

A listing of the field duplicate RPDs exceeding 20% (after database correction) are tabulated at the end of this memorandum (**Attachment 3**).

## 3. Charge Balance Summary

The charge balance results were evaluated against an upper limit of 20% for field samples and duplicates from the lake and the tributaries. The upper limit of 20% is the value used by the laboratory (**Attachment 4**).

| | Tributaries | Lake |
|---|---|---|
| Average | 4.87% | 2.74% |
| Median | 3.70% | 2.19% |
| N Exceeds 20% | 8 | 0 |

The laboratory re-evaluated the major cations and anions for eight samples where charge balance exceeded 20% (listed below), and confirmed the results. The laboratory noted that several samples had high solids which will interfere with the analytical measurements.

| Sample No. | Source | Date | Charge Balance (%) | TSS (mg/l) |
|---|---|---|---|---|
| 2702493 | Crk-Allied East Flume-Over Weir | 3/14/2007 | 23.36 | 297 |
| 2706919 | Crk-Allied East Flume-Over Weir | 6/26/2007 | 26.32 | 8 |
| 2706925 | Crk-Allied East Flume-Over Weir - Duplicate | 6/26/2007 | 25.07 | 36 |
| 2702494 | Crk-Harbor Brook @ Velasko Road | 3/14/2007 | 60.24 | 738 |
| 2709041 | Crk-Harbor Brook @ Velasko Road | 8/21/2007 | 20.88 | 6 |
| 2713154 | Crk-Onondaga Creek @ Adams Street | 11/27/2007 | 26.4 | 520 |
| 2713151 | Crk-Onondaga Creek @ Dorwin Ave. | 11/27/2007 | 29.5 | 546 |
| 2707968 | Crk-Onondaga Creek @ Kirkpatrick | 7/24/2007 | 22.64 | 47 |

## 4. Hardness Calculation

Hardness is calculated using calcium and magnesium results. To review the hardness values in the database, EcoLogic used the calcium (Ca) and magnesium (Mg) results in the database to re-calculate hardness using the equation:

$$\text{Hardness} = (Ca * 2.5) + (Mg * 4.12)$$

The calculated values for hardness were compared with the values reported in the database, and the results were reasonable except for two samples:

| Sample | Date | Ca (mg/l) | Mg (mg/l) | Hardness (mg/l) Calculated | Hardness (mg/l) Database |
|---|---|---|---|---|---|
| Ley Creek at Park Street Duplicate (2700847) | 1/23/07 | 156 | 30.9 | 517 | 392 |
| Ninemile Creek at Rt 48 (2700839) | 1/23/07 | 163 | 24.1 | 507 | 418 |

The laboratory reviewed these sample results, and reported that results for magnesium were modified after the hardness had been calculated. The hardness results were re-calculated and corrected for samples 2700847 and 2700839.

## 5. Database non-detects check

Non-detect data in the database are reported as less than the MRL. As a QC check to identify possible typographic errors, the "less than MRL" values were compared against the published MRL list for the 2007 AMP. The result of this evaluation may be divided into three categories: metals, solids, and other parameters.

- ***Metals*** – These metals were reported at levels less than the MRL, but the MRL does not match with the published values. The MRLs for metals varies depending on whether concentration procedures were used. There are relatively few samples for which the MRL does not match the reported value, which may be an indicator of a data entry error. The laboratory was asked to verify that the reported sample results were accurate, and the laboratory's responses by parameter are presented below.

| Parameter (units) | Reported Result | N Samples | Published MRL | Laboratory response |
|---|---|---|---|---|
| Cd (mg/l) | <0.0020<br><0.0050 | 4<br>6 | 0.0008<br>0.0008 | MRL values differ due to results from contract laboratory CES |
| Ca (mg/l) | <0.125 | 1 | 1 | Ca was entered incorrectly. Result was <0.125 and has been corrected to <1.25 mg/L |
| Cu (mg/l) | <0.002 | 1 | 0.0125 (0.0031) | MRL values differ due to results from contract laboratory CES |
| Pb (mg/l) | <0.001<br><0.03 | 1<br>6 | 0.002<br>0.002 | MRL values differ due to results from contract laboratory CES |
| Hg (mg/l) | <0.0002 | 4 | 0.00002 | MRL values differ due to results from contract laboratory CES |
| Ni (mg/l) | <0.00200 | 1 | 0.015 (0.00375) | MRL values differ due to results from contract laboratory CES |
| Ag (mg/l) | <0.001 | 1 | 0.0125 | MRL values differ due to results from contract laboratory CES |
| Zn (mg/l) | <0.00200 | 1 | 0.025 (0.00625) | MRL values differ due to results from contract laboratory CES |

*Cd = cadmium; Ca = calcium; Cu = copper; Pb = lead; Hg = mercury; Ni = nickel; Ag = silver; Zn = zinc*

- ***Solids*** – The MRL for solids (TS, TVS, TSS, VSS and TDS) is 1 mg/l. Numerous results were reported ranging from <2 to <20. Given the high number of sample results with elevated detection levels, it is likely these are not data entry errors. However, for completeness, the laboratory was asked to verify that the reported sample results were accurate, and the laboratory's responses by parameter are presented below.

| Parameter (units) | Reported Result | N Samples | Published MRL | Laboratory response |
|---|---|---|---|---|
| TS | <10 | 22 | 1 | MRL adjusted higher due to sample dilution factors |
| TVS | <10 | 22 | 1 | MRL adjusted higher due to sample dilution factors |
| TSS | <2<br><4<br><5<br><10 | 86<br>253<br>2<br>2 | 1<br>1<br>1<br>1 | MRL adjusted higher due to sample dilution factors |
| VSS | <2<br><4 | 108<br>22 | 1<br>1 | MRL adjusted higher due to sample dilution factors |
| TDS | <10<br><20 | 106<br>1 | 1<br>1 | MRL adjusted higher due to sample dilution factors |

*TS = total solids; TVS = total volatile solids; TSS = total suspended solids; VSS = volatile suspended solids; TDS = total dissolved solids*

□ ***Other parameters*** – Five other parameters were reported in the database with "less than MRL" values that did not match the published MRLS. The number of these samples was low, raising the possibility of data entry error. The laboratory was asked to verify that the reported sample results were accurate, and the laboratory's responses by parameter are presented below.

| Parameter (units) | Reported Result | N Samples | Published MRL | Laboratory response |
|---|---|---|---|---|
| TIC | <0.05 | 1 | 0.5 | TIC was entered incorrectly. Result was <0.05 and has been corrected to <0.5 mg/L |
| TKN | <1.5 | 2 | 0.15 | MRL adjusted higher due to sample dilution factors |
| TKN-F | <1.5 | 1 | 0.15 | MRL adjusted higher due to sample dilution factors |
| TP | <0.05 | 3 | 0.01 | MRL adjusted higher due to sample dilution factors |
| FCOLI-MF | <10<br><20 | 24<br>1 | 2<br>2 | MRL adjusted higher due to sample dilution factors |

*TIC = total inorganic carbon; TKN = total Kjeldahl nitrogen; TKN-F = filtered TKN; TP = total phosphorus; FCOLI-MF = fecal coliforms*

## 6. Verify parameters for limnological reasonableness

Several parameters were evaluated for limnological reasonableness for each sample, using the data from tributaries and the lakes. These evaluations were:

- Soluble reactive phosphorus (SRP) should be less than or equal to total phosphorus (TP)
- Total dissolved phosphorus (TDP) should be greater than or equal to SRP
- TDP should be less than or equal to TP
- Ammonia as nitrogen (NH3-N) should be less than or equal to total Kjeldahl nitrogen (TKN)
- NH3-N should be less than or equal to filtered TKN
- Biochemical oxygen demand (BOD5) should be greater than or equal to carbonaceous biochemical oxygen demand (CBOD5)

- Plot TP versus TSS
- Plot TP versus chlorophyll-α (lake only)

Overall, the comparisons were reasonable, with two exceptions:

□ One sample exhibited a TDP value (0.003 mg/l) that was less than the SRP result (0.009 mg/l). This sample was collected on October 30 at the Onondaga Creek Kirkpatrick Street location. The laboratory verified these results. Both results were close to the analytical limit of detection for the low-level phosphorus method.

□ A plot of TP vs chlorophyll-α revealed a sample result for which chlorophyll-α seemed unusually high given the phosphorus concentration at the time. The sample was collected from South Deep on September 11. For comparison, two other dates with South Deep phosphorus concentrations similar to September 11 are shown below with chlorophyll-α concentrations.

| Parameter | Sample | South Deep 9/11/07 | Comparison Dates 7/3/07 | 10/9/07 |
|---|---|---|---|---|
| Phosphorus (mg/l) | Average 0-3m | 0.035 | 0.036 | 0.030 |
| Chlorophyll-α ($mg/m^3$) | Photic Zone | 28.84 | 7.48 | 16.55 |
| | Tube Composite | 26.17 | 5.87 | 17.09 |

The laboratory confirmed the chlorophyll-α sample results from September 11.

## 7. Review for Outliers

The 2007 AMP data were reviewed for outliers in the tributaries and in the lake. Due to the nature of the data set, this review for outliers was conducted using different methods for tributaries and the lake:

Tributaries: The tributary data are influenced in large part by stream flow. Therefore, the 2007 concentration data for the monitored parameters were compared against the 10-year average plus two standard deviations. Outliers were identified as data that fell outside the two standard deviation range.

Onondaga Lake: Histograms and temporal plots were constructed for analytical parameters of greatest interest – dissolved oxygen (DO), chlorophyll-α, Phaeophytin-α, Secchi depth, fecal coliforms (FCOLI), E. coli (ECOLI), phosphorus (TP, SRP and TDP), nitrogen (NH3-N, nitrate NO3 and nitrite NO2). These parameters were evaluated separately for depths 0-3 meters, 6 meters, and 9-18 meters at both North and South Deep. Outliers were identified by visual assessment of the plots.

The results of the outlier reviews are discussed below.

### a. *Tributaries*

Several parameters were identified with results greater than the defined screening values (10-year average plus two standard deviations). Many of these were found to occur on sample dates with high or low flow (based on preliminary USGS flow data downloaded from the web site on 3/4/08):

□ **March 14** was a high flow date for Onondaga Creek, Ninemile Creek, Ley Creek and Harbor Brook. According to National Weather Service climate data for the period in Syracuse, snow depth was 9 inches on March 13. Warm temperatures (maximums above 55°F from the 12$^{h}$ through the 14$^{th}$) reduced the snow depth to 1 inch by March

15. Snowmelt combined with precipitation (0.36 inches on the 14th, and 0.33 inches on the 15th), resulting in a significant runoff event that spiked tributary flows from March 14 through 15. Parameters that exceeded the screening values on this date included BOD5, DO, FCOLI, Fe (iron), Mn (manganese), NH3-N, NO2, ORG-N, pH, TOC (total organic carbon), TOC-F (filtered TOC), TP, TKN, and TSS. Not all parameters exceeded the screening values for all tributaries:

**Parameter concentrations exceeding 10-year average plus two standard deviations on March 14, 2007.**

| Parameter | KIRKPAT | DORWIN | VELASKO | HIAWATHA | RT48 | PARK | TRIB5A | EFLUME |
|---|---|---|---|---|---|---|---|---|
| BOD5 (mg/l) | | | 8 | 10 | | | 9 | 10 |
| DO (mg/l) | | | 17.65 | | | | 10.56 | |
| FCOLI (count/100) | | | | | | | 4800 | 5800 |
| Fe (mg/l) | | | 19.2 | 6.23 | 3.53 | | | 5.94 |
| Mn (mg/l) | 0.212 | | 0.529 | 0.135 | 0.134 | | | 0.114 |
| NH3-N (mg/l) | | | 0.22 | | | | | |
| NO2 (mg/l) | 0.08 | | 0.09 | 0.06 | | | | |
| ORG-N (mg/l) | | | 3.19 | 1.68 | 1.08 | | | |
| TKN (mg/l) | | 0.98 | 3.41 | 1.92 | | | | |
| TP (mg/l) | | | | 0.508 | | | | 0.523 |
| TOC (mg/l) | | | 5.26 | | | | 8.03 | |
| TOC-F (mg/l) | | | 3.89 | | | | 7.98 | |
| pH (std units) | | | 8.25 | | | | 8.42 | |
| TSS (mg/l) | 270 | 271 | 738 | 243 | 144 | | | 297 |

□ **November 27** was another high flow date for Onondaga Creek, Ninemile Creek, and Ley Creek; the ratings tables were being revised for Harbor Brook on this date. According to National Weather Service, there had been 1.10 inches of precipitation the day before, which likely accounts for the spike in tributary flows. Parameters that exceeded the screening values on this date included BOD5, DO, Fe, Mn, NO2, NO3 ORG-N, TOC, TOC-F, TP, TKN, and TSS. Not all parameters exceeded the screening values for all tributaries:

**Parameter concentrations exceeding 10-year average plus two standard deviations on November 27, 2007.**

| Parameter | KIRKPAT | DORWIN | VELASKO | HIAWATHA | RT48 | PARK | TRIB5A | EFLUME |
|---|---|---|---|---|---|---|---|---|
| BOD5 (mg/l) | | 3 | | | | | | |
| DO (mg/l) | 16.83 | | | | 16.89 | | | |
| Fe (mg/l) | | 19.8 | | | 5.42 | | | |
| Mn (mg/l) | 0.586 | 0.685 | | | 0.203 | | | |

**Parameter concentrations exceeding 10-year average plus two standard deviations on November 27, 2007.**

| Parameter | KIRKPAT | DORWIN | VELASKO | HIAWATHA | RT48 | PARK | TRIB5A | EFLUME |
|---|---|---|---|---|---|---|---|---|
| NO2 (mg/l) | 0.16 | 0.18 | | | | | | |
| NO3 (mg/l) | | | | | 1.57 | | | |
| ORG-N (mg/l) | 1.89 | 2.1 | | | 1.43 | | | |
| TKN (mg/l) | 1.99 | 2.18 | | | 1.52 | | | |
| TP (mg/l) | 0.285 | 0.855 | | | 0.272 | | | |
| TOC (mg/l) | | 5.8 | | | | | | |
| TOC-F (mg/l) | | | | | 5.21 | | | |
| TSS (mg/l) | 562 | 546 | | | 191 | | | |

- □ **August 7** was a low-flow date for Harbor Brook. At the Hiawatha sampling location, TDS exceeded the screening value. The charge balance for this date was 7.74%. The charge balance verifies the TDS result.
- □ **October 2** was a low-flow date for Onondaga Creek. At the Kirkpatrick sampling location, both chloride and sodium exceeded the screening values. The charge balance for this date was 3.24%. The charge balance verifies the Na and Cl results.

Two parameters that exceeded the statistically-defined screening values were identified for the laboratory to review:

- □ In Harbor Brook at the Velasko Road sampling location, sulfate was measured at 827 mg/l on October 16. The screening value was 787 mg/l. The laboratory verified this result.
- □ In Ley Creek at the Park Street sampling location, pH was measured at 7.98 standard units on December 26. The winter screening value was 7.77 standard units. The laboratory verified this result.

The 2007 data were also screened against the winter (December, January and February) 10-year average plus two standard deviations to refine evaluation of parameters found in road de-icing materials.

- □ At the Harbor Brook Hiawatha Boulevard monitoring location, chloride and sodium exceeded the winter screening values on December 18. The charge balance for this date was 1.27%. The charge balance verifies that these results are not the result of laboratory analytical issues.
- □ At the Ley Creek Park Street monitoring location, chloride, hardness, sodium and total dissolved solids exceeded the winter screening values on February 27. The charge balance for this date was 1.70%. The charge balance verifies that these results are not the result of laboratory analytical issues.
- □ At the Tributary 5A monitoring location, sodium exceeded the winter screening values on January 23. The charge balance for this date was 1.05%. The charge balance verifies that the sodium result is not in error.

*b. Onondaga Lake North and South basins*

Review of the histograms and temporal plots of the 2007 lake data did not reveal outliers except for dissolved oxygen field profile measurements collected in South Deep on September 25. These data were compared with the UFI buoy located in close proximity to the County buoy.

| | Dissolved Oxygen (mg/l) | | |
|---|---|---|---|
| **Depth (m)** | **Field Profile** | **DWEP Buoy** | **UFI Buoy** |
| 0 to 3 | 6.52 to 4.16 | -- | 11.09 |
| 6 | 0.38 | 8.88 | 9.19 |
| 9 to 18 | -9.43 to 0.27 | -- | 0.19 – 0.17 |

The Onondaga County field profile data was clearly in error for this date (9/25/2007), and was removed from the database. Another field profile was measured on 9/27/07.

## 8. Low-level mercury results

The County subcontracts low-level mercury and methyl mercury analyses. In 2007, samples were collected on four dates, and two laboratories were used:

| Brooks Rand Labs | Frontier Geosciences Inc. |
|---|---|
| April 10 | August 29 |
| June 5 | October 24 |

The hard copy data packages for low-level mercury were reviewed, and the results presented below.

- Sample receipt:
  - insufficient sample volume received for methyl mercury for location Lake 18m South and Duplicate collected on 4/10/07; the results were qualified as non-detect (U) at elevated MDLs.
- Holding times were met (Method 1631 = 90 days)
- Calibration verification was within QC limits.
- Matrix Spike and Matrix spike duplicates were within QC limits
- Method, Prep and Calibration Blanks were within QC limits except:
  - 8/29/07 Total Mercury Prep Blanks - two of the six blanks were reported with detectable concentrations; these blanks are noted that the blank was preserved to 3% and 5% rather than 1% BrCl, and that the control limit for these blanks is the preservation percentage multiplied by the MRL. There were no comments from the laboratory that this affects the reported results, or that any action was taken to correct it.
- Laboratory Spike Blanks were within QC limits
- Laboratory duplicates were within QC limits
- MDLs and PQLs: The laboratories both identified sample-specific adjustments to the MDLs and PQLs, which are summarized below by laboratory:

**1. Brooks Rand Dataset - Some MDLs adjusted to account for sample aliquot size.**

| Date | Parameter | MDL | PQL | Sample-specific MDL & PQL |
|---|---|---|---|---|
| 4/10/07 | Total mercury | 0.15 | 0.40 | Equip Blank – 0.28 & 0.74<br>Field Blank – 0.31 & 0.82 |
| | Methyl mercury | 0.020 | 0.050 | Lake 18m South – 0.098 & 0.245<br>Lake 18m South Dup – 0.115 & 0.287 |
| 6/5/07 | Total mercury | 0.15 | 0.40 | Lake 3m South – 0.72 & 1.91<br>Lake 18m South – 0.25 & 0.66<br>Lake 18m South Dup – 0.25 & 0.66<br>Lake 3m North – 0.64 & 1.70<br>Lake 18m North – 0.23 & 0.60 |
| | Methyl mercury | 0.020 | 0.050 | none identified. |

**2. Frontier Geosciences**

| Date | Parameter | MRL | Sample-specific MRL |
|---|---|---|---|
| 8/29/07 | Total mercury | 0.50 | Lake 18m South – 0.51<br>Lake 18m South - Duplicate – 0.51<br>Lake 18m North – 0.51 |
| | Methyl mercury | 0.050 | none; dilution noted as 1.25 |
| 10/24/07 | Total mercury | 0.50 | Lake Field Blk (Teflon Dunker) - 0.98 (dilution 1.95)<br>Lake 3m North – 0.67 (dilution 1.33) |
| | Methyl mercury | 0.050 | none; dilution noted as 1.25 |

- Rinsate and Field Blanks were non-detect except for:
  - 4/10/07 – the laboratory noted Total Mercury blank contamination, and confirmed it with reanalysis. The associated sample results had concentrations less than 5x the blank concentration, therefore the sample results could be affected by blank contamination. The laboratory did not flag these sample results with any qualifiers to indicate possible blank contamination.

# Attachment 1

# Laboratory Minimum Reportable Limits Summary

**Attachment 1**. Ambient Monitoring Program 2007 - Parameter Minimum Reportable Limits Summary

| Parameter | Database parameters - 2007 | | | Analytical Procedures for Water Quality Analyses | | | |
|---|---|---|---|---|---|---|---|
| | | | | 2006 (Jan-May) | | 2007 (May-Dec) | |
| | Code | Units | Method | Method | MRL | Method | MRL |
| Bio Oxy Demand 5-day | BOD5 | mg/L | 3 | 2:(5210) | 2 | 2:(5210) | 2 |
| Carbon. Bio Oxy Demand 5-day | CBOD5 | mg/L | 48 | 2:(5210 B) | 2 | 2:(5210 B) | 2 |
| Bio Oxy Demand 10-day | BOD10 | mg/L | 450 | 2:(5210) | 2 | 2:(5210) | 2 |
| Carbon. Bio Oxy Demand 10-day | CBOD10 | mg/L | 451 | 2:(5210 B) | 2 | 2:(5210 B) | 2 |
| Total Alk as CaCO3 | ALK-T | mg/L | 37 | 1:(310.1) | 1 | 1:(310.1) | 1 |
| Total Organic Carbon | TOC | mg/L | 140; 146 | 1:(415.1) | 0.5 | 1:(415.1) | 0.5 |
| Total Organic Carbon - Filtered | TOC-F | mg/L | 141; 146 | 1:(415.1) | 0.5 | 1:(415.1) | 0.5 |
| Total Inorganic Carbon | TIC | mg/L | 146 | 1:(415.1) | 0.5 | 1:(415.1) | 0.5 |
| Particulate Organic Carbon | POC | mg/L | 398 | Contract Lab | | Contract Lab | |
| Total Kjeldahl Nitrogen as N | TKN | mg/L | 138 | 3:(10-107-06-2-D) | 0.15 | 3:(10-107-06-2-D) | 0.15 |
| Total Kjeldahl Nitrogen as N, filtered | TKN-F | mg/L | 139 | 3:(10-107-06-2-D) | 0.15 | 3:(10-107-06-2-D) | 0.15 |
| Ammonia Nitrogen as N | NH3-N | mg/L | 125 | 3:(10-107-06-1-B) | 0.05 | 3:(10-107-06-1-B) | 0.03 |
| Organic Nitrogen as N | ORG-N | mg/L | 447 | 3:(10-107-06-2-D) | 0.05 | 3:(10-107-06-2-D) | 0.05 |
| Nitrate as N | NO3 | mg/L | 118 | 3:(10-107-04-1-B) | 0.01 | 3:(10-107-04-1-B) | 0.01 |
| Nitrite as N | NO2 | mg/L | 118 | 3:(10-107-04-1-B) | 0.01 | 3:(10-107-04-1-B) | 0.01 |
| Total Phosphorus -Manual | TP | mg/L | 354 | 1:(365.2) | 0.003 | 1:(365.2) | 0.003 |
| Total Phosphorus | TP | mg/L | 5 | 3:(10-115-01-1-E) | 0.01 | 3:(10-115-01-1-E) | 0.01 |
| Total Dissolved Phosphorus | TDP | mg/L | 134 | 1:(365.2) | 0.003 | 1:(365.2) | 0.003 |
| Soluble Reactive Phosphorus | SRP | mg/L | 308 | 1:(365.2) | 0.003 | 1:(365.2) | 0.001 |
| Silica | SiO2 | mg/L | 129 | 1:(370.1) | 0.2 | 1:(370.1) | 0.2 |
| Sulfates | SO4 | mg/L | 130 | 1:(375.4) | 10 | 1:(375.4) | 10 |
| Sulfide | Sulfide | mg/L | 127 | 1:(376.1) | 0.2 | 1:(376.1) | 0.2 |
| Total Solids | TS | mg/L | 143 | 1:(160.3) | 1 | 1:(160.3) | 1 |
| Total Volatile Solids | TVS | mg/L | 144 | 1:(160.4) | 1 | 1:(160.4) | 1 |
| Total Suspended Solids | TSS | mg/L | 4 | 1:(160.2) | 1 | 1:(160.2) | 1 |

**Attachment 1**. Ambient Monitoring Program 2007 - Parameter Minimum Reportable Limits Summary

| Parameter | Database parameters - 2007 | | | Analytical Procedures for Water Quality Analyses | | | |
|---|---|---|---|---|---|---|---|
| | | | | 2006 (Jan-May) | | 2007 (May-Dec) | |
| | Code | Units | Method | Method | MRL | Method | MRL |
| Total Volatile Suspended Solids | VSS | mg/L | 38 | 1:(160.4) | 1 | 1:(160.4) | 1 |
| Total Dissolved Solids | TDS | mg/L | 142 | 1:(160.1) | 1 | 1:(160.1) | 1 |
| | | | | | | | |
| Arsenic - furnace | As | mg/L | 473; 509 | 4:(200.9) | 0.002 | 4:(200.9) | 0.002 |
| Beryllium | Be | mg/L | 509 | Contract Lab | | Contract Lab | |
| Total Cadmium | Cd | mg/L | 161; 500; 509 | 4:(200.9) | 0.0008 | 4:(200.9) | 0.0008 |
| Total Calcium | Ca | mg/L | 35 | 1:(215.1) | 1 | 1:(215.1) | 1 |
| Total Chromium | Cr | mg/L | 65; 161; 356; 509 | 4:(200.7) | 0.010(0.0025)* | 4:(200.7) | 0.010(0.0025)* |
| Hexavalent Chromium | Cr-Hex | mg/L | 69 | 2:(3500CrD) | 0.005 | 2:(3500CrD) | 0.005 |
| Chloride | Chloride | mg/L | 68 | 3:(10-117-07-1-B) | 2 | 3:(10-117-07-1-B) | 1 |
| Residual Chlorine | CL2-Res-field | mg/L | 206 | 1:(330.4) | 0.1 | 1:(330.4) | 0.1 |
| Total Copper | Cu | mg/L | 67; 161; 356; 509 | 4:(200.7) | 0.0125(0.0031)* | 4:(200.7) | 0.0125(0.0031)* |
| Ammendable Cyanide | CN-A | mg/L | 73 | 3:(10-204-00-1-A) | 0.005 | 3:(10-204-00-1-A) | 0.005 |
| Chlorinated Cyanide | CN-Cl2 | mg/L | 73 | 3:(10-204-00-1-A) | 0.005 | 3:(10-204-00-1-A) | 0.005 |
| Total Cyanide | CN-T | mg/L | 73; 75; 399 | 3:(10-201-00-1-A) | 0.005 | 3:(10-201-00-1-A) | 0.003 |
| Total Iron | Fe | mg/L | 85; 537 | 4:(200.7) | 0.05 | 4:(200.7) | 0.05 |
| Total Lead - furnace | Pb | mg/L | 95; 161; 509 | 4:(200.9) | 0.002 | 4:(200.9) | 0.002 |
| Total Magnesium | Mg | mg/L | 88 | 1:(242.1) | 0.1 | 1:(242.1) | 0.1 |
| Total Manganese | Mn | mg/L | 89 | 4:(200.7) | 0.025 | 4:(200.7) | 0.025 |
| Total Molybdenum | Mo | mg/L | 311 | Contract Lab | | Contract Lab | |
| Total Mercury (Cold Vapor) | Hg | mg/L | 86; 389; 509 | 1:(245.2) | 0.00002 | 1:(245.2) | 0.00002 |
| Total Mercury (Brooks Rand) | Hg | ng/l | 393 | | | | |
| Methyl Mercury (Brooks Rand) | Hg-methyl | ng/l | 295 | | | | |
| Antimony | Sb | mg/L | 509 | Contract Lab | | Contract Lab | |
| Selenium - furnace | Se | mg/L | 472; 509 | 4:(200.9) | 0.002 | 4:(200.9) | 0.002 |
| Total Sodium | Na | mg/L | 92 | 1:(273.1) | 3 | 1:(273.1) | 3 |
| Total Nickel | Ni | mg/L | 93; 161; 356; 509 | 4:(200.7) | 0.015(0.00375)* | 4:(200.7) | 0.015(0.00375)* |
| Potassium | K | mg/L | 87 | 1:(258.1) | 0.02 | 1:(258.1) | 0.02 |
| Thallium | Tl | mg/L | 509 | Contract Lab | | Contract Lab | |
| Total Silver | Ag | mg/L | 17; 509 | 4:(200.7) | 0.0125 | 4:(200.7) | 0.0125 |

**Attachment 1**. Ambient Monitoring Program 2007 - Parameter Minimum Reportable Limits Summary

| | Database parameters - 2007 | | | Analytical Procedures for Water Quality Analyses | | | |
|---|---|---|---|---|---|---|---|
| | | | | 2006 (Jan-May) | | 2007 (May-Dec) | |
| Parameter | Code | Units | Method | Method | MRL | Method | MRL |
| Total Zinc | Zn | mg/L | 97; 161; 356; 509 | 4:(200.7) | 0.025(0.00625)* | 4:(200.7) | 0.025(0.00625)* |
| Turbidity | Turbidity | NTU | 145 | 2:(2130B) | 0.1 | 2:(2130B) | 0.1 |
| Hardness | Hardness | mg/L | 238 | 4:(215.1 & 424.1) | 3 | 4:(215.1 & 424.1) | 3 |
| Conductivity - field | COND-field | umHos/cm | 286 | 2:(2510B) | - | 2:(2510B) | - |
| Dissolved Oxygen - field | DO-field | mg/L | 286 | 1:(360.1) | 0.1 | 1:(360.1) | 0.1 |
| pH - field | pH-field | Std Units | 286 | 1:(150.1) | - | 1:(150.1) | - |
| Temperature - field | Temp-field | °C | 133; 286 | 1:(170.1) | - | 1:(170.1) | - |
| Phenol | Phenol | µg/L | 433 | Contract Lab (GC method cannot be compared. Unknown MRL) | | | |
| Phenol | Phenol | mg/L | 126 | 3:(10-210-00-1-B) | 0.015 | 3:(10-210-00-1-B) | 0.015 |
| Phaeophytin a | Phaeophytin-a | mg/m3 | 155 | 2:(10200 H.2) | 0.0002 | 2:(10200 H.2) | 0.0002 |
| Chlorophyll a | Chlorophyll-a | mg/m3 | 155 | 2:(10200 H.2) | 0.0002 | 2:(10200 H.2) | 0.0002 |
| E. Coliform | ECOLI-MF | cells/100ml | 360 | 2:(9213 D) | 2 | 2:(9213 D) | 2 |
| E. Coliform | ECOLI | cells/100ml | 525 | N/A | | 2:(9223 B) | 1.0 MPN |
| Fecal Coliform | FCOLI-MF | cells/100ml | 80 | 2:(9222 D) | 2 | 2:(9222 D) | 2 |
| Fecal Coliform | FCOLI | cells/100ml | 80 | 2:(9222 D) | 2 | 2:(9222 D) | 2 |

*Notes:*

Contract Lab - indicates the analyses were conducted by a contract laboratory (in 2007, Certified Environmental Services) using unidentified method or reporting limits.

N/A - Not applicable; MPN – Most Probable Number

# Attachment 2

# List of Sample Results Qualified for Blank Contamination

**Attachment 2.** List of 2007 samples where (a) exceedance criterion (blank concentration <2x MRL) was met, but sample results were less than five times the concentration measured in the blank, or (b) exceedance criterion was not met, and sample results were less than five times the concentration measured in the blank.

***BOD-5 (mg/l) - exceedance criterion (blank concentration <2x MRL) was met, but sample results were less than five times the concentration measured in the blank.***

| Date | Blank ID | Blank Result | Sample No | Ind_Code | Source | Result |
|---|---|---|---|---|---|---|
| 8/27/2007 | Crk-Blank Churn (Crew A) | 3 | 2709307 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | <2 |
| | | | 2709345 | 789 | Metro Final Effluent | 3 |

***SRP (mg/l) - exceedance criterion (blank concentration <2x MRL) was met, but sample results were less than five times the concentration measured in the blank.***

| Date | Blank ID | Blank Result | Sample No | Ind_Code | Source | Result |
|---|---|---|---|---|---|---|
| 1/30/2007 | Crk-Blank Churn (Crew A) | 0.002 | 2701090 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | 0.002 |

***TKN (mg/l) - exceedance criterion (blank concentration <2x MRL) was met, but sample results were less than five times the concentration measured in the blank.***

| Date | Blank ID | Blank Result | Sample No | Ind_Code | Source | Result |
|---|---|---|---|---|---|---|
| 5/30/2007 | Crk-Blank Dunker Churn (Crew B) | 0.16 | 2705777 | 902 | Crk-Harbour Brook @ Hiawatha | 0.29 |
| | | | 2705780 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | 0.60 |
| | | | 2705781 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | 0.52 |
| | | | 2705790 | 1907 | Crk-Onondaga Lake Outlet 12 ft. - Duplicate | 0.54 |
| | | | 2705783 | 904 | Crk-Tributary 5a @ State Fair Blvd | 0.60 |
| | | | 2705785 | 911 | Crk-Harbor Brook @ Velasko Road | 0.18 |
| 2/7/2007 | Crk-Blank Churn (Crew A) | 0.16 | 2701332 | 882 | Crk-Onondaga Creek @ Kirkpatrick | 0.29 |
| | | | 2701344 | 882 | Crk-Onondaga Creek @ Kirkpatrick-Duplicate | 0.34 |
| | | | 2701336 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | 0.75 |
| | | | 2701340 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | 0.31 |
| | | | 2701343 | 1939 | Crk-Onondaga Creek @ Adams Street | 0.29 |
| 2/12/2007 | Crk-Blank Churn (Crew A) | 0.18 | 2701550 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | 0.32 |

***TKN (mg/l) - (continued)***

| Date | Blank ID | Blank Result | Sample No | Ind_Code | Source | Result |
|---|---|---|---|---|---|---|
| 2/27/2007 | Crk-Blank Churn (Crew A) | 0.2 | 2701843 | 882 | Crk-Onondaga Creek @ Kirkpatrick | 0.3 |
| | | | 2701847 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | 0.53 |
| | | | 2701849 | 903 | Crk-Allied East Flume-Over Weir | 0.83 |
| | | | 2701851 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | 0.38 |
| | | | 2701855 | 1939 | Crk-Onondaga Creek @ Adams Street | 0.31 |
| 3/28/2007 | Crk-Blank Churn (Crew A) | 0.15 | 2703573 | 882 | Crk-Onondaga Creek @ Kirkpatrick | 0.36 |
| | | | 2703577 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | 0.45 |
| | | | 2703579 | 903 | Crk-Allied East Flume-Over Weir | 0.64 |
| | | | 2703584 | 903 | Crk-Allied East Flume-Over Weir -Duplicate | 0.61 |
| | | | 2703581 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | 0.37 |
| | | | 2703588 | 1939 | Crk-Onondaga Creek @ Adams Street | 0.38 |
| 4/26/2007 | Crk-Blank Churn (Crew A) | 0.18 | 2704636 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | 0.30 |
| 8/14/2007 | Crk-Blank Churn (Crew A) | 0.19 | 2708717 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | 0.38 |
| 9/10/2007 | Crk-Blank Churn (Crew A) | 0.17 | 2710013 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | 0.57 |

***Turbidity (NTU) - exceedance criterion was not met, and sample results were less than five times the concentration measured in the blank.***

| Date | Blank ID | Blank Result | Sample No | Ind_Code | Source | Result |
|---|---|---|---|---|---|---|
| 5/15/2007 | Crk-Blank Dunker Churn (Crew B) | 0.34 P | 2705266 | 902 | Crk-Harbour Brook @ Hiawatha | 1.63 |
| 9/11/2007 | Lake Equip. Blk (Dunker Churn) | 0.48 | 2710055 | 918 | Lake 0m South | 1.55 |
| | | | 2710066 | 925 | Lake Upper Mixed Layer South | 2.11 |
| | | | 2710070 | 983 | Lake Nearshore (Nine Mile Creek) | 1.46 |
| | | | 2710072 | 985 | Lake Nearshore (Metro/Outfall) | 1.74 |
| | | | 2710074 | 987 | Lake Nearshore (Eastside) | 0.93 |
| | | | 2710075 | 988 | Lake Nearshore (Willow Bay) | 1.34 |
| | | | 2710076 | 989 | Lake Nearshore (Maple Bay) | 1.15 |
| | | | 2710096 | 895 | Lake Nearshore (Bloody Brook) | 1.31 |
| 5/15/2007 | Crk-Blank Churn (Crew A) | 0.37 P | 2705276 | 789 | Crk-Metro Effluent | 1.43 |

# Attachment 3

# Field Duplicates with RPDs Exceeding 20%

**Attachment 3**. List of 2007 samples and field duplicates with Relative Percent Difference (RPD) exceeding 20%.

| Site | Source | Date | Sample Number | Duplicate Number | Parameter (units) | Sample Conc | Dup Conc | RPD | Absolute Difference |
|---|---|---|---|---|---|---|---|---|---|
| Tributaries | Crk-Allied East Flume-Over Weir | 6/26/2007 | 2706919 | 2706925 | TOC (mg/l) | 4.49 | 1.78 | 86.44 | 2.71 |
| | | | | | TOC-F (mg/l) | 4.06 | 1.56 | 88.97 | 2.5 |
| | | | | | TSS (mg/l) | 8 | 36 | 127.27 | 28 |
| | | 11/14/2007 | 2712739 | 2712745 | TSS (mg/l) | <4 | 5 | 22.22 | 1 |
| | Crk-Harbour Brook @ Hiawatha | 5/1/2007 | 2704764 | 2704777 | ORG-N (mg/l) | 0.46 | 0.19 | 83.08 | 0.27 |
| | | | | | TKN (mg/l) | 0.49 | 0.22 | 76.06 | 0.27 |
| | Crk-Ley Creek @ Park Street | 5/15/2007 | 2705268 | 2705279 | TDP (mg/l) | 0.011 | 0.058 P | 136.23 | 0.047 |
| | | 10/30/2007 | 2712258 | 2712268 | ORG-N (mg/l) | 0.42 | 0.74 | 55.17 | 0.32 |
| | Crk-Onondaga Creek @ Kirkpatrick | 2/7/2007 | 2701332 | 2701344 | TSS (mg/l) | <4 | 5 | 22.22 | 1 |
| Outlet | Crk-Onondaga Lake Outlet 12 ft. | 5/30/2007 | 2705781 | 2705790 | Phaeophytin-a (mg/m$^3$) | 0.32 | <0.2 | 46.15 | 0.12 |
| | | | | | Fe (mg/l) | 0.116 | 0.0678 | 52.45 | 0.0482 |
| | Crk-Onondaga Lake Outlet 2 ft. | 6/12/2007 | 2706298 | 2706307 | Fe (mg/l) | 0.0585 | 0.144 | 84.44 | 0.0855 |
| Lake | Lake 6m North | 6/19/2007 | 2706587 | 2706592 | TDP (mg/l) | 0.008 | <0.003 | 90.91 | 0.005 |
| | Lake 6m South | 5/22/2007 | 2705544 | 2705549 | TVS (mg/l) | 124 | 178 | 35.76 | 54 |
| | | 9/25/2007 | 2710705 | 2710710 | NH3-N (mg/l) | 0.071 | 0.101 | 34.88 | 0.03 |
| | Lake Tube Composite (South) | 6/5/2007 | 2705985 | 2705986 | Phaeophytin-a (mg/m$^3$) | <0.20 | 1.01 | 133.88 | 0.81 |
| | | 7/17/2007 | 2707682 | 2707683 | Phaeophytin-a (mg/m$^3$) | 0.48 | 1.76 | 114.29 | 1.28 |
| | | 8/6/2007 | 2708464 | 2708467 | Phaeophytin-a (mg/m$^3$) | 0.85 | <0.2 | 123.81 | 0.65 |
| | | 9/4/2007 | 2709711 | 2709712 | Phaeophytin-a (mg/m$^3$) | 1.17 | 0.43 | 92.50 | 0.74 |
| | | 11/8/2007 | 2712608 | 2712609 | Phaeophytin-a (mg/m$^3$) | 0.59 | 1.12 | 61.99 | 0.53 |
| | | 12/13/2007 | 2713465 | 2713466 | Phaeophytin-a (mg/m$^3$) | 0.21 | 1.5 | 150.88 | 1.29 |
| | Lake Upper Mixed Layer North | 3/7/2007 | 2702615 | 2702617 | Fe (mg/l) | 0.141 | 0.0776 | 58.01 | 0.0634 |
| | | 4/10/2007 | 2703996 | 2703998 | K (mg/l) | 3.6 | <0.020 | 197.79 | 3.58 |
| | | 6/19/2007 | 2706593 | 2706595 | Fe (mg/l) | <0.050 | 0.0821 | 48.60 | 0.0321 |
| | | 10/9/2007 | 2711405 | 2711407 | BOD5 (mg/l) | <2 N | 4 N | 66.67 | 2 |
| | | | | | Zn (mg/l) | 0.0094 | <0.0063 | 39.49 | 0.0031 |
| | Lake Upper Mixed Layer South | 4/10/2007 | 2700226 | 2700228 | Fe (mg/l) | 0.134 | 0.383 | 96.32 | 0.249 |
| | | 6/5/2007 | 2705981 | 2705983 | BOD5 (mg/l) | <2 | 3 | 40.00 | 1 |
| | | 6/19/2007 | 2706576 | 2706578 | Pb (mg/l) | 0.0036 | <0.0020 | 57.14 | 0.0016 |

| Site | Source | Date | Sample Number | Duplicate Number | Parameter (units) | Sample Conc | Dup Conc | RPD | Absolute Difference |
|---|---|---|---|---|---|---|---|---|---|
| Lake (continued) | Lake Upper Mixed Layer South (continued) | 7/3/2007 | 2707229 | 2707231 | Fe (mg/l) | 0.213 | 0.16 | 28.42 | 0.053 |
| | | 10/24/2007 | 2712065 | 2712067 | TKN-F (mg/l) | 0.63 | 0.33 | 62.50 | 0.3 |
| | | 10/31/2007 | 2712336 | 2712337 | Phaeophytin-a ($mg/m^3$) | 0.69 | 1.82 | 90.04 | 1.13 |
| Treatment Plant | Metro Final Effluent | 11/28/2007 | 2713253 | 2713288 | TP (mg/l) | 0.072 | <0.05 | 36.07 | 0.022 |
| | | | | | NH3-N (mg/l) | 0.69 | 0.45 P | 42.11 | 0.24 |

# Attachment 4

# Laboratory Letter Addressing QC Issues

Onondaga County
Department of
Water Environment Protection

# Inter-Office Letter

## Subject: AMP 2007 QC data Review

**To:** **Janaki Suryadevara**
**From:** **Mark Fowkes**
**Date:** Tuesday, March 25, 2008

Below is a list of questions from Kerry Thurston and responses.

1. Please double-check Chlorophyll-a (South Basin on 9/11/07) for sample numbers 2710069 (Photic Zone) and 2710095 (Tube composite) – the values seem high.

**Confirmed by laboratory.**

2. Please re-evaluate the cations/anions for these samples, where Charge Balance exceeds 15%:

| SAMPLE_NO | SOURCE | START_DATE | ChargeBalance% |
|---|---|---|---|
| 2702493 | Crk-Allied East Flume-Over Weir | 3/14/2007 | 23.36 |
| 2706919 | Crk-Allied East Flume-Over Weir | 6/26/2007 | 26.32 |
| 2706925 | Crk-Allied East Flume-Over Weir - Duplicate | 6/26/2007 | 25.07 |
| 2702494 | Crk-Harbor Brook @ Velasko Road | 3/14/2007 | 60.24 |
| 2703243 | Crk-Harbor Brook @ Velasko Road | 3/20/2007 | 19.44 |
| 2708513 | Crk-Harbor Brook @ Velasko Road | 8/7/2007 | 19.84 |
| 2709041 | Crk-Harbor Brook @ Velasko Road | 8/21/2007 | 20.88 |
| 2709764 | Crk-Harbor Brook @ Velasko Road | 9/6/2007 | 17.57 |
| 2707426 | Crk-Metro Effluent | 7/10/2007 | 15.41 |
| 2709766 | Crk-Metro Effluent | 9/6/2007 | 18.5 |
| 2702491 | Crk-Nine Mile Creek @ Lakeland Rt 48 | 3/14/2007 | 17.48 |
| 2709769 | Crk-Onondaga Creek @ Adams Street | 9/6/2007 | 15.11 |
| 2713154 | Crk-Onondaga Creek @ Adams Street | 11/27/2007 | 26.4 |
| 2713151 | Crk-Onondaga Creek @ Dorwin Ave. | 11/27/2007 | 29.5 |
| 2707968 | Crk-Onondaga Creek @ Kirkpatrick | 7/24/2007 | 22.64 |

**Confirmed by laboratory. Note that most samples had high solids which will interfere with the balance calculation. Current limit used is 20% not 15%.**

3. Please check the samples listed in the attached Excel spreadsheet (Review_FieldDups_AMP2007.xls), for data entry or other possible errors. The duplicate RPDs are high.

**The following data were corrected:**

**Sample# 2703998 Potassium result was <0.020 missed a dilution factor and is now <0.20 mg/L.**

**Sample# 2712268 NH3-N result was 0.034 typo and result is now 0.34 mg/L.**

**Sample# 2713288 NH3 result was 0.045 typo and result is now 0.45 mg/L.**

**Sample# 2710488 TKN result waas 2.63 typo and result is now 1.20 mg/L.**

**All other results are confirmed by laboratory.**
**See revised table ($Update_Review_FieldDups_AMP2007.xls)**

4. Please check the hardness calculations for samples 2700847 and 2700839. The reported results in the database (392 and 418 mg/l, respectively) are less than that calculated using Mg and Ca (517 and 507 mg/l, respectively).

**Hardness results are a calculation based upon Mg and Ca. Results for Mg were modified after the hardness calculation. Results have now been re-calculated and corrected for Samples 2700847 and 2700839.**

5. Would you verify if samples collected from Bloody Brook and Sawmill Creek on March 28, 2007 were collected by Crew A or Crew B? This information would be helpful in evaluating the equipment blanks.

**Samples were collected by Crew B.**

6. I am updating a table of the MRLs associated with the 2007 AMP data. Would you review the attached spreadsheet (Review-MRLTable-2007AMP.xls) for accuracy and fill in missing information?

**See revised Table ($Update-MRL Table-2007 AMP.xls). Note that some samples and data were reported from the contract laboratory CES and therefore the methods and detection limits do not match.**

7. Please check the data in the attached spreadsheet (Review-MRLTypos-2007AMP.xls) for possible typographic errors. The 2007 non-detect data reported (less than MRL) were compared to the published MRLs; where the non-detect result doesn't match the published MRL, there could be a data entry error.

**Sample# 2711380 for TIC was entered incorrectly. Result was <0.05 and has been corrected to <0.5 mg/L.**

**Sample# 2712731 for Ca was entered incorrectly. Result was <0.125 and has been corrected to <1.25 mg/L.**

**All MRL for the following parameter have been adjusted higher due to sample dilution factors (TSS,VSS,TDS,TKN,TKN-F,TP,FCOLI)**
**Other than Calcium, all other metal MRL values differ due to results from the contract laboratory CES.**

**See revised Table ($Update-MRL Typos-2007AMP.xls).**

# Attachment 5

# Results of Field Audits, 2007

Onondaga County Department of Water Environment Protection
Tributary Audit Checklist

Completed on: _June 26, 2007___________________________________________
Completed by: _Liz Moran, EcoLogic ___________________________________

| Quality Assurance Project Plan Requirement (April 2006 Revision) | Comment |
|---|---|
| Sondes calibrated per written procedure and logged in bound notebook | Acceptable |
| Bottles pre-labeled and match planned field effort | Acceptable |
| Chain-of-custody accurate and complete | Acceptable |
| Wash blanks prepared on cleaned equipment and submitted to lab check-in | Acceptable |
| Field crews verify that all equipment is loaded into vehicles prior to departure | Acceptable |
| Schedule and sequence of sites are reviewed prior to departure | Acceptable |
| Safety precautions observed | Most sites are OK. Need to place traffic cones on lower Onondaga Cr sites |
| Field team verifies correct location prior to initiating sampling | Acceptable. Discussion of upstream vs. downstream sampling locations (Adams St) |
| Samples collected per QAPP | Acceptable |
| Duplicate sample collected | Acceptable |
| Water mixed in churn | Discussed proper rate of churning and associated degree of agitation with field crew. Need to churn with sufficient energy to keep particulates in suspension, without creating turbulence. |
| Bottles rinsed with sample water prior to filling | Acceptable |
| Field filtration SRP, TDP samples | Acceptable |
| Preservation in accordance with QAPP | Acceptable |
| | |
| Proper equipment used for each sampling location | Acceptable |
| Field crews observe ambient conditions and make notes as needed | Acceptable |
| Field crews properly trained and understand assignments | Acceptable |

Onondaga County Department of Water Environment Protection
Lake Audit Checklist

Completed on: _May 22, 2007_______________________________________
Completed by: _Liz Moran, EcoLogic ________________________________

| Quality Assurance Project Plan Requirement (April 2006 Revision) | Comment |
|---|---|
| Sondes calibrated per written procedure and logged in bound notebook | Acceptable |
| Bottles pre-labeled and match planned field effort | Acceptable |
| Chain-of-custody accurate and complete | Acceptable |
| Wash blanks prepared on cleaned equipment and submitted to lab check-in | Acceptable |
| Field crews verify that all equipment is loaded into vehicle prior to departure | Acceptable |
| Schedule and sequence of sites are reviewed prior to departure | Acceptable (S. Deep plus nearshore) |
| Field team verifies correct location prior to initiating sampling | Acceptable |
| Samples collected per QAPP | Acceptable |
| Duplicate sample collected | Acceptable |
| Equipment markings maintained and legible | Acceptable |
| Submersible pump allowed to run for sufficient time to purge system of previous sample | Acceptable |
| Tube composites sampled properly | Acceptable |
| Depth composites determined in field using proper reasoning and reference to SOP | DWEP to include reference profiles to assist field crews with determination of composites |
| Water mixed in churn at proper rate | Acceptable (gentle mixing best for lake water, discussed with field crew) |
| Flow meter for zooplankton net tow calculations | Acceptable |
| Bottles rinsed with sample prior to filling | Acceptable |
| Field filtration SRP, TDP samples | Acceptable |
| Field crew discusses and reaches correct decision regarding collection of sulfide samples | Acceptable |
| Preservation in accordance with QAPP | Acceptable |
| Proper equipment used for each sampling location | Acceptable |
| Field crews observe ambient conditions and make notes as needed | Acceptable |
| Field crews properly trained and understand assignments | Acceptable |

***EcoLogic Memorandum***

**TO**: Joe Mastriano, DWEP
**FROM**: Liz Moran
**RE**: Quality control measures for phosphorus sampling and analysis
**DATE**: August 1, 2007

There are a number of quality assurance/quality control (QA/QC) measures built into the Ambient Monitoring Program to document the precision and accuracy of the phosphorus measurements. As you requested, I have prepared this brief summary of current DWEP practices.

Several techniques are employed to assess and document the integrity of the entire sample collection and analysis process.

- Audits of the field efforts.
- Voluntary proficiency samples of the Onondaga County environmental laboratory (in addition to the proficiency samples required twice per year as part of the ELAP certification).
- Calculation of relative percent difference in field duplicates.
- Inclusion of equipment rinsate and laboratory blank analyses,

In addition to these criteria, analytical and field data are screened for criteria of "limnological reasonableness", which refers to compliance with a conceptual model of how lakes function and our cumulative understanding of the processes in Onondaga Lake. Examples of criteria for limnological reasonableness are noted below.

- Distribution of chemicals as a function of depth, thermal stratification, and season.
- Relationship between total and dissolved fractions of a parameter.
- Charge balance of samples for which major cations and anions are measured.
- Changes in concentration between sampling events that are not explicable (for example, a sudden reappearance of dissolved oxygen in the lower waters during stable thermal stratification).

Finally, the integrated database of AMP water quality results designed by Dr. William Walker has an outlier screening function that identifies results that are statistical outliers. This enables the program managers and laboratory staff to investigate and verify individual results and make any necessary corrections.

Several of these measures are discussed in greater detail in the following sections.

(1) The annual AMP workplan and accompanying QA/QC plan

The annual program submittal is reviewed from the perspective of whether the AMP provides the data and information needed to assess management questions. This review includes OCDWEP and Onondaga County managers and members of the Onondaga Lake Technical Advisory Committee.

The annual submittal documents the measures OCDWEP has implemented to document the EPA PARCC parameters (precision, accuracy, representativeness, completeness and comparability). Good data begins with good field sampling, and the County has committed enormous resources in equipment and staff training to ensure proper sampling of the lake, river, tributary streams, and effluents. The nature and integrity of the sample containers is fully documented. A routine program of blanks evaluates whether there is any potential for cross-contamination of samples. Chain-of-custody forms accompany each sample through collection and analysis.

The annual QA/QC plan is submitted to NYSDEC for review and approval annually.

(2) Field audits

Field sampling is audited a minimum of twice each year, when professional staff accompany the AMP sampling teams to observe sampling and sample handling. NYSDEC and USGS have also accompanied the field teams.

(3) Laboratory audits

The National Water Research Institute (NWRI) of Environment Canada manages performance evaluation (PE) studies to help laboratories assess the accuracy and integrity of their analytical results. More than 200 laboratories from the US and Canada participate in the PE studies; results are evaluated for precision and systematic bias. The NWRI routinely provides samples of natural waters for analysis of a suite of water quality parameters. PE samples are prepared for major ions and nutrients, or for TP. The water originates from various lakes and rivers in different geologic and land use settings. Lake Superior water is used as the TP blank. Samples were prepared in natural lake and river waters and preserved with 0.2% sulfuric acid. Standard phosphate solutions were prepared with potassium dihydrogen phosphate and sodium β-glycerophosphate for inorganic and organic spikes respectively.

The PE evaluations are run twice each year, spring and fall. The Onondaga County Environmental Laboratory participated in the NWRI program for the first time in fall 2002. Since then, the County laboratory has routinely participated in the twice-yearly (spring and fall) performance evaluations.

Prior to 2002, DWEP implemented various other round-robin evaluations using proficiency samples from USGS, from commercial sources, and from other local certified laboratories.

(4) ELAP certification requirements

The Onondaga County environmental laboratory is required to fully document precision and accuracy and method detection limit for all analytes, including phosphorus. This includes formal determination of control limits, reference samples, spikes, duplicates, blanks, and surrogate samples. The laboratory is subject to formal audit by the New York State Department of Health twice annually.

(5) Program-level oversight

OCDWEP has designed several means of assessing whether the goals of the data acquisition program are being met. Both the field and laboratory components of the AMP are assessed on an ongoing basis, with formal checkpoints each month.

Data are received from the laboratory on a monthly basis and are immediately reviewed for completeness and potential outliers.

The program team reviews the workplan with key field and laboratory personnel. Monthly coordination meetings are held with field and laboratory personnel. Any significant activities or problems identified in either the field or laboratory component of the program are discussed. A formal list of action items is kept from these monthly meetings.

EcoLogic LLC conducts an annual training and feedback session that is open to the entire AMP field, laboratory, and management team. The "State of the Lake" is presented as an opportunity for the AMP team to understand the significance of their efforts in striving for excellence in data quality. There is also ample opportunity for questions and answers.

# Attachment 6

# Environment Canada Phosphorus Proficiency Samples

## Background

The National Water Research Institute (NWRI) of Environment Canada manages performance evaluation (PE) studies to help laboratories assess the accuracy and integrity of their analytical results. More than 200 laboratories from the US and Canada participate in the PE studies; results are evaluated for precision and systematic bias. The NWRI routinely provides samples of natural waters for analysis of a suite of water quality parameters. PE samples are prepared for major ions and nutrients in water, Total Phosphorus in water, rain and soft waters, trace elements in water, and trace elements in sediment.

The Onondaga County Environmental Laboratory participated in the NWRI program for the first time in fall 2002. Since that time, the County laboratory has routinely participated in the proficiency testing program for total phosphorus in water. Water used in this evaluation originates from various lakes and rivers in different geologic and land use settings. Lake Superior water is used as the TP blank. Samples are prepared in natural lake and river waters and preserved with 0.2% sulfuric acid. Standard phosphate solutions are prepared with potassium dihydrogen phosphate and sodium β-glycerophosphate for inorganic and organic spikes respectively.

## Results

Onondaga County participated in PT Study 0090, June to September 2007 and received results on September 17, 2007. The performance of the laboratory was rated as “satisfactory”. Two of the ten samples were flagged as outside of advisory limits. No bias was assigned to the laboratory results. The laboratory rates performance based on the percent of the sample results that are flagged (2/10 in this round) or systematically biased (0/10 in this round). The satisfactory rating on Study Code 0090 reflected a 10% score.

**NWRI Laboratory Performance Rating**

| Rating | Percent Score * |
|---|---|
| Good | 0 - 5 |
| Satisfactory | >5 – 12.5 |
| Moderate | >12.5 - 30 |
| Poor | >30 |

*Sum of Bias and Flagged Data

Previous proficiency testing through the Environment Canada program consistently earned a rating of “good”. The laboratory completed an internal review of the June – Sept 2007 proficiency study to identify factors contributing to the decline in rating. The samples and results are summarized in the table below.

| Sample | Measured Result (mg/l) | Assigned Value (mg/l) | High warning Limit (mg/l) | High acceptance Limit (mg/l) | Standard deviation (mg/l) |
|---|---|---|---|---|---|
| PT90-1 | <0.003 | 0.0010 | 0.003 | 0.004 | 0.0012 |
| PT90-2 | <0.003 | 0.0040 | 0.005 | 0.006 | 0.0007 |
| PT90-3 | 0.008 | 0.0065 | 0.008 | 0.009 | 0.0009 |
| PT90-4 | 0.087 | 0.0880 | 0.098 | 0.103 | 0.0051 |
| PT90-5 | 0.015 | 0.0180 | 0.021 | 0.023 | 0.0017 |
| PT90-6 | 0.060 | 0.06490 | 0.073 | 0.077 | 0.0041 |
| PT90-7 | 0.422* | 0.334 | 0.364 | 0.379 | 0.0151 |
| PT90-8 | 0.131 | 0.1336 | 0.148 | 0.155 | 0.0062 |
| PT90-9 | 0.254 # | 0.228 | 0.249 | 0.259 | 0.0103 |
| PT90-10 | 0.854 | 0.834 | 0.893 | 0.922 | 0.0294 |

Note: # Warning limits: greater than 2 standard deviations above the mean responses of participating laboratories

*Acceptance limits: greater than 3 standard deviations above the mean responses of participating laboratories

According to the internal investigation, the calibration range for TP samples extends to 0.3 mg/l. The two samples outside of the range (PT90-7 and PT90-10) were manually diluted, re-digested, and re-analyzed. Sample PT90-9 was also re-digested and re- analyzed due to an undocumented problem with the original analysis. The review resulted in a recommendation for additional training and supervision of analysts, which has been implemented. Two procedural changes have also been implemented:

1. When the relative percent difference between laboratory duplicates exceeds established control limits, regardless of whether the sample was subsequently diluted, the sample must be re-analyzed, verified by the QC officer, and documented.
2. The rationale for repeating the digestion and/or analysis of a sample must be documented.

The laboratory will continue to participate in the Environment Canada proficiency testing program.

# Attachment 7

# Lists of Qualified and Rejected Data

*2007 samples flagged in the database as not to be used for data queries or analyses.*

| SAMPLE_ NO | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ TYPE | DEPTH | START_ DATE | SAMPLE_REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/21/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/22/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | TIME | 0 | 8/23/2007 | Side by side second sampler |

*2007 samples flagged in the database as not to be used for data queries or analyses.*

| SAMPLE_ NO | IND_ CODE | SOURCE | SAMPLE_ NOTES | Parameter | Units | SRESULT | LAB_ COMMENTS | LAB | START_ TIME | END_ TIME |
|---|---|---|---|---|---|---|---|---|---|---|
| 2709187 | 789 | Metro Final Effluent | | CBOD5 | mg/L | 3 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | | NH3-N | mg/L | 0.23 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | | BOD5 | mg/L | 5 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | | TKN | mg/L | 1.56 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | | TP | mg/L | 0.13 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | | TSS | mg/L | 3 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | | TP | mg/L | 0.12 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | | TKN | mg/L | 1.08 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | | NH3-N | mg/L | 0.2 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | | Chloride | mg/L | 222 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | | CBOD5 | mg/L | 3 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | | BOD5 | mg/L | 3 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | | TSS | mg/L | 5 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | | TP | mg/L | 0.15 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | | BOD5 | mg/L | 6 | N | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | | CBOD5 | mg/L | 4 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | | TKN | mg/L | 1.36 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | | TSS | mg/L | 5 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | | NH3-N | mg/L | 0.17 | | ELS | 8:30 | 8:15 |

*2007 sample results flagged in the database as not to be used for data queries or analyses.*

| SAMPLE_ NO | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE _TYPE | DEPTH | START_ DATE | SAMPLE_ REMARKS |
|---|---|---|---|---|---|---|---|---|
| 2701343 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | | Grab | 0 | 2/7/2007 | TDS: Blank corrected. |
| 2701855 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | | Grab | 0 | 2/27/2007 | |
| 2703588 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | High Flow | Grab | 0 | 3/28/2007 | |
| 2701090 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Midland RTF Dewater | Grab | 0 | 1/30/2007 | |
| 2701340 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | | Grab | 0 | 2/7/2007 | TDS: Blank corrected. |
| 2701550 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Midland RTF Dewater | Grab | 0 | 2/12/2007 | Stage Gauge: Ice conditions |
| 2701851 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | | Grab | 0 | 2/27/2007 | |
| 2703581 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | High Flow | Grab | 0 | 3/28/2007 | |
| 2704636 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Midland RTF Dewater | Grab | 0 | 4/26/2007 | |
| 2708717 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Midland RTF Dewater | Grab | 0 | 8/14/2007 | TDS: blank corrected. |
| 2710013 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Midland RTF Dewater | Grab | 0 | 9/10/2007 | |
| 2701849 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | | Grab | 0 | 2/27/2007 | |
| 2703579 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | High Flow | Grab | 0 | 3/28/2007 | |
| 2705266 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | | Grab | 0 | 5/15/2007 | TDS-blank corrected. |
| 2705777 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | Routine (Biweekly) | Grab | 0 | 5/30/2007 | |
| 2701332 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | | Grab | 0 | 2/7/2007 | TDS: Blank corrected. |
| 2701843 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | | Grab | 0 | 2/27/2007 | |
| 2703573 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | High Flow | Grab | 0 | 3/28/2007 | |
| 2710070 | 983 | Lake Nearshore (Nine Mile Creek) | Onondaga Lake | Special Weekly | Grab | 0 | 9/11/2007 | |
| 2710096 | 895 | Lake Nearshore (Bloody Brook) | Onondaga Lake | Special Weekly | Grab | 0 | 9/11/2007 | |
| 2710074 | 987 | Lake Nearshore (Eastside) | Onondaga Lake | Special Weekly | Grab | 0 | 9/11/2007 | |
| 2710076 | 989 | Lake Nearshore (Maple Bay) | Onondaga Lake | Special Weekly | Grab | 0 | 9/11/2007 | |
| 2710072 | 985 | Lake Nearshore (Metro/Outfall) | Onondaga Lake | Special Weekly | Grab | 0 | 9/11/2007 | |
| 2710075 | 988 | Lake Nearshore (Willow Bay) | Onondaga Lake | Special Weekly | Grab | 0 | 9/11/2007 | |

*2007 sample results flagged in the database as not to be used for data queries or analyses.*

| SAMPLE_ NO | IND_ CODE | SOURCE | Parameter | Units | SRESULT | LAB_ COMMENTS | LAB | START_ TIME | END_ TIME |
|---|---|---|---|---|---|---|---|---|---|
| 2701343 | 1939 | Crk-Onondaga Creek @ Adams Street | TKN | mg/L | 0.29 | | ELS | 9:50 | |
| 2701855 | 1939 | Crk-Onondaga Creek @ Adams Street | TKN | mg/L | 0.31 | | ELS | 9:50 | |
| 2703588 | 1939 | Crk-Onondaga Creek @ Adams Street | TKN | mg/L | 0.38 | | ELS | 9:45 | |
| 2701090 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | SRP | mg/L | 0.002 | | ELS | 10:00 | |
| 2701340 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | TKN | mg/L | 0.31 | | ELS | 9:15 | |
| 2701550 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | TKN | mg/L | 0.32 | | ELS | 10:20 | |
| 2701851 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | TKN | mg/L | 0.38 | | ELS | 9:20 | |
| 2703581 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | TKN | mg/L | 0.37 | | ELS | 9:10 | |
| 2704636 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | TKN | mg/L | 0.3 | | ELS | 10:25 | |
| 2708717 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | TKN | mg/L | 0.38 | | ELS | 10:20 | |
| 2710013 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | TKN | mg/L | 0.57 | | ELS | 10:25 | |
| 2701849 | 903 | Crk-Allied East Flume-Over Weir | TKN | mg/L | 0.83 | | ELS | 14:15 | |
| 2703579 | 903 | Crk-Allied East Flume-Over Weir | TKN | mg/L | 0.64 | | ELS | 11:25 | |
| 2705266 | 902 | Crk-Harbour Brook @ Hiawatha | Turbidity | NTU | 1.63 | | ELS | 10:35 | |
| 2705777 | 902 | Crk-Harbour Brook @ Hiawatha | TKN | mg/L | 0.29 | | ELS | 9:05 | |
| 2701332 | 882 | Crk-Onondaga Creek @ Kirkpatrick | TKN | mg/L | 0.29 | | ELS | 10:30 | |
| 2701843 | 882 | Crk-Onondaga Creek @ Kirkpatrick | TKN | mg/L | 0.3 | | ELS | 10:35 | |
| 2703573 | 882 | Crk-Onondaga Creek @ Kirkpatrick | TKN | mg/L | 0.36 | | ELS | 11:00 | |
| 2710070 | 983 | Lake Nearshore (Nine Mile Creek) | Turbidity | NTU | 1.46 | | ELS | 11:50 | |
| 2710096 | 895 | Lake Nearshore (Bloody Brook) | Turbidity | NTU | 1.31 | | ELS | 11:30 | |
| 2710074 | 987 | Lake Nearshore (Eastside) | Turbidity | NTU | 0.93 | | ELS | 11:35 | |
| 2710076 | 989 | Lake Nearshore (Maple Bay) | Turbidity | NTU | 1.15 | | ELS | 11:45 | |
| 2710072 | 985 | Lake Nearshore (Metro/Outfall) | Turbidity | NTU | 1.74 | | ELS | 11:20 | |
| 2710075 | 988 | Lake Nearshore (Willow Bay) | Turbidity | NTU | 1.34 | | ELS | 11:40 | |

*2007 sample results flagged in the database as not to be used for data queries or analyses.*

| SAMPLE_ NO | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE _TYPE | DEPTH | START_ DATE | SAMPLE_ REMARKS |
|---|---|---|---|---|---|---|---|---|
| 2705276 | 789 | Crk-Metro Effluent | Onondaga Creeks | | Grab | 0 | 5/15/2007 | TDS-blank corrected. |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/21/2007 | Side by side second sampler |
| 2709187 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/21/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/22/2007 | Side by side second sampler |
| 2709249 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/22/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/23/2007 | Side by side second sampler |

***2007 sample results flagged in the database as not to be used for data queries or analyses.***

| SAMPLE_ NO | IND_ CODE | SOURCE | Parameter | Units | SRESULT | LAB_ COMMENTS | LAB | START_ TIME | END_ TIME |
|---|---|---|---|---|---|---|---|---|---|
| 2705276 | 789 | Crk-Metro Effluent | Turbidity | NTU | 1.43 | | ELS | 10:55 | |
| 2709187 | 789 | Metro Final Effluent | TKN | mg/L | 1.56 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | TSS | mg/L | 3 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | BOD5 | mg/L | 5 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | NH3-N | mg/L | 0.23 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | TP | mg/L | 0.13 | | ELS | 8:30 | 8:15 |
| 2709187 | 789 | Metro Final Effluent | CBOD5 | mg/L | 3 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | BOD5 | mg/L | 3 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | TP | mg/L | 0.12 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | TKN | mg/L | 1.08 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | NH3-N | mg/L | 0.2 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | Chloride | mg/L | 222 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | TSS | mg/L | 5 | | ELS | 8:30 | 8:15 |
| 2709249 | 789 | Metro Final Effluent | CBOD5 | mg/L | 3 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | TSS | mg/L | 5 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | TP | mg/L | 0.15 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | TKN | mg/L | 1.36 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | BOD5 | mg/L | 6 | N | ELS | 8:30 | 8:15 |

***2007 sample results flagged in the database as not to be used for data queries or analyses.***

| SAMPLE_ NO | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE _TYPE | DEPTH | START_ DATE | SAMPLE_ REMARKS |
|---|---|---|---|---|---|---|---|---|
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/23/2007 | Side by side second sampler |
| 2709223 | 789 | Metro Final Effluent | Quality Control | HRFS Project | Composite | 0 | 8/23/2007 | Side by side second sampler |
| 2709345 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 0 | 8/27/2007 | Metals on Wednesday, Phenol & CN-A on Thursday |
| 2704011 | 933 | Lake 18m North | Onondaga Lake | | Grab | 18 | 4/10/2007 | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 2704010 | 928 | Lake 3m North | Onondaga Lake | | Grab | 3 | 4/10/2007 | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 2705781 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | Routine (Biweekly) | Grab | 3.6585 | 5/30/2007 | |
| 2705780 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | Routine (Biweekly) | Grab | 0.6098 | 5/30/2007 | |
| 2701336 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | | Grab | 0 | 2/7/2007 | TDS: Blank corrected. |
| 2701847 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | | Grab | 0 | 2/27/2007 | |
| 2703577 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | High Flow | Grab | 0 | 3/28/2007 | |
| 2704009 | 924 | Lake 18m South - Duplicate | Quality Control | | Grab | 18 | 4/10/2007 | Sample is Duplicate of #2704008 Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 2704008 | 924 | Lake 18m South | Onondaga Lake | | Grab | 18 | 4/10/2007 | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 2704006 | 919 | Lake 3m South | Onondaga Lake | | Grab | 3 | 4/10/2007 | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 2710055 | 918 | Lake 0m South | Onondaga Lake | Routine (Biweekly) | Grab | 0 | 9/11/2007 | TS: blank corrected. Actual field measurement taken at depth of 0.1 |

***2007 sample results flagged in the database as not to be used for data queries or analyses.***

| SAMPLE_ NO | IND_ CODE | SOURCE | Parameter | Units | SRESULT | LAB_ COMMENTS | LAB | START_ TIME | END_ TIME |
|---|---|---|---|---|---|---|---|---|---|
| 2709223 | 789 | Metro Final Effluent | NH3-N | mg/L | 0.17 | | ELS | 8:30 | 8:15 |
| 2709223 | 789 | Metro Final Effluent | CBOD5 | mg/L | 4 | | ELS | 8:30 | 8:15 |
| 2709345 | 789 | Metro Final Effluent | BOD5 | mg/L | 3 | | ELS | 8:30 | 8:15 |
| | | | | | | | | | |
| 2704011 | 933 | Lake 18m North | Hg | ng/l | 1.58 | | BRKS_ RND | 11:35 | |
| 2704010 | 928 | Lake 3m North | Hg | ng/l | 1.86 | | BRKS_ RND | 11:30 | |
| | | | | | | | | | |
| 2705781 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | TKN | mg/L | 0.52 | | ELS | 11:10 | |
| 2705780 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | TKN | mg/L | 0.6 | | ELS | 10:55 | |
| | | | | | | | | | |
| 2701336 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | TKN | mg/L | 0.75 | | ELS | 11:15 | |
| 2701847 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | TKN | mg/L | 0.53 | | ELS | 11:20 | |
| 2703577 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | TKN | mg/L | 0.45 | | ELS | 14:20 | |
| | | | | | | | | | |
| 2704009 | 924 | Lake 18m South - Duplicate | Hg | ng/l | 1.32 | | BRKS_ RND | 10:55 | |
| 2704008 | 924 | Lake 18m South | Hg | ng/l | 1.97 | | BRKS_ RND | 10:50 | |
| 2704006 | 919 | Lake 3m South | Hg | ng/l | 3.53 | | BRKS_ RND | 10:45 | |
| 2710055 | 918 | Lake 0m South | Turbidity | NTU | 1.55 | | ELS | 9:25 | |

***2007 sample results flagged in the database as not to be used for data queries or analyses.***

| SAMPLE_ NO | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE _TYPE | DEPTH | START_ DATE | SAMPLE_ REMARKS |
|---|---|---|---|---|---|---|---|---|
| 2710066 | 925 | Lake Upper Mixed Layer South | Onondaga Lake | Routine (Biweekly) | Grab | 3 | 9/11/2007 | |
| 2710703 | 918 | Lake 0m South | Onondaga Lake | Routine (Biweekly) | Grab | 0 | 9/25/2007 | TDS & TS: blank corrected. D.O. Profile questionable |
| 2710704 | 919 | Lake 3m South | Onondaga Lake | Routine (Biweekly) | Grab | 3 | 9/25/2007 | D.O. Profile questionable |
| 2710705 | 920 | Lake 6m South | Onondaga Lake | Routine (Biweekly) | Grab | 6 | 9/25/2007 | TDS & TS: blank corrected. D.O. Profile questionable |
| 2710706 | 921 | Lake 9m South | Onondaga Lake | Routine (Biweekly) | Grab | 9 | 9/25/2007 | D.O. Profile questionable |
| 2710707 | 922 | Lake 12m South | Onondaga Lake | Routine (Biweekly) | Grab | 12 | 9/25/2007 | TDS & TS: blank corrected. D.O. profile questionable |
| 2710709 | 924 | Lake 18m South | Onondaga Lake | Routine (Biweekly) | Grab | 18 | 9/25/2007 | TDS & TS: blank corrected. D.O. Profile questionable |
| 2710708 | 923 | Lake 15m South | Onondaga Lake | Routine (Biweekly) | Grab | 15 | 9/25/2007 | D.O. Profile questionable |
| 2705783 | 904 | Crk-Tributary 5a @ State Fair Blvd | Onondaga Creeks | Routine (Biweekly) | Grab | 0 | 5/30/2007 | Coli sample collected at 1230. |
| 2705785 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | Routine (Biweekly) | Grab | 0 | 5/30/2007 | |

***2007 sample results flagged in the database as not to be used for data queries or analyses.***

| SAMPLE_ NO | IND_ CODE | SOURCE | Parameter | Units | SRESULT | LAB_ COMMENTS | LAB | START_ TIME | END_ TIME |
|---|---|---|---|---|---|---|---|---|---|
| 2710066 | 925 | Lake Upper Mixed Layer South | Turbidity | NTU | 2.11 | | ELS | 9:25 | |
| 2710703 | 918 | Lake 0m South | DO-field | mg/L | 6.52 | V | ELS | 9:50 | |
| 2710704 | 919 | Lake 3m South | DO-field | mg/L | 4.16 | V | ELS | 10:00 | |
| 2710705 | 920 | Lake 6m South | DO-field | mg/L | 0.38 | V | ELS | 10:05 | |
| 2710706 | 921 | Lake 9m South | DO-field | mg/L | -9.43 | V | ELS | 10:15 | |
| 2710707 | 922 | Lake 12m South | DO-field | mg/L | -0.02 | V | ELS | 10:20 | |
| 2710709 | 924 | Lake 18m South | DO-field | mg/L | 0.13 | V | ELS | 10:30 | |
| 2710708 | 923 | Lake 15m South | DO-field | mg/L | 0.27 | V | ELS | 10:25 | |
| 2705783 | 904 | Crk-Tributary 5a @ State Fair Blvd | TKN | mg/L | 0.6 | | ELS | 10:20 | |
| 2705785 | 911 | Crk-Harbor Brook @ Velasko Road | TKN | mg/L | 0.18 | | ELS | 9:40 | |

***2007 Data Qualified "P" = Laboratory data qualified with P do not meet all internal laboratory QC requirements, and are therefore considered unacceptable for quality assurance criteria.***

| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/31/2007 | 789 | Metro Effluent-Duplicate | Quality Control | | Composite | 2701180 | Chloride | mg/L | 837 | P | Sample is Duplicate of #2701138 |
| 5/15/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | | Grab | 2705265 | Turbidity | NTU | 0.34 | P | Turbidity: Blanks taken before DI system change. TDS-blank corrected. ALK-T: initial pH is 9.80 |
| 5/15/2007 | 908 | Crk-Ley Creek @ Park Street - Duplicate | Quality Control | | Grab | 2705279 | TDP | mg/L | 0.058 | P | Sample is Duplicate of #2705268. TDS-blank corrected. |
| 5/15/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | | Grab | 2705264 | Turbidity | NTU | 0.37 | P | Turbidity:Blanks taken before DI system change. TDS-blank corrected. |
| 10/30/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | Routine (Biweekly) | Grab | 2712255 | Chloride | mg/L | 2 | P | |
| 10/31/2007 | 789 | Metro Effluent - Duplicate | Quality Control | | Composite | 2712374 | BOD5 | mg/L | 3 | P | Sample is duplicate of #2712344 |
| 11/28/2007 | 789 | Metro Effluent - Duplicate | Quality Control | | Composite | 2713288 | NH3-N | mg/L | 0.45 | P | Duplicate of sample #2713253; NH3:Repepped 12/07/07 |

***2007 Data Qualified "V" = The laboratory data qualified with "V" are reported as estimates due to variance from quality assurance or control criteria.***

| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700180 | BOD5 | mg/L | >16 | V | BOD exhibited toxic tendencies. |
| 1/13/2007 | 630 | Metro By-Pass Event #3 | Treatment Plant | | Composite | 2700327 | CBOD5 | mg/L | 13 | V | Composite consists of 2 grab samples. CBOD: past hold time: original result <24 mg/l. CBOD: Incubation temperature exceeded acceptable limits. |
| 1/18/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700690 | BOD5 | mg/L | 4 | V | BOD & CBOD: Incubation temperature exceeded acceptable limits. |
| 1/18/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700690 | CBOD5 | mg/L | 3 | V | BOD & CBOD: Incubation temperature exceeded acceptable limits. |
| 1/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700735 | BOD5 | mg/L | 3 | V | BOD & CBOD: Incubation temperature exceeded acceptable limits. |
| 1/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700735 | CBOD5 | mg/L | <2 | V | BOD & CBOD: Incubation temperature exceeded acceptable limits. |
| 1/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700738 | BOD5 | mg/L | 3 | V | TP: Reprepped 1/22/07. BOD& CBOD: Incubation temperature exceeded acceptable limits. |
| 1/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700738 | CBOD5 | mg/L | <2 | V | TP: Reprepped 1/22/07. BOD& CBOD: Incubation temperature exceeded acceptable limits. |
| 1/21/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700756 | CBOD5 | mg/L | 2 | V | BOD & CBOD: Incubation temperature exceeded acceptable limits. |
| 1/21/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700756 | BOD5 | mg/L | 4 | V | BOD & CBOD: Incubation temperature exceeded acceptable limits. |
| 1/22/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700789 | BOD5 | mg/L | 4 | V | BOD & CBOD: Incubation temperature exceeded acceptable limits. |
| 1/22/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700789 | CBOD5 | mg/L | <2 | V | BOD & CBOD: Incubation temperature exceeded acceptable limits. |
| 1/23/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | | Grab | 2700844 | BOD5 | mg/L | 6 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | | Grab | 2700835 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | | Grab | 2700833 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. |
| 1/23/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | | Grab | 2700834 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | | Grab | 2700841 | BOD5 | mg/L | 2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 904 | Crk-Tributary 5a @ State Fair Blvd | Onondaga Creeks | | Grab | 2700840 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |

*2007 Data Qualified "V" = The laboratory data qualified with "V" are reported as estimates due to variance from quality assurance or control criteria.*

| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/23/2007 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | | Grab | 2700839 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 908 | Crk-Ley Creek @ Park Street-Duplicate | Quality Control | | Grab | 2700847 | BOD5 | mg/L | 4 | V | Sample is Duplicate of #2700836. BOD: Incubation temperature exceeded acceptable limits. |
| 1/23/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | | Grab | 2700836 | BOD5 | mg/L | 4 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | | Grab | 2700843 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | | Grab | 2700842 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | | Grab | 2700832 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. |
| 1/23/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | | Grab | 2700837 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | | Grab | 2700838 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 1/23/2007 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | | Grab | 2700846 | BOD5 | mg/L | <2 | V | BOD: Incubation temperature exceeded acceptable limits. TKN:Reprepped 1/31/07 |
| 2/13/2007 | 999 | Lake 12m North | Onondaga Lake | Winter Lake | Grab | 2701469 | SRP | mg/L | 0.008 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 12.1. |
| 2/13/2007 | 999 | Lake 9m North | Onondaga Lake | Winter Lake | Grab | 2701468 | TDP | mg/L | 0.018 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 9.1. |
| 2/13/2007 | 999 | Lake 6m North - Duplicate | Quality Control | Winter Lake | Grab | 2701472 | TDP | mg/L | 0.02 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. Sample is Duplicate of #2701467; SRP/TDP samples were filtered at Henry Clay Bio Lab. |
| 2/13/2007 | 999 | Lake 6m North - Duplicate | Quality Control | Winter Lake | Grab | 2701472 | SRP | mg/L | 0.012 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. Sample is Duplicate of #2701467; SRP/TDP samples were filtered at Henry Clay Bio Lab. |

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| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/13/2007 | 999 | Lake 15m North | Onondaga Lake | Winter Lake | Grab | 2701470 | TDP | mg/L | 0.017 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. TKN: Representative 02/20/07 |
| 2/13/2007 | 999 | Lake 15m North | Onondaga Lake | Winter Lake | Grab | 2701470 | SRP | mg/L | 0.008 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. TKN: Reprepped 02/20/07 |
| 2/13/2007 | 999 | Lake 0m North | Onondaga Lake | Winter Lake | Grab | 2701465 | SRP | mg/L | 0.008 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 0.5. |
| 2/13/2007 | 999 | Lake 6m North | Onondaga Lake | Winter Lake | Grab | 2701467 | TDP | mg/L | 0.018 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 6.0. TKN,TK |
| 2/13/2007 | 999 | Lake 9m North | Onondaga Lake | Winter Lake | Grab | 2701468 | SRP | mg/L | 0.012 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 9.1. |
| 2/13/2007 | 999 | Lake 6m North | Onondaga Lake | Winter Lake | Grab | 2701467 | SRP | mg/L | 0.013 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 6.0. TKN,TK |
| 2/13/2007 | 999 | Lake 3m North | Onondaga Lake | Winter Lake | Grab | 2701466 | TDP | mg/L | 0.019 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 3.1 |
| 2/13/2007 | 999 | Lake 3m North | Onondaga Lake | Winter Lake | Grab | 2701466 | SRP | mg/L | 0.011 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 3.1 |
| 2/13/2007 | 999 | Lake 0m North | Onondaga Lake | Winter Lake | Grab | 2701465 | TDP | mg/L | 0.015 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 0.5. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 2/13/2007 | 999 | Lake 12m North | Onondaga Lake | Winter Lake | Grab | 2701469 | TDP | mg/L | 0.017 | V | DGPS Coordinates: 43°06.128'N 76°13.257'W. SRP/TDP samples were filtered at Henry Clay Bio Lab. Actual field measurement taken at depth of 12.1. |
| 2/15/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701693 | CBOD5 | mg/L | 5 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/15/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701693 | BOD5 | mg/L | 11 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/16/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701719 | BOD5 | mg/L | 6 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/16/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701719 | CBOD5 | mg/L | 3 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/17/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701722 | BOD5 | mg/L | 6 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/17/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701722 | CBOD5 | mg/L | 3 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/18/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701732 | BOD5 | mg/L | 7 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/18/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701732 | CBOD5 | mg/L | 4 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701754 | BOD5 | mg/L | 6 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701754 | CBOD5 | mg/L | 3 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701797 | CBOD5 | mg/L | 3 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701797 | BOD5 | mg/L | 7 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 2/21/2007 | 916 | Lake Equip. Blk (Dunker Churn) | Quality Control | Winter Lake | Grab | 2701770 | BOD5 | mg/L | <2 | V | BOD: Incubator temperature is outside of acceptable limits. |
| 2/21/2007 | 916 | Lake Equip. Blk (Dunker Churn) | Quality Control | Winter Lake | Grab | 2701770 | TIC | mg/L | <0.50 | V | TIC:Past hold time |
| 2/21/2007 | 999 | Lake Upper Mixed Layer North - Duplicate | Quality Control | Winter Lake | Grab | 2701782 | BOD5 | mg/L | <2 | V | DGPS Coordinates: 43°06.120'N 76°13.271'W. Sample is Duplicate of #2701779. BOD: Incubator temperature is outside of acceptable limits. |
| 2/21/2007 | 999 | Lake Lower Water Layer North | Onondaga Lake | Winter Lake | Grab | 2701781 | BOD5 | mg/L | <2 | V | DGPS Coordinates: 43°06.120'N 76°13.271'W. BOD: Incubator temperature is outside of acceptable limits. |
| 2/21/2007 | 999 | Lake Upper Mixed Layer North | Onondaga Lake | Winter Lake | Grab | 2701779 | BOD5 | mg/L | <2 | V | DGPS Coordinates: 43°06.120'N 76°13.271'W. BOD: Incubator temperature is outside of acceptable limits. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/7/2007 | 999 | Lake 3m North | Onondaga Lake | Winter Lake | Grab | 2702608 | SRP | mg/L | 0.004 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168. Actual field measurement taken at depth of 3.1 m. |
| 3/7/2007 | 999 | Lake 6m North - Duplicate | Quality Control | Winter Lake | Grab | 2702614 | SRP | mg/L | 0.01 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. Sample is Duplicate of #2702609; SRP/TDP filtered @ HCF @ 12:20 PM Rm 168 |
| 3/7/2007 | 999 | Lake 15m North | Onondaga Lake | Winter Lake | Grab | 2702612 | TDP | mg/L | 0.016 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168. |
| 3/7/2007 | 999 | Lake 12m North | Onondaga Lake | Winter Lake | Grab | 2702611 | TDP | mg/L | 0.018 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168. Actual field measurement taken at depth of 12.1 m. |
| 3/7/2007 | 999 | Lake 9m North | Onondaga Lake | Winter Lake | Grab | 2702610 | TDP | mg/L | 0.017 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168 |
| 3/7/2007 | 999 | Lake 9m North | Onondaga Lake | Winter Lake | Grab | 2702610 | SRP | mg/L | 0.009 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168 |
| 3/7/2007 | 999 | Lake 6m North | Onondaga Lake | Winter Lake | Grab | 2702609 | TDP | mg/L | 0.016 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168. Actual field measurement taken at depth of 6.1 m. |
| 3/7/2007 | 999 | Lake 3m North | Onondaga Lake | Winter Lake | Grab | 2702608 | TDP | mg/L | 0.013 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168. Actual field measurement taken at depth of 3.1 m. |
| 3/7/2007 | 999 | Lake 0m North | Onondaga Lake | Winter Lake | Grab | 2702607 | TDP | mg/L | 0.021 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168 |
| 3/7/2007 | 999 | Lake 0m North | Onondaga Lake | Winter Lake | Grab | 2702607 | SRP | mg/L | 0.008 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168 |
| 3/7/2007 | 999 | Lake 15m North | Onondaga Lake | Winter Lake | Grab | 2702612 | SRP | mg/L | 0.008 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168. |
| 3/7/2007 | 999 | Lake 6m North - Duplicate | Quality Control | Winter Lake | Grab | 2702614 | TDP | mg/L | 0.015 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. Sample is Duplicate of #2702609; SRP/TDP filtered @ HCF @ 12:20 PM Rm 168 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/7/2007 | 999 | Lake 6m North | Onondaga Lake | Winter Lake | Grab | 2702609 | SRP | mg/L | 0.009 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168. Actual field measurement taken at depth of 6.1 m. |
| 3/7/2007 | 999 | Lake 12m North | Onondaga Lake | Winter Lake | Grab | 2702611 | SRP | mg/L | 0.009 | V | DGPS Coordinates: 43°06.117'N 76°13.320'W. SRP/TDP filtered @ HCF @ 12:20 PM Rm 168. Actual field measurement taken at depth of 12.1 m. |
| 3/13/2007 | 999 | Lake 6m North | Onondaga Lake | Winter Lake | Grab | 2703022 | TDP | mg/L | 0.016 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. TKN:Repepped 03/22/07 |
| 3/13/2007 | 999 | Lake 6m North-Duplicate | Quality Control | Winter Lake | Grab | 2703027 | TDP | mg/L | 0.016 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. Duplicate of sample 2703022; SRP/TDP filtered @ HCF rm 168 @1150. TKN:Repepped 03/22/07 |
| 3/13/2007 | 999 | Lake 6m North-Duplicate | Quality Control | Winter Lake | Grab | 2703027 | SRP | mg/L | 0.008 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. Duplicate of sample 2703022; SRP/TDP filtered @ HCF rm 168 @1150. TKN:Repepped 03/22/07 |
| 3/13/2007 | 999 | Lake 15m North | Onondaga Lake | Winter Lake | Grab | 2703025 | TDP | mg/L | 0.014 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/13/2007 | 999 | Lake 15m North | Onondaga Lake | Winter Lake | Grab | 2703025 | SRP | mg/L | 0.008 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/13/2007 | 999 | Lake 12m North | Onondaga Lake | Winter Lake | Grab | 2703024 | TDP | mg/L | 0.013 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/13/2007 | 999 | Lake 12m North | Onondaga Lake | Winter Lake | Grab | 2703024 | SRP | mg/L | 0.006 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/13/2007 | 999 | Lake 6m North | Onondaga Lake | Winter Lake | Grab | 2703022 | SRP | mg/L | 0.008 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. TKN:Repepped 03/22/07 |
| 3/13/2007 | 999 | Lake 9m North | Onondaga Lake | Winter Lake | Grab | 2703023 | SRP | mg/L | 0.005 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/13/2007 | 999 | Lake 0m North | Onondaga Lake | Winter Lake | Grab | 2703020 | SRP | mg/L | 0.003 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/13/2007 | 999 | Lake 0m North | Onondaga Lake | Winter Lake | Grab | 2703020 | TDP | mg/L | 0.011 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |

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| 3/13/2007 | 999 | Lake 3m North | Onondaga Lake | Winter Lake | Grab | 2703021 | SRP | mg/L | 0.004 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/13/2007 | 999 | Lake 3m North | Onondaga Lake | Winter Lake | Grab | 2703021 | TDP | mg/L | 0.011 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/13/2007 | 999 | Lake 9m North | Onondaga Lake | Winter Lake | Grab | 2703023 | TDP | mg/L | 0.012 | V | DGPS Coordinates: 43°06.117'N 76°13.316'W. SRP/TDP filtered @ HCF rm 168 @1150. |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | NO3 | mg/L | <0.010 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | ORG-N | mg/L | 0.12 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Pb | mg/L | <0.0020 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | SiO2 | mg/L | <0.20 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | SO4 | mg/L | <10 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | SRP | mg/L | <0.001 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | TDP | mg/L | <0.003 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | TDS | mg/L | <10 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | TIC | mg/L | <0.50 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Turbidity | NTU | <0.10 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | TOC | mg/L | <0.50 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | TP | mg/L | <0.003 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | NO2 | mg/L | <0.010 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | TOC-F | mg/L | <0.50 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Zn | mg/L | <0.0063 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | ALK-T | mg/L | 1 | V | Concentration procedure used for some metals. TP (Manual): Repprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | TKN | mg/L | <0.15 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Ca | mg/L | <1.25 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Ni | mg/L | <0.0038 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | TSS | mg/L | <4 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Cd | mg/L | <0.00080 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | As | mg/L | <0.0020 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Chloride | mg/L | <1 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | CN-T | mg/L | <0.003 | V | Concentration procedure used for some metals. TP (Manual): Repepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Cr | mg/L | <0.0025 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Fe | mg/L | <0.050 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Hg | mg/L | <0.000020 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | K | mg/L | <0.025 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Mg | mg/L | <0.125 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Mn | mg/L | <0.025 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Na | mg/L | <4 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | NH3-N | mg/L | <0.030 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |
| 3/14/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | High Flow | Grab | 2702485 | Cu | mg/L | <0.0031 | V | Concentration procedure used for some metals. TP (Manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank-(churn was not us |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | TOC-F | mg/L | 4.68 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | SiO2 | mg/L | 3.99 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | SO4 | mg/L | 65 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | SRP | mg/L | 0.087 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Stage Gauge | Ft. | 4.53 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | TDP | mg/L | 0.103 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | TDS | mg/L | 642 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | TIC | mg/L | 41.1 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Turbidity | NTU | 159 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | TOC | mg/L | 4.95 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | TP | mg/L | 0.508 | V | TP (manual): Reprepped 03/16/07. Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | TSS | mg/L | 243 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | NH3-N | mg/L | 0.24 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | TKN | mg/L | 1.92 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Charge Balance | % | 13.69 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | NO3 | mg/L | 1.29 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | ORG-N | mg/L | 1.68 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | ALK-T | mg/L | 154 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Ca | mg/L | 95.9 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Chloride | mg/L | 247 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | FCOLI-MF | count/100 | >6000 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Fe | mg/L | 6.23 | V | Note: Incorrect procedure used for collecting blank. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Hardness | mg/L | 329 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Mg | mg/L | 21.8 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Mn | mg/L | 0.135 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | Na | mg/L | 147 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | NO2 | mg/L | 0.06 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | High Flow | Grab | 2702486 | BOD5 | mg/L | 10 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | NO2 | mg/L | 0.02 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Fe | mg/L | 1.38 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | NH3-N | mg/L | 0.22 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Na | mg/L | 296 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Mn | mg/L | 0.0986 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Mg | mg/L | 14.9 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Hardness | mg/L | 264 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | FCOLI-MF | count/100 | 210 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Chloride | mg/L | 450 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Charge Balance | % | 9.09 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Ca | mg/L | 81.2 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | BOD5 | mg/L | 3 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | ALK-T | mg/L | 140 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Turbidity | NTU | 45.1 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | TSS | mg/L | 45 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | NO3 | mg/L | 0.48 | V | Note: Incorrect procedure used for collecting blank. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | TP | mg/L | 0.157 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | TOC-F | mg/L | 5.13 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | TOC | mg/L | 5.22 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | TKN | mg/L | 0.78 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | TIC | mg/L | 37.7 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | TDP | mg/L | 0.028 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | Stage Gauge | Ft. | 2.84 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | SRP | mg/L | 0.018 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | SO4 | mg/L | 55 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | SiO2 | mg/L | 4.52 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | ORG-N | mg/L | 0.56 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | High Flow | Grab | 2702488 | TDS | mg/L | 1040 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | TSS | mg/L | <4 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | SiO2 | mg/L | 4.31 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | SO4 | mg/L | 126 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | SRP | mg/L | 0.005 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | TDP | mg/L | 0.017 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | TDS | mg/L | 1088 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | TIC | mg/L | 51.2 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | TKN | mg/L | 0.71 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | TOC | mg/L | 3.82 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | ALK-T | mg/L | 192 | V | Note: Incorrect procedure used for collecting blank. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | TP | mg/L | 0.043 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Turbidity | NTU | 3.35 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Phaeophytin-a | mg/m3 | <0.2 | V | Note: Incorrect procedure used for collecting blank. 2L AMB bottle (Chlorophyll-a/Phaeophytin-a) collected on 3/14 but not received until 3/26/07. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | NO2 | mg/L | 0.04 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | TOC-F | mg/L | 3.79 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Charge Balance | % | 3.99 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | BOD5 | mg/L | <2 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | ORG-N | mg/L | 0.39 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Ca | mg/L | 140 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Chloride | mg/L | 392 | V | Note: Incorrect procedure used for collecting blank. 2L AMB bottle (Chlorophyll-a/Phaeophytin-a) collected on 3/14 but not received until 3/26/07. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Chlorophyll-a | mg/m3 | 4.81 | V | Note: Incorrect procedure used for collecting blank. 2L AMB bottle (Chlorophyll-a/Phaeophytin-a) collected on 3/14 but not received until 3/26/07. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | FCOLI-MF | count/100 | 20 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Fe | mg/L | 0.14 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Mg | mg/L | 23.6 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Mn | mg/L | <0.025 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Na | mg/L | 214 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | NH3-N | mg/L | 0.32 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | NO3 | mg/L | 1.59 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | High Flow | Grab | 2702489 | Hardness | mg/L | 447 | V | Note: Incorrect procedure used for collecting blank. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | TOC-F | mg/L | 3.6 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Phaeophytin-a | mg/m3 | <0.2 | V | Note: Incorrect procedure used for collecting blank. 2L AMB bottle (Chlorophyll-a/Phaeophytin-a) collected on 3/14 but not received until 3/26/07. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | SiO2 | mg/L | 4.68 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | SO4 | mg/L | 140 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | SRP | mg/L | 0.007 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | TDP | mg/L | 0.018 | V | Note: Incorrect procedure used for collecting blank. 2L AMB bottle (Chlorophyll-a/Phaeophytin-a) collected on 3/14 but not received until 3/26/07. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | TDS | mg/L | 1194 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | TIC | mg/L | 53.8 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | TSS | mg/L | <4 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Turbidity | NTU | 1.81 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | TOC | mg/L | 3.64 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | ORG-N | mg/L | 0.38 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | TKN | mg/L | 0.72 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Charge Balance | % | 1.32 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | NO3 | mg/L | 1.93 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | ALK-T | mg/L | 204 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | TP | mg/L | 0.051 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Ca | mg/L | 150 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Chloride | mg/L | 429 | V | Note: Incorrect procedure used for collecting blank. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Chlorophyll-a | mg/m3 | 2.14 | V | Note: Incorrect procedure used for collecting blank. 2L AMB bottle (Chlorophyll-a/Phaeophytin-a) collected on 3/14 but not received until 3/26/07. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Fe | mg/L | 0.0582 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Hardness | mg/L | 477 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Mg | mg/L | 24.9 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Mn | mg/L | <0.025 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | Na | mg/L | 226 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | NH3-N | mg/L | 0.34 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | NO2 | mg/L | 0.05 | V | Note: Incorrect procedure used for collecting blank. |
| 3/14/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | High Flow | Grab | 2702490 | BOD5 | mg/L | <2 | V | Note: Incorrect procedure used for collecting blank. |
| 3/28/2007 | 630 | Metro By-Pass Event #16 | Treatment Plant | | Grab | 2703494 | O&G (SPE) | mg/L | 8 | V | Grab 5; O&G: Telfon-coated stirbar in jar. |
| 3/31/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703645 | BOD5 | mg/L | 4 | V | BOD/CBOD:Incubator temperature is outside of acceptable limits. |
| 3/31/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703645 | CBOD5 | mg/L | 2 | V | BOD/CBOD:Incubator temperature is outside of acceptable limits. |
| 4/1/2007 | 630 | Metro By-Pass Event #19 | Treatment Plant | | Composite | 2703769 | CBOD5 | mg/L | 44 | V | Consists of 3 grabs. BOD/CBOD:Incubator temperature is outside of acceptable limits. |
| 4/1/2007 | 630 | Metro By-Pass Event #19 | Treatment Plant | | Composite | 2703769 | BOD5 | mg/L | 71 | V | Consists of 3 grabs. BOD/CBOD:Incubator temperature is outside of acceptable limits. |
| 4/1/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703659 | CBOD5 | mg/L | 4 | V | BOD/CBOD:Incubator temperature is outside of acceptable limits. |
| 4/1/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703659 | BOD5 | mg/L | 7 | V | BOD/CBOD:Incubator temperature is outside of acceptable limits. |
| 4/2/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703709 | BOD5 | mg/L | 4 | V | Split sample. BOD/CBOD:Incubator temperature is outside of acceptable limits. |
| 4/2/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703709 | CBOD5 | mg/L | <2 | V | Split sample. BOD/CBOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703788 | BOD5 | mg/L | 3 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703788 | CBOD5 | mg/L | <2 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | | Grab | 2703752 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | | Grab | 2703743 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | | Grab | 2703741 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | | Grab | 2703742 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | | Grab | 2703749 | BOD5 | mg/L | 4 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 904 | Crk-Tributary 5a @ State Fair Blvd | Onondaga Creeks | | Grab | 2703748 | BOD5 | mg/L | 3 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | | Grab | 2703747 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | | Grab | 2703744 | BOD5 | mg/L | 2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | | Grab | 2703751 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | | Grab | 2703750 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | | Grab | 2703740 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. - Duplicate | Quality Control | | Grab | 2703755 | BOD5 | mg/L | 2 | V | Sample is Duplicate of #2703745.Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. TDS: blank co |
| 4/3/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | | Grab | 2703745 | BOD5 | mg/L | 2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. TDS: blank corrected. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/3/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | | Grab | 2703746 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | | Grab | 2703754 | BOD5 | mg/L | <2 | V | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/4/2007 | 630 | Metro By-Pass Event #20 | Treatment Plant | | Grab | 2703770 | CBOD5 | mg/L | 29 | V | One grab only. BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 4/4/2007 | 630 | Metro By-Pass Event #20 | Treatment Plant | | Grab | 2703770 | BOD5 | mg/L | 48 | V | One grab only. BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 4/4/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703817 | BOD5 | mg/L | <2 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 4/4/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703817 | CBOD5 | mg/L | <2 | V | BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 4/4/2007 | 789 | Metro Final Effluent-Duplicate | Quality Control | HRFS Project | Composite | 2703831 | BOD5 | mg/L | 2 | V | Duplicate of sample 2703817. BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 4/4/2007 | 789 | Metro Final Effluent-Duplicate | Quality Control | HRFS Project | Composite | 2703831 | CBOD5 | mg/L | <2 | V | Duplicate of sample 2703817. BOD/CBOD: Incubator temperature is outside of acceptable limits. |
| 4/17/2007 | 630 | Crk-Metro By Pass | Onondaga Creeks | | Grab | 2704340 | TIC | mg/L | 57 | V | TDS: blank corrected. TIC:Past hold time |
| 4/17/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | | Grab | 2704231 | TIC | mg/L | 43.6 | V | TDS: blank corrected. TIC:Past hold time |
| 4/17/2007 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | | Grab | 2704226 | TDP | mg/L | >0.3 | V | TDS: blank corrected. TDP:Sample contaminated |
| 5/25/2007 | 630 | Metro By-Pass Event #31 | Treatment Plant | | Grab | 2704778 | FCOLI-MF | count/100 | 1800000 | V | Grab 1. Ony grab taken during compositing period. FCOLI read outside of 4 hour read window. |
| 5/30/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | Routine (Biweekly) | Grab | 2705776 | TIC | mg/L | <0.50 | V | TIC:Past hold time |
| 6/5/2007 | 917 | Lake Equip. Blk (Pump) | Quality Control | Routine (Biweekly) | Grab | 2705972 | TIC | mg/L | <0.50 | V | |
| 6/12/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | Quarterly | Grab | 2706294 | ALK-T | mg/L | 9 | V | Air bubble is present in T-alk bottle upon receipt. ALK-T initial pH is 9.5.Concentration procedure used for some metals. |
| 6/12/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | Quarterly | Grab | 2706293 | ALK-T | mg/L | 1 | V | Air bubble is present in t-alk bottle upon receipt.Concentration procedure used for some metals. |
| 7/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707343 | TKN | mg/L | 1.4 | V | Invalid sample; no sample in bottles 16-24; bottles 1-15 composited, but not flow composited. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707343 | TP | mg/L | 0.12 | V | Invalid sample; no sample in bottles 16-24; bottles 1-15 composited, but not flow composited. |
| 7/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707343 | CBOD5 | mg/L | <2 | V | Invalid sample; no sample in bottles 16-24; bottles 1-15 composited, but not flow composited. |
| 7/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707343 | BOD5 | mg/L | 3 | V | Invalid sample; no sample in bottles 16-24; bottles 1-15 composited, but not flow composited. |
| 7/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707343 | TSS | mg/L | 4 | V | Invalid sample; no sample in bottles 16-24; bottles 1-15 composited, but not flow composited. |
| 7/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707343 | NH3-N | mg/L | 0.24 | V | Invalid sample; no sample in bottles 16-24; bottles 1-15 composited, but not flow composited. |
| 7/23/2007 | 630 | Metro By-Pass Event #38 | Treatment Plant | | Grab | 2707490 | O&G | mg/L | 16 | V | Grab 1; one grab only, composite parameters added. O&G: improper container. |
| 8/9/2007 | 1075 | Anhueser-Busch Effluent Discharge | River Monitoring | Monthly River | Grab | 2707932 | TKN | mg/L | <1.5 | V | Split Sample TKN:matrix interference. |
| 8/9/2007 | 1075 | Anhueser-Busch Effluent Discharge | River Monitoring | Monthly River | Grab | 2707932 | TKN-F | mg/L | <1.5 | V | Split Sample TKN:matrix interference. |
| 8/28/2007 | 918 | Lake 0m South | Onondaga Lake | Routine (Biweekly) | Grab | 2709382 | SRP | mg/L | <0.001 | V | Actual field measurement taken at depth of 0.1; SRP sample filtered from PC bottle by Wet Chem. SRP Bottle contaminated. |
| 9/10/2007 | 630 | Metro By-Pass Event #40 | Treatment Plant | | Grab | 2707993 | FCOLI-MF | count/100 | 250000 | V | Grab 3 |
| 9/24/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | Midland RTF Dewater | Grab | 2710478 | SRP | mg/L | <0.001 | V | TDS: blank corrected. SRP:Tested past hold time |
| 9/26/2007 | 630 | Metro By-Pass Event #41 | Treatment Plant | | Grab | 2709409 | O&G | mg/L | 18 | V | Grab 1; one grab only; composite parameters added. O&G: improper container |
| 9/26/2007 | 974 | River Buoy #240 Bottom | River Monitoring | Monthly River | Grab | 2710609 | SRP | mg/L | 0.028 | V | SRP: SRP>TDP (verified) |
| 10/24/2007 | 918 | Lake 0m South | Onondaga Lake | Routine/Turnover | Grab | 2712057 | COND-field | umHos/cm | 1822 | V | 0 meter data flagged. Probe out of water. |
| 10/24/2007 | 918 | Lake 0m South | Onondaga Lake | Routine/Turnover | Grab | 2712057 | DO-field | mg/L | 11.32 | V | 0 meter data flagged. Probe out of water. |
| 10/24/2007 | 918 | Lake 0m South | Onondaga Lake | Routine/Turnover | Grab | 2712057 | pH-field | Std Units | 7.62 | V | 0 meter data flagged. Probe out of water. |
| 10/24/2007 | 918 | Lake 0m South | Onondaga Lake | Routine/Turnover | Grab | 2712057 | Salinity-field | ppt | 0.93 | V | 0 meter data flagged. Probe out of water. |
| 10/24/2007 | 918 | Lake 0m South | Onondaga Lake | Routine/Turnover | Grab | 2712057 | Temp-field | °C | 16.03 | V | 0 meter data flagged. Probe out of water. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 11/14/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Quarterly | Grab | 2712741 | ALK-T | mg/L | 244 | V | Air bubble is present in the Alkalinity bottle upon receipt. |
| 11/20/2007 | 630 | Metro By-Pass Event #48 | Treatment Plant | | Grab | 2712274 | O&G | mg/L | 13 | V | Grab 1. O&G container cover did not have a teflon liner. |
| 11/20/2007 | 929 | Lake 6m North-Duplicate | Quality Control | Quarterly | Grab | 2712966 | SiO2 | mg/L | 4.15 | V | Sample is duplicate of #2712961 SiO2:Estimate due to varience from QA/QC criteria |
| 12/3/2007 | 630 | Metro By-Pass Event #50 | Treatment Plant | | Grab | 2713046 | Phenol | mg/L | 0.014 | V | Grab 4; Phenol bottle: Sample acceptance criteria not met. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700080 | CBOD5 | mg/L | 4 | N | |
| 1/5/2007 | 630 | Metro By-Pass Event #1 | Treatment Plant | | Composite | 2700114 | BOD5 | mg/L | 32 | N | Composite consists of 4 grab samples. |
| 1/5/2007 | 630 | Metro By-Pass Event #1 | Treatment Plant | | Composite | 2700114 | CBOD5 | mg/L | 28 | N | Composite consists of 4 grab samples. |
| 1/5/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700164 | BOD5 | mg/L | 5 | N | |
| 1/5/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700164 | CBOD5 | mg/L | 2 | N | |
| 1/6/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700167 | BOD5 | mg/L | 4 | N | |
| 1/6/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700167 | CBOD5 | mg/L | <2 | N | |
| 1/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700180 | CBOD5 | mg/L | 3 | N | BOD exhibited toxic tendencies. |
| 1/13/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2700515 | CBOD5 | mg/L | <2 | N | |
| 1/26/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701003 | CBOD5 | mg/L | 2 | N | |
| 2/2/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701221 | TP | mg/L | 0.18 | N | |
| 2/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701224 | BOD5 | mg/L | 10 | N | |
| 2/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701224 | CBOD5 | mg/L | 4 | N | |
| 2/7/2007 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | | Grab | 2701339 | SRP | mg/L | 0.004 | N | TDS: Blank corrected. SRP: > TDP |
| 2/13/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701600 | BOD5 | mg/L | 9 | N | |
| 2/13/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2701600 | CBOD5 | mg/L | 4 | N | |
| 2/23/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2702103 | BOD5 | mg/L | 7 | N | |
| 2/23/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2702103 | CBOD5 | mg/L | 3 | N | |
| 2/26/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2702187 | Cd | mg/L | <0.00080 | N | |
| 2/27/2007 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | | Grab | 2701855 | NH3-N | mg/L | 0.12 | N | |
| 2/28/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2702275 | BOD5 | mg/L | 8 | N | Split with LSL for TP. |
| 3/3/2007 | 630 | Metro By-Pass Event #6 | Treatment Plant | | Grab | 2702527 | Hg | mg/L | <0.000020 | N | Grab 1. Composite parameters added; one grab taken. |
| 3/12/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2702877 | BOD5 | mg/L | 6 | N | Split with S & W |
| 3/12/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2702877 | CBOD5 | mg/L | 3 | N | Split with S & W |
| 3/13/2007 | 630 | Metro By-Pass Event #7 | Treatment Plant | | Composite | 2702540 | CBOD5 | mg/L | 51 | N | Consists of 6 grab samples |
| 3/13/2007 | 916 | Lake Equip. Blk (Dunker Churn) | Quality Control | Winter Lake | Grab | 2703019 | BOD5 | mg/L | <2 | N | |
| 3/13/2007 | 999 | Lake Upper Mixed Layer North-Duplicate | Quality Control | Winter Lake | Grab | 2703030 | BOD5 | mg/L | <2 | N | DGPS Coordinates: 43°06.117'N 76°13.316'W. Duplicate of sample 2703028 |
| 3/13/2007 | 999 | Lake Upper Mixed Layer North | Onondaga Lake | Winter Lake | Grab | 2703028 | BOD5 | mg/L | <2 | N | DGPS Coordinates: 43°06.117'N 76°13.316'W. |
| 3/13/2007 | 999 | Lake Lower Water Layer North | Onondaga Lake | Winter Lake | Grab | 2703029 | BOD5 | mg/L | <2 | N | DGPS Coordinates: 43°06.117'N 76°13.316'W. |
| 3/14/2007 | 630 | Metro By-Pass Event #8 | Treatment Plant | | Composite | 2702865 | CBOD5 | mg/L | 26 | N | |
| 3/14/2007 | 630 | Metro By-Pass Event #8 | Treatment Plant | | Composite | 2702865 | BOD5 | mg/L | 31 | N | |
| 3/14/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703044 | BOD5 | mg/L | 8 | N | Split with S&W |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 3/14/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703044 | CBOD5 | mg/L | 3 | N | Split with S&W |
| 3/15/2007 | 630 | Metro By-Pass Event #9 | Treatment Plant | | Composite | 2702872 | BOD5 | mg/L | 40 | N | consists of 6 grabs |
| 3/15/2007 | 630 | Metro By-Pass Event #9 | Treatment Plant | | Composite | 2702872 | CBOD5 | mg/L | 34 | N | consists of 6 grabs |
| 3/15/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703099 | BOD5 | mg/L | 7 | N | Split with S&W |
| 3/15/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703099 | CBOD5 | mg/L | 4 | N | Split with S&W |
| 3/16/2007 | 630 | Metro By-Pass Event #10 | Treatment Plant | | Composite | 2703187 | CBOD5 | mg/L | 45 | N | Composite consists of 6 grabs. |
| 3/16/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703130 | CBOD5 | mg/L | 6 | N | |
| 3/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703289 | BOD5 | mg/L | 26 | N | |
| 3/26/2007 | 630 | Metro By-Pass Event #15 | Treatment Plant | | Composite | 2703489 | CBOD5 | mg/L | 25 | N | Composite consists of 6 grabs. |
| 3/26/2007 | 630 | Metro By-Pass Event #15 | Treatment Plant | | Composite | 2703489 | BOD5 | mg/L | 47 | N | Composite consists of 6 grabs. |
| 3/26/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703457 | BOD5 | mg/L | 4 | N | |
| 3/26/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703457 | CBOD5 | mg/L | <2 | N | |
| 3/28/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2703539 | NH3-N | mg/L | 0.52 | N | |
| 3/28/2007 | 794 | Crk-Bloody Brk @ Onondaga Lake Parkway | Onondaga Creeks | High Flow | Grab | 2703586 | Pb | mg/L | <0.0020 | N | Concentration procedure used for some metals. |
| 4/3/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | | Grab | 2703752 | Ni | mg/L | <0.0038 | N | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | | Grab | 2703752 | Zn | mg/L | 0.0148 | N | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/3/2007 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | | Grab | 2703750 | TIC | mg/L | 67.6 | N | Concentration procedure used for some metals. BOD:Incubator temperature is outside of acceptable limits. |
| 4/10/2007 | 935 | Lake Lower Water Layer North | Onondaga Lake | | Grab | 2703997 | Pb | mg/L | <0.0020 | N | Concentration procedure used for some metals. |
| 4/19/2007 | 630 | Metro By-Pass Event #26 | Treatment Plant | | Composite | 2704440 | BOD5 | mg/L | 61 | N | Consists of 4 grabs |
| 4/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2704351 | BOD5 | mg/L | 5 | N | |
| 4/22/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2704405 | CBOD5 | mg/L | 3 | N | |
| 4/24/2007 | 918 | Lake 0m South | Onondaga Lake | | Grab | 2704479 | DO-field | mg/L | 10.61 | N | |
| 4/24/2007 | 919 | Lake 3m South | Onondaga Lake | | Grab | 2704480 | DO-field | mg/L | 11.55 | N | |
| 4/24/2007 | 920 | Lake 6m South | Onondaga Lake | | Grab | 2704481 | DO-field | mg/L | 8.78 | N | |
| 4/24/2007 | 921 | Lake 9m South | Onondaga Lake | | Grab | 2704482 | DO-field | mg/L | 9.78 | N | |
| 4/24/2007 | 922 | Lake 12m South | Onondaga Lake | | Grab | 2704483 | DO-field | mg/L | 11.31 | N | Actual field measurement taken at depth of 11.9 |
| 4/24/2007 | 923 | Lake 15m South | Onondaga Lake | | Grab | 2704484 | DO-field | mg/L | 10.67 | N | |
| 4/24/2007 | 924 | Lake 18m South | Onondaga Lake | | Grab | 2704485 | DO-field | mg/L | 8.39 | N | |
| 4/25/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2704574 | CBOD5 | mg/L | <2 | N | |

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| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/25/2007 | 789 | Metro Final Effluent-Duplicate | Quality Control | HRFS Project | Composite | 2704576 | CBOD5 | mg/L | 2 | N | Sample is Duplicate of #2704574 |
| 4/29/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2704659 | BOD5 | mg/L | 4 | N | |
| 5/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2704874 | CBOD5 | mg/L | 2 | N | |
| 5/4/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2704911 | BOD5 | mg/L | 3 | N | |
| 5/5/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2704924 | CBOD5 | mg/L | 2 | N | |
| 5/9/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705062 | BOD5 | mg/L | 3 | N | |
| 5/9/2007 | 789 | Metro Effluent - Duplicate | Quality Control | | Composite | 2705088 | BOD5 | mg/L | 3 | N | Sample is Duplicate of #2705062 |
| 5/12/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705185 | CBOD5 | mg/L | 2 | N | |
| 5/14/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705247 | BOD5 | mg/L | 3 | N | split sample. TDS-blank corrected. |
| 5/15/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | | Grab | 2705276 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/15/2007 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | | Grab | 2705267 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/15/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | | Grab | 2705265 | BOD5 | mg/L | <2 | N | Turbidity: Blanks taken before DI system change. TDS-blank corrected. ALK-T: initial pH is 9.80 |
| 5/15/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | | Grab | 2705266 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/15/2007 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | | Grab | 2705273 | BOD5 | mg/L | 6 | N | TDS-blank corrected. |
| 5/15/2007 | 904 | Crk-Tributary 5a @ State Fair Blvd | Onondaga Creeks | | Grab | 2705272 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/15/2007 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | | Grab | 2705271 | BOD5 | mg/L | <2 | N | Split with USGS #2705282. TDS-blank corrected. |
| 5/15/2007 | 908 | Crk-Ley Creek @ Park Street - Duplicate | Quality Control | | Grab | 2705279 | BOD5 | mg/L | <2 | N | Sample is Duplicate of #2705268. TDS-blank corrected. |
| 5/15/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | | Grab | 2705268 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/15/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | | Grab | 2705275 | BOD5 | mg/L | <2 | N | Split with USGS #2705281. TDS-blank corrected. |
| 5/15/2007 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | | Grab | 2705274 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/15/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | | Grab | 2705264 | BOD5 | mg/L | <2 | N | Turbidity:Blanks taken before DI system change. TDS-blank corrected. |
| 5/15/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | | Grab | 2705269 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/15/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | | Grab | 2705270 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/15/2007 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | | Grab | 2705278 | BOD5 | mg/L | <2 | N | TDS-blank corrected. |
| 5/17/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705415 | TKN | mg/L | 1.28 | N | |
| 5/18/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705445 | TKN | mg/L | 1.15 | N | |
| 5/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705448 | BOD5 | mg/L | 2 | N | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705448 | CBOD5 | mg/L | <2 | N | |
| 5/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705448 | TKN | mg/L | 1.26 | N | |
| 5/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705452 | TKN | mg/L | 0.71 | N | |
| 5/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705452 | CBOD5 | mg/L | <2 | N | |
| 5/21/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705511 | TKN | mg/L | 1.04 | N | |
| 5/21/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705511 | Pb | mg/L | <0.0020 | N | |
| 5/21/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Midland RTF Dewater | Grab | 2705493 | TKN | mg/L | 0.28 | N | |
| 5/21/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | Midland RTF Dewater | Grab | 2705492 | TKN | mg/L | <0.15 | N | |
| 5/22/2007 | 917 | Lake Equip. Blk (Pump) | Quality Control | | Grab | 2705541 | TKN | mg/L | <0.15 | N | |
| 5/22/2007 | 917 | Lake Equip. Blk (Pump) | Quality Control | | Grab | 2705541 | TKN-F | mg/L | <0.15 | N | |
| 5/22/2007 | 918 | Lake 0m South | Onondaga Lake | | Grab | 2705542 | TKN | mg/L | 0.53 | N | |
| 5/22/2007 | 918 | Lake 0m South | Onondaga Lake | | Grab | 2705542 | TKN-F | mg/L | 0.34 | N | |
| 5/22/2007 | 919 | Lake 3m South | Onondaga Lake | | Grab | 2705543 | TKN-F | mg/L | 0.41 | N | |
| 5/22/2007 | 919 | Lake 3m South | Onondaga Lake | | Grab | 2705543 | TKN | mg/L | 0.6 | N | |
| 5/22/2007 | 920 | Lake 6m South | Onondaga Lake | | Grab | 2705544 | TKN | mg/L | 0.61 | N | |
| 5/22/2007 | 920 | Lake 6m South | Onondaga Lake | | Grab | 2705544 | TKN-F | mg/L | 0.41 | N | |
| 5/28/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705726 | CBOD5 | mg/L | <2 | N | |
| 5/28/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705726 | Cd | mg/L | <0.00080 | N | |
| 5/29/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705740 | CBOD5 | mg/L | <2 | N | |
| 5/29/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705740 | BOD5 | mg/L | 2 | N | |
| 5/30/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | Routine (Biweekly) | Grab | 2705787 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | Routine (Biweekly) | Grab | 2705778 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | Routine (Biweekly) | Grab | 2705776 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | Routine (Biweekly) | Grab | 2705777 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | Routine (Biweekly) | Grab | 2705784 | BOD5 | mg/L | 3 | N | |
| 5/30/2007 | 904 | Crk-Tributary 5a @ State Fair Blvd | Onondaga Creeks | Routine (Biweekly) | Grab | 2705783 | BOD5 | mg/L | 2 | N | |
| 5/30/2007 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | Routine (Biweekly) | Grab | 2705782 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | Routine (Biweekly) | Grab | 2705779 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Routine (Biweekly) | Grab | 2705786 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | Routine (Biweekly) | Grab | 2705785 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | Routine (Biweekly) | Grab | 2705775 | BOD5 | mg/L | <2 | N | |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/30/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | Routine (Biweekly) | Grab | 2705780 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | Routine (Biweekly) | Grab | 2705781 | BOD5 | mg/L | <2 | N | |
| 5/30/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. - Duplicate | Quality Control | Routine (Biweekly) | Grab | 2705790 | BOD5 | mg/L | <2 | N | Sample is Duplicate of #2705781 |
| 5/30/2007 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | Routine (Biweekly) | Grab | 2705789 | BOD5 | mg/L | <2 | N | |
| 6/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2705855 | CBOD5 | mg/L | 3 | N | |
| 6/12/2007 | 789 | Metro Final Effluent | Treatment Plant | Excursion | Composite | 2706331 | CBOD5 | mg/L | <2 | N | NH3:Reprepped 6/15/07 |
| 6/14/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2706445 | CBOD5 | mg/L | 2 | N | TKN:Reprepped 6/20/07 |
| 6/16/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2706495 | BOD5 | mg/L | 4 | N | NH3:Reprepped 6/21/07 |
| 7/10/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707439 | BOD5 | mg/L | 4 | N | |
| 7/11/2007 | 630 | Metro By-Pass Event #36 | Treatment Plant | | Grab | 2706868 | BOD5 | mg/L | 90 | N | 1 grab only, composite parameters added. |
| 7/11/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707505 | BOD5 | mg/L | 4 | N | |
| 7/12/2007 | 1025 | River Buoy #316 BOD Composite | River Monitoring | Monthly River | Composite | 2707576 | BOD5 | mg/L | <2 | N | |
| 7/23/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2707938 | TKN | mg/L | 1.17 | N | TKN:Reprepped 08/09/07 from PC bottle |
| 8/9/2007 | 1059 | River Lake Outlet #1 Bottom | River Monitoring | Monthly River | Grab | 2707923 | NH3-N | mg/L | 0.12 | N | Split Sample |
| 8/23/2007 | 630 | Metro By-Pass Event #39 | Treatment Plant | | Grab | 2707984 | BOD5 | mg/L | 96 | N | One grab only. |
| 8/23/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2709192 | BOD5 | mg/L | 4 | N | |
| 8/28/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2709417 | BOD5 | mg/L | 3 | N | Metals added. |
| 8/28/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2709417 | Pb | mg/L | <0.00200 | N | Metals added. |
| 8/28/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2709417 | TSS | mg/L | 3 | N | Metals added. |
| 9/2/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2709646 | CBOD5 | mg/L | <2 | N | |
| 9/5/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2709819 | BOD5 | mg/L | 5 | N | NH3:Reprepped 9/17/07 |
| 9/6/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | Routine (Biweekly) | Grab | 2709766 | BOD5 | mg/L | 2 | N | TDS: blank corrected. |
| 9/6/2007 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | Routine (Biweekly) | Grab | 2709757 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/6/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | Routine (Biweekly) | Grab | 2709755 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/6/2007 | 902 | Crk-Harbour Brook @ Hiawatha-Duplicate | Quality Control | Routine (Biweekly) | Grab | 2709770 | BOD5 | mg/L | <2 | N | Duplicate of sample # 2709756 |
| 9/6/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | Routine (Biweekly) | Grab | 2709756 | BOD5 | mg/L | <2 | N | TDS: blank corrected. SO4:Retested 9/17/07 |
| 9/6/2007 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | Routine (Biweekly) | Grab | 2709763 | BOD5 | mg/L | 5 | N | TDS: blank corrected. |
| 9/6/2007 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | Routine (Biweekly) | Grab | 2709763 | NO2 | mg/L | 0.43 | N | TDS: blank corrected. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/6/2007 | 904 | Crk-Tributary 5a @ State Fair Blvd | Onondaga Creeks | Routine (Biweekly) | Grab | 2709762 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/6/2007 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | Routine (Biweekly) | Grab | 2709761 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/6/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | Routine (Biweekly) | Grab | 2709758 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/6/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Routine (Biweekly) | Grab | 2709765 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/6/2007 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | Routine (Biweekly) | Grab | 2709764 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/6/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | Routine (Biweekly) | Grab | 2709754 | BOD5 | mg/L | <2 | N | TDS: blank corrected. TKN:Repepped 9/17/07 |
| 9/6/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | Routine (Biweekly) | Grab | 2709759 | BOD5 | mg/L | 4 | N | TDS: blank corrected. |
| 9/6/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | Routine (Biweekly) | Grab | 2709760 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/6/2007 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | Routine (Biweekly) | Grab | 2709769 | BOD5 | mg/L | <2 | N | TDS: blank corrected. |
| 9/8/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2709973 | BOD5 | mg/L | 3 | N | |
| 9/8/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2709973 | CBOD5 | mg/L | 2 | N | |
| 9/10/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710037 | Cd | mg/L | <0.0008 | N | |
| 9/10/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Midland RTF Dewater | Grab | 2710013 | TDS | mg/L | 906 | N | |
| 9/11/2007 | 918 | Lake 0m South | Onondaga Lake | Routine (Biweekly) | Grab | 2710055 | TDS | mg/L | 1126 | N | Actual field measurement taken at depth of 0.1 |
| 9/11/2007 | 920 | Lake 6m South-Duplicate | Quality Control | Routine (Biweekly) | Grab | 2710058 | TDS | mg/L | 1202 | N | Sample is duplicate of #2710057 TS: blank corrected. |
| 9/11/2007 | 924 | Lake 18m South | Onondaga Lake | Routine (Biweekly) | Grab | 2710062 | TDS | mg/L | 1066 | N | Actual field measurement taken at depth of 18.1 |
| 9/15/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710271 | CBOD5 | mg/L | <2 | N | |
| 9/17/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710343 | Pb | mg/L | <0.002 | N | |
| 9/17/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710343 | As | mg/L | <0.00200 | N | |
| 9/17/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710343 | Cd | mg/L | <0.0008 | N | |
| 9/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710462 | BOD5 | mg/L | 4 | N | |
| 9/19/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710462 | CBOD5 | mg/L | 2 | N | |
| 9/19/2007 | 789 | Metro Effluent - Duplicate | Quality Control | | Composite | 2710488 | BOD5 | mg/L | 3 | N | Sample is duplicate of #2710462 |
| 9/19/2007 | 789 | Metro Effluent - Duplicate | Quality Control | | Composite | 2710488 | CBOD5 | mg/L | <2 | N | Sample is duplicate of #2710462 |
| 9/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710492 | BOD5 | mg/L | 4 | N | TP:Repepped 9/26/07 |
| 9/21/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710534 | TKN | mg/L | 1.07 | N | |
| 9/26/2007 | 611 | Wetzel Rd Effluent | River Monitoring | Monthly River | Grab | 2710628 | TKN | mg/L | 8.54 | N | Spilt Sample |
| 9/26/2007 | 616 | Oak Orchard Effluent | River Monitoring | Monthly River | Grab | 2710629 | NO2 | mg/L | 2.43 | N | Spilt Sample |
| 9/27/2007 | 630 | Metro By-Pass Event #42 | Treatment Plant | | Grab | 2710099 | CBOD5 | mg/L | 70 | N | 1 grab only. |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/28/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710902 | CBOD5 | mg/L | <2 | N | |
| 10/1/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2710978 | BOD5 | mg/L | 3 | N | Split sample. |
| 10/2/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711102 | BOD5 | mg/L | 8 | N | |
| 10/2/2007 | 789 | Crk-Metro Effluent | Onondaga Creeks | Quarterly | Grab | 2711055 | BOD5 | mg/L | 3 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 882 | Crk-Onondaga Creek @ Kirkpatrick | Onondaga Creeks | Quarterly | Grab | 2711046 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 888 | Crk-Blank Dunker Churn (Crew B) | Quality Control | Quarterly | Grab | 2711044 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | Quarterly | Grab | 2711045 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | Quarterly | Grab | 2711052 | BOD5 | mg/L | 8 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 904 | Crk-Tributary 5a @ State Fair Blvd | Onondaga Creeks | Quarterly | Grab | 2711051 | BOD5 | mg/L | 2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | Quarterly | Grab | 2711050 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 908 | Crk-Ley Creek @ Park Street | Onondaga Creeks | Quarterly | Grab | 2711047 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 910 | Crk-Onondaga Creek @ Dorwin Ave. | Onondaga Creeks | Quarterly | Grab | 2711054 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 911 | Crk-Harbor Brook @ Velasko Road | Onondaga Creeks | Quarterly | Grab | 2711053 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 911 | Crk-Harbor Brook @ Velasko Road - Duplicate | Quality Control | Quarterly | Grab | 2711064 | BOD5 | mg/L | <2 | N | Sample is duplicate of #2711053.Concentration procedure used for some metals. |
| 10/2/2007 | 911 | Crk-Harbor Brook @ Velasko Road - Duplicate | Quality Control | Quarterly | Grab | 2711064 | Cd | mg/L | <0.0008 | N | Sample is duplicate of #2711053.Concentration procedure used for some metals. |
| 10/2/2007 | 990 | Crk-Blank Churn (Crew A) | Quality Control | Quarterly | Grab | 2711043 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 1906 | Crk-Onondaga Lake Outlet 2 ft. | Onondaga Creeks | Quarterly | Grab | 2711048 | BOD5 | mg/L | 3 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 1907 | Crk-Onondaga Lake Outlet 12 ft. | Onondaga Creeks | Quarterly | Grab | 2711049 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/2/2007 | 1939 | Crk-Onondaga Creek @ Adams Street | Onondaga Creeks | Quarterly | Grab | 2711065 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711159 | BOD5 | mg/L | 5 | N | |
| 10/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711159 | CBOD5 | mg/L | <2 | N | |
| 10/4/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711215 | BOD5 | mg/L | 3 | N | |
| 10/4/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711215 | CBOD5 | mg/L | <2 | N | |
| 10/5/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711267 | BOD5 | mg/L | 3 | N | |
| 10/5/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711267 | CBOD5 | mg/L | <2 | N | |
| 10/6/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711273 | CBOD5 | mg/L | <2 | N | |
| 10/6/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711273 | BOD5 | mg/L | 3 | N | |

***2007 Data Qualified "N" = The laboratory data qualified with N varied from quality control or assurance criteria, however the result is considered acceptable under established NELAC guidelines.***

| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/7/2007 | 630 | Metro By-Pass Event #43 | Treatment Plant | | Grab | 2711056 | BOD5 | mg/L | 186 | N | Grab 1; one grab only, composite parameters added. |
| 10/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711279 | BOD5 | mg/L | 4 | N | |
| 10/8/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711332 | BOD5 | mg/L | 4 | N | |
| 10/9/2007 | 916 | Lake Equip. Blk (Dunker Churn) | Quality Control | Quarterly | Grab | 2711379 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/9/2007 | 925 | Lake Upper Mixed Layer South | Onondaga Lake | Quarterly | Grab | 2711389 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/9/2007 | 925 | Lake Upper Mixed Layer South - Duplicate | Quality Control | Quarterly | Grab | 2711391 | BOD5 | mg/L | <2 | N | Sample is duplicate of #2711389.Concentration procedure used for some metals. |
| 10/9/2007 | 926 | Lake Lower Water Layer South | Onondaga Lake | Quarterly | Grab | 2711390 | BOD5 | mg/L | 6 | N | Concentration procedure used for some metals. |
| 10/9/2007 | 934 | Lake Upper Mixed Layer North | Onondaga Lake | Quarterly | Grab | 2711405 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 10/9/2007 | 934 | Lake Upper Mixed Layer North - Duplicate | Quality Control | Quarterly | Grab | 2711407 | BOD5 | mg/L | 4 | N | Sample is duplicate of #2711405.Concentration procedure used for some metals. |
| 10/9/2007 | 935 | Lake Lower Water Layer North | Onondaga Lake | Quarterly | Grab | 2711406 | BOD5 | mg/L | 4 | N | Concentration procedure used for some metals. |
| 10/12/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711561 | BOD5 | mg/L | 4 | N | |
| 10/19/2007 | 630 | Metro By-Pass Event #45 | Treatment Plant | | Grab | 2711073 | BOD5 | mg/L | 124 | N | Grab 1; one grab only; composite parameters added. |
| 10/20/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2711861 | BOD5 | mg/L | 4 | N | |
| 11/12/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2712708 | TSS | mg/L | 7 | N | |
| 11/14/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | Quarterly | Grab | 2712732 | Ca | mg/L | 275 | N | Concentration procedure used for some metals. |
| 11/27/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713213 | BOD5 | mg/L | 3 | N | |
| 11/27/2007 | 794 | Crk-Bloody Brk @ Onondaga Lake Parkway | Onondaga Creeks | High Flow | Grab | 2713289 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 11/27/2007 | 796 | Crk-Sawmill Crk @ Onondaga Lake Rec. Trail | Onondaga Creeks | High Flow | Grab | 2713290 | BOD5 | mg/L | <2 | N | Concentration procedure used for some metals. |
| 11/27/2007 | 903 | Crk-Allied East Flume-Over Weir | Onondaga Creeks | High Flow | Grab | 2713149 | BOD5 | mg/L | 3 | N | |
| 11/27/2007 | 905 | Crk-Nine Mile Creek @ Lakeland Rt 48 | Onondaga Creeks | High Flow | Grab | 2713147 | BOD5 | mg/L | 4 | N | ALK-T exhibited buffering capacity that precludes obtaining a definitive endpoint. |
| 12/1/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713372 | BOD5 | mg/L | 4 | N | |
| 12/3/2007 | 630 | Metro By-Pass Event #50 | Treatment Plant | | Composite | 2713049 | BOD5 | mg/L | 85 | N | Composite consists of 5 grabs. |
| 12/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713424 | BOD5 | mg/L | 4 | N | Split sample |
| 12/3/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713424 | Pb | mg/L | <0.002 | N | Split sample |
| 12/4/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713473 | CBOD5 | mg/L | <2 | N | |

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| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/7/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713599 | BOD5 | mg/L | 3 | N | |
| 12/8/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713604 | CBOD5 | mg/L | <2 | N | |
| 12/8/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713604 | BOD5 | mg/L | 2 | N | |
| 12/10/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713640 | BOD5 | mg/L | 6 | N | |
| 12/11/2007 | 630 | Metro By-Pass Event #51 | Treatment Plant | | Composite | 2713056 | BOD5 | mg/L | 44 | N | composite consists of 5 grabs |
| 12/11/2007 | 630 | Metro By-Pass Event #51 | Treatment Plant | | Composite | 2713056 | CBOD5 | mg/L | 35 | N | composite consists of 5 grabs |
| 12/11/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713673 | BOD5 | mg/L | 6 | N | |
| 12/12/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713702 | BOD5 | mg/L | 4 | N | |
| 12/12/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2713702 | CBOD5 | mg/L | 2 | N | |
| 12/12/2007 | 789 | Metro Effluent - Duplicate | Quality Control | | Composite | 2713733 | BOD5 | mg/L | 3 | N | Sample is duplicate of #2713702 |
| 12/12/2007 | 789 | Metro Effluent - Duplicate | Quality Control | | Composite | 2713733 | CBOD5 | mg/L | 3 | N | Sample is duplicate of #2713702 |
| 12/13/2007 | 916 | Lake Equip. Blk (Dunker Churn) | Quality Control | Routine (Biweekly) | Grab | 2713451 | BOD5 | mg/L | <2 | N | Chloride: result verified. |
| 12/13/2007 | 925 | Lake Upper Mixed Layer South - Duplicate | Quality Control | Routine (Biweekly) | Grab | 2713463 | BOD5 | mg/L | <2 | N | Sample is duplicate of #2713461 |
| 12/13/2007 | 925 | Lake Upper Mixed Layer South | Onondaga Lake | Routine (Biweekly) | Grab | 2713461 | BOD5 | mg/L | <2 | N | |
| 12/13/2007 | 926 | Lake Lower Water Layer South | Onondaga Lake | Routine (Biweekly) | Grab | 2713462 | BOD5 | mg/L | <2 | N | |
| 12/26/2007 | 902 | Crk-Harbour Brook @ Hiawatha | Onondaga Creeks | Routine(Biweekly) | Grab | 2714088 | NO3 | mg/L | 1.91 | N | |
| 12/29/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2714186 | CBOD5 | mg/L | 3 | N | |
| 12/29/2007 | 789 | Metro Final Effluent | Treatment Plant | HRFS Project | Composite | 2714186 | BOD5 | mg/L | 5 | N | |

***2007 Data Qualified "B" = The contract laboratory Brooks Rand qualified with "B" mercury analytical results that were detected between the MDL and the PQL. Measured result is reported and considered an estimate.***

| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/10/2007 | 919 | Lake 3m South | Onondaga Lake | | Grab | 2704006 | Hg-methyl | ng/l | 0.047 | B | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 4/10/2007 | 928 | Lake 3m North | Onondaga Lake | | Grab | 2704010 | Hg-methyl | ng/l | 0.04 | B | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 4/10/2007 | 933 | Lake 18m North | Onondaga Lake | | Grab | 2704011 | Hg-methyl | ng/l | 0.036 | B | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 6/5/2007 | 924 | Lake 18m South | Quality Control | | Grab | 2706044 | Hg-methyl | ng/l | 0.036 | B | Sample is duplicate of #2706043 |
| 6/5/2007 | 924 | Lake 18m South | Onondaga Lake | | Grab | 2706043 | Hg-methyl | ng/l | 0.036 | B | |
| 6/5/2007 | 928 | Lake 3m North | Onondaga Lake | | Grab | 2706045 | Hg-methyl | ng/l | 0.074 | B | |
| 6/5/2007 | 933 | Lake 18m North | Onondaga Lake | | Grab | 2706046 | Hg-methyl | ng/l | 0.03 | B | Note: bottles labeled field were used for sample; one field bottle not double bagged, used inner bag of reagent water. |

*Note: MDL = method detection limit; PQL = practical quantitation limit*

***2007 Data Qualified "U" = The laboratories qualified results that were not detected above the method detection limit with "U".***

| START_ DATE | IND_ CODE | SOURCE | CATEGORY | STUDY | LAB_ SAMPLE_ TYPE | SAMPLE_ NO | Parameter | Units | SRESULT | LAB_ COMMENTS | REMARK_CODE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4/10/2007 | 780 | Lake Field Blk (Teflon Dunker) | Quality Control | | Grab | 2704005 | Hg-methyl | ng/l | 0.02 | U | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 4/10/2007 | 915 | Lake Equip. Blk (Teflon Dunker-Glass) | Quality Control | | Grab | 2704004 | Hg-methyl | ng/l | 0.02 | U | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 4/10/2007 | 924 | Lake 18m South - Duplicate | Quality Control | | Grab | 2704009 | Hg-methyl | ng/l | 0.115 | U | Sample is Duplicate of #2704008 Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 4/10/2007 | 924 | Lake 18m South | Onondaga Lake | | Grab | 2704008 | Hg-methyl | ng/l | 0.098 | U | Seals on teflon dunker leaked during collection KOB 5/11/07 |
| 6/5/2007 | 780 | Lake Field Blk (Teflon Dunker) | Quality Control | | Grab | 2706041 | Hg-methyl | ng/l | 0.02 | U | |
| 6/5/2007 | 780 | Lake Field Blk (Teflon Dunker) | Quality Control | | Grab | 2706041 | Hg | ng/l | 0.15 | U | |
| 6/5/2007 | 915 | Lake Equip. Blk (Teflon Dunker-Glass) | Quality Control | | Grab | 2706040 | Hg-methyl | ng/l | 0.02 | U | |
| 6/5/2007 | 915 | Lake Equip. Blk (Teflon Dunker-Glass) | Quality Control | | Grab | 2706040 | Hg | ng/l | 0.15 | U | |
| 7/12/2007 | 789 | Metro Final Effluent | River Monitoring | Monthly River | Grab | 2706778 | POC | mg/L | <0.0620 | U | Split Sample TKN:Repepped 07/24/07 |
| 10/24/2007 | 780 | Lake Field Blk (Teflon Dunker) | Quality Control | | Grab | 2712074 | Hg-methyl | ng/l | <0.05 | U | |
| 10/24/2007 | 780 | Lake Field Blk (Teflon Dunker) | Quality Control | | Grab | 2712074 | Hg | ng/l | <0.98 | U | |
| 10/24/2007 | 915 | Lake Equip. Blk (Teflon Dunker-Glass) | Quality Control | | Grab | 2712073 | Hg-methyl | ng/l | <0.05 | U | |

# APPENDIX 3: ASSESSING COMMUNITY STRUCTURE OF LOWER TROPHIC LEVELS IN ONONDAGA LAKE, NEW YORK IN 2007

# Assessing Community Structure of Lower Trophic Levels In Onondaga Lake, New York in 2007

**2007 Annual Report**

Prepared by

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**Introduction**

Onondaga Lake is a well-studied urban lake in which detailed limnological investigations have documented water quality changes over the past several decades (Murphy 1978; Effler 1996; Stearns and Wheler 1996, Stearns and Wheler 1997). The lake (20.5 m maximum depth) is a highly eutrophic body of water located at the northern edge of the city of Syracuse in central New York State. Onondaga Lake is a relatively steep sided lake with two basins - a northern one at 18 m in depth and a southern one at 19 m in depth - that are separated by a slightly shallower 17 m deep "saddle". Since the 1960's, summer blooms of planktonic algae have been associated with the hyper-eutrophic conditions of the lake. Recent studies have shown that overall phytoplankton abundance has been low compared to values prior to 1988, and that there has been a change in the composition of the algal community (Stearns and Wheler 1996). The contributions to the phytoplankton community made by cyanobacteria, commonly known as blue green algae, decreased in the mid-1970's, associated with a state-wide ban of phosphates in detergents (Effler 1996). Prior to the phosphorus ban (1968 - 1971), *Aphanizomenon flos-aquae* formed dense summer blooms in Onondaga Lake. From 1972 – 1989, *A. flos-aquae* was only sporadically detected, but made a substantial reappearance in the 1990s (Effler 1996). *A. flos-aquae* typically dominated cyanobacteria blooms from 1996 through 1998, although the duration of the blooms declined each year (Mills and Keats 1998). Interestingly, in 1999 the dominant cyanobacteria in algal blooms shifted to *Oscillatoria limnetica* (biomass) and *Microcystis aeruginosa* (density) (Mills et al. 1999). In more recent years (2000 – 2003) *Aphanizomenon flos-aquae* was again the most prevalent cyanophyte in terms of density and biomass. In 2002 and 2003, *A. flos-aquae* remained the dominant species in terms of biomass (2002) and density (2003). However, *Oscillatoria amphibia* reached the greatest density for cyanophytes in 2002 and *Aphanizomenon issatschenkoi* the greatest biomass in 2003. Cyanobacterial blooms were reduced in 2005 compared to 2003 and 2004. In 2006 cyanobacterial blooms increased in biomass (although still far less than 2002-2004 values) while decreasing in density. 2006 cyanobacterial blooms were dominated by *Aphanizomenon issatschenkoi* (density) and *Plankothrix* (= *Oscillatoria*) *agardhii* (biomass). In 2007, cyanobacterial blooms decreased once again in biomass and density. Blooms in 2007 were dominated by *Synechocystis* sp. (density) and *Aphanizomenon issatschenkoi* (biomass).

The composition of the zooplankton community has been documented since the late 1960's (Waterman 1971; Auer et al. 1990; Siegfried et al. 1994; Makarewicz et al. 1995; Hairston et al. 1999). *Daphnia* were present in 1969, very rare in 1978, absent 1979-1981 and appeared again in 1986-1989. The exotic *Daphnia exilis* invaded the lake in the 1920's and 1930's and persisted until the late 1970's. *Daphnia exilis* has not been observed in Onondaga Lake since the early 1980's (Hairston et al. 1999). The introduction of this species, its successful colonization, and subsequent disappearance corresponded with distinct events in the history of industrial activity in Onondaga Lake. The return of large numbers of *Daphnia pulicaria* and *Daphnia mendotae* in the late 1980's has been accompanied by substantial increases in water clarity (Auer et al. 1990) in accordance with the “trophic cascade” hypothesis (e.g. Carpenter and Kitchell 1993; Gulati et al. 1990). After initial appearance in 2000, the exotic zooplankter *Cercopagis* *pengoi* has again been detected in Onondaga Lake in 2003 through 2007. This Ponto-Caspian invader has been established in Lake Ontario since 1998 and has subsequently spread to several of the Finger Lakes (Makarewicz et al. 2001). Other temporal patterns in Onondaga Lake zooplankton have been the continued presence of the cladocerans *Ceriodaphnia quadrangula* and *Bosmina longirostris*, the copepods *Acanthocyclops vernalis* and *Diacyclops thomasi* and a variety of rotifers. A few zooplankton species have only appeared recently: *Diaphanosoma birgei* and *Chydorus sphaericus*. *Diaptomus sicilis* had appeared in the mid-1990's, but has only been seen in one sample since 2003 (Siegfried et al. 1994). This has been accompanied by a decline of all diaptomids over the same time period.

The objective of this report is to present data on phytoplankton community structure, biomass, and abundance in Onondaga Lake in 2007 and to make comparisons with the data from previous years. We also present 2007 data on species composition, biomass, and size structure of the crustacean zooplankton community.

## Methods

Phytoplankton samples were collected January through December in 2007 and preserved in Lugol's Iodine solution. The phytoplankton sample for each date and sampling site is comprised of an integrated sample of the upper mixed layer (UML) of the water column, The UML depth is the same depth as the epilimnion depth when a thermocline is present, or is a default of six meters when there is no thermocline. All integrated water samples for phytoplankton analysis were collected using a 2 cm i.d. Tygon tube.

Phytoplankton samples were processed by Ann St. Amand at PhycoTech, Inc. (620 Broad St., Ste. 100, St. Joseph, MI 49085). Raw water samples were run through filtration towers and the filters from these towers were then made into slides. The method used in counting the phytoplankton depended on the relative importance of soft algae and diatoms in the samples as well as alga size. Phytoplankton were identified to species when possible and density and biovolume estimates were made. Individual phytoplankton species were converted to biomass, based on estimates of biovolume and density. In this study, biomass is reported in μg/L. PhycoTech reported biomass as total biovolume ($\mu m^3$/mL). Total biovolume ($\mu m^3$/mL) was converted to total biomass (μg/L) by multiplying total biovolume by $1 \times 10^{-3}$.

Calculations of zooplankton density, species composition, size structure, and biomass were based on vertical hauls using a 0.50 m diameter net with 80 micron nylon mesh. Vertical tows were taken from the UML when the lake was thermally stratified or from a depth of three or six meters when no thermocline was present. In addition, a second sample was collected with a vertical tow to a depth of 15 meters. Zooplankton samples were collected at the South Deep site throughout the year and at the North Deep site on several dates. Samples were preserved in 190-proof ethyl alcohol, this preservative comprising at least 70% of each final sample volume. Flowmeter readings were taken on the zooplankton net tows to determine the volume of water strained in each haul.

However, in 2007 the flowmeter was thought to be malfunctioning, so the length of tow line was used to determine the volume of water strained in each haul.

A compound microscope (40X-200X magnification) was used to identify zooplankton to species when possible and a dry weight conversion was used to estimate biomass. For each sample, one to three 1-mL subsamples were withdrawn with a Henson-Stemple pipette from a known volume of sample, until at least 100 individual zooplankton were counted. Zooplankton length was measured using a compound scope equipped with a drawing tube and a digitizing pad interfaced with a computer.

## Results and Discussion

***Phytoplankton Community Structure.*** The raw phytoplankton data from the analyses done by PhycoTech, Inc. for 2007 is presented in Appendix A. The phytoplankton community of Onondaga Lake is comprised of Bacillariophyta, Chlorophyta, Chrysophyta, Cryptophyta, Cyanophyta, Pyrrhophyta, Euglenophyta, and "miscellaneous microflagellates". Euglenophyta and Xanthophyta were present briefly in June 2002 but Xanthophyta has not been seen since 2002, and Euglenophyta was absent in 2003 and 2004 but present briefly in the spring of 2005, 2006 and 2007. The two dominant cyanophytes found in the 2007 algal blooms were *Synechocystis* sp. (density) and *Aphanizomenon issatschenkoi* (biomass). The most frequently occurring algal species of other taxonomic groups, determined by the highest average abundance and/or biomass were: *Stephanodiscus parvus* (density) and *Asterionella fermosa* (biomass) (Bacillariophyta); Unknown species from the Chlorococcaceae family (density and biomass) (Chlorophyta); *Erkenia subaequiciliata (*density and biomass) (Chrysophyta); *Rhodomonas minuta* (density) and *Cryptomonas erosa* (biomass) (Cryptophyta); and a species from the genus Gymnodinium (density) and *Peridinium umbonatum* (biomass) (Pyrrhophyta).

***Phytoplankton Abundance and Biomass***. The abundance and biomass of phytoplankton in Onondaga Lake for 2007 are summarized in Appendix B. Seasonal trends in abundance of algal groups in 2006 and 2007 are presented in Figures 1 and 2, respectively. In 2007, algal abundance peaked in early July (dominated by chlororphytes). Algal abundance exhibited lesser peaks in May (dominated by chrysophytes), early August (dominated by chlorophytes), and in September (also dominated by chlorophytes). The 2007 summer peak in algal abundance ($4.02 \times 10^7$ per liter) occurred later in the season (early July) than the first peak ($2.97 \times 10^7$ per liter) seen in 2006 (Mid-April). While the 2006 early summer peak was nearly three times the corresponding 2007 peak, both the 2006 and 2007 peaks were less than one quarter of the early summer peak in 2003 ($1.27 \times 10^8$ per liter). The 2007 mid-July to early August peak occurred earlier than the corresponding peak in 2005. The July algal abundance peak for 2007 was of greater magnitude ($4.02 \times 10^7$ per liter) than the corresponding peak in 2006 ($1.61 \times 10^7$ per liter). The late August peak seen in 2006 occurred again in 2007 approximately two weeks earlier with similar magnitude. ($1.28 \times 10^7$ per liter and, $1.10 \times 10^7$ per liter respectively).

Overall, algal abundance in 2007 (yearly average 7.23 x $10^6$ per liter) was lower than in 2006 (yearly average 9.11 x $10^6$ per liter). Both year's averages were significantly less than the 2003 average (1.13 x $10^7$ per liter), but densities remained higher than in either the 2001 or 2002 season (yearly averages of 2.9 x $10^6$ per liter and 4.42 x $10^6$ per liter, respectively).

The comparison of 2006 and 2007 algal biomass data shows similar temporal patterns in peak algal biomass (Figures 3 and 4, respectively). In both 2006 and 2007, spring blooms in Onondaga Lake were dominated by bacillariophytes. The spring biomass peak in 2006 (9,783 μg/L) and 2007 peak (2,644 μg/L) occurred in early April and in both years bacillariophyte biomass remained high through May. Overall algal biomass in 2007 (26,625 μg/L) was a large decrease over 2006 biomass (42,369 μg/L), and was still less than the values in 2003 or 2002 (78,135 μg/L and 76,083 μg/L, respectively).
We compared the overall seasonal biomass of each division of phytoplankton observed in Onondaga Lake in 2006 and 2007 temporally for the integrated upper mixed layer samples (Figure 5A – 5I). Maximum biomass of Bacillariophyta was much greater in 2006 than in 2007 with values of 2644 μg/L and 8,926 μg/L, respectively. Overall seasonal biomass showed an even greater difference between years with 2006 having almost twice the bacillariophyte biomass of 2007 (yearly averages, 22,174 μg/L and 11,791 μg/L, respectively) (Figure 5A). Again both maximum biomass and overall seasonal biomass were higher for Chlorophyta in 2006 than in 2007. In 2006 Chlorophyta biomass peaked in mid-July, at 2,517μg/L and late September at 1024 μg/L in 2007. Total Chlorophyta biomass decreased from 9,324μg/L in 2006 to 3999μg/L in

2007 (Figure 5B). In 2006, Chrysophyta biomass reached its peak in early June and in 2007 the peak was in late October. Peak Chrysophyta biomass was greater in 2007 than in 2006, with values of 725µg/L and 371µg/L, respectively. However, in 2007 biomass was steady up until the peak, leading to an overall seasonal biomass similar to that in 2006 (Figure 5C).

The Cryptophyta biomass peak in late June 2006 (1,666µg/L) was very similar to the 2007 peak in late September (1974µg/L). Overall biomass was simlar as well (6459µg/L in 2006 and 6775µg/L in 2007) (Figure 5D). Overall 2007 Cyanophyta annual biomass was 188µg/L, which was an eleven fold decrease from 2006 (842 µg/L). Cyanophyta biomass peaked in September/October of both years; in late September of 2006 at 331µg/L and in early October of 2007 at 61µg/L. In 2006 "Miscellaneous flagellates" had a biomass peak of 22µg/L in late May, and total seasonal biomass 49µg/L. In 2007, there was a peak of "Miscellaneous flagellates" in late February at 26µg/L and a total seasonal biomass of 76 µg/L (Figure 6G). Overall Pyrrhophyta biomass in 2007 was 1,956µg/L compared to 2,326µg/L in 2006 and exhibited similar seasonal trends (Figure 5H). Euglenophytes were present in late March 2006 with a biomass of 3 µg/L and to a lesser extent in late December 2006 with a biomass of 9µg/L (figure 5H).

Seasonal changes in phytoplankton size were examined by dividing the phytoplankton into two functional groups based on cell or colony size. Netplankton were categorized as phytoplankton greater than 50 µm in length and nannoplankton were less than 50 µm in length. Nannoplankton abundance reached a much greater maximum ($4.02 \times 10^7$ per liter) than that seen for netplankton ($5.02 \times 10^6$ per liter). The greatest peaks in nannoplankton and netplankton abundance occurred in early July and late May respectively (Figure 6A). Overall nannoplankton biomass (24052µg/L) was nine times the overall biomass of the netplankton (2644µg/L), the difference being much greater than in 2005 and 2006. Nannoplankton biomass had only two peaks during 2007 that exceeded 3,000µg/L (late April, 3,360µg/L and early September 3,068µg/L) and netplankton biomass had only one peak exceeding 700 µg/L (late April, 713µg/L) (Figure 6A).

***Zooplankton Community Structure***. A summary of the zooplankton community in Onondaga Lake from December 29, 2006 to December 13, 2007 is presented in Appendix C. A total of 12 species, as well as nauplii and copepodites, were identified in Onondaga Lake in 2007. The dominant cladoceran was *Bosmina longirostris*. Other cladocerans present included *Diaphanosoma birgei*, *Ceriodaphnia quadrangula*, *Eubosmina coregoni*, *Daphnia mendotae*, *Daphnia retrocurva*, *Daphnia ambigua*, *Daphnia sp.*, *Leptodora kindtii*, and *Cercopagis pengoi*. The dominant copepods during the year were *Diacyclops thomasi*, *Acanthocyclops vernalis*, and nauplii. No calanoid copepods were detected throughout the 2007 season.

***Zooplankton Abundance and Biomass***. A summary of seasonal changes in the biomass, average size and abundance of the total zooplankton community, cladocerans, copepods, and individual species is presented in Table 1. Seasonally, total zooplankton density and biomass were highest during spring 2007 (Table 1). Zooplankton density and biomass were lowest in mid-March (0.33/L and 0.45 μg/L, respectively) (Table 1, Figure 7A, 7B). Zooplankton density and biomass peaked in mid-June (707.3/L and 485.1 μg/L, respectively) (Figure 7A, 7B). While zooplankton density and biomass were generally high from early June to early July (>143.0/L and >90.9μg/L, respectively), during the rest of the season they remained relatively low ranging from 0.33/L to 95.1/L and 0.45 μg/L to 87.5 μg/L, respectively (Figure 7A, 7B).

We analyzed the zooplankton community by assessing the relative proportion in density and biomass by taxa and by species. By taxa, cladoceran proportion abundance was high from early June through November, with copepod proportion abundance dominating in February through May, and in December (Figure 8A). The proportion of zooplankton biomass occupied by cladocerans and copepods mirrored their relative abundance (Figure 8B). The cladoceran zooplankton community was proportionally dominated by *Bosmina longirostris* throughout the season (Figure 9A). *Cercopagis pengoi* was a significant contributor to cladoceran biomass with a peak contribution of 40.6% in mid-July. During the August through October reduction in *B. longirostris* proportion of biomass, *Diaphanosoma birgei*, *C. pengoi*, *Ceriodaphnia sp.*, and *D. retrocurva* rounded out the cladoceran biomass contribution. The prevalence of *Bosmina longirostris* was consistent with our observations from 1996 through 2006. In 2006, *D. mendotae* was a significant contributor to cladoceran biomass; however, in 2007 it was a minor contributor to cladoceran biomass. *D. mendotae* was detected in January, May-July and September 2006, and only in mid to late September 2007. *D. retrocurva*, however, was a significant contributor to cladoceran biomass from mid-August to late October 2006, and from mid-July to late October in 2007. The copepod community was largely dominated by *D. thomasi* throughout the season except mid-August which *Acanthocyclops vernalis* predominated (Figure 9B). *Bosmina longirostris, D. thomasi,* and *D. retrocurva* were the dominant species in the zooplankton community throughout the year (Figure 10).

***Zooplankton Community Size Structure***. A summary of mean size of the crustacean zooplankton community is shown in Table 1. The mean size of the crustacean community was 0.32 mm in winter, 0.28 mm in the spring, 0.29 mm in the summer, and 0.36 mm in the fall, with an average for the entire sampling season (January - December) of 0.29 mm. The highest mean size of zooplankton (0.56 mm) was observed in mid-April, while average body lengths ranged from 0.26 to 0.51 mm for the remainder of 2007.

We compared mean zooplankton size found at the Shackelton Point site of Oneida Lake (March - November 2007) with mean adjusted zooplankton size for the entire season in Onondaga Lake. The 80-micron mesh net used to collect zooplankton samples in Onondaga Lake is nearly half the mesh size (153 micron) Mills and Schiavone (1982) used in their studies and in Oneida Lake. Consequently, the average size of Onondaga Lake zooplankton would be expected to be lower compared to samples collected with a 153 micron net because of the likelihood of retaining higher numbers of small zooplankton such as nauplii. To compensate for the differing mesh sizes, we adjusted the mean zooplankton size by excluding nauplii from the average zooplankton lengths that were calculated after analyzing samples from Onondaga Lake. Our results indicated that temporal patterns in zooplankton size were dissimilar between the two lakes, with average adjusted zooplankton size in Oneida being larger than in Onondaga for corresponding dates for the entire season, and by a large margin from May to November (Figure 11). In Oneida Lake, average zooplankton size was largest in early June (1.14 mm) and smallest in late September (0.56 mm). In Onondaga Lake, average adjusted zooplankton size was largest in mid-April (0.89 mm), and then declined to its smallest value in early July (0.27 mm), remaining low for the duration of the year (Figure 11).

***Cercopagis pengoi***. The exotic zooplanktor *Cercopagis pengoi* was observed in 2007 as it has been in 2000 and 2002-2006. It was found in samples collected on 10 dates (7/3, 7/17, 7/31, 8/14, 8/28, 9/11, 9/25, 10/9, 10/24 and 11/8), spanning from early summer to mid-fall. The biomass of the species was relatively small throughout most of the season (maximum value of 8.25 μg/L), however, reaching a proportion of 35.9% of the total biomass in the mid-summer of 2007, thus possessing some potential to impact the zooplankton community through predation (Ojaveer et al. 2000).

## Significant Findings

Onondaga Lake remains a productive aquatic system as evidenced by its high levels of algal biomass. The duration of the cyanobacteria blooms in Onondaga Lake declined from 1996-2000. For example, cyanobacteria blooms (typically dominated by *Aphanizomenon flos-aquae*) that historically occurred July through October (1996) decreased in duration (middle to late July through August) from 1997 to 2000. In 2001 there was no significant cyanobacteria bloom documented. The 2002 sampling season saw a reversal of this declining trend however, with cyanobacteria blooms of greater magnitude, lasting from late June through mid-September. A similar resurgence of cyanobacteria was again seen in 2003, but the onset of the bloom did not occur until mid-August, but remained in significant quantity through the end of October. The 2004 and 2005 seasons had no lengthy period of late season dominance like that seen in either 2002 or 2003. During the 2004 sampling season only one minor peak was seen in early August (1,741µg/L) and in 2005 no significant cyanobacterial bloom was seen, with biomass reaching a peak of only 170µg/L in mid-September. Although 2006 cyanobacterial biomass increased slightly from 2005, the trend of low cyanobacterial biomass continued. Cyanobacterial biomass reached a late September peak of 331µg/L and remained near peak values into early October. In 2007, cyanobacterial biomass decreased from 2006, and even from 2005 values. No significant cyanobacterial bloom was seen in 2007 and biomass reached a peak in early October with a value of only 61.5µg/L. The resurgence of cyanobacteria seen in 2002 and 2003 may still reflect changes in the food web that favor blooms of cyanobacteria, but the limited cyanobacterial productivity observed from 2004 through 2007 appears to signal an overall improvement of water quality.

Average total zooplankton biomass in nearby Oneida Lake (Cornell Biological Field Station unpublished data) was 179 µg/L for a single deep site (March - November 2007), while it averaged 79 µg/L in all of Onondaga Lake for the same time period. As in 2006, but unlike prior years from 1997-2003, average total zooplankton biomass was greater in

Oneida Lake than Onondaga Lake. During 1996, and 2004-2007 small zooplankton dominated Onondaga Lake while larger species, especially *Daphnia pulicaria* and *Daphnia mendotae*, led to high average total zooplankton biomass in Oneida Lake. In 2007, Onondaga Lake zooplankton biomass peaked at a higher value (485.1 μg/L) than Oneida Lake biomass (447.3 μg/L), but Onondaga Lake biomass was more variable, less than 90.9 μg/L during the majority of the season except the peak in mid-June to early July (Figure 7B). In contrast, Oneida Lake zooplankton biomass was more consistent, remaining above 92 μg/L on all sampling dates between mid-May and mid-October. Temporal patterns in average zooplankton size showed little similarity between the two lakes (Figure 11). The consistently small average size of the total zooplankton community in Onondaga Lake throughout the seasons in 2007 (0.29 mm year-round) is a bit smaller than values observed in 2006 (0.38 mm). In contrast, during 2002 average size showed more variation, declining from 0.92 mm during the winter (January – March) to 0.27 mm in fall (October – December). Associated with this change in size structure is the dominance of the small cladoceran *B. longirostris*, but also a reduced *Daphnia* population and near lack of calanoid copepods throughout the 2004 and 2005 seasons, with no observations in 2006 or 2007. These findings suggest intense planktivory by plankton-eating fish in 2006 and 2007. Populations of *Daphnia* have a tremendous capability to exert strong influence on the phytoplankton community (Mills *et al*. 1987). The low number of *Daphnia* individuals in Onondaga Lake in 2007 was likely linked to heavy predation by planktivorous fish, namely alewife (*Alosa pseudoharengus*). *Cercopagis pengoi* again appeared in the lake in the 2007 season. Interestingly, the periods of *Cercopagis* detection in the lake also represent periods of decreased dominance by *Bosmina longirostris* (Figure 10) suggesting possible predatory impacts by *Cercopagis* leading to a structuring of the zooplankton community.

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TABLES

Table 1. Density (animals/L), average size (mm), and biomass (µg/L) of the total zooplankton community, cladocerans, copepods, and individual taxa collected from Onondaga Lake, NY, 12/29/06-12/13/07. Data are grouped by season into Winter (n = 6), Spring (n=6), Summer (n=6), and Fall (n=6). Yearly averages (n=24) are also listed. An asterisk ("*") indicates that the sample is an average of "North" and "South" site collections. All averages are generated from epilimnion and 15m tows, except 2/13, 2/21, 2/28, 3/7, 3/13 which are North epilimnetic tows only. Data are mean and standard errors (SE). Total Community = Cladocerans + Copepods. Cladocerans = Individually listed species + Other Cladocerans. Copepods = Individually listed species + Nauplii + Cyclopoid Copepods + Calanoid Copepods.

| **Taxon** | | **Winter (n = 6) 12/29, 2/13, 2/21, 2/28, 3/7, 3/13** | | | **Spring (n =6) 4/10*, 4/24, 5/8, 5/22, 6/5, 6/19*** | | | **Summer (n = 6) 7/3, 7/17, 7/31, 8/14, 8/28, 9/11** | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Density (animals/L) | Ave. Size (mm) | Biomass (µg/L) | Density (animals/L) | Ave. Size (mm) | Biomass (µg/L) | Density (animals/L) | Ave. Size (mm) | Biomass (µg/L) |
| Total Community | mean | 5.98 | 0.32 | 5.05 | 162.47 | 0.28 | 114.61 | 145.13 | 0.29 | 102.15 |
| | SE | 4.67 | 0.03 | 4.07 | 110.60 | 0.05 | 74.84 | 106.41 | 0.04 | 66.28 |
| Cladocerans | mean | 3.40 | | 3.28 | 127.36 | | 87.97 | 136.63 | | 95.69 |
| | SE | 3.25 | | 3.10 | 109.55 | | 75.59 | 99.52 | | 62.08 |
| Copepods | mean | 2.58 | | 1.77 | 35.11 | | 26.65 | 8.50 | | 6.47 |
| | SE | 1.43 | | 0.97 | 6.63 | | 2.74 | 6.95 | | 4.29 |
| *Bosmina longirostris* | mean | 3.38 | 0.31 | 3.26 | 127.31 | 0.27 | 87.94 | 129.26 | 0.27 | 84.70 |
| | SE | 3.24 | 0.01 | 3.10 | 109.50 | 0.02 | 75.57 | 99.74 | 0.00 | 63.25 |
| *Diacyclops thomasi* | mean | 0.96 | 0.58 | 1.64 | 12.06 | 0.63 | 25.08 | 3.99 | 0.54 | 5.78 |
| | SE | 0.57 | 0.01 | 0.93 | 2.37 | 0.06 | 2.75 | 3.16 | 0.03 | 4.13 |
| *Daphnia mendotae* | mean | 0.02 | 0.45 | 0.01 | 0.00 | | 0.00 | 0.09 | 0.78 | 0.25 |
| | SE | 0.02 | | 0.01 | 0.00 | | 0.00 | 0.09 | | 0.25 |
| *Daphnia retrocurva* | mean | 0.00 | | 0.00 | 0.05 | 0.46 | 0.03 | 3.82 | 0.52 | 3.73 |
| | SE | 0.00 | | 0.00 | 0.05 | | 0.03 | 1.28 | 0.03 | 1.55 |
| *Daphnia ambigua* | mean | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.09 | 0.44 | 0.05 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.06 | 0.04 | 0.03 |
| *Daphnia sp.* | mean | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.14 | 0.62 | 0.17 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.08 | 0.05 | 0.10 |
| Nauplii | mean | 1.62 | 0.18 | 0.11 | 23.05 | 0.18 | 1.57 | 4.40 | 0.19 | 0.28 |
| | SE | 0.88 | 0.01 | 0.05 | 5.16 | 0.01 | 0.41 | 3.81 | 0.01 | 0.25 |
| *Acanthocyclops vernalis* | mean | 0.00 | 0.80 | 0.01 | 0.00 | | 0.00 | 0.09 | 0.89 | 0.39 |
| | SE | 0.00 | | 0.01 | 0.00 | | 0.00 | 0.08 | 0.11 | 0.30 |
| *Diaphanosoma sp.* | mean | 0.00 | | 0.00 | 0.00 | | 0.00 | 1.54 | 0.50 | 1.28 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.65 | 0.02 | 0.62 |
| *Ceriodaphnia quadrangula* | mean | 0.00 | 0.93 | 0.01 | 0.00 | | 0.00 | 1.13 | 0.38 | 1.27 |
| | SE | 0.00 | | 0.01 | 0.00 | | 0.00 | 0.70 | 0.02 | 0.74 |
| *Cercopagis pengoi* | mean | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.56 | 1.11 | 4.25 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.19 | 0.02 | 1.40 |
| *Tropocyclops prasinus* | mean | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.01 | 0.52 | 0.01 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.01 | | 0.01 |
| Other Cladocerans | mean | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.00 | | 0.00 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.00 | | 0.00 |
| Cyclopoid Copepods | mean | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.00 | | 0.00 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.00 | | 0.00 |
| Calanoid Copepods | mean | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.00 | | 0.00 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 | 0.00 | | 0.00 |

Table 1 (continued).

| Taxon | | Fall (n = 6) 9/25, 10/9*, 10/24, 11/8, 11/20*, 12/13 | | | Year (n = 24) | | |
|---|---|---|---|---|---|---|---|
| | | Density (animals/L) | Ave. Size (mm) | Biomass (µg/L) | Density (animals/L) | Ave. Size (mm) | Biomass (µg/L) |
| Total Community | mean | 40.35 | 0.36 | 39.21 | 88.48 | 0.29 | 65.26 |
| | SE | 11.69 | 0.02 | 10.64 | 38.50 | 0.02 | 25.26 |
| Cladocerans | mean | 35.13 | | 33.81 | 75.63 | | 55.19 |
| | SE | 12.42 | | 11.30 | 36.65 | | 24.32 |
| Copepods | mean | 5.21 | | 5.40 | 12.85 | | 10.07 |
| | SE | 2.34 | | 2.95 | 3.58 | | 2.46 |
| *Bosmina longirostris* | mean | 27.62 | 0.30 | 24.59 | 71.89 | 0.27 | 50.12 |
| | SE | 9.50 | 0.00 | 7.67 | 36.60 | 0.01 | 24.31 |
| *Diacyclops thomasi* | mean | 2.22 | 0.64 | 4.76 | 4.81 | 0.61 | 9.31 |
| | SE | 1.16 | 0.02 | 2.93 | 1.32 | 0.02 | 2.36 |
| *Daphnia mendotae* | mean | 0.03 | 0.62 | 0.04 | 0.03 | 0.70 | 0.07 |
| | SE | 0.03 | | 0.04 | 0.02 | 0.10 | 0.06 |
| *Daphnia retrocurva* | mean | 6.14 | 0.57 | 7.10 | 2.50 | 0.55 | 2.71 |
| | SE | 3.21 | 0.03 | 3.60 | 0.97 | 0.02 | 1.10 |
| *Daphnia ambigua* | mean | 0.00 | | 0.00 | 0.02 | 0.44 | 0.01 |
| | SE | 0.00 | | 0.00 | 0.02 | 0.04 | 0.01 |
| *Daphnia sp.* | mean | 0.05 | 0.78 | 0.12 | 0.05 | 0.66 | 0.07 |
| | SE | 0.03 | 0.08 | 0.09 | 0.02 | 0.05 | 0.04 |
| Nauplii | mean | 2.90 | 0.18 | 0.21 | 7.99 | 0.18 | 0.54 |
| | SE | 1.36 | 0.01 | 0.11 | 2.39 | 0.00 | 0.17 |
| *Acanthocyclops vernalis* | mean | 0.09 | 0.91 | 0.42 | 0.05 | 0.90 | 0.21 |
| | SE | 0.06 | 0.04 | 0.28 | 0.02 | 0.04 | 0.10 |
| *Diaphanosoma sp.* | mean | 0.53 | 0.57 | 0.61 | 0.52 | 0.52 | 0.47 |
| | SE | 0.44 | 0.06 | 0.51 | 0.23 | 0.03 | 0.22 |
| *Ceriodaphnia quadrangula* | mean | 0.67 | 0.36 | 0.71 | 0.45 | 0.37 | 0.50 |
| | SE | 0.39 | 0.04 | 0.42 | 0.21 | 0.05 | 0.23 |
| *Cercopagis pengoi* | mean | 0.08 | 1.12 | 0.62 | 0.16 | 1.11 | 1.22 |
| | SE | 0.04 | 0.04 | 0.30 | 0.07 | 0.02 | 0.50 |
| *Tropocyclops prasinus* | mean | 0.00 | 0.62 | 0.01 | 0.00 | 0.54 | 0.00 |
| | SE | 0.00 | | 0.01 | 0.00 | 0.05 | 0.00 |
| Other Cladocerans | mean | 0.01 | | 0.01 | 0.00 | | 0.00 |
| | SE | 0.01 | | 0.01 | 0.00 | | 0.00 |
| Cyclopoid Copepods | mean | 0.00 | | 0.00 | 0.00 | | 0.00 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 |
| Calanoid Copepods | mean | 0.00 | | 0.00 | 0.00 | | 0.00 |
| | SE | 0.00 | | 0.00 | 0.00 | | 0.00 |

FIGURES

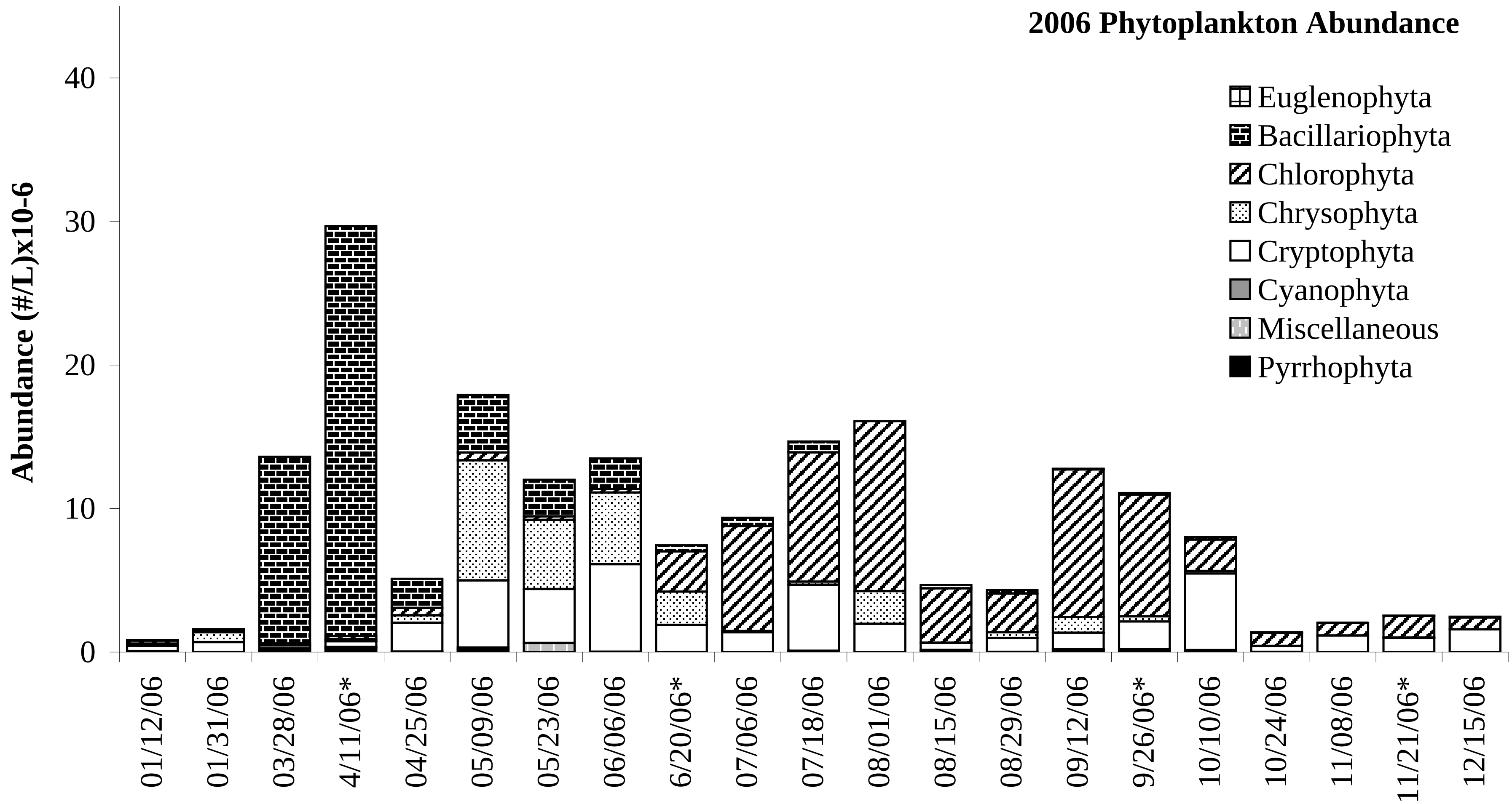



Figure 1. Abundance (#/L) x 10-6 of eight major groups of phytoplankton collected from Onondaga Lake, 1/12/06 - 12/15/06. Data are averages of integrated upper mixed layer samples (UML). An asterisk indicates "North" station samples were taken in addition to "South" station samples

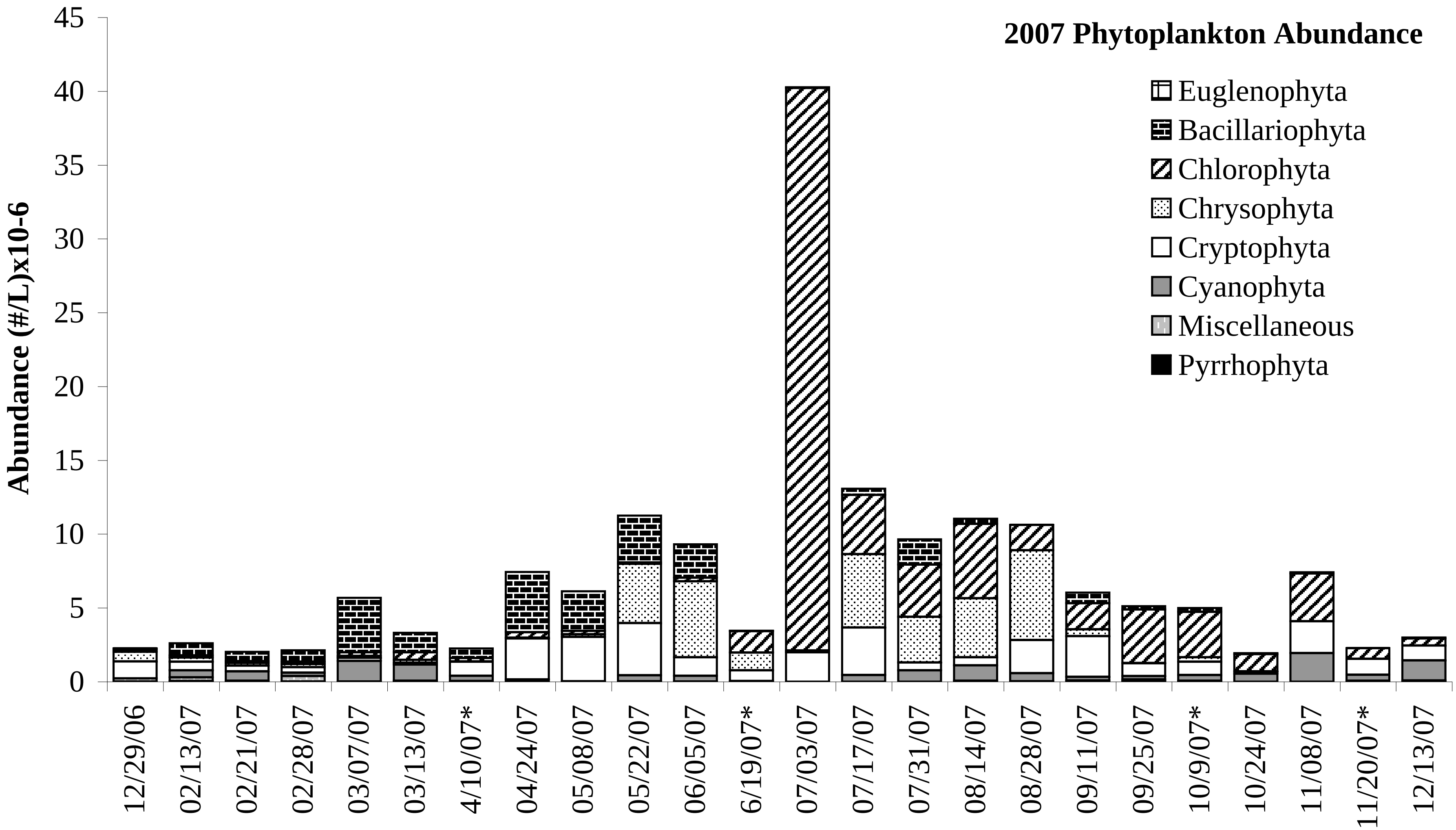



Figure 2. Abundance (#/L) x 10-6 of eight major groups of phytoplankton collected from Onondaga Lake, 12/29/06 - 12/13/07. Data are averages of integrated upper mixed layer samples (UML). An asterisk indicates "North" station samples were taken in addition to "South" station samples

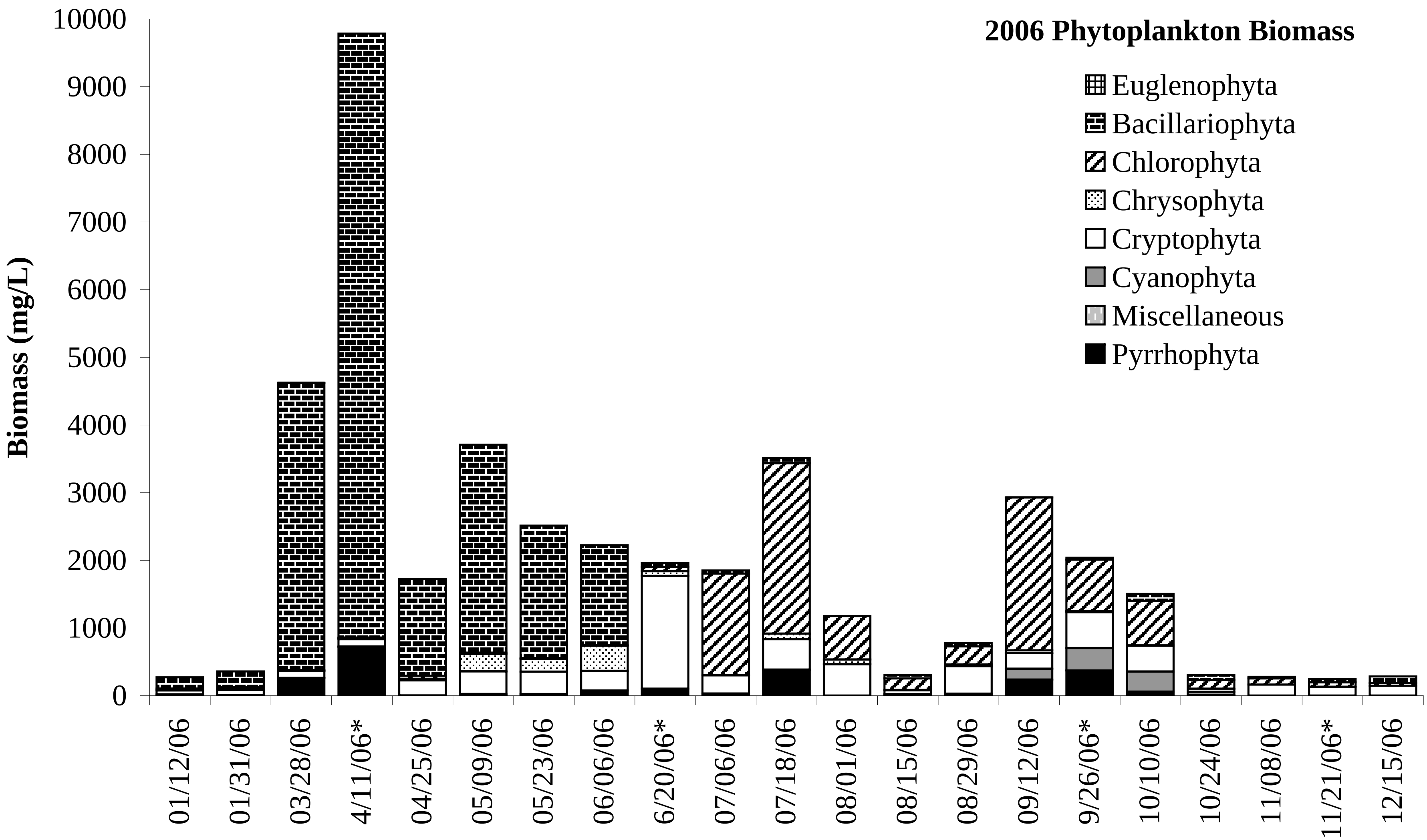



Figure 3. Biomass (ug/L) of eight major groups of phytoplankton collected from Onondaga Lake, 1/12/06 - 12/15/06. Data are averages of integrated upper mixed layer samples (UML). An asterisk indicates "North" station samples were taken in addition to "South" station samples.

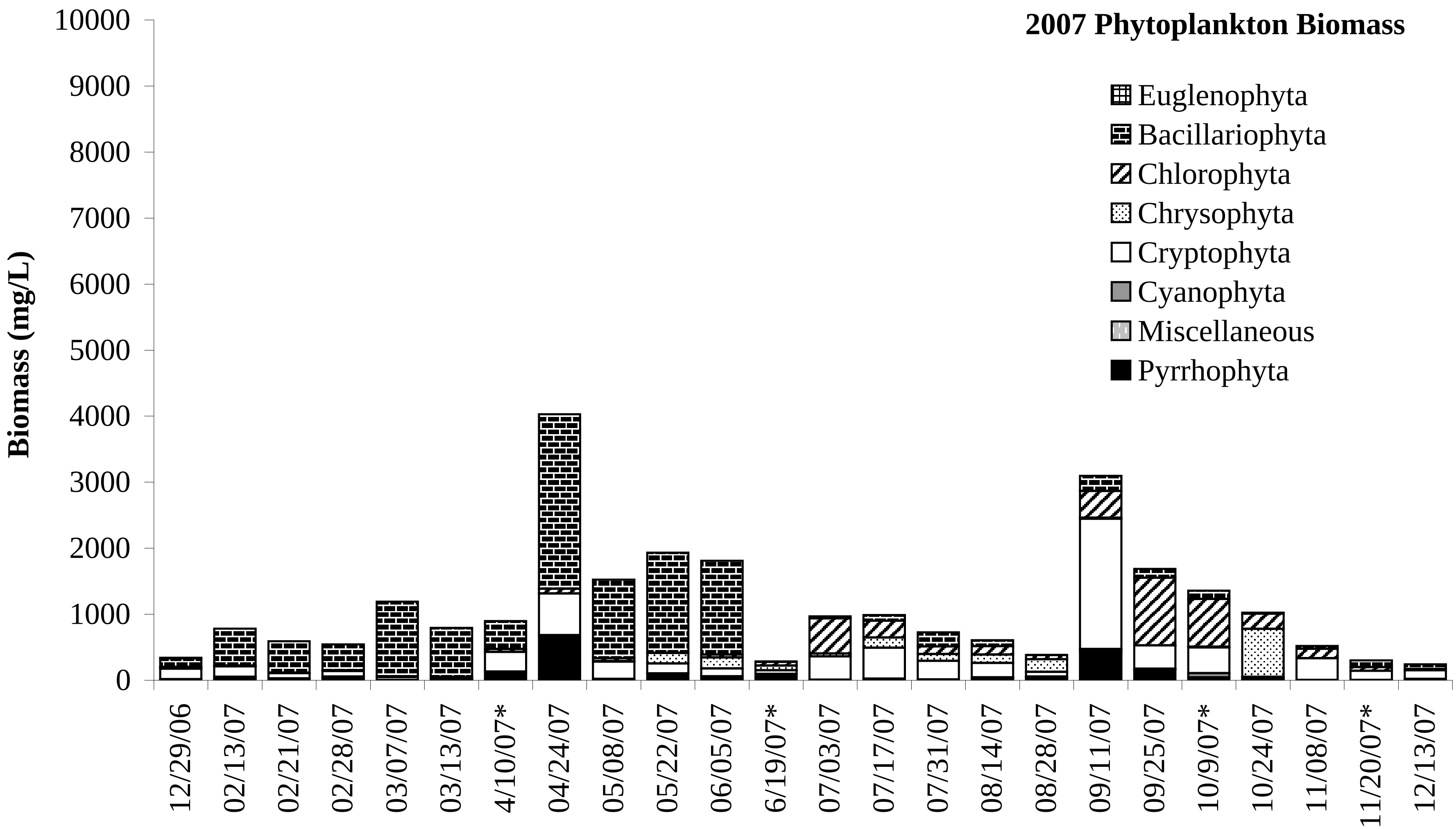



Figure 4. Biomass (ug/L) of eight major groups of phytoplankton collected from Onondaga Lake, 12/29/06 - 12/13/07. Data are averages of integrated upper mixed layer samples (UML). An asterisk indicates "North" station samples were taken in addition to "South" station samples.

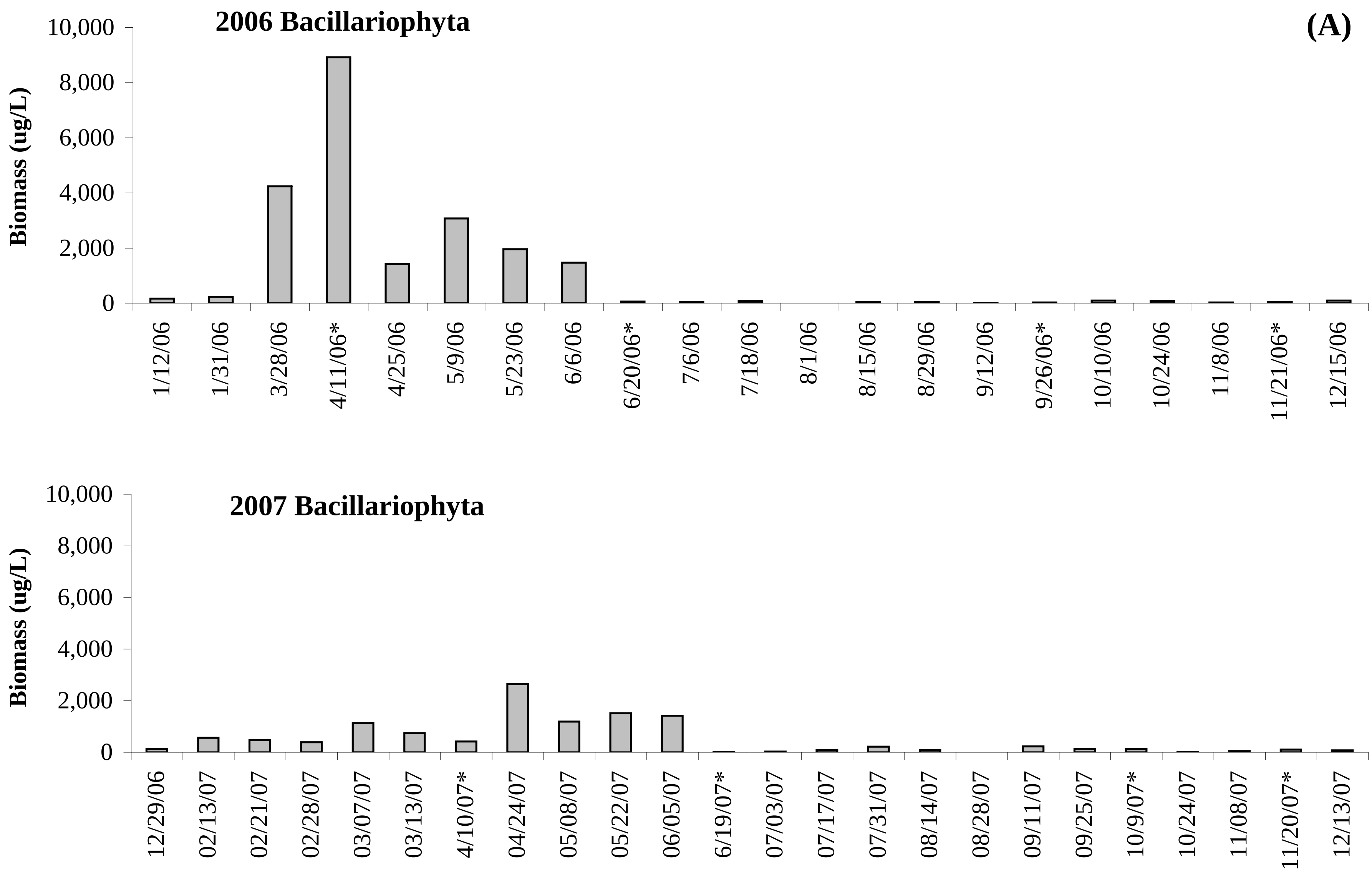



Figure 5A-H. Biomass (μg/L) of (A) Bacillariophyta, (B) Chlorophyta, (C) Chrysophyta, (D) Cryptophyta, (E) Cyanophyta, (F) Miscellaneous Microflagellates, (G) Pyrrhophyta and (H) Euglenophyta in the years 2006 and 2007; from integrated upper mixed layer (UML) samples from Onondaga Lake "South" sampling station. The dates with an asterisk ("*") indicates that the sample is an average of "North" and "South" site collections.

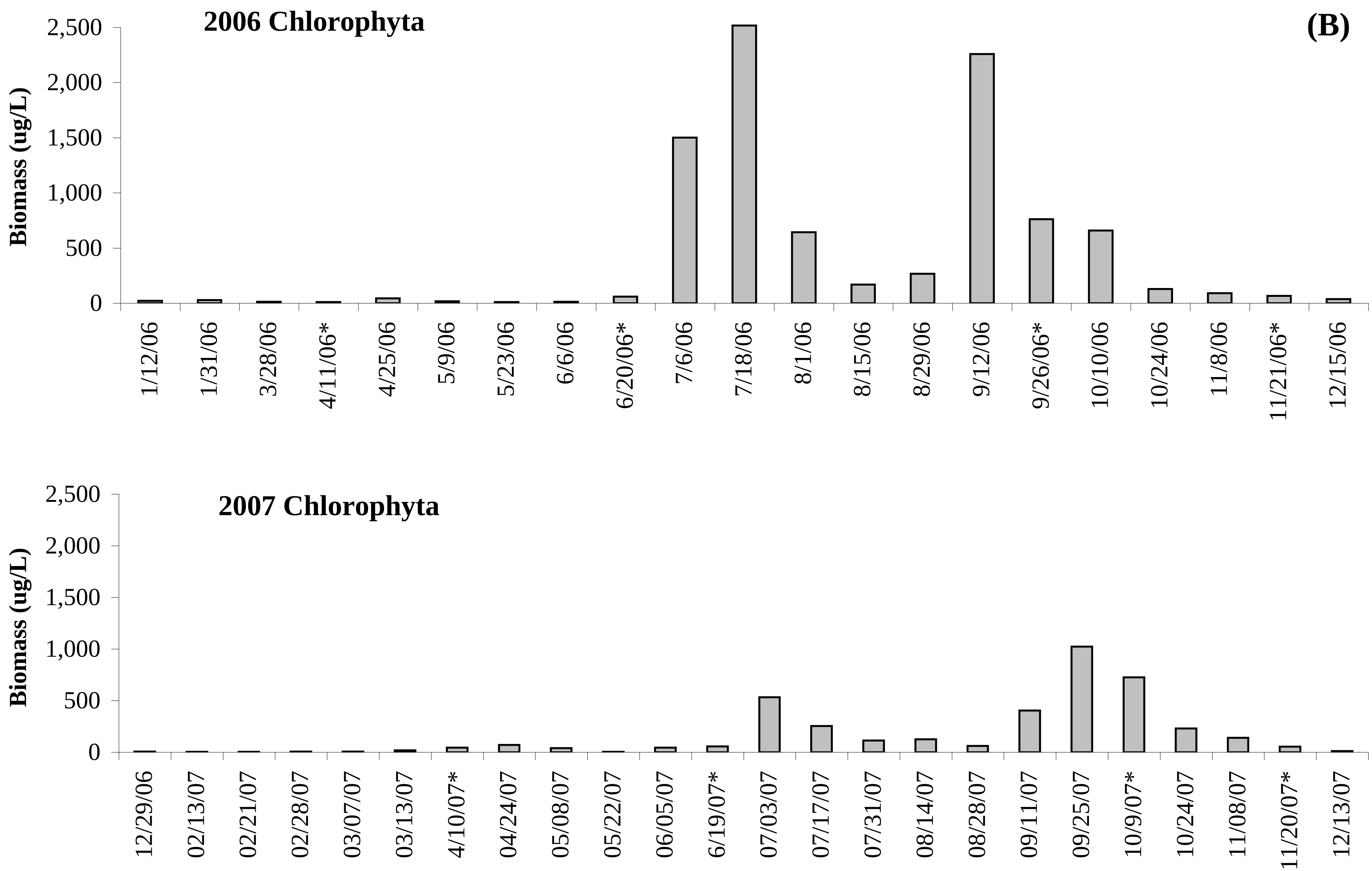



Figure 5A-H. *(continued)* Biomass (μg/L) of (A) Bacillariophyta, (B) Chlorophyta, (C) Chrysophyta, (D) Cryptophyta, (E) Cyanophyta, (F) Miscellaneous Microflagellates, (G) Pyrrhophyta and (H) Euglenophyta in the years 2006 and 2007; from integrated upper mixed layer (UML) samples from Onondaga Lake "South" sampling station. The dates with an asterisk ("*") indicates that the sample is an average of "North" and "South" site collections.

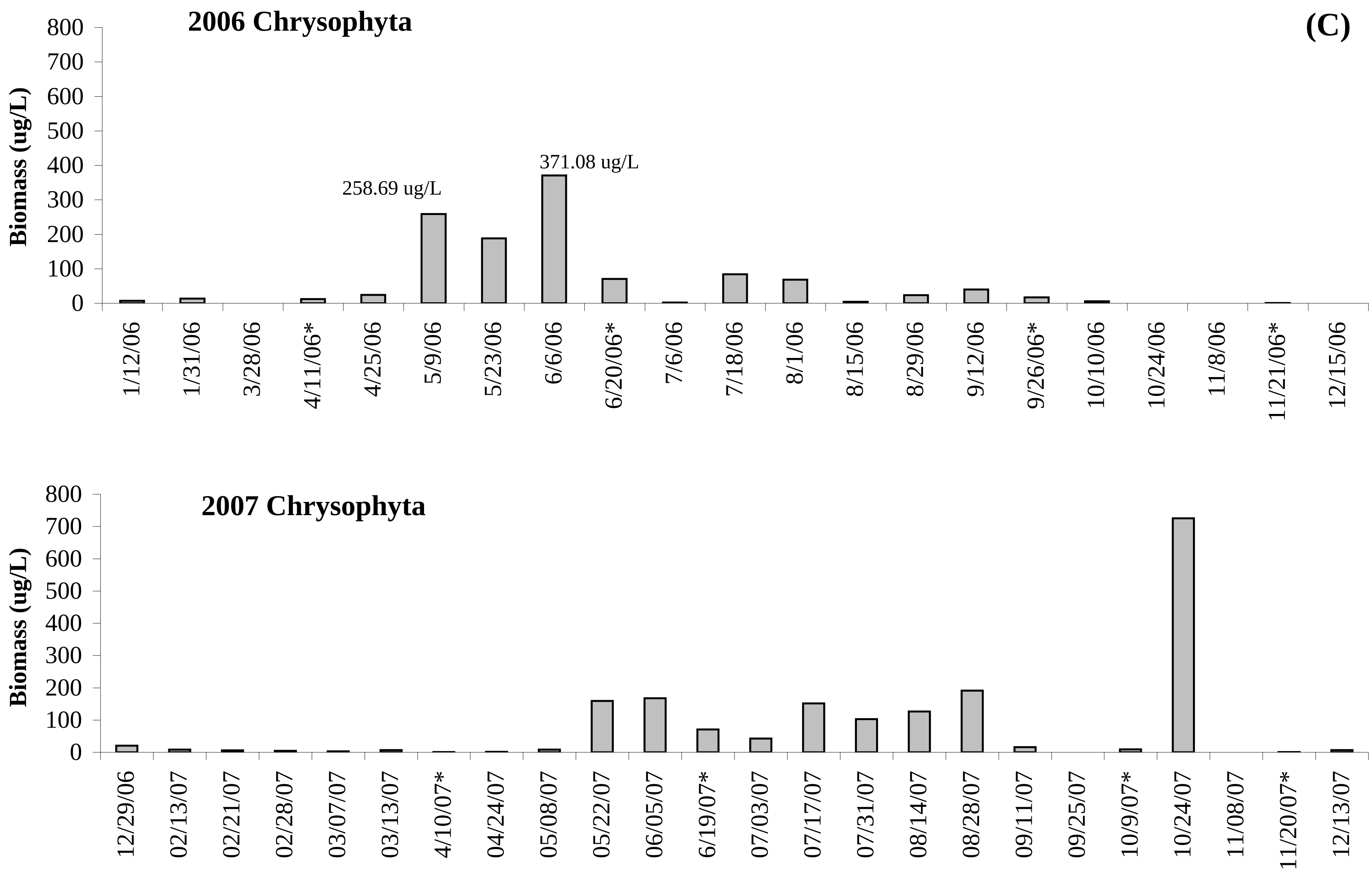
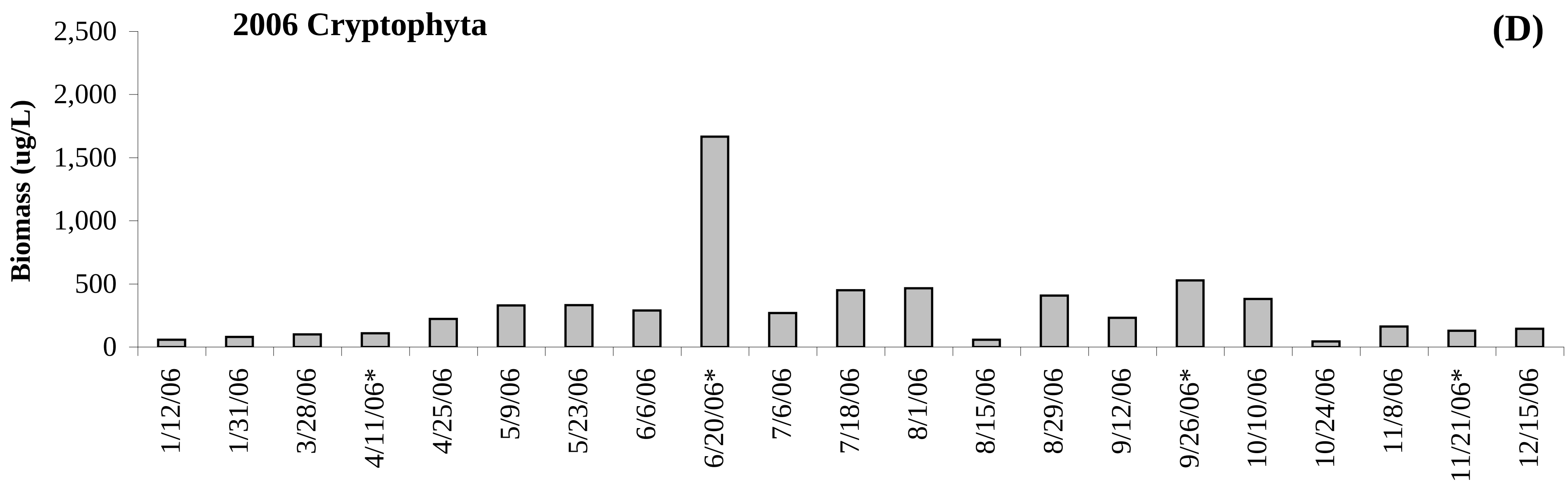



Figure 5A-H. *(continued)* Biomass (µg/L) of (A) Bacillariophyta, (B) Chlorophyta, (C) Chrysophyta, (D) Cryptophyta, (E) Cyanophyta, (F) Miscellaneous Microflagellates, (G) Pyrrhophyta and (H) Euglenophyta in the years 2006 and 2007; from integrated upper mixed layer (UML) samples from Onondaga Lake "South" sampling station. The dates with an asterisk ("*") indicates that the sample is an average of "North" and "South" site collections.



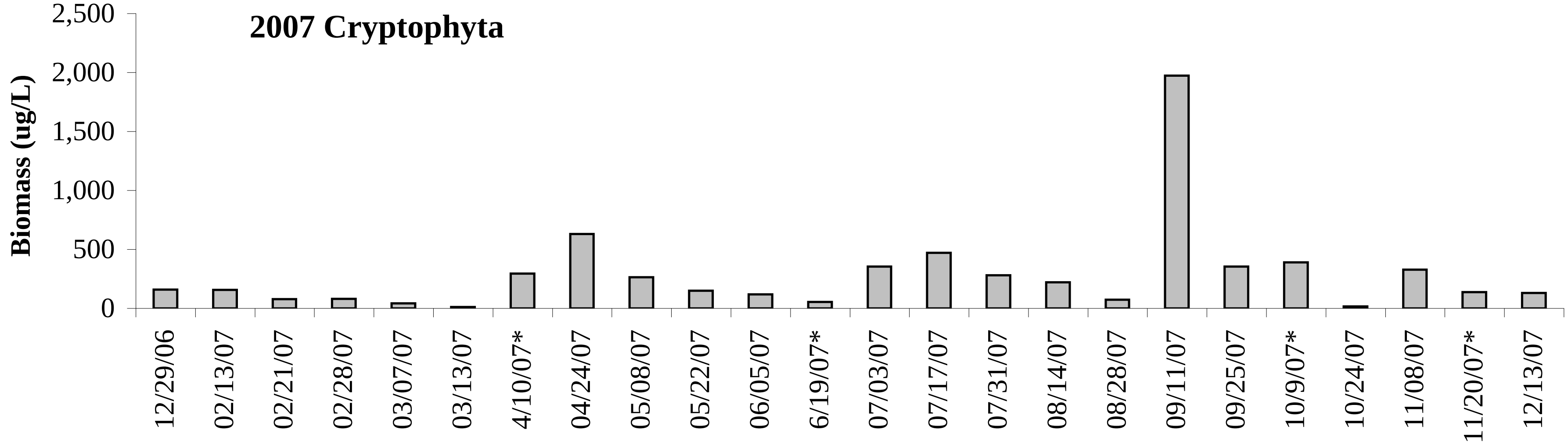




Figure 5A-H. *(continued)* Biomass (µg/L) of (A) Bacillariophyta, (B) Chlorophyta, (C) Chrysophyta, (D) Cryptophyta, (E) Cyanophyta, (F) Miscellaneous Microflagellates, (G) Pyrrhophyta and (H) Euglenophyta in the years 2006 and 2007; from integrated upper mixed layer (UML) samples from Onondaga Lake "South" sampling station.  The dates with an asterisk ("*") indicates that the sample is an average of "North" and "South" site collections.

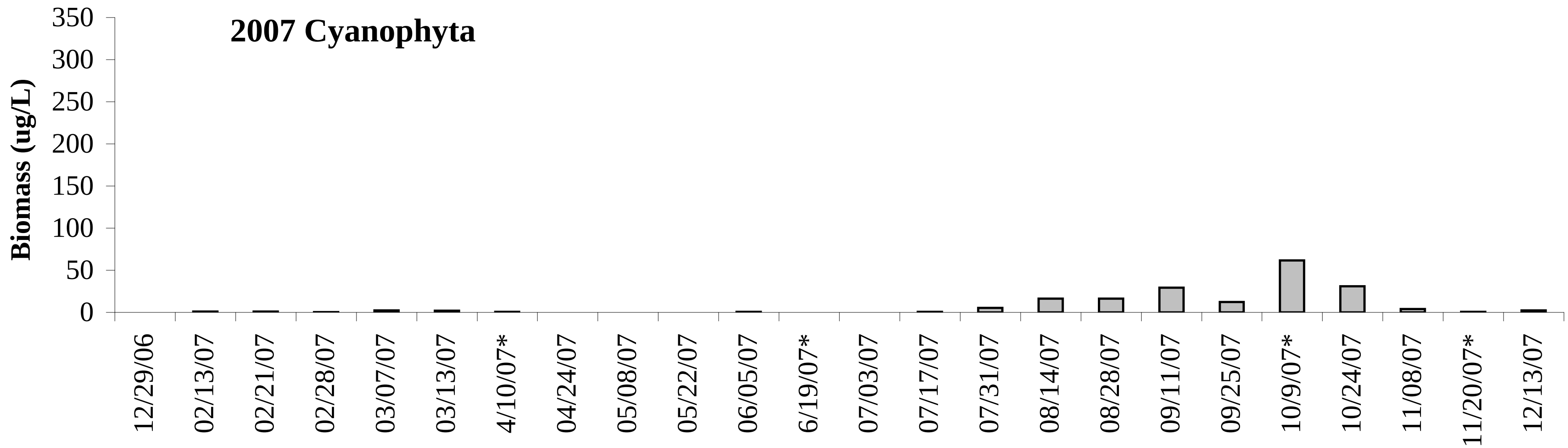
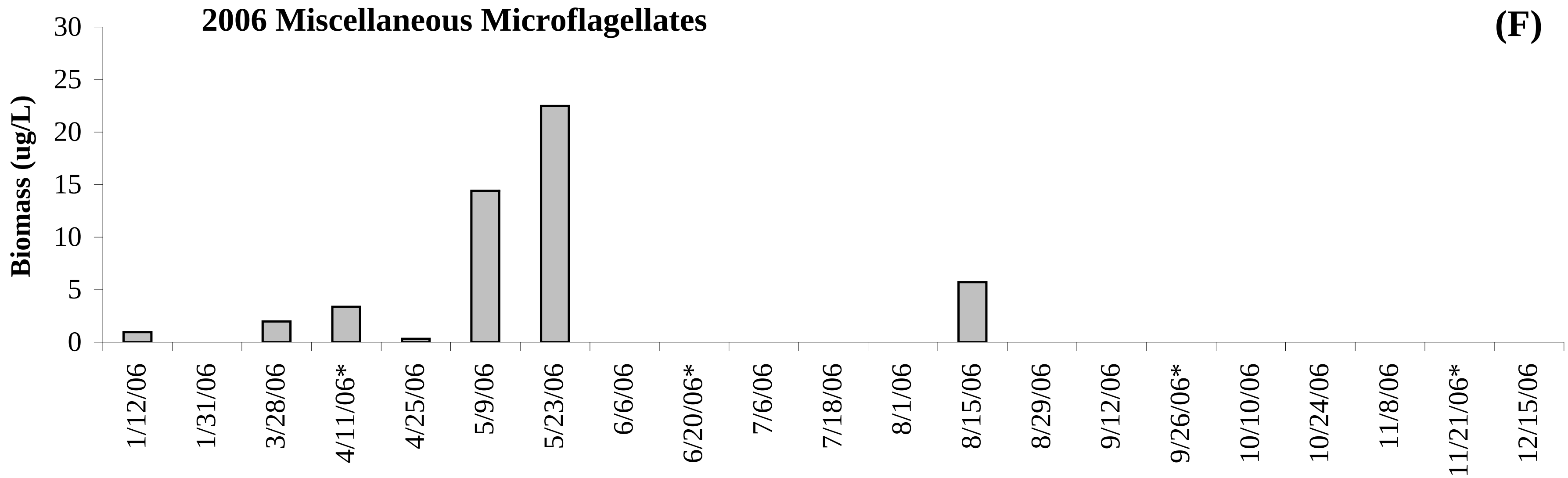




Figure 5A-H. *(continued)* Biomass (μg/L) of (A) Bacillariophyta, (B) Chlorophyta, (C) Chrysophyta, (D) Cryptophyta, (E) Cyanophyta, (F) Miscellaneous Microflagellates, (G) Pyrrhophyta and (H) Euglenophyta in the years 2006 and 2007; from integrated upper mixed layer (UML) samples from Onondaga Lake "South" sampling station. The dates with an asterisk ("*") indicates that the sample is an average of "North" and "South" site collections.



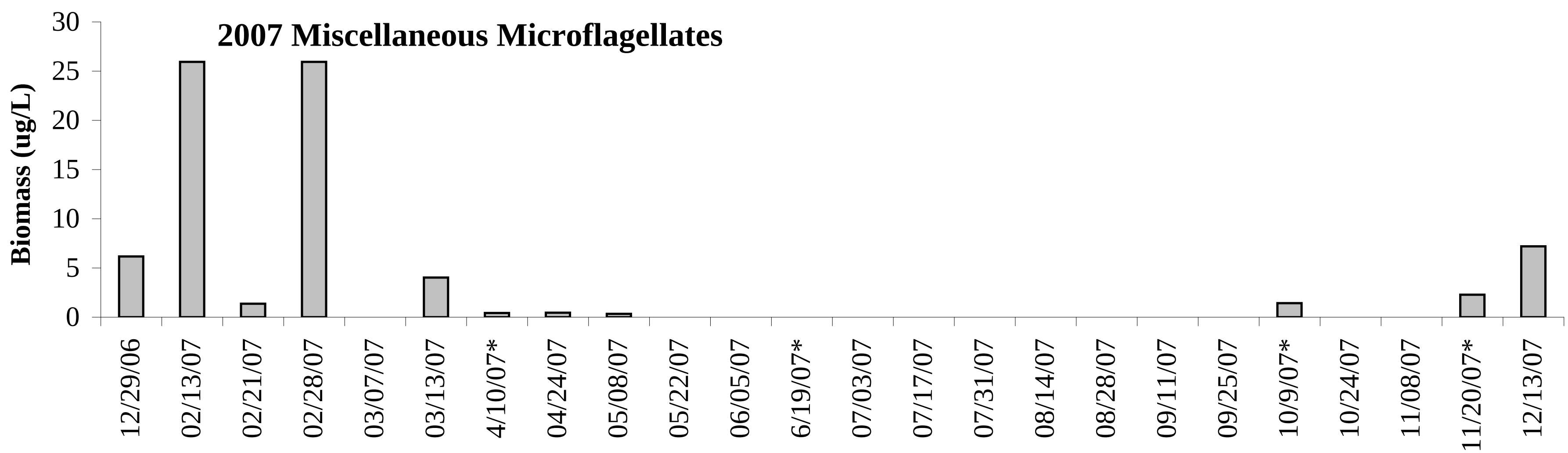
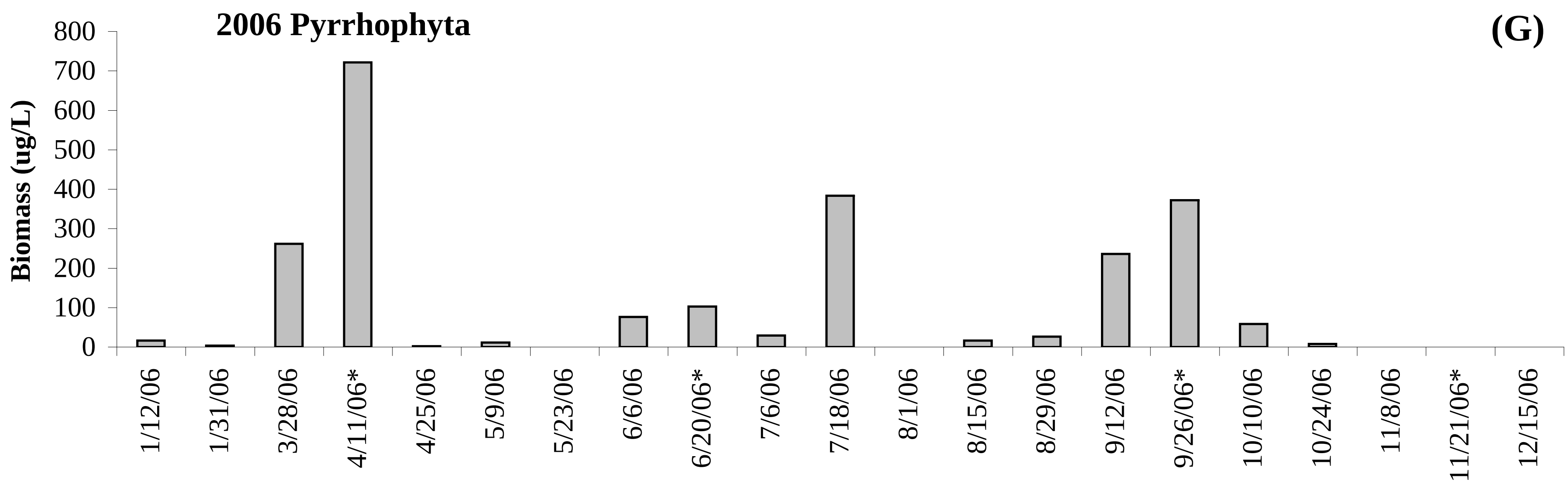




Figure 5A-H. *(continued)* Biomass (μg/L) of (A) Bacillariophyta, (B) Chlorophyta, (C) Chrysophyta, (D) Cryptophyta, (E) Cyanophyta, (F) Miscellaneous Microflagellates, (G) Pyrrhophyta and (H) Euglenophyta in the years 2006 and 2007; from integrated upper mixed layer (UML) samples from Onondaga Lake "South" sampling station. The dates with an asterisk ("*") indicates that the sample is an average of "North" and "South" site collections.



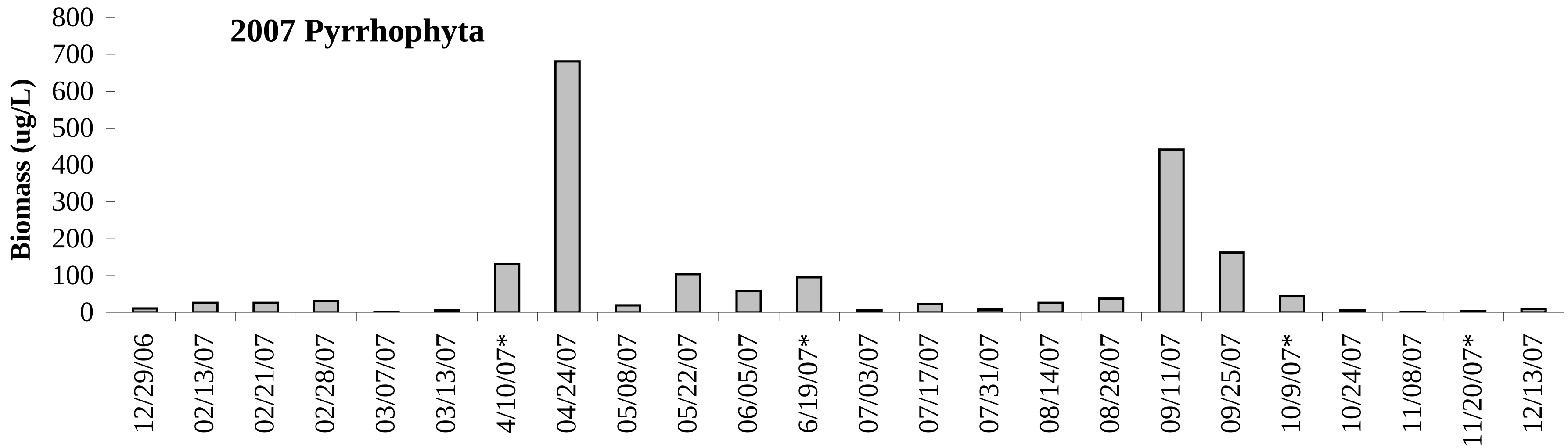
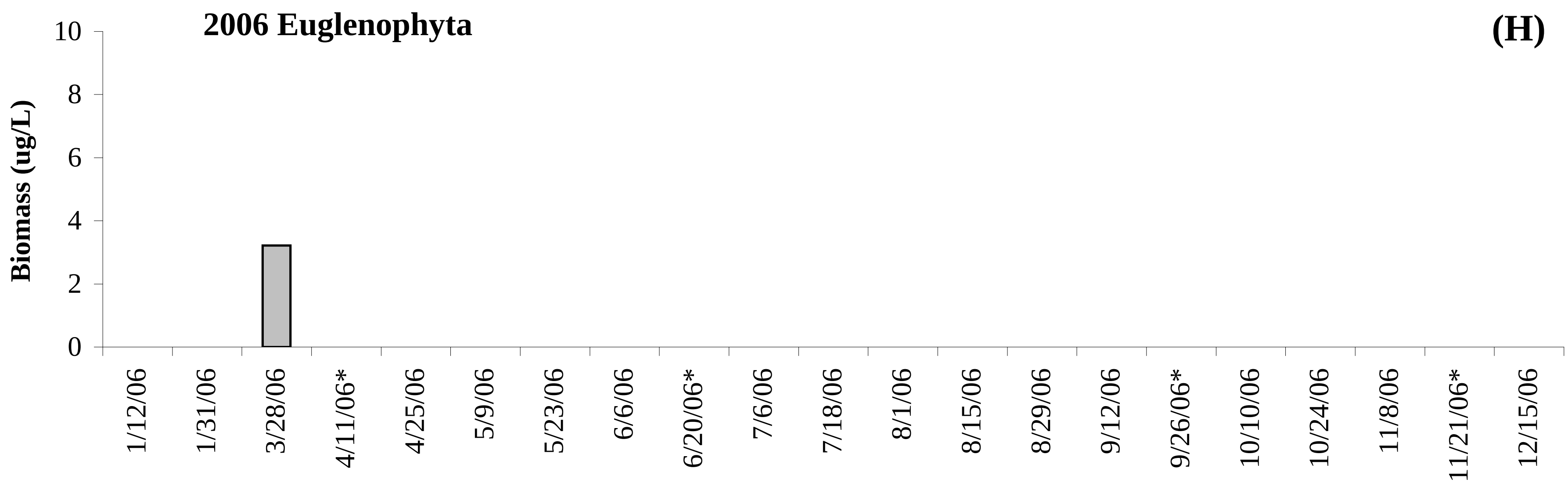




Figure 5A-H. *(continued)* Biomass (μg/L) of (A) Bacillariophyta, (B) Chlorophyta, (C) Chrysophyta, (D) Cryptophyta, (E) Cyanophyta, (F) Miscellaneous Microflagellates, (G) Pyrrhophyta and (H) Euglenophyta in the years 2006 and 2007; from integrated upper mixed layer (UML) samples from Onondaga Lake "South" sampling station. The dates with an asterisk ("*") indicates that the sample is an average of "North" and "South" site collections.



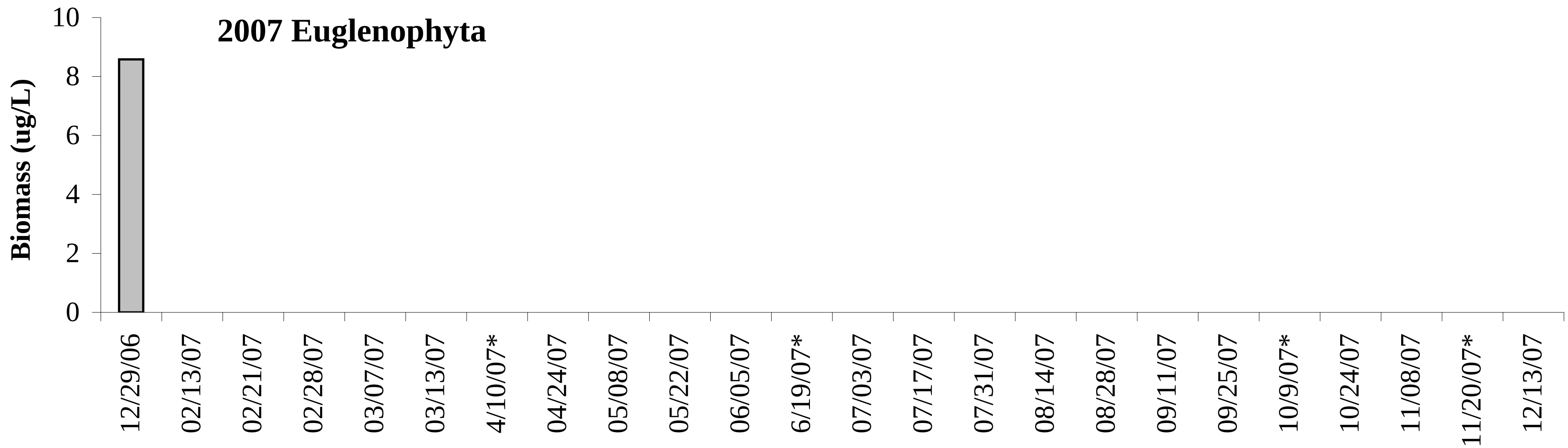




Figure 5A-H. *(continued)* Biomass (μg/L) of (A) Bacillariophyta, (B) Chlorophyta, (C) Chrysophyta, (D) Cryptophyta, (E) Cyanophyta, (F) Miscellaneous Microflagellates, (G) Pyrrhophyta and (H) Euglenophyta in the years 2006 and 2007; from integrated upper mixed layer (UML) samples from Onondaga Lake "South" sampling station. The dates with an asterisk ("*") indicates that the sample is an average of "North" and "South" site collections.

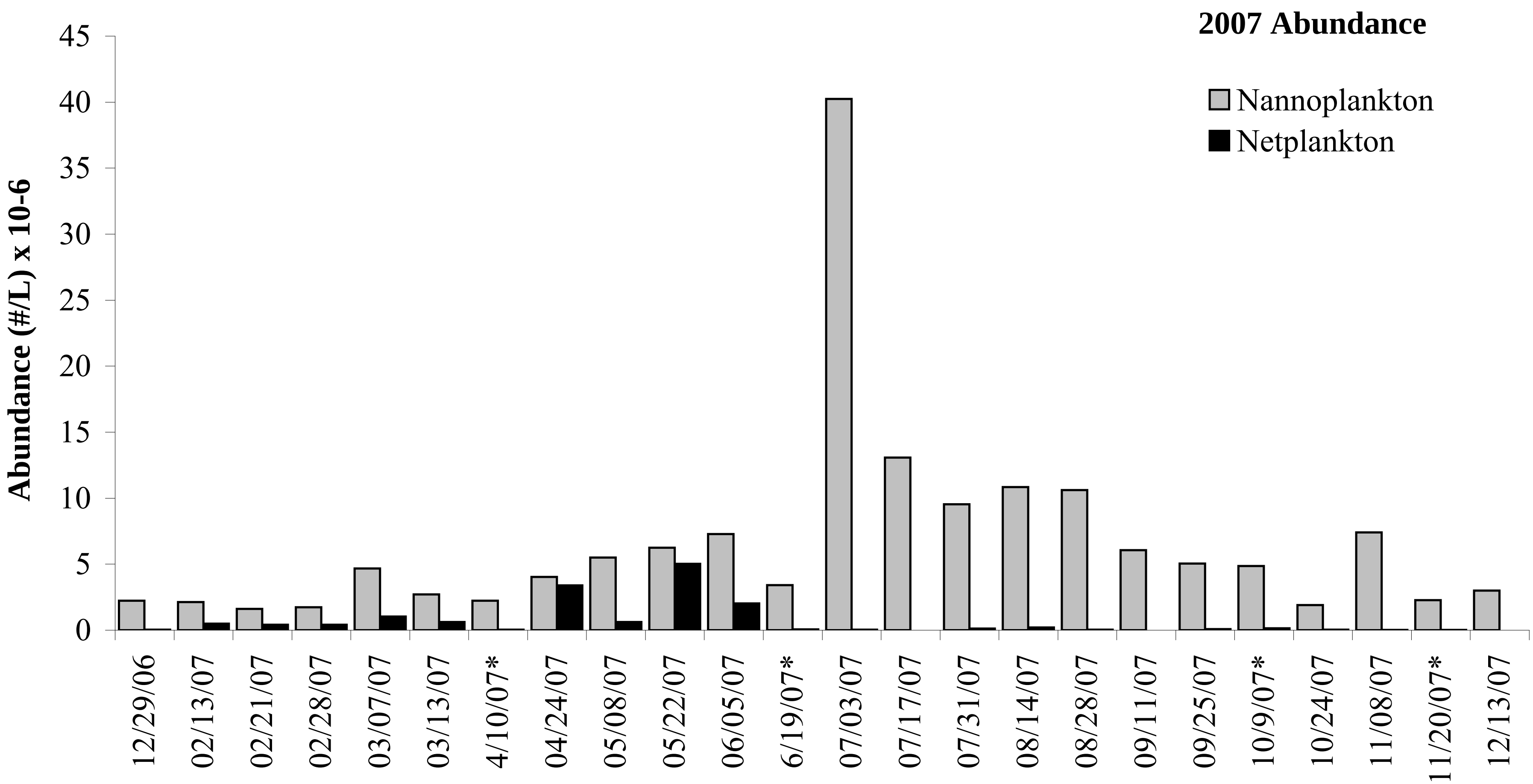



Figure 6A. Abundance (#/L) x 10-6 of nannoplankton (<50µm) and netplankton (>50µm) collected from Onondage Lake during 2007. Data are averages of integrated upper mixed layer samples 12/29/06 - 12/13/07. An asterisk indicates "North" station samples were taken in addition to "South" station samples.

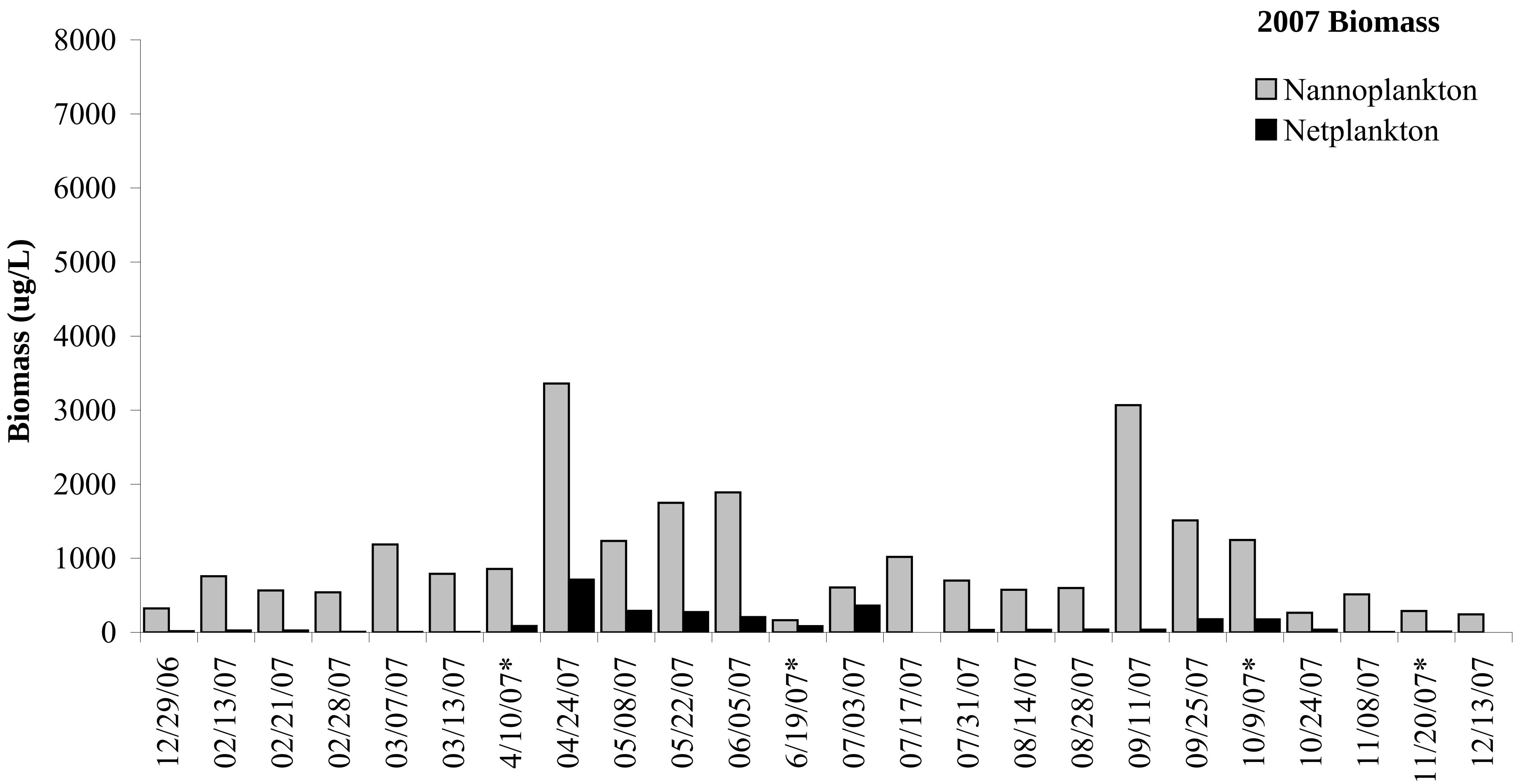



Figure 6B. Biomass (ug/L) of nannoplankton (<50µm) and netplankton (>50µm) collected from Onondage Lake during 2007. Data are averages of integrated upper mixed layer samples 12/29/06 - 12/13/07. An asterisk indicates "North" station samples were taken in addition to "South" station samples.

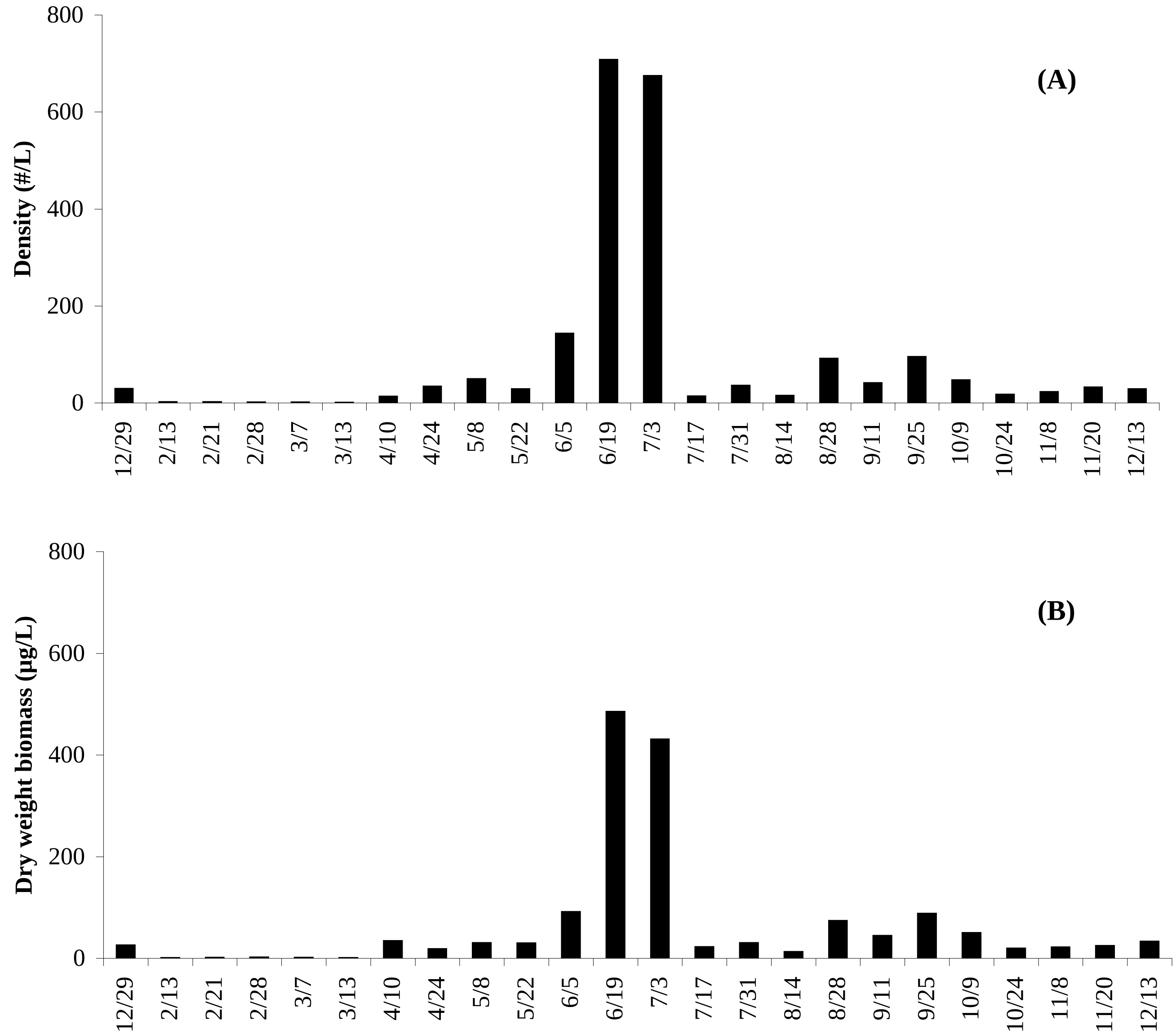



Figure 7. (A) Density (animals/L) and (B) dry weight biomass (µg/L) of crustacean zooplankton community in Onondaga Lake, late December 2006 and February-December 2007.

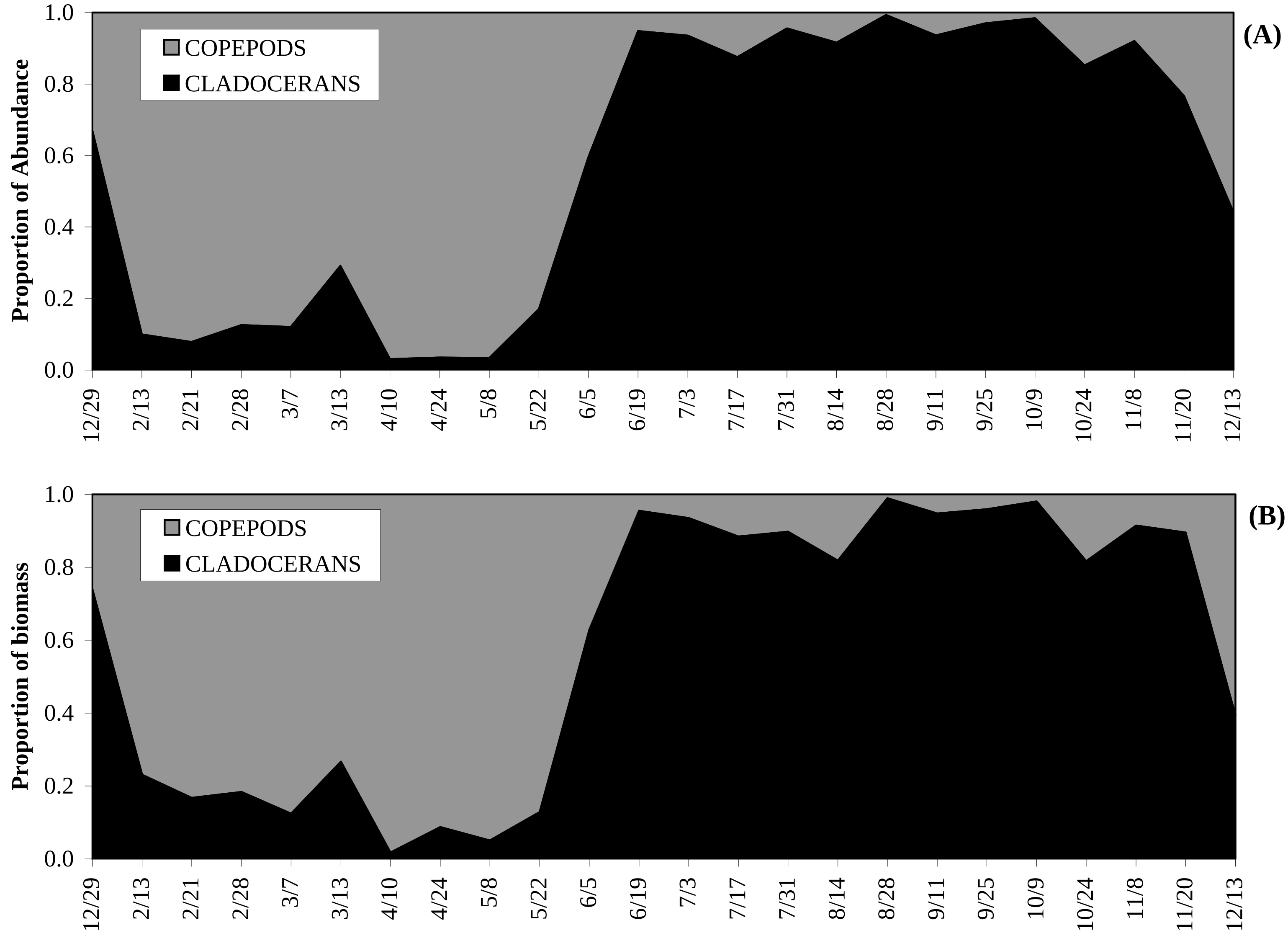



Figure 8. (A) Proportion of abundance and (B) proportion of biomass of cladocerans and copepods in Onondaga Lake during 2007.

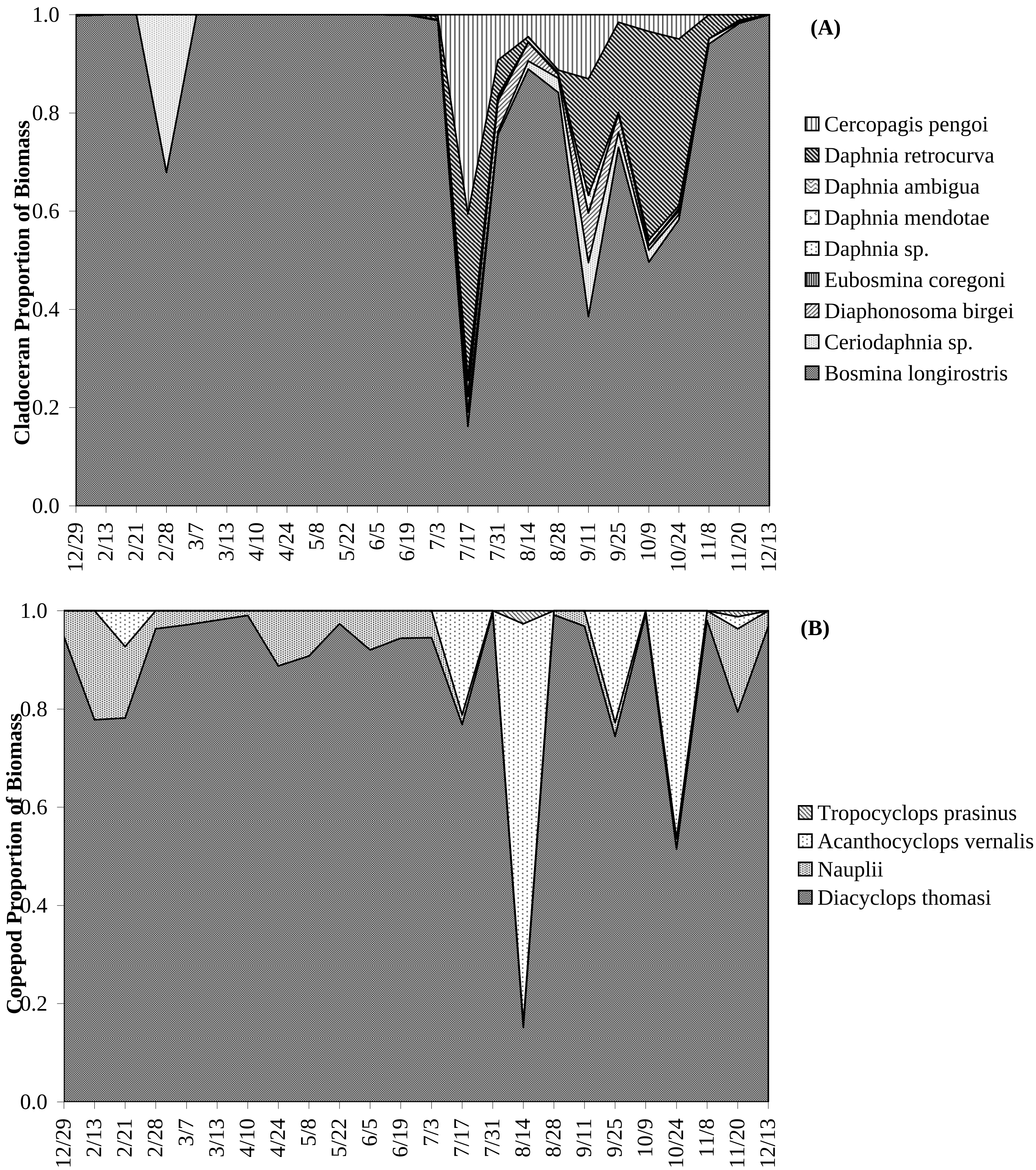



Figure 9. (A) Contributions to the total cladoceran biomass by each species in the Onondaga Lake cladoceran community from late December 2006 to December 2007. (B) Proportion of total copepod biomass contributed by each copepod species during this same time period in Onondaga Lake.

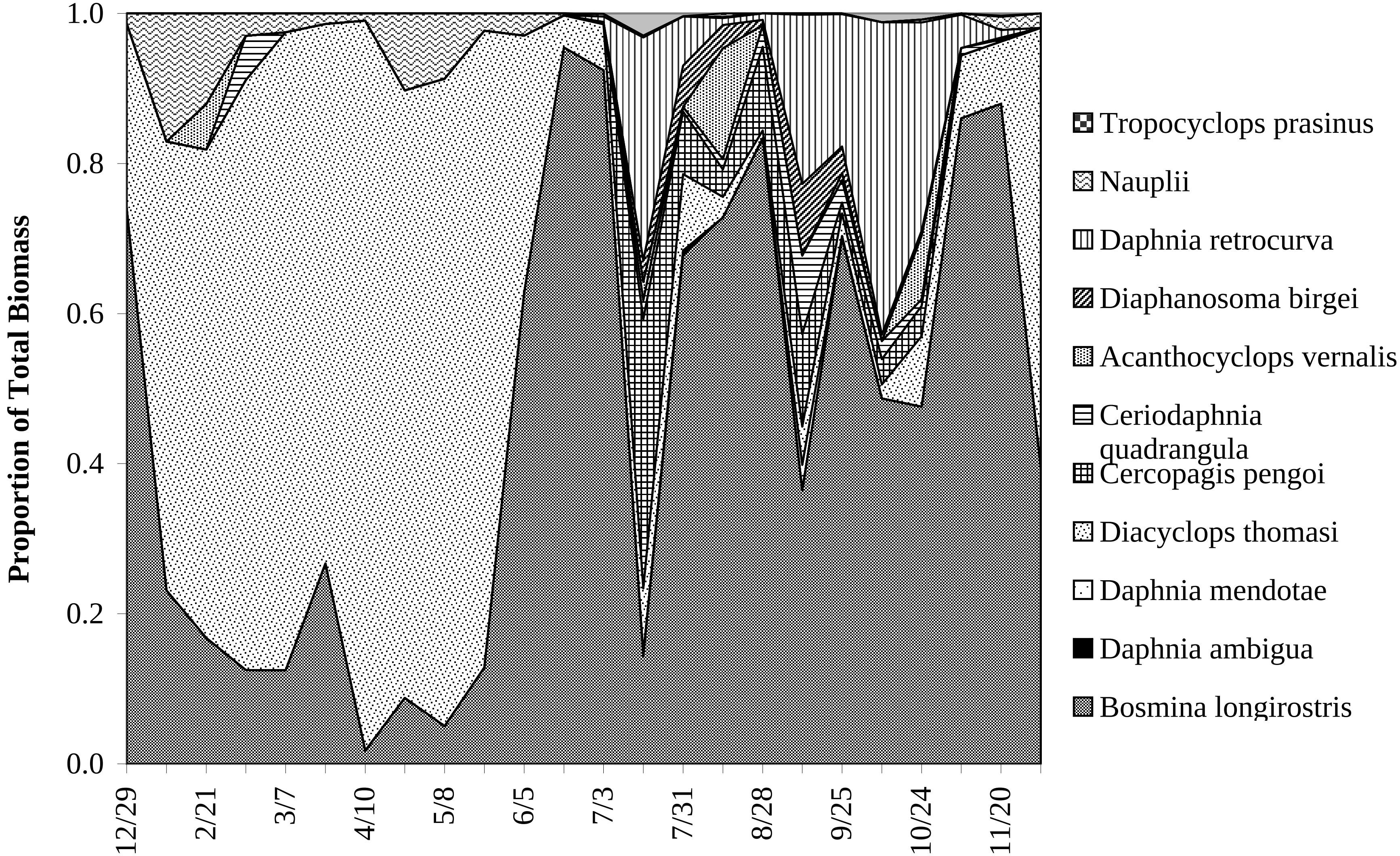



Figure 10. Major zooplankton species proportions of total biomass in Onondaga Lake in 2007.

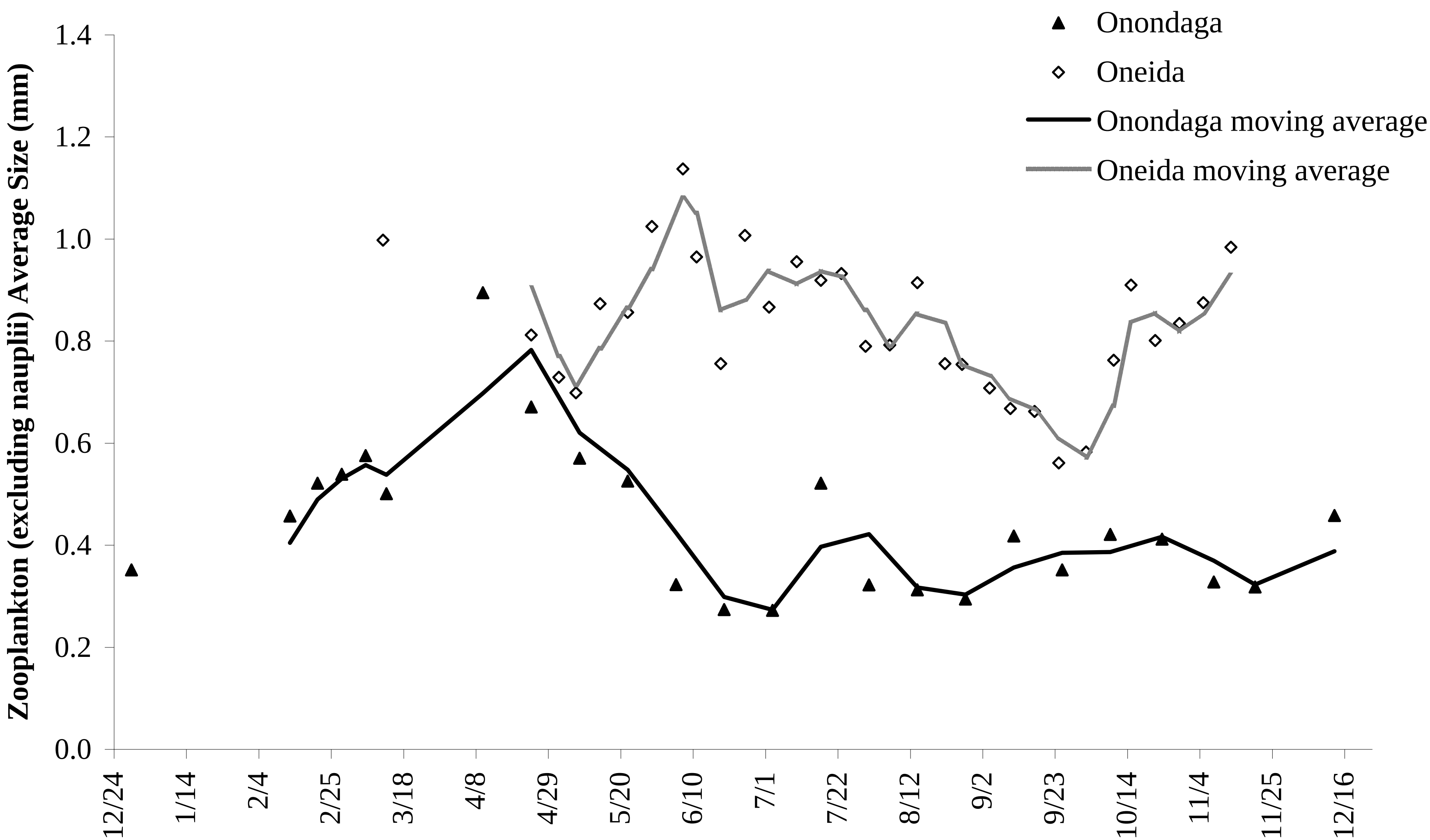



Figure 11. Average zooplankton lengths (mm) in Oneida (April - November 2007) and adjusted average zooplankton (excluding nauplii) lengths in Onondaga Lake (December 2006, and February - December 2007). Averages represent a composite of all samples for each date. Trend lines reflect averages between two adjacent data

# APPENDICES

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 66.667 | 34.0789 | 0.01533621 | 869.3333 | 29625.885 | 0.08725786 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 24 | 5.6798 | 0.00219082 | 5428.6721 | 30833.8231 | 0.09081563 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1106 | Bacillariophyta | Diatoma | vulgaris | 24 | 5.6798 | 0.00219082 | 471.2389 | 2676.5472 | 0.0078833 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1210 | Bacillariophyta | Navicula | . | 8 | 5.6798 | 0.00219082 | 28.2743 | 160.5926 | 0.000473 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1214 | Bacillariophyta | Navicula | cryptocephala | 40 | 2.7431 | 0.00105807 | 2261.9467 | 6204.7108 | 0.01827489 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 8 | 22.7192 | 0.00876329 | 201.0619 | 4567.9731 | 0.01345417 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1315 | Bacillariophyta | Synedra | ulna | 300 | 2.7431 | 0.00105807 | 19200 | 52667.221 | 0.15512208 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 3.7143 | 39.7587 | 0.01533579 | 29.7703 | 1183.6274 | 0.00348617 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 5 | 17.0394 | 0.00657246 | 41.8879 | 713.7459 | 0.00210221 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 2195 | Chlorophyta | Crucigenia | quadrata | 10 | 5.6798 | 0.01314497 | 96 | 545.2617 | 0.00160597 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 7.5 | 22.7192 | 0.05257979 | 45 | 1022.3657 | 0.0030112 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1000538 | Chlorophyta | Monomastix | minuta | 4 | 17.0394 | 0.00657246 | 9.4248 | 160.5932 | 0.000473 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 5.6798 | 0.00219082 | 7.8108 | 44.3639 | 0.00013067 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 8226 | Chlorophyta | Scenedesmus | intermedius | 18 | 11.3596 | 0.01752661 | 75.3982 | 856.4948 | 0.00252266 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 20 | 5.6798 | 0.00876329 | 167.5516 | 951.6612 | 0.00280295 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 8 | 39.7587 | 0.06134311 | 63.6696 | 2531.4184 | 0.00745585 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 647.4983 | 0.24975405 | 30.2431 | 19582.3552 | 0.0576764 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 9511 | Chrysophyta | Polygoniochloris | circularis | 8 | 5.6798 | 0.00219082 | 144.6557 | 821.6168 | 0.00241993 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 16.889 | 68.1577 | 0.02628989 | 479.3838 | 32673.7037 | 0.09623467 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 3069 | Cryptophyta | Cryptomonas | rostratiformis | 56 | 5.6798 | 0.00219082 | 5864.3063 | 33308.1424 | 0.0981033 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12.667 | 596.38 | 0.23003662 | 106.7269 | 63649.7879 | 0.18746931 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 477.104 | 0.1840293 | 61.0865 | 29144.6132 | 0.08584036 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 5023 | Euglenophyta | Euglena | acus | 120 | 2.7431 | 0.00105807 | 3129.0263 | 8583.1833 | 0.02528026 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 4 | 204.4731 | 0.07886968 | 30.2431 | 6183.9016 | 0.0182136 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 5.6798 | 0.00219082 | 603.1858 | 3425.9804 | 0.01009063 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 6034 | Pyrrhophyta | Gymnodinium | sp. 3 | 8 | 5.6798 | 0.00219082 | 96.7611 | 549.5846 | 0.00161871 |
| 060 | Onondaga Lake | 2616358 | 12/29/2006 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 16 | 11.3596 | 0.00438164 | 603.1858 | 6851.9608 | 0.02018125 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 67 | 477.104 | 0.17236269 | 853.8 | 407351.3905 | 0.52044958 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 1523 | Bacillariophyta | Cyclostephanos | damasii | 20 | 18.1754 | 0.00596927 | 4183.0306 | 76028.2137 | 0.0971369 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 7.5 | 333.9728 | 0.10968535 | 172.0022 | 57444.0557 | 0.07339299 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 1315 | Bacillariophyta | Synedra | ulna | 100 | 4.5438 | 0.0014923 | 3600 | 16357.8512 | 0.02089949 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 3.5 | 68.1577 | 0.02238476 | 23.8237 | 1623.7689 | 0.0020746 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 5 | 9.0877 | 0.00298464 | 67.9631 | 617.6279 | 0.00078911 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 10 | 4.5438 | 0.00596927 | 80 | 363.5078 | 0.00046443 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 1000538 | Chlorophyta | Monomastix | minuta | 4 | 4.5438 | 0.0014923 | 9.4248 | 42.8249 | 0.00005471 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 7 | 13.6315 | 0.00895391 | 37.6991 | 513.8969 | 0.00065658 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 32 | 2.1945 | 0.00288289 | 272.2714 | 597.4908 | 0.00076338 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 2492 | Chlorophyta | Schroederia | setigera | 50 | 9.0877 | 0.00298464 | 67.0206 | 609.0628 | 0.00077816 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 8.4 | 36.3508 | 0.04775416 | 70.8115 | 2574.0533 | 0.00328872 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 272.6309 | 0.08953908 | 30.2431 | 8245.2022 | 0.01053442 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 21.8 | 81.7893 | 0.02686173 | 1316.5368 | 107678.5656 | 0.13757475 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 13 | 272.6309 | 0.08953908 | 132.6668 | 36169.063 | 0.04621114 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8.5 | 238.552 | 0.07834668 | 58.9049 | 14051.8815 | 0.01795329 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 12.667 | 18.1754 | 0.08158023 | 7.1558 | 130.0595 | 0.00016617 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 463.4725 | 0.15221642 | 1.7671 | 819.0022 | 0.00104639 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 6 | 245.3678 | 0.08058516 | 105.6832 | 25931.251 | 0.03313088 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 14 | 36.3508 | 0.01193855 | 458.6725 | 16673.1034 | 0.02130227 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 6040 | Pyrrhophyta | Peridinium | . | 15 | 9.0877 | 0.00298464 | 565.4867 | 5138.9707 | 0.00656577 |
| 060 | Onondaga Lake | 2701489 | 2/13/2007 | North | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 16 | 4.5438 | 0.0014923 | 821.0029 | 3730.512 | 0.00476626 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 64.6 | 413.4901 | 0.19554659 | 802.6 | 331867.1772 | 0.56142103 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 1523 | Bacillariophyta | Cyclostephanos | damasii | 24 | 18.1754 | 0.00859546 | 5485.2208 | 99696.0287 | 0.16865617 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 7.6 | 204.4731 | 0.09669885 | 177.8141 | 36358.2075 | 0.06150733 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 1315 | Bacillariophyta | Synedra | ulna | 112 | 1.6459 | 0.00077837 | 4032 | 6636.0698 | 0.01122627 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 5 | 31.8069 | 0.01504203 | 70.6858 | 2248.2985 | 0.00380346 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6 | 4.5438 | 0.00214884 | 105.6832 | 480.2084 | 0.00081237 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 8 | 4.5438 | 0.00644657 | 45.6 | 207.1994 | 0.00035052 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 1000538 | Chlorophyta | Monomastix | minuta | 5 | 9.0877 | 0.00429773 | 20.944 | 190.3327 | 0.00032199 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 9.0877 | 0.00429773 | 7.8108 | 70.9822 | 0.00012008 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 5.5 | 27.2631 | 0.01289319 | 29.6161 | 807.4263 | 0.00136593 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 2367 | Chlorophyta | Oocystis | pusilla | 4 | 9.0877 | 0.00429773 | 8.3776 | 76.1331 | 0.00012879 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 9 | 13.6315 | 0.02578638 | 45.8777 | 625.3838 | 0.00105796 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 190.8416 | 0.09025228 | 30.2431 | 5771.6415 | 0.00976391 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 22 | 36.3508 | 0.01719092 | 1276.9826 | 46419.3142 | 0.07852774 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 3061 | Cryptophyta | Cryptomonas | ovata | 24 | 4.5438 | 0.00214884 | 904.7787 | 4111.1765 | 0.00695489 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 154.4908 | 0.07306136 | 33.5103 | 5177.0336 | 0.00875801 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 186.2978 | 0.08810344 | 117.6788 | 21923.2957 | 0.03708773 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 9 | 9.0877 | 0.02148865 | 2.618 | 23.7916 | 0.00004025 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 627.051 | 0.29654322 | 1.7671 | 1108.0618 | 0.00187451 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 6 | 27.2631 | 0.01289319 | 50.2655 | 1370.3926 | 0.0023183 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 14 | 40.8946 | 0.01933976 | 567.5811 | 23211.018 | 0.03926617 |
| 060 | Onondaga Lake | 2701787 | 2/21/2007 | North | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 16 | 4.5438 | 0.00214884 | 603.1858 | 2740.7843 | 0.0046366 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 65 | 408.9463 | 0.17493292 | 627 | 256409.3182 | 0.46859619 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 1523 | Bacillariophyta | Cyclostephanos | damasii | 20 | 4.5438 | 0.00194368 | 3141.5927 | 14274.9183 | 0.02608787 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 1152 | Bacillariophyta | Fragilaria | crotonensis | 72 | 4.5438 | 0.0038874 | 1809.5574 | 8222.353 | 0.01502661 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 24 | 4.5438 | 0.00194368 | 5428.6721 | 24667.0585 | 0.04507983 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 8.5 | 363.5078 | 0.15549592 | 251.728 | 91505.0928 | 0.16722847 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 3.4 | 72.7016 | 0.0310992 | 21.8864 | 1591.1754 | 0.00290792 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6 | 18.1754 | 0.0077748 | 87.2106 | 1585.0867 | 0.0028968 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 8 | 4.5438 | 0.0077748 | 64 | 290.8062 | 0.00053146 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 13.2 | 22.7192 | 0.038874 | 86.6032 | 1967.5587 | 0.00359578 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 2641 | Chlorophyta | Sphaerocystis | schroeteri | 10 | 4.5438 | 0.0077748 | 134.0413 | 609.0632 | 0.00111308 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 8.6667 | 31.8069 | 0.05442356 | 54.5346 | 1734.5784 | 0.00317 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 1591 | Chrysophyta | Chromulina | . | 4.3333 | 40.8946 | 0.01749328 | 44.1568 | 1805.7759 | 0.00330011 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 163.5785 | 0.06997316 | 30.2431 | 4947.1213 | 0.00904102 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 18.333 | 31.8069 | 0.01360588 | 877.9006 | 27923.3255 | 0.05103077 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 3069 | Cryptophyta | Cryptomonas | rostratiformis | 36 | 4.5438 | 0.00194368 | 3769.9112 | 17129.9018 | 0.03130544 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8.3333 | 95.4208 | 0.04081768 | 74.002 | 7061.33 | 0.01290481 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 14.5 | 249.9116 | 0.10690344 | 115.3226 | 28820.4573 | 0.0526703 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 218.1047 | 0.09329756 | 1.7671 | 385.4128 | 0.00070435 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 5 | 381.6832 | 0.16327072 | 67.9631 | 25940.3732 | 0.04740686 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 6032 | Pyrrhophyta | Gymnodinium | sp. 1 | 40 | 2.1945 | 0.00093873 | 10723.3029 | 23531.9402 | 0.04300537 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 12 | 9.0877 | 0.0038874 | 444.8495 | 4042.6566 | 0.00738808 |
| 060 | Onondaga Lake | 2702230 | 2/28/2007 | North | Grab | Upper Mixed | 0-6m | 6040 | Pyrrhophyta | Peridinium | . | 16 | 4.5438 | 0.00194368 | 603.1858 | 2740.7843 | 0.00500887 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 59.2 | 1011.0061 | 0.17218864 | 532.8 | 538664.0413 | 0.45170745 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 1523 | Bacillariophyta | Cyclostephanos | damasii | 20 | 11.3596 | 0.0019347 | 3141.5927 | 35687.2959 | 0.02992629 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 4272 | Bacillariophyta | Diatoma | vulgaris | 24 | 11.3596 | 0.0019347 | 678.584 | 7708.4556 | 0.00646408 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 1210 | Bacillariophyta | Navicula | . | 52 | 1.9363 | 0.00032978 | 2940.5307 | 5693.7346 | 0.00477459 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 8 | 2658.1508 | 0.45272068 | 201.0619 | 534452.8557 | 0.44817608 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 1000481 | Bacillariophyta | Synedra | radians | 52 | 11.3596 | 0.0038694 | 936 | 10632.6033 | 0.00891618 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 3 | 136.3154 | 0.02321644 | 14.1372 | 1927.1185 | 0.00161602 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 10 | 1.9363 | 0.00032978 | 519.4184 | 1005.7472 | 0.00084339 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 2682 | Chlorophyta | Colonial | . | 20 | 11.3596 | 0.02321644 | 402.1239 | 4567.9743 | 0.00383057 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 2195 | Chlorophyta | Crucigenia | quadrata | 10 | 11.3596 | 0.00773882 | 80 | 908.7695 | 0.00076207 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 6 | 34.0789 | 0.00580412 | 28.2743 | 963.5558 | 0.00080801 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 3 | 56.7981 | 0.00967352 | 9.4248 | 535.3107 | 0.0004489 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 1591 | Chrysophyta | Chromulina | . | 3.5 | 113.5962 | 0.01934704 | 23.8237 | 2706.2815 | 0.00226941 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 25.143 | 15.4904 | 0.00263823 | 1182.4356 | 18316.3521 | 0.01535954 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 3061 | Cryptophyta | Cryptomonas | ovata | 28 | 1.9363 | 0.00032978 | 1876.578 | 3633.6084 | 0.00304703 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 181.7539 | 0.03095526 | 109.8685 | 19969.0287 | 0.01674543 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 22.7192 | 0.0038694 | 33.5103 | 761.3285 | 0.00063843 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 1397.2331 | 0.23796856 | 1.7671 | 2469.0507 | 0.00207047 |
| 060 | Onondaga Lake | 2702621 | 3/7/2007 | North | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 10 | 11.3596 | 0.0019347 | 167.5516 | 1903.3223 | 0.00159607 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 63.6 | 617.9633 | 0.21023862 | 870.2 | 537751.6367 | 0.67594115 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 4272 | Bacillariophyta | Diatoma | vulgaris | 20 | 18.1754 | 0.00475653 | 392.6991 | 7137.4594 | 0.00897162 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 24 | 9.0877 | 0.00237827 | 5428.6721 | 49334.117 | 0.06201182 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 9818 | Bacillariophyta | Stephanodiscus | medius | 16 | 2.1945 | 0.0005743 | 1608.4954 | 3529.7909 | 0.00443686 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 8.1818 | 672.4894 | 0.1759916 | 216.5557 | 145631.4214 | 0.18305527 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 4 | 72.7016 | 0.01902613 | 33.5103 | 2436.2511 | 0.00306231 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 2687 | Chlorophyta | . | . | 4 | 136.3154 | 0.03567397 | 18.8496 | 2569.4913 | 0.00322979 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 7 | 27.2631 | 0.0071348 | 206.019 | 5616.7136 | 0.00706008 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 2682 | Chlorophyta | Colonial | . | 20 | 9.0877 | 0.02378266 | 335.1032 | 3045.3157 | 0.00382789 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 36.3508 | 0.00951307 | 9.4248 | 342.5988 | 0.00043064 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 5.3333 | 27.2631 | 0.0071348 | 38.5718 | 1051.5863 | 0.00132182 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 1000229 | Chlorophyta | Spermatozopsis | exsultans | 5 | 9.0877 | 0.00237827 | 33.5103 | 304.5314 | 0.00038279 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 3 | 136.3154 | 0.03567397 | 9.4248 | 1284.7456 | 0.00161489 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 8.6667 | 63.6139 | 0.06381622 | 61.7881 | 3930.5799 | 0.00494065 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 1590 | Chrysophyta | Chromulina | . | 4 | 190.8416 | 0.04994357 | 37.6991 | 7194.5565 | 0.00904339 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 16 | 9.0877 | 0.00237827 | 603.1858 | 5481.5687 | 0.0068902 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 11.333 | 36.3508 | 0.00951307 | 113.7082 | 4133.3818 | 0.00519556 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 7.3333 | 81.7893 | 0.0214044 | 40.5789 | 3318.918 | 0.0041718 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 8 | 9.0877 | 0.01664786 | 3.6652 | 33.3082 | 0.00004187 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 1090.5234 | 0.2853918 | 1.7671 | 1927.0639 | 0.00242227 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 5.5 | 54.5262 | 0.0142696 | 73.7855 | 4023.2408 | 0.00505712 |
| 060 | Onondaga Lake | 2703034 | 3/13/2007 | North | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 9.0877 | 0.00237827 | 603.1858 | 5481.5687 | 0.0068902 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 9141 | Bacillariophyta | Anomoeoneis | vitrea | 20 | 6.4912 | 0.00203266 | 282.7433 | 1835.3464 | 0.00184572 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 60 | 532.2793 | 0.16667822 | 589 | 313512.4997 | 0.31528525 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1071 | Bacillariophyta | Cyclotella | sp. 1 | 6 | 6.4912 | 0.00203266 | 84.823 | 550.604 | 0.00055372 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1109 | Bacillariophyta | Diatoma | tenuis | 40 | 3.135 | 0.0009817 | 785.3982 | 2462.1869 | 0.00247611 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 9286 | Bacillariophyta | Gomphonema | olivaceum | 20 | 6.4912 | 0.00203266 | 291.292 | 1890.8378 | 0.00190153 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1210 | Bacillariophyta | Navicula | . | 40 | 6.4912 | 0.00203266 | 4021.2386 | 26102.7075 | 0.0262503 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1216 | Bacillariophyta | Navicula | halophila | 24 | 6.4912 | 0.00203266 | 603.1858 | 3915.4062 | 0.00393755 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 9818 | Bacillariophyta | Stephanodiscus | medius | 16 | 6.4912 | 0.00203266 | 1608.4954 | 10441.0827 | 0.01050012 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 7.6 | 77.8945 | 0.02439192 | 177.8141 | 13850.7457 | 0.01392906 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1315 | Bacillariophyta | Synedra | ulna | 76 | 3.135 | 0.0009817 | 2736 | 8577.2331 | 0.00862573 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 8 | 253.1572 | 0.07927378 | 268.0826 | 67867.0462 | 0.0682508 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 2687 | Chlorophyta | . | . | 6 | 12.9824 | 0.00406532 | 28.2743 | 367.0689 | 0.00036914 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6.6667 | 25.9648 | 0.00813063 | 155.4041 | 4035.0431 | 0.00405786 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 6.4912 | 0.00203266 | 9.4248 | 61.1784 | 0.00006152 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 5 | 12.9824 | 0.00406532 | 23.5619 | 305.8905 | 0.00030762 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 2641 | Chlorophyta | Sphaerocystis | schroeteri | 20 | 6.4912 | 0.01626129 | 268.0826 | 1740.1807 | 0.00175002 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 25.9648 | 0.00813063 | 12.5664 | 326.2846 | 0.00032813 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 8 | 38.9473 | 0.04878388 | 49.4361 | 1925.4009 | 0.00193629 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1653 | Chrysophyta | . | . | 6 | 6.4912 | 0.00203266 | 105.6832 | 686.0119 | 0.00068989 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 1590 | Chrysophyta | Chromulina | . | 4 | 12.9824 | 0.00406532 | 33.5103 | 435.0448 | 0.0004375 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 22 | 279.1221 | 0.08740444 | 1208.6754 | 337367.9733 | 0.33927562 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 3069 | Cryptophyta | Cryptomonas | rostratiformis | 40 | 6.4912 | 0.00203266 | 2680.8257 | 17401.8048 | 0.0175002 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 181.7539 | 0.05691451 | 94.2478 | 17129.9055 | 0.01722677 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 636.1387 | 0.19920081 | 58.9049 | 37471.6841 | 0.03768357 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 4062 | Cyanophyta | Aphanothece | nidulans | 20 | 6.4912 | 0.03252259 | 16.7552 | 108.7615 | 0.00010938 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 701.0508 | 0.21952742 | 1.7671 | 1238.8268 | 0.00124583 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 6 | 6.4912 | 0.00203266 | 105.6832 | 686.0119 | 0.00068989 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 6032 | Pyrrhophyta | Gymnodinium | sp. 1 | 24 | 6.4912 | 0.00203266 | 2513.2741 | 16314.192 | 0.01640644 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 14 | 25.9648 | 0.00813063 | 458.6725 | 11909.3596 | 0.0119767 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 6045 | Pyrrhophyta | Peridinium | polonicum | 29 | 19.4736 | 0.00609797 | 4373.097 | 85160.0836 | 0.08564162 |
| 060 | Onondaga Lake | 2700234 | 4/10/2007 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 20 | 6.4912 | 0.00203266 | 1340.4129 | 8700.9027 | 0.0087501 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 1343 | Bacillariophyta | Amphora | pediculus | 12 | 3.7865 | 0.00229237 | 218.6548 | 827.9451 | 0.00093035 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 9141 | Bacillariophyta | Anomoeoneis | vitrea | 20 | 7.5731 | 0.00458481 | 502.6548 | 3806.6446 | 0.00427746 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 62.8 | 471.4242 | 0.28540356 | 696.8 | 328488.3721 | 0.36911706 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 12 | 3.7865 | 0.00229237 | 678.584 | 2569.4852 | 0.00288729 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 9131 | Bacillariophyta | Entomoneis | cf ornata | 64 | 3.7865 | 0.00229237 | 24127.4316 | 91359.4761 | 0.10265916 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 1214 | Bacillariophyta | Navicula | cryptocephala | 40 | 3.7865 | 0.00229237 | 1570.7963 | 5947.8825 | 0.00668354 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 9102 | Bacillariophyta | Navicula | tripunctata | 44 | 2.7431 | 0.00166069 | 2488.1414 | 6825.1819 | 0.00766935 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 9687 | Bacillariophyta | Navicula | viridula | 50 | 3.7865 | 0.00229237 | 1963.4954 | 7434.8532 | 0.00835442 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 24 | 15.1462 | 0.00916962 | 5428.6721 | 82223.5284 | 0.09239325 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 7.5 | 140.102 | 0.08481875 | 172.0022 | 24097.8465 | 0.02707836 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 6 | 22.7192 | 0.01375436 | 150.7964 | 3425.9793 | 0.00384972 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6.3333 | 37.8654 | 0.02292398 | 141.8188 | 5370.0251 | 0.00603421 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 2840 | Chlorophyta | Lobomonas | . | 8 | 3.7865 | 0.00229237 | 130.6903 | 494.864 | 0.00055607 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 3.7865 | 0.00229237 | 9.4248 | 35.6874 | 0.0000401 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 5.5 | 7.5731 | 0.00458481 | 36.9137 | 279.5504 | 0.00031413 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 2488 | Chlorophyta | Scenedesmus | denticulatus | 32 | 3.7865 | 0.00916962 | 1340.4129 | 5075.5266 | 0.00570329 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 9 | 7.5731 | 0.01833917 | 73.7227 | 558.3079 | 0.00062736 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 30.2923 | 0.01833917 | 30.2431 | 916.1336 | 0.00102944 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 23 | 159.0347 | 0.09628074 | 861.4945 | 137007.4891 | 0.1539531 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 11 | 159.0347 | 0.09628074 | 94.2478 | 14988.6673 | 0.01684252 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 477.104 | 0.28884215 | 58.9049 | 28103.7631 | 0.03157974 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 4166 | Cyanophyta | Merismopedia | warmingiana | 6 | 3.7865 | 0.00916962 | 0.5236 | 1.9826 | 0.00000223 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 5 | 3.7865 | 0.00229237 | 41.8879 | 158.6102 | 0.00017823 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 6032 | Pyrrhophyta | Gymnodinium | sp. 1 | 20 | 3.7865 | 0.00229237 | 2073.4512 | 7851.2052 | 0.00882227 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 12 | 7.5731 | 0.00458481 | 444.8495 | 3368.8805 | 0.00378556 |
| 060 | Onondaga Lake | 2704003 | 4/10/2007 | North | Grab | Upper Mixed | 0-6m | 6045 | Pyrrhophyta | Peridinium | polonicum | 38 | 18.9327 | 0.01146199 | 6798.4065 | 128712.1785 | 0.14463179 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 64.2 | 3317.0087 | 0.46335834 | 631.8 | 2095686.112 | 0.51449784 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1109 | Bacillariophyta | Diatoma | tenuis | 53 | 30.2923 | 0.00577034 | 596.9026 | 18081.5628 | 0.00443908 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1160 | Bacillariophyta | Gomphonema | . | 24 | 30.2923 | 0.00384689 | 356.3893 | 10795.8577 | 0.00265042 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1210 | Bacillariophyta | Navicula | . | 12 | 15.1462 | 0.00192345 | 75.3982 | 1141.9931 | 0.00028036 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 26 | 60.5846 | 0.00769378 | 6983.7605 | 423108.5754 | 0.10387455 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 7.2 | 575.554 | 0.07309098 | 154.5664 | 88961.3137 | 0.0218403 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 75 | 30.2923 | 0.00384689 | 412.5 | 12495.5808 | 0.00306771 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 9504 | Bacillariophyta | Synedra | tenera | 50 | 15.1462 | 0.00192345 | 312.5 | 4733.1745 | 0.00116201 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 10 | 60.5846 | 0.00769378 | 900.5899 | 54561.9097 | 0.01339513 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 5.1667 | 106.0231 | 0.01346413 | 72.7319 | 7711.2622 | 0.00189314 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 2082 | Chlorophyta | Chlamydomonas | globosa | 5 | 30.2923 | 0.00384689 | 65.4498 | 1982.6261 | 0.00048674 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 15.1462 | 0.00192345 | 9.4248 | 142.7495 | 0.00003505 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 6 | 30.2923 | 0.00384689 | 12.2741 | 371.8109 | 0.00009128 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 5.75 | 106.0231 | 0.01346413 | 39.9244 | 4232.909 | 0.00103919 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 8399 | Chlorophyta | Scenedesmus | acutus | 16 | 15.1462 | 0.00769378 | 166.6308 | 2523.8165 | 0.00061961 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 8 | 15.1462 | 0.00769378 | 28.0858 | 425.392 | 0.00010444 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1590 | Chrysophyta | Chromulina | . | 4 | 30.2923 | 0.00384689 | 33.5103 | 1015.1046 | 0.00024921 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 1630 | Chrysophyta | Uroglena | . | 5 | 15.1462 | 0.00192345 | 23.5619 | 356.8723 | 0.00008761 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 24.2 | 393.8001 | 0.05000961 | 1175.3745 | 462862.622 | 0.1136343 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 3069 | Cryptophyta | Cryptomonas | rostratiformis | 44 | 15.1462 | 0.00192345 | 4607.6692 | 69788.4883 | 0.0171333 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 7.5 | 1908.416 | 0.2423543 | 29.6357 | 56557.2434 | 0.01388499 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 454.3848 | 0.05770341 | 94.2478 | 42824.7637 | 0.01051362 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 4 | 15.1462 | 0.00192345 | 30.2431 | 458.0668 | 0.00011246 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 6032 | Pyrrhophyta | Gymnodinium | sp. 1 | 20 | 15.1462 | 0.00192345 | 2073.4512 | 31404.8206 | 0.00770999 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 6034 | Pyrrhophyta | Gymnodinium | sp. 3 | 8 | 15.1462 | 0.00192345 | 52.3599 | 793.0513 | 0.0001947 |
| 060 | Onondaga Lake | 2704495 | 4/24/2007 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 32 | 121.1693 | 0.01538758 | 5614.0261 | 680247.4356 | 0.16700299 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 60.889 | 272.6309 | 0.04296282 | 660.6667 | 180118.1266 | 0.11820142 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1109 | Bacillariophyta | Diatoma | tenuis | 54.727 | 151.4616 | 0.02148163 | 662.7333 | 100378.6364 | 0.06587287 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 9045 | Bacillariophyta | Fragilaria | construens | 8 | 15.1462 | 0.00429632 | 100.531 | 1522.6585 | 0.00099924 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1152 | Bacillariophyta | Fragilaria | crotonensis | 108 | 2.1945 | 0.00062247 | 6107.2561 | 13402.1753 | 0.0087951 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 9687 | Bacillariophyta | Navicula | viridula | 50 | 2.1945 | 0.00031124 | 2827.4334 | 6204.7108 | 0.0040718 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 24 | 15.1462 | 0.00214817 | 5428.6721 | 82223.5284 | 0.05395869 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1296 | Bacillariophyta | Stephanodiscus | hantzschii | 10 | 30.2923 | 0.00429632 | 392.6991 | 11895.7657 | 0.00780652 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 7.7 | 2022.0122 | 0.28677972 | 186.3357 | 376773.0526 | 0.24725502 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 71 | 90.877 | 0.01288898 | 341.1875 | 31006.0798 | 0.02034755 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 9504 | Bacillariophyta | Synedra | tenera | 80 | 60.5846 | 0.00859265 | 953.3333 | 57757.3493 | 0.03790291 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 9776 | Bacillariophyta | Synedra | ulna | 240 | 15.1462 | 0.00214817 | 3840 | 58161.2489 | 0.03816796 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1315 | Bacillariophyta | Synedra | ulna | 280 | 15.1462 | 0.00214817 | 17920 | 271419.1613 | 0.17811717 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 4 | 15.1462 | 0.00214817 | 33.5103 | 507.5523 | 0.00033308 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 80 | 15.1462 | 0.00214817 | 75.3982 | 1141.9931 | 0.00074943 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6 | 30.2923 | 0.00429632 | 105.6832 | 3201.389 | 0.00210089 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2682 | Chlorophyta | Colonial | . | 32 | 45.4385 | 0.09451937 | 491.4847 | 22332.3156 | 0.01465545 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 15.1462 | 0.00214817 | 7.8108 | 118.3036 | 0.00007764 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2340 | Chlorophyta | Mougeotia | . | 160 | 2.1945 | 0.00062247 | 4523.8934 | 9927.5372 | 0.00651489 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 4 | 15.1462 | 0.00214817 | 18.8496 | 285.499 | 0.00018736 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 16 | 15.1462 | 0.00859265 | 56.5487 | 856.4956 | 0.00056207 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 5 | 15.1462 | 0.00429632 | 17.017 | 257.7422 | 0.00016914 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 20 | 15.1462 | 0.00859265 | 54.4543 | 824.7735 | 0.00054125 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 9.3333 | 45.4385 | 0.02577795 | 51.8084 | 2354.0947 | 0.00154486 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1653 | Chrysophyta | . | . | 6 | 15.1462 | 0.00214817 | 105.6832 | 1600.6945 | 0.00105045 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1590 | Chrysophyta | Chromulina | . | 4 | 90.877 | 0.01288898 | 33.5103 | 3045.3139 | 0.00199847 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1127 | Chrysophyta | Dinobryon | divergens | 36 | 30.2923 | 0.00429632 | 78.5398 | 2379.1525 | 0.0015613 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1129 | Chrysophyta | Dinobryon | sertularia | 30 | 15.1462 | 0.00214817 | 78.5398 | 1189.5763 | 0.00078065 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 15.1462 | 0.00214817 | 30.2431 | 458.0668 | 0.0003006 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 20.889 | 166.6077 | 0.02362978 | 1019.0396 | 169779.8889 | 0.11141702 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 7.3333 | 2817.1855 | 0.39955825 | 32.1141 | 90471.3766 | 0.05937129 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 30.2923 | 0.00429632 | 94.2478 | 2854.9842 | 0.00187357 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 4 | 30.2923 | 0.00429632 | 11.3228 | 342.9938 | 0.00022509 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 6032 | Pyrrhophyta | Gymnodinium | sp. 1 | 32 | 2.1945 | 0.00031124 | 8471.4093 | 18590.2327 | 0.01219973 |
| 060 | Onondaga Lake | 2705015 | 5/8/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 12 | 2.1945 | 0.00031124 | 201.0619 | 441.2238 | 0.00028955 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 70 | 181.7539 | 0.01580084 | 840 | 152673.2782 | 0.07549218 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1109 | Bacillariophyta | Diatoma | tenuis | 46.2 | 1454.0312 | 0.1264067 | 574.9115 | 835939.2705 | 0.41334593 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 9045 | Bacillariophyta | Fragilaria | construens | 20 | 22.7192 | 0.00790042 | 141.3717 | 3211.8573 | 0.00158816 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1152 | Bacillariophyta | Fragilaria | crotonensis | 96 | 4.3889 | 0.00183146 | 9047.7868 | 39710.1489 | 0.01963543 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 9123 | Bacillariophyta | Nitzschia | palea | 24 | 22.7192 | 0.0019751 | 150.7964 | 3425.9793 | 0.00169404 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 6 | 181.7539 | 0.01580084 | 84.823 | 15416.9113 | 0.00762318 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 78.8 | 1294.9966 | 0.11258098 | 360.2 | 466457.7596 | 0.23064883 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 9776 | Bacillariophyta | Synedra | ulna | 240 | 22.7192 | 0.0019751 | 3840 | 87241.8733 | 0.04313839 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6 | 22.7192 | 0.0019751 | 105.6832 | 2401.0418 | 0.00118724 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 5 | 22.7192 | 0.0019751 | 23.5619 | 535.3084 | 0.00026469 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 10 | 22.7192 | 0.00395021 | 83.7758 | 1903.3223 | 0.00094113 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 16 | 22.7192 | 0.00395021 | 28.2743 | 642.3705 | 0.00031763 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1590 | Chrysophyta | Chromulina | . | 5 | 22.7192 | 0.0019751 | 65.4498 | 1486.9696 | 0.00073526 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1127 | Chrysophyta | Dinobryon | divergens | 30 | 22.7192 | 0.0019751 | 78.5398 | 1784.3644 | 0.00088231 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1128 | Chrysophyta | Dinobryon | divergens | 94.667 | 35.1115 | 0.01220971 | 523.5988 | 18384.3292 | 0.00909048 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 3884.9897 | 0.33774292 | 30.2431 | 117494.1311 | 0.05809719 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1180 | Chrysophyta | Mallomonas | . | 20 | 22.7192 | 0.0019751 | 837.758 | 19033.2232 | 0.00941134 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 1631 | Chrysophyta | Uroglena | . | 5 | 22.7192 | 0.0019751 | 41.8879 | 951.6612 | 0.00047057 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 16 | 68.1577 | 0.00592531 | 477.5221 | 32546.8145 | 0.01609339 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 80 | 3476.0434 | 0.30219103 | 33.5103 | 116483.2568 | 0.05759734 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 408.9463 | 0.03555189 | 1.7671 | 722.649 | 0.00035733 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 14 | 22.7192 | 0.0019751 | 366.5191 | 8327.0346 | 0.00411746 |
| 060 | Onondaga Lake | 2705557 | 5/22/2007 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 52 | 4.3889 | 0.00038155 | 21781.7091 | 95598.5073 | 0.04727048 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1021 | Bacillariophyta | Asterionella | formosa | 64 | 72.7016 | 0.00760349 | 800 | 58161.2489 | 0.02774596 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 12 | 36.3508 | 0.00380175 | 678.584 | 24667.0581 | 0.01176748 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 9363 | Bacillariophyta | Cyclotella | ocellata | 8.3333 | 181.7539 | 0.01900872 | 308.3997 | 56052.8491 | 0.02674014 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1109 | Bacillariophyta | Diatoma | tenuis | 54 | 1181.4004 | 0.12355668 | 557.6327 | 658787.4766 | 0.31427613 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1152 | Bacillariophyta | Fragilaria | crotonensis | 84 | 18.1754 | 0.00570262 | 3166.7254 | 57556.47 | 0.02745745 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1221 | Bacillariophyta | Nitzschia | acicularis | 40 | 18.1754 | 0.00190087 | 141.3717 | 2569.4858 | 0.00122578 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 6 | 18.1754 | 0.00190087 | 84.823 | 1541.6911 | 0.00073547 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1477 | Bacillariophyta | Synedra | filiformis | 84.889 | 708.8402 | 0.0823703 | 790.1111 | 560062.5263 | 0.26717916 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 9776 | Bacillariophyta | Synedra | ulna | 220 | 36.3508 | 0.00380175 | 7920 | 287898.1818 | 0.13734251 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 2683 | Chlorophyta | . | . | 6 | 109.0523 | 0.01140523 | 113.0973 | 12333.5254 | 0.00588374 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 2080 | Chlorophyta | Chlamydomonas | . | 8 | 18.1754 | 0.00190087 | 254.846 | 4631.9255 | 0.00220967 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1000012 | Chlorophyta | Closterium | . | 120 | 18.1754 | 0.00190087 | 804.2477 | 14617.5158 | 0.00697332 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 8101 | Chlorophyta | Pyramichlamys | dissecta | 16 | 18.1754 | 0.00190087 | 418.879 | 7613.2893 | 0.00363194 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 8303 | Chlorophyta | Scenedesmus | opoliensis | 16 | 18.1754 | 0.00760349 | 25.1327 | 456.7966 | 0.00021792 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 21 | 36.3508 | 0.01140523 | 124.0929 | 4510.8738 | 0.00215192 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 2501 | Chlorophyta | Selenastrum | minutum | 6 | 18.1754 | 0.00190087 | 21.1595 | 384.5822 | 0.00018347 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 4580.1983 | 0.47901971 | 30.2431 | 138519.3966 | 0.06608101 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 1631 | Chrysophyta | Uroglena | . | 6 | 572.5248 | 0.05987747 | 50.2655 | 28778.245 | 0.01372873 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 3015 | Cryptophyta | Cryptomonas | erosa | 20.667 | 72.7016 | 0.00760349 | 1083.5004 | 78772.1705 | 0.03757845 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 1181.4004 | 0.12355668 | 33.5103 | 39589.0807 | 0.01888607 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 381.6832 | 0.03991831 | 1.7671 | 674.4724 | 0.00032176 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 18.1754 | 0.00190087 | 603.1858 | 10963.1373 | 0.00522999 |
| 060 | Onondaga Lake | 2705989 | 6/5/2007 | South | Grab | Upper Mixed | 0-3m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 40 | 4.3889 | 0.00045901 | 10723.3029 | 47063.8803 | 0.02245194 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 9363 | Bacillariophyta | Cyclotella | ocellata | 5 | 9.0877 | 0.00356131 | 98.1748 | 892.1827 | 0.00336072 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 70 | 4.5438 | 0.00178064 | 280 | 1272.2773 | 0.00479247 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 4.3333 | 177.2101 | 0.06944551 | 48.8692 | 8660.1136 | 0.03262132 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6 | 13.6315 | 0.00534194 | 128.2335 | 1748.0204 | 0.00658452 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2211 | Chlorophyta | Dictyosphaerium | pulchellum | 6 | 4.5438 | 0.00534194 | 41.8479 | 190.1505 | 0.00071627 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 5 | 4.5438 | 0.00178064 | 11.781 | 53.5311 | 0.00020164 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 77.2454 | 0.03027111 | 7.8108 | 603.3484 | 0.00227272 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 7.5455 | 59.07 | 0.035776 | 98.2105 | 5801.296 | 0.02185259 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2389 | Chlorophyta | Pediastrum | boryanum | 60 | 4.5438 | 0.02849047 | 2434.7047 | 11062.927 | 0.04167235 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 6 | 4.5438 | 0.00356131 | 28.2743 | 128.4741 | 0.00048394 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 28 | 4.5438 | 0.00712262 | 314.1593 | 1427.492 | 0.00537714 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 6 | 127.2277 | 0.04985829 | 32.0285 | 4074.9134 | 0.01534957 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 27.2631 | 0.01068393 | 7.0686 | 192.7118 | 0.00072592 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 1590 | Chrysophyta | Chromulina | . | 4 | 9.0877 | 0.00356131 | 33.5103 | 304.5314 | 0.00114712 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 1123 | Chrysophyta | Dinobryon | . | 10 | 31.8069 | 0.01246456 | 130.8997 | 4163.518 | 0.01568333 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 1128 | Chrysophyta | Dinobryon | divergens | 86.333 | 49.9823 | 0.06855516 | 879.1084 | 43939.8802 | 0.16551478 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 1127 | Chrysophyta | Dinobryon | divergens | 36 | 4.5438 | 0.00178064 | 157.0796 | 713.7458 | 0.00268857 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 790.6295 | 0.30983376 | 30.2431 | 23911.0863 | 0.09006939 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 1569 | Chrysophyta | Kephyrion | gracilis | 8 | 4.5438 | 0.00178064 | 18.8496 | 85.6497 | 0.00032263 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 1631 | Chrysophyta | Uroglena | . | 5 | 13.6315 | 0.00534194 | 41.8879 | 570.9967 | 0.00215086 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 17.2 | 59.07 | 0.02314849 | 704.764 | 41630.4224 | 0.1568154 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 3018 | Cryptophyta | Cryptomonas | lucens | 10 | 13.6315 | 0.00534194 | 118.6824 | 1617.8242 | 0.0060941 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 6 | 776.9979 | 0.30449177 | 22.1657 | 17222.7031 | 0.06487528 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 22.7192 | 0.00890325 | 1.7671 | 40.1472 | 0.00015123 |
| 060 | Onondaga Lake | 2706584 | 6/19/2007 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 50 | 4.5438 | 0.00178064 | 20943.951 | 95166.1208 | 0.35847615 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 9363 | Bacillariophyta | Cyclotella | ocellata | 5 | 18.1754 | 0.00341987 | 98.1748 | 1784.3653 | 0.00776926 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 1109 | Bacillariophyta | Diatoma | tenuis | 60 | 9.0877 | 0.00170993 | 753.9822 | 6851.9604 | 0.02983393 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 1222 | Bacillariophyta | Nitzschia | gracilis | 60 | 9.0877 | 0.00170993 | 376.9911 | 3425.9802 | 0.01491697 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 6 | 36.3508 | 0.00683974 | 84.823 | 3083.3823 | 0.01342527 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 9504 | Bacillariophyta | Synedra | tenera | 60 | 2.1945 | 0.00041292 | 960 | 2106.6888 | 0.00917268 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 3.25 | 1472.2066 | 0.27700926 | 18.9805 | 27943.2176 | 0.12166679 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 5 | 18.1754 | 0.00341987 | 64.9273 | 1180.079 | 0.00513815 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2171 | Chlorophyta | Coelastrum | microporum | 32 | 4.3889 | 0.00660655 | 1436.755 | 6305.8244 | 0.02745601 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 8.2857 | 318.0693 | 0.15389233 | 84.2994 | 26813.0536 | 0.11674597 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2367 | Chlorophyta | Oocystis | pusilla | 4 | 36.3508 | 0.00683974 | 8.3776 | 304.5323 | 0.00132596 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2389 | Chlorophyta | Pediastrum | boryanum | 40 | 2.1945 | 0.00578072 | 1298.1921 | 2848.8404 | 0.01240406 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 16 | 9.0877 | 0.00341987 | 83.7758 | 761.3289 | 0.00331488 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 20 | 18.1754 | 0.01025961 | 92.1534 | 1674.924 | 0.00729274 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 16 | 9.0877 | 0.00683974 | 167.5516 | 1522.6579 | 0.00662976 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 8 | 327.157 | 0.06155761 | 29.0943 | 9518.4046 | 0.04144382 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 3.5 | 163.5785 | 0.03077881 | 6.185 | 1011.7331 | 0.00440516 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 1123 | Chrysophyta | Dinobryon | . | 16 | 45.4385 | 0.00854967 | 209.4395 | 9516.6116 | 0.04143601 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 1128 | Chrysophyta | Dinobryon | divergens | 66.667 | 36.3508 | 0.01595916 | 366.5191 | 13323.2554 | 0.05801042 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 1127 | Chrysophyta | Dinobryon | divergens | 36 | 36.3508 | 0.00683974 | 104.7198 | 3806.6465 | 0.01657441 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 1390.4174 | 0.26161987 | 30.2431 | 42050.5311 | 0.18309105 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 15.778 | 99.9646 | 0.01880926 | 472.6352 | 47246.8107 | 0.20571603 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 7 | 490.7355 | 0.09233642 | 33.5103 | 16444.6951 | 0.07160139 |
| 060 | Onondaga Lake | 2706601 | 6/19/2007 | North | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 81.7893 | 0.01538941 | 1.7671 | 144.5298 | 0.00062929 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 9363 | Bacillariophyta | Cyclotella | ocellata | 5 | 45.4385 | 0.00110791 | 98.1748 | 4460.9133 | 0.00460779 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 24 | 4.3889 | 0.00010701 | 5428.6721 | 23826.0894 | 0.02461057 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 9504 | Bacillariophyta | Synedra | tenera | 60 | 4.3889 | 0.00010701 | 540 | 2370.0249 | 0.00244806 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 2.7 | 37077.7961 | 0.90405269 | 11.8988 | 441181.2807 | 0.45570724 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 2162 | Chlorophyta | Closterium | moniliferum | 52 | 13.1668 | 0.00032104 | 423.1895 | 5572.0537 | 0.00575551 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 45.4385 | 0.00110791 | 7.8108 | 354.9108 | 0.0003666 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 12.333 | 136.3154 | 0.00775524 | 292.6917 | 39898.3941 | 0.04121205 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 12 | 90.877 | 0.00443163 | 12.5664 | 1141.9961 | 0.0011796 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 16 | 13.1668 | 0.00128416 | 134.0413 | 1764.8957 | 0.00182301 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 2488 | Chlorophyta | Scenedesmus | denticulatus | 24 | 45.4385 | 0.00443163 | 418.879 | 19033.2232 | 0.01965989 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 11.333 | 136.3154 | 0.00553965 | 28.2743 | 3854.2233 | 0.00398112 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 8 | 545.2617 | 0.01329489 | 36.1612 | 19717.3177 | 0.02036651 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 1123 | Chrysophyta | Dinobryon | . | 12 | 45.4385 | 0.00110791 | 226.1947 | 10277.9424 | 0.01061635 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 1128 | Chrysophyta | Dinobryon | divergens | 120 | 21.9447 | 0.00428054 | 837.758 | 18384.3274 | 0.01898963 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 1411 | Chrysophyta | Dinobryon | sertularia | 30 | 45.4385 | 0.00221582 | 314.1593 | 14274.9197 | 0.01474492 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 18.571 | 363.5078 | 0.00886326 | 846.1356 | 307576.895 | 0.31770391 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 7 | 1635.7851 | 0.03988468 | 29.3215 | 47963.6735 | 0.04954288 |
| 060 | Onondaga Lake | 2707237 | 7/3/2007 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 22 | 4.3889 | 0.00010701 | 1474.4542 | 6471.2838 | 0.00668435 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 1013 | Bacillariophyta | Achnanthes | minutissima | 12 | 60.5846 | 0.00427152 | 150.7964 | 9135.9447 | 0.0089735 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 12 | 60.5846 | 0.00427152 | 852.9424 | 51675.2033 | 0.0507564 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 9363 | Bacillariophyta | Cyclotella | ocellata | 5 | 121.1693 | 0.00854305 | 98.1748 | 11895.7687 | 0.01168426 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 6 | 181.7539 | 0.01281456 | 84.823 | 15416.9113 | 0.01514279 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 4.2 | 2726.3085 | 0.19221847 | 39.8982 | 108774.8034 | 0.10684075 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6 | 30.2923 | 0.00213576 | 105.6832 | 3201.389 | 0.00314447 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2175 | Chlorophyta | Coelastrum | pseudomicroporum | 20 | 4.3889 | 0.00247554 | 904.7787 | 3971.015 | 0.00390041 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 60.5846 | 0.00427152 | 9.4248 | 570.9981 | 0.00056085 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 60.5846 | 0.00427152 | 7.8108 | 473.2145 | 0.0004648 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 12 | 333.2155 | 0.0391564 | 164.7591 | 54900.2839 | 0.05392414 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2367 | Chlorophyta | Oocystis | pusilla | 4 | 60.5846 | 0.00427152 | 4.7124 | 285.499 | 0.00028042 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2381 | Chlorophyta | Pediastrum | . | 40 | 30.2923 | 0.02349337 | 1090.1595 | 33023.4573 | 0.03243629 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 14.667 | 90.877 | 0.02562913 | 130.5506 | 11864.0405 | 0.01165309 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 28 | 90.877 | 0.02562913 | 329.8672 | 29977.3255 | 0.02944432 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2491 | Chlorophyta | Schroederia | judayi | 20 | 30.2923 | 0.00213576 | 18.8496 | 570.9981 | 0.00056085 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 8 | 121.1693 | 0.00854305 | 23.8044 | 2884.3617 | 0.00283308 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 3 | 30.2923 | 0.00213576 | 5.3014 | 160.5917 | 0.00015774 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 8332 | Chlorophyta | Tetraedron | muticum | 7.6667 | 333.2155 | 0.02349337 | 100.1 | 33354.8704 | 0.03276181 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 2571 | Chlorophyta | Treubaria | setigera | 48 | 4.3889 | 0.00030944 | 121.6 | 533.6945 | 0.00052421 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 1590 | Chrysophyta | Chromulina | . | 4 | 60.5846 | 0.00427152 | 33.5103 | 2030.2093 | 0.00199411 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 1127 | Chrysophyta | Dinobryon | divergens | 40 | 8.7779 | 0.00061889 | 100.531 | 882.4481 | 0.00086676 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 4907.3554 | 0.34599326 | 30.2431 | 148413.6392 | 0.14577479 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 21.111 | 363.5078 | 0.02562913 | 1028.8134 | 373981.7011 | 0.36733217 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 3018 | Cryptophyta | Cryptomonas | lucens | 10 | 30.2923 | 0.00213576 | 94.2478 | 2854.9842 | 0.00280422 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 2817.1855 | 0.19862576 | 33.5103 | 94404.731 | 0.09272618 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 454.3848 | 0.03203642 | 1.7671 | 802.9433 | 0.00078867 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 12 | 4.3889 | 0.00030944 | 201.0619 | 882.4476 | 0.00086676 |
| 060 | Onondaga Lake | 2707686 | 7/17/2007 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 32 | 4.3889 | 0.00030944 | 4825.4863 | 21178.7461 | 0.02080218 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 10 | 21.6374 | 0.00184719 | 392.6991 | 8496.9755 | 0.01162296 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 5.5 | 1514.6159 | 0.12930304 | 66.9552 | 101411.4075 | 0.13872 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 20 | 21.6374 | 0.00184719 | 3141.5927 | 67975.8016 | 0.09298365 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 6 | 86.5495 | 0.00738875 | 84.823 | 7341.3863 | 0.01004223 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 9504 | Bacillariophyta | Synedra | tenera | 50 | 43.2747 | 0.00369437 | 450 | 19473.6324 | 0.02663785 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 131383 | Bacillariophyta | Urosolenia | . | 56 | 21.6374 | 0.00184719 | 549.7787 | 11895.7648 | 0.01627214 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2683 | Chlorophyta | . | . | 5 | 129.8242 | 0.01108312 | 65.4498 | 8496.969 | 0.01162295 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2082 | Chlorophyta | Chlamydomonas | globosa | 6 | 43.2747 | 0.00369437 | 113.0973 | 4894.2561 | 0.00669482 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2162 | Chlorophyta | Closterium | moniliferum | 80 | 43.2747 | 0.00369437 | 825.2194 | 35711.1539 | 0.04884905 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2175 | Chlorophyta | Coelastrum | pseudomicroporum | 20 | 3.135 | 0.00214105 | 904.7787 | 2836.4393 | 0.00387995 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 21.6374 | 0.00184719 | 9.4248 | 203.9279 | 0.00027895 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2363 | Chlorophyta | Oocystis | parva | 7 | 43.2747 | 0.00554156 | 32.9867 | 1427.4908 | 0.00195266 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2462 | Chlorophyta | Quadrigula | lacustris | 16 | 3.135 | 0.00026764 | 45.2389 | 141.8219 | 0.000194 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2483 | Chlorophyta | Scenedesmus | bijuga | 8 | 367.8353 | 0.0753652 | 38.5369 | 14175.2314 | 0.01939021 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 8396 | Chlorophyta | Scenedesmus | bijuga | 12 | 21.6374 | 0.00738875 | 25.1327 | 543.8055 | 0.00074387 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 8303 | Chlorophyta | Scenedesmus | opoliensis | 40 | 43.2747 | 0.01477749 | 138.2301 | 5981.8715 | 0.00818256 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 12 | 43.2747 | 0.00738875 | 67.0206 | 2900.299 | 0.0039673 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 8308 | Chlorophyta | Scenedesmus | serratus | 5.3333 | 108.1868 | 0.01847186 | 27.9253 | 3021.1502 | 0.00413261 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2501 | Chlorophyta | Selenastrum | minutum | 8.6667 | 64.9121 | 0.00554156 | 46.1761 | 2997.388 | 0.00410011 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2538 | Chlorophyta | Staurastrum | hexacerum | 56 | 3.135 | 0.00026764 | 1058.9262 | 3319.6845 | 0.00454097 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2910 | Chlorophyta | Stichococcus | . | 4 | 2466.6601 | 0.21057924 | 7.0686 | 17435.8336 | 0.02385036 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2551 | Chlorophyta | Tetraedron | caudatum | 12 | 3.135 | 0.00026764 | 152.169 | 477.0428 | 0.00065254 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 2554 | Chlorophyta | Tetraedron | minimum | 6 | 21.6374 | 0.00184719 | 54 | 1168.4179 | 0.00159827 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 8332 | Chlorophyta | Tetraedron | muticum | 8 | 108.1868 | 0.00923593 | 102.7 | 11110.7892 | 0.01519838 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 1653 | Chrysophyta | . | . | 6 | 21.6374 | 0.00184719 | 105.6832 | 2286.7064 | 0.00312797 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 1127 | Chrysophyta | Dinobryon | divergens | 36 | 21.6374 | 0.00184719 | 157.0796 | 3398.7893 | 0.00464918 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 1128 | Chrysophyta | Dinobryon | divergens | 132 | 3.135 | 0.00227487 | 1178.0972 | 3693.2801 | 0.00505201 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 1411 | Chrysophyta | Dinobryon | sertularia | 100 | 3.135 | 0.0008029 | 471.2389 | 1477.3121 | 0.00202081 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 3050.8691 | 0.26045327 | 30.2431 | 92267.7387 | 0.12621243 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 3015 | Cryptophyta | Cryptomonas | erosa | 24.857 | 151.4616 | 0.01293031 | 1732.9623 | 262477.2177 | 0.35904086 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 3061 | Cryptophyta | Cryptomonas | ovata | 12 | 43.2747 | 0.00369437 | 201.0619 | 8700.9012 | 0.01190191 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 324.5605 | 0.02770779 | 31.4159 | 10196.3615 | 0.01394754 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 8 | 64.9121 | 0.09974806 | 9.4248 | 611.7836 | 0.00083685 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 4082 | Cyanophyta | Chroococcus | limneticus | 40 | 3.135 | 0.00214105 | 1072.3303 | 3361.7058 | 0.00459846 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 714.0332 | 0.06095715 | 1.7671 | 1261.768 | 0.00172596 |
| 060 | Onondaga Lake | 2708222 | 7/31/2007 | South | Grab | Upper Mixed | 0-3m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 24 | 3.135 | 0.00026764 | 2513.2741 | 7878.9978 | 0.01077763 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 1523 | Bacillariophyta | Cyclostephanos | damasii | 20 | 4.3889 | 0.00018911 | 3141.5927 | 13788.2464 | 0.02261505 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 12 | 4.3889 | 0.00018911 | 678.584 | 2978.2611 | 0.00488485 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 6 | 90.877 | 0.00391568 | 84.823 | 7708.4556 | 0.01264317 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 1091 | Bacillariophyta | Cymbella | microcephala | 12 | 22.7192 | 0.00097892 | 58 | 1317.7158 | 0.00216128 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 7 | 45.4385 | 0.00195784 | 142.9425 | 6495.0893 | 0.01065304 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 51.5 | 136.3154 | 0.00587352 | 302.25 | 41201.3378 | 0.06757714 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 9504 | Bacillariophyta | Synedra | tenera | 70 | 45.4385 | 0.00195784 | 430 | 19538.5445 | 0.03204651 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 4 | 1567.6274 | 0.06754547 | 33.5103 | 52531.6648 | 0.08616078 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2035 | Chlorophyta | Ankistrodesmus | convolutus | 12 | 22.7192 | 0.00097892 | 22.6886 | 515.4677 | 0.00084545 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 34.8 | 181.7539 | 0.00783136 | 32.8359 | 5968.053 | 0.00978861 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 7 | 45.4385 | 0.00195784 | 180.2646 | 8190.9486 | 0.01343454 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2175 | Chlorophyta | Coelastrum | pseudomicroporum | 12 | 22.7192 | 0.00783136 | 268.0826 | 6090.6323 | 0.00998966 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 159.0347 | 0.00685244 | 9.4248 | 1498.8699 | 0.0024584 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 22.7192 | 0.00097892 | 7.8108 | 177.4554 | 0.00029106 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 12 | 45.4385 | 0.00195784 | 515.2212 | 23410.866 | 0.03839777 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 4 | 113.5962 | 0.0097892 | 8.3776 | 951.6634 | 0.00156089 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 12 | 45.4385 | 0.00391568 | 52.3599 | 2379.154 | 0.00390221 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 4 | 181.7539 | 0.01566272 | 8.3776 | 1522.6615 | 0.00249742 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2491 | Chlorophyta | Schroederia | judayi | 27 | 68.1577 | 0.00293676 | 25.4469 | 1734.4025 | 0.00284471 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 12 | 22.7192 | 0.00097892 | 126.9568 | 2884.3617 | 0.00473084 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 2521.8354 | 0.10866011 | 7.0686 | 17825.8457 | 0.02923739 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 8332 | Chlorophyta | Tetraedron | muticum | 6 | 22.7192 | 0.00097892 | 54 | 1226.8388 | 0.00201222 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 1127 | Chrysophyta | Dinobryon | divergens | 32 | 21.9447 | 0.00094555 | 226.1947 | 4963.7693 | 0.00814142 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 9736 | Chrysophyta | Dinobryon | sociale | 50 | 22.7192 | 0.00097892 | 78.5398 | 1784.3644 | 0.00292666 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 3953.1474 | 0.17033206 | 30.2431 | 119555.4316 | 0.19609106 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 22 | 159.0347 | 0.00685244 | 1278.6282 | 203346.2072 | 0.33352205 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 3018 | Cryptophyta | Cryptomonas | lucens | 10 | 22.7192 | 0.00097892 | 167.5516 | 3806.6446 | 0.00624354 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 340.7886 | 0.0146838 | 33.5103 | 11419.9271 | 0.01873061 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 22.7192 | 0.00097892 | 94.2478 | 2141.2382 | 0.00351199 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 4332 | Cyanophyta | Anabaena | aphanizomenoides | 160 | 4.3889 | 0.00605149 | 2010.6193 | 8824.4776 | 0.01447363 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 9.5 | 522.5425 | 0.24766673 | 5.7596 | 3009.6356 | 0.00493631 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 4062 | Cyanophyta | Aphanothece | nidulans | 10 | 408.9463 | 0.17620558 | 10.472 | 4282.4855 | 0.007024 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 4166 | Cyanophyta | Merismopedia | warmingiana | 12.667 | 113.5962 | 0.11747038 | 3.1416 | 356.8738 | 0.00058533 |
| 060 | Onondaga Lake | 2708782 | 8/14/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 13 | 68.1577 | 0.00293676 | 385.3687 | 26265.8494 | 0.04308042 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 1021 | Bacillariophyta | Asterionella | formosa | 60 | 3.6574 | 0.00023436 | 540 | 1975.0208 | 0.00310323 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 6 | 25.2436 | 0.0016176 | 84.823 | 2141.2377 | 0.0033644 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 5.25 | 252.436 | 0.01617595 | 102.1018 | 25774.1675 | 0.04049739 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 80 | 25.2436 | 0.0016176 | 75.3982 | 1903.3218 | 0.00299057 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 2162 | Chlorophyta | Closterium | moniliferum | 64 | 7.3149 | 0.00046873 | 312.4328 | 2285.4121 | 0.00359093 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 2175 | Chlorophyta | Coelastrum | pseudomicroporum | 32 | 3.6574 | 0.0014062 | 1608.4954 | 5882.9849 | 0.00924358 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 50.4872 | 0.00323519 | 9.4248 | 475.8317 | 0.00074765 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 50.4872 | 0.00323519 | 7.8108 | 394.3454 | 0.00061961 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 6 | 25.2436 | 0.0016176 | 50.2655 | 1268.8821 | 0.00199372 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 4 | 25.2436 | 0.00323519 | 8.3776 | 211.4808 | 0.00033229 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 25.5 | 126.218 | 0.02426393 | 112.0501 | 14142.7382 | 0.02222163 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 4.6667 | 151.4616 | 0.01941114 | 15.0098 | 2273.4081 | 0.00357207 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 984.5003 | 0.06308621 | 7.0686 | 6959.0389 | 0.01093432 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 8332 | Chlorophyta | Tetraedron | muticum | 10 | 3.6574 | 0.00023436 | 160 | 585.1913 | 0.00091948 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 1653 | Chrysophyta | . | . | 5 | 25.2436 | 0.0016176 | 64.9273 | 1638.9986 | 0.00257526 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 1128 | Chrysophyta | Dinobryon | divergens | 340 | 3.6574 | 0.0042186 | 1809.5574 | 6618.3583 | 0.01039902 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 6058.4634 | 0.38822281 | 30.2431 | 183226.7151 | 0.28789302 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 18.2 | 302.9232 | 0.01941114 | 829.171 | 251175.1087 | 0.39465621 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 7.3333 | 1767.0518 | 0.11323165 | 32.1141 | 56747.2792 | 0.08916356 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 10 | 176.7052 | 0.01132317 | 94.2478 | 16654.0748 | 0.02616754 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 8 | 252.436 | 0.19411141 | 6.2832 | 1586.1057 | 0.00249215 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 4062 | Cyanophyta | Aphanothece | nidulans | 12 | 75.7308 | 0.05823342 | 12.5664 | 951.6634 | 0.00149529 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 4082 | Cyanophyta | Chroococcus | limneticus | 20 | 25.2436 | 0.00647038 | 536.1651 | 13534.736 | 0.02126631 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 4166 | Cyanophyta | Merismopedia | warmingiana | 8 | 50.4872 | 0.05176304 | 2.0944 | 105.7404 | 0.00016614 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 151.4616 | 0.00970557 | 1.7671 | 267.6478 | 0.00042054 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 6021 | Pyrrhophyta | Glenodinium | quadridens | 20 | 25.2436 | 0.0016176 | 1340.4129 | 33836.8439 | 0.05316578 |
| 060 | Onondaga Lake | 2709397 | 8/28/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 3.6574 | 0.00023436 | 1045.522 | 3823.9402 | 0.00600833 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 9363 | Bacillariophyta | Cyclotella | ocellata | 8 | 28.399 | 0.00314114 | 201.0619 | 5709.9664 | 0.00183996 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 6 | 354.9881 | 0.03926431 | 84.823 | 30111.1549 | 0.00970293 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 1298 | Bacillariophyta | Stephanodiscus | parvus | 8 | 14.1995 | 0.00157057 | 201.0619 | 2854.9832 | 0.00091998 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 131383 | Bacillariophyta | Urosolenia | . | 40 | 340.7886 | 0.03769374 | 565.4867 | 192711.4024 | 0.06209878 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2683 | Chlorophyta | . | . | 3 | 127.7957 | 0.01413515 | 14.1372 | 1806.6736 | 0.00058218 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 40 | 3.4289 | 0.00037926 | 67.0206 | 229.804 | 0.00007405 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2080 | Chlorophyta | Chlamydomonas | . | 10 | 553.7814 | 0.06125232 | 549.3598 | 304225.2513 | 0.0980327 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2171 | Chlorophyta | Coelastrum | microporum | 20 | 28.399 | 0.02512916 | 1206.3716 | 34259.8041 | 0.01103978 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2251 | Chlorophyta | Eudorina | elegans | 37.333 | 10.2866 | 0.01668734 | 2158.1183 | 22199.6276 | 0.00715355 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 113.5962 | 0.01256458 | 9.4248 | 1070.6214 | 0.00034499 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2363 | Chlorophyta | Oocystis | parva | 15.4 | 70.9976 | 0.02041744 | 375.4203 | 26653.9471 | 0.00858889 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2367 | Chlorophyta | Oocystis | pusilla | 3 | 14.1995 | 0.00157057 | 3.5343 | 50.1854 | 0.00001617 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2483 | Chlorophyta | Scenedesmus | bijuga | 20 | 14.1995 | 0.00628229 | 314.1593 | 4460.9124 | 0.00143747 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 8226 | Chlorophyta | Scenedesmus | intermedius | 16 | 14.1995 | 0.00628229 | 13.9487 | 198.0649 | 0.00006382 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 16 | 28.399 | 0.00942343 | 18.8496 | 535.3107 | 0.0001725 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 8308 | Chlorophyta | Scenedesmus | serratus | 4 | 127.7957 | 0.0282703 | 4.6496 | 594.1989 | 0.00019147 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2491 | Chlorophyta | Schroederia | judayi | 48 | 3.4289 | 0.00037926 | 101.8714 | 349.3023 | 0.00011256 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2501 | Chlorophyta | Selenastrum | minutum | 6 | 56.7981 | 0.00628229 | 12.2741 | 697.1455 | 0.00022465 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 1000229 | Chlorophyta | Spermatozopsis | exsultans | 6 | 14.1995 | 0.00157057 | 22.6195 | 321.1861 | 0.0001035 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 2910 | Chlorophyta | Stichococcus | . | 4 | 553.7814 | 0.06125232 | 7.0686 | 3914.4594 | 0.00126138 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 8332 | Chlorophyta | Tetraedron | muticum | 8 | 28.399 | 0.00314114 | 92 | 2612.7124 | 0.00084191 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 1653 | Chrysophyta | . | . | 6 | 28.399 | 0.00314114 | 105.6832 | 3001.3022 | 0.00096713 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 425.9857 | 0.04711717 | 30.2431 | 12883.1284 | 0.00415142 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 3015 | Cryptophyta | Cryptomonas | erosa | 25.8 | 1277.9571 | 0.1413515 | 1504.404 | 1922563.815 | 0.6195216 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 3043 | Cryptophyta | Rhodomonas | minuta | 6 | 1448.3514 | 0.16019837 | 33.5103 | 48534.6903 | 0.01563968 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 3041 | Cryptophyta | Rhodomonas | minuta | 10 | 28.399 | 0.00314114 | 94.2478 | 2676.5477 | 0.00086248 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 4046 | Cyanophyta | Aphanizomenon | issatschenkoi | 280 | 3.4289 | 0.01769867 | 1979.2034 | 6786.4025 | 0.00218683 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 8.6667 | 156.1948 | 0.21883365 | 6.6323 | 1035.9305 | 0.00033382 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 4082 | Cyanophyta | Chroococcus | limneticus | 30 | 56.7981 | 0.03769374 | 494.2772 | 28074.0032 | 0.00904649 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 42.5986 | 0.00471172 | 1.7671 | 75.2759 | 0.00002426 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 6021 | Pyrrhophyta | Glenodinium | quadridens | 40 | 42.5986 | 0.00471172 | 9424.778 | 401482.0742 | 0.12937246 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 12 | 14.1995 | 0.00157057 | 314.1593 | 4460.9124 | 0.00143747 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 6034 | Pyrrhophyta | Gymnodinium | sp. 3 | 8 | 14.1995 | 0.00157057 | 33.5103 | 475.8303 | 0.00015333 |
| 060 | Onondaga Lake | 2710065 | 9/11/2007 | South | Grab | Upper Mixed | 0-3m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 24 | 14.1995 | 0.00157057 | 2513.2741 | 35687.295 | 0.01149977 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 6 | 170.3943 | 0.02279662 | 84.823 | 14453.3543 | 0.00855015 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 9131 | Bacillariophyta | Entomoneis | cf ornata | 40 | 11.3596 | 0.00151977 | 6157.5216 | 69947.0988 | 0.04137849 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 9123 | Bacillariophyta | Nitzschia | palea | 40 | 2.7431 | 0.00036699 | 565.4867 | 1551.1778 | 0.00091763 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 131383 | Bacillariophyta | Urosolenia | . | 40 | 56.7981 | 0.00759887 | 848.23 | 48177.8478 | 0.02850049 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 4.5 | 431.6655 | 0.05775142 | 49.4801 | 21358.853 | 0.01263522 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 54 | 5.4862 | 0.00073398 | 49.5457 | 271.8161 | 0.0001608 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 8.8 | 522.5425 | 0.06990962 | 498.2617 | 260362.8995 | 0.15402245 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 1000012 | Chlorophyta | Closterium | . | 180 | 2.7431 | 0.00036699 | 678.584 | 1861.4132 | 0.00110115 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2171 | Chlorophyta | Coelastrum | microporum | 13.333 | 34.0789 | 0.03039563 | 351.1602 | 11967.1382 | 0.00707938 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2175 | Chlorophyta | Coelastrum | pseudomicroporum | 20 | 2.7431 | 0.00293593 | 2144.6606 | 5882.9851 | 0.00348019 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 6 | 22.7192 | 0.0121582 | 26.91 | 611.3747 | 0.00036167 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2211 | Chlorophyta | Dictyosphaerium | pulchellum | 20 | 11.3596 | 0.0121582 | 519.4184 | 5900.3951 | 0.00349049 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2340 | Chlorophyta | Mougeotia | . | 390 | 45.4385 | 0.04356706 | 12786.2821 | 580989.1681 | 0.3436948 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 9.2857 | 102.2366 | 0.02931051 | 113.7705 | 11631.5057 | 0.00688083 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2381 | Chlorophyta | Pediastrum | . | 44 | 22.7192 | 0.03647459 | 1914.5736 | 43497.653 | 0.02573183 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2385 | Chlorophyta | Pediastrum | simplex | 72 | 2.7431 | 0.00587185 | 9216 | 25280.2661 | 0.01495501 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 12 | 11.3596 | 0.00303954 | 12.5664 | 142.7495 | 0.00008445 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 6 | 45.4385 | 0.01519774 | 14.1372 | 642.3728 | 0.00038001 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 8226 | Chlorophyta | Scenedesmus | intermedius | 14.667 | 34.0789 | 0.0151976 | 20.944 | 713.7476 | 0.00042223 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 16 | 56.7981 | 0.02532932 | 49.5674 | 2815.3339 | 0.00166546 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 5 | 136.3154 | 0.03647459 | 10.472 | 1427.4952 | 0.00084446 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 8 | 113.5962 | 0.01519774 | 38.6822 | 4394.1505 | 0.00259944 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2538 | Chlorophyta | Staurastrum | hexacerum | 50 | 22.7192 | 0.00303954 | 782.466 | 17777.0312 | 0.01051633 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 1874.3371 | 0.25076275 | 7.0686 | 13248.9394 | 0.00783765 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2551 | Chlorophyta | Tetraedron | caudatum | 16 | 11.3596 | 0.00151977 | 64.1963 | 729.2455 | 0.0004314 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 8332 | Chlorophyta | Tetraedron | muticum | 8.4 | 90.877 | 0.0121582 | 123.2 | 11196.0404 | 0.00662322 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 12 | 22.7192 | 0.0121582 | 63.6696 | 1446.5248 | 0.00085572 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 11.3596 | 0.00151977 | 30.2431 | 343.5501 | 0.00020323 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 24.8 | 249.9116 | 0.03343503 | 1327.6371 | 331791.9333 | 0.1962776 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 602.0598 | 0.08054803 | 33.5103 | 20175.2046 | 0.01193501 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 10 | 22.7192 | 0.00303954 | 94.2478 | 2141.2382 | 0.00126669 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 4046 | Cyanophyta | Aphanizomenon | issatschenkoi | 280 | 5.4862 | 0.03425245 | 1979.2034 | 10858.2441 | 0.00642339 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 8.6667 | 45.4385 | 0.06079098 | 5.236 | 237.9159 | 0.00014074 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 4172 | Cyanophyta | Oscillatoria | limnetica | 200 | 2.7431 | 0.01834951 | 344.0672 | 943.8054 | 0.00055833 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 170.3943 | 0.02279662 | 1.7671 | 301.1037 | 0.00017812 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 4 | 102.2366 | 0.01367797 | 30.2431 | 3091.9508 | 0.0018291 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 6021 | Pyrrhophyta | Glenodinium | quadridens | 40 | 11.3596 | 0.00151977 | 9424.778 | 107061.8865 | 0.06333442 |
| 060 | Onondaga Lake | 2710718 | 9/25/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 18 | 45.4385 | 0.0060791 | 1214.7492 | 55196.352 | 0.03265241 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 1343 | Bacillariophyta | Amphora | pediculus | 10 | 11.3596 | 0.00146611 | 182.2124 | 2069.8634 | 0.00110039 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 6 | 204.4731 | 0.02639006 | 84.823 | 17344.0252 | 0.00922051 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 1221 | Bacillariophyta | Nitzschia | acicularis | 80 | 2.4204 | 0.00031239 | 251.3274 | 608.305 | 0.00032339 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 1296 | Bacillariophyta | Stephanodiscus | hantzschii | 16 | 11.3596 | 0.00146611 | 1608.4954 | 18271.8948 | 0.00971378 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 85 | 22.7192 | 0.00293222 | 1185 | 26922.2968 | 0.01431255 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 9776 | Bacillariophyta | Synedra | ulna | 200 | 11.3596 | 0.00146611 | 7200 | 81789.2562 | 0.04348116 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 131383 | Bacillariophyta | Urosolenia | . | 40 | 11.3596 | 0.00146611 | 1130.9734 | 12847.4268 | 0.00683 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 4 | 477.104 | 0.06157682 | 33.5103 | 15987.898 | 0.00849956 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 22 | 45.4385 | 0.00586446 | 20.7345 | 942.1441 | 0.00050087 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 8.5714 | 329.4289 | 0.04251732 | 743.4806 | 244924.0323 | 0.13020758 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2162 | Chlorophyta | Closterium | moniliferum | 60 | 2.4204 | 0.00031239 | 264.824 | 640.9717 | 0.00034076 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2171 | Chlorophyta | Coelastrum | microporum | 20 | 11.3596 | 0.01759337 | 1357.168 | 15416.9113 | 0.00819601 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 6 | 11.3596 | 0.00586446 | 36 | 408.9463 | 0.00021741 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2251 | Chlorophyta | Eudorina | elegans | 36 | 7.2611 | 0.01499433 | 1408.0099 | 10223.7089 | 0.00543517 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 79.5173 | 0.0102628 | 9.4248 | 749.435 | 0.00039842 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 11.3596 | 0.00146611 | 7.8108 | 88.7277 | 0.00004717 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2340 | Chlorophyta | Mougeotia | . | 345 | 45.4385 | 0.05791153 | 11184.0698 | 508187.0835 | 0.27016463 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 16.286 | 90.877 | 0.03015974 | 275.9366 | 25076.277 | 0.01333116 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2381 | Chlorophyta | Pediastrum | . | 32 | 2.4204 | 0.00312382 | 1106.3558 | 2677.7889 | 0.00142358 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 8101 | Chlorophyta | Pyramichlamys | dissecta | 16 | 22.7192 | 0.00293222 | 418.879 | 9516.6116 | 0.00505926 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 15 | 68.1577 | 0.02639006 | 23.0383 | 1570.2379 | 0.00083478 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 102793 | Chlorophyta | Scenedesmus | acutus | 40 | 2.4204 | 0.00249905 | 603.1858 | 1459.932 | 0.00077614 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 10.5 | 56.7981 | 0.01649379 | 118.0715 | 6706.2362 | 0.0035652 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2488 | Chlorophyta | Scenedesmus | denticulatus | 12 | 11.3596 | 0.00586446 | 75.3982 | 856.4948 | 0.00045533 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 8303 | Chlorophyta | Scenedesmus | opoliensis | 17 | 56.7981 | 0.02199172 | 60.7375 | 3449.7743 | 0.00183398 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 4 | 454.3848 | 0.11728918 | 8.3776 | 3806.6537 | 0.00202371 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 8 | 90.877 | 0.01172892 | 54.5518 | 4957.5013 | 0.00263553 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 613.4194 | 0.07917019 | 7.0686 | 4336.0165 | 0.00230513 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2551 | Chlorophyta | Tetraedron | caudatum | 20 | 11.3596 | 0.00146611 | 152.169 | 1728.5819 | 0.00091896 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2554 | Chlorophyta | Tetraedron | minimum | 12 | 11.3596 | 0.00146611 | 432 | 4907.3554 | 0.00260887 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 8332 | Chlorophyta | Tetraedron | muticum | 9 | 79.5173 | 0.0102628 | 193.5 | 15386.6038 | 0.00817989 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 8 | 11.3596 | 0.0102628 | 111.4218 | 1265.7092 | 0.00067288 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 562.3011 | 0.07257267 | 30.2431 | 17005.7295 | 0.00904066 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 25.2 | 340.7886 | 0.04398345 | 1501.2624 | 511613.0627 | 0.27198596 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 3069 | Cryptophyta | Cryptomonas | rostratiformis | 50 | 11.3596 | 0.00146611 | 5235.9878 | 59478.8261 | 0.03162039 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 511.1829 | 0.06597517 | 32.1141 | 16416.1772 | 0.00872724 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 56.7981 | 0.00733057 | 94.2478 | 5353.0955 | 0.00284584 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 4046 | Cyanophyta | Aphanizomenon | issatschenkoi | 170 | 22.7192 | 0.08307974 | 2136.283 | 48534.7216 | 0.02580224 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 8.4 | 68.1577 | 0.07917019 | 4.7124 | 321.1864 | 0.00017075 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 4023 | Cyanophyta | Cylindrospermopsis | raciborskii | 110 | 11.3596 | 0.01343943 | 1382.3008 | 15702.4103 | 0.00834778 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 4172 | Cyanophyta | Oscillatoria | limnetica | 224 | 2.4204 | 0.01749337 | 385.3553 | 932.7019 | 0.00049585 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 68.1577 | 0.00879669 | 1.7671 | 120.4415 | 0.00006403 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 6 | 22.7192 | 0.00293222 | 105.6832 | 2401.0418 | 0.00127645 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 45.4385 | 0.00586446 | 603.1858 | 27407.8433 | 0.01457068 |
| 060 | Onondaga Lake | 2711396 | 10/9/2007 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 30 | 22.7192 | 0.00293222 | 5749.1146 | 130615.5019 | 0.06943838 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 9363 | Bacillariophyta | Cyclotella | ocellata | 12 | 11.3596 | 0.00135459 | 678.584 | 7708.4556 | 0.00800324 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 7 | 170.3943 | 0.02031888 | 142.9425 | 24356.5849 | 0.02528801 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 1221 | Bacillariophyta | Nitzschia | acicularis | 80 | 22.7192 | 0.00270918 | 565.4867 | 12847.4268 | 0.01333873 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 20 | 11.3596 | 0.00135459 | 3141.5927 | 35687.2959 | 0.03705202 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 60 | 22.7192 | 0.00270918 | 240 | 5452.6171 | 0.00566113 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 9504 | Bacillariophyta | Synedra | tenera | 60 | 11.3596 | 0.00135459 | 240 | 2726.3085 | 0.00283057 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 4 | 851.9714 | 0.10159441 | 33.5103 | 28549.8178 | 0.0296416 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 45 | 68.1577 | 0.00812755 | 42.4115 | 2890.6709 | 0.00300121 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 9.5 | 283.9905 | 0.03386481 | 471.8567 | 134002.8074 | 0.13912724 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 1000012 | Chlorophyta | Closterium | . | 180 | 34.0789 | 0.00406378 | 1884.9556 | 64237.1319 | 0.06669364 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2171 | Chlorophyta | Coelastrum | microporum | 30 | 34.0789 | 0.02844644 | 552.9203 | 18842.8917 | 0.01956347 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2180 | Chlorophyta | Cosmarium | . | 10 | 22.7192 | 0.00270918 | 130.8997 | 2973.9414 | 0.00308767 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2195 | Chlorophyta | Crucigenia | quadrata | 7 | 34.0789 | 0.01219133 | 28.61 | 974.9961 | 0.00101228 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 6 | 11.3596 | 0.00541837 | 26.82 | 304.665 | 0.00031632 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2251 | Chlorophyta | Eudorina | elegans | 34 | 22.7192 | 0.02709185 | 1851.1939 | 42057.7145 | 0.04366605 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 22.7192 | 0.00270918 | 9.4248 | 214.1243 | 0.00022231 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2340 | Chlorophyta | Mougeotia | . | 160 | 34.0789 | 0.01300408 | 4523.8934 | 154169.1151 | 0.16006473 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 10.143 | 124.9558 | 0.03618739 | 181.5392 | 22684.3774 | 0.02355186 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2381 | Chlorophyta | Pediastrum | . | 40 | 11.3596 | 0.01083674 | 2450.9229 | 27841.5501 | 0.02890625 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 20 | 22.7192 | 0.01083674 | 25.1327 | 570.9958 | 0.00059283 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 8396 | Chlorophyta | Scenedesmus | bijuga | 16 | 11.3596 | 0.00541837 | 201.0619 | 2283.9866 | 0.00237133 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2488 | Chlorophyta | Scenedesmus | denticulatus | 16 | 22.7192 | 0.01083674 | 54.4543 | 1237.1602 | 0.00128447 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 8303 | Chlorophyta | Scenedesmus | opoliensis | 12 | 11.3596 | 0.00270918 | 16.7552 | 190.3327 | 0.00019761 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 20 | 56.7981 | 0.01806146 | 113.0973 | 6423.7111 | 0.00666936 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 8391 | Chlorophyta | Scenedesmus | semipulcher | 12 | 11.3596 | 0.00270918 | 12.5664 | 142.7495 | 0.00014821 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 4 | 238.552 | 0.05689287 | 8.3776 | 1998.4932 | 0.00207492 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 8 | 68.1577 | 0.00812755 | 50.5844 | 3447.717 | 0.00357956 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2538 | Chlorophyta | Staurastrum | hexacerum | 44 | 5.4862 | 0.00065421 | 804.2477 | 4412.2387 | 0.00458097 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 1329.0754 | 0.15848728 | 7.0686 | 9394.7025 | 0.00975397 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2551 | Chlorophyta | Tetraedron | caudatum | 16 | 11.3596 | 0.00135459 | 285.4358 | 3242.4419 | 0.00336644 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 8332 | Chlorophyta | Tetraedron | muticum | 9.5 | 181.7539 | 0.02167347 | 165 | 29989.3939 | 0.03113623 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 2572 | Chlorophyta | Treubaria | schmidlei | 50 | 11.3596 | 0.00135459 | 249.6 | 2835.3609 | 0.00294379 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 56.7981 | 0.00677296 | 30.2431 | 1717.7505 | 0.00178344 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 14 | 193.1135 | 0.02302806 | 402.1239 | 77655.5624 | 0.08062521 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 3069 | Cryptophyta | Cryptomonas | rostratiformis | 36 | 34.0789 | 0.00406378 | 2412.7432 | 82223.5299 | 0.08536786 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 545.2617 | 0.06502042 | 33.5103 | 18271.8834 | 0.01897062 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 10 | 124.9558 | 0.01490051 | 94.2478 | 11776.81 | 0.01222717 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 4332 | Cyanophyta | Anabaena | aphanizomenoides | 64 | 2.7431 | 0.00261682 | 804.2477 | 2206.1193 | 0.00229048 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 4046 | Cyanophyta | Aphanizomenon | issatschenkoi | 340 | 11.3596 | 0.07676027 | 4272.566 | 48534.7216 | 0.05039075 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 7.25 | 56.7981 | 0.03047832 | 2.3562 | 133.8277 | 0.00013895 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 4172 | Cyanophyta | Oscillatoria | limnetica | 280 | 11.3596 | 0.09482145 | 494.8008 | 5620.7485 | 0.00583569 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 511.1829 | 0.06095665 | 1.7671 | 903.3112 | 0.00093785 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 5 | 11.3596 | 0.00135459 | 41.8879 | 475.8306 | 0.00049403 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 11.3596 | 0.00135459 | 603.1858 | 6851.9608 | 0.00711399 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 6034 | Pyrrhophyta | Gymnodinium | sp. 3 | 20 | 11.3596 | 0.00135459 | 2073.4512 | 23553.6155 | 0.02445434 |
| 060 | Onondaga Lake | 2711412 | 10/9/2007 | North | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 24 | 11.3596 | 0.00135459 | 2513.2741 | 28549.836 | 0.02964162 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 11.333 | 16.5231 | 0.00410402 | 583.289 | 9637.732 | 0.03197057 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 6 | 41.3077 | 0.01026005 | 84.823 | 3503.8435 | 0.01162305 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 9123 | Bacillariophyta | Nitzschia | palea | 8 | 4.1308 | 0.00102601 | 50.2655 | 207.6352 | 0.00068877 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 56 | 4.1308 | 0.00102601 | 504 | 2081.9083 | 0.00690617 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 5.6667 | 289.1539 | 0.07182033 | 97.2148 | 28110.0421 | 0.09324747 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 24 | 4.1308 | 0.00102601 | 22.6195 | 93.436 | 0.00030995 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 7.8333 | 49.5692 | 0.01231205 | 297.4811 | 14745.9139 | 0.04891559 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2162 | Chlorophyta | Closterium | moniliferum | 60 | 1.8287 | 0.00045421 | 507.8273 | 928.6754 | 0.00308063 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 9 | 49.5692 | 0.04924824 | 72 | 3568.9857 | 0.01183915 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2211 | Chlorophyta | Dictyosphaerium | pulchellum | 10 | 4.1308 | 0.00820805 | 111.5944 | 460.9709 | 0.00152915 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2851 | Chlorophyta | Lagerheimia | ciliata | 40 | 4.1308 | 0.00102601 | 402.1239 | 1661.0815 | 0.00551019 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 6 | 8.2615 | 0.002052 | 26.4493 | 218.512 | 0.00072485 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2340 | Chlorophyta | Mougeotia | . | 240 | 8.2615 | 0.00820805 | 12063.7158 | 99664.8831 | 0.33061134 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 12 | 28.9154 | 0.0205198 | 233.3755 | 6748.1444 | 0.02238515 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2371 | Chlorophyta | Pandorina | morum | 70 | 3.6574 | 0.01453503 | 10919.0702 | 39935.9086 | 0.13247659 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2385 | Chlorophyta | Pediastrum | simplex | 40 | 4.1308 | 0.00820805 | 576 | 2379.3238 | 0.00789276 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 8101 | Chlorophyta | Pyramichlamys | dissecta | 16 | 4.1308 | 0.00102601 | 418.879 | 1730.293 | 0.00573978 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 17 | 70.2231 | 0.05232625 | 36.3901 | 2555.4256 | 0.00847693 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 8396 | Chlorophyta | Scenedesmus | bijuga | 16 | 4.1308 | 0.00410402 | 167.5516 | 692.1172 | 0.00229591 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 11 | 8.2615 | 0.00615602 | 115.7153 | 955.9867 | 0.00317123 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2488 | Chlorophyta | Scenedesmus | denticulatus | 16 | 12.3923 | 0.01231205 | 201.0619 | 2491.6217 | 0.00826528 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2487 | Chlorophyta | Scenedesmus | dimorphus | 30 | 8.2615 | 0.01026005 | 486.6679 | 4020.6268 | 0.01333734 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 8303 | Chlorophyta | Scenedesmus | opoliensis | 28 | 24.7846 | 0.02462412 | 159.174 | 3945.0676 | 0.0130867 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 44.4 | 20.6539 | 0.0184681 | 156.6608 | 3235.6491 | 0.01073339 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 8 | 433.7309 | 0.32319154 | 16.7552 | 7267.248 | 0.02410713 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 8 | 16.5231 | 0.00410402 | 29.0943 | 480.7275 | 0.00159468 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2538 | Chlorophyta | Staurastrum | hexacerum | 36 | 8.2615 | 0.002052 | 640.8849 | 5294.6969 | 0.01756373 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 74.3539 | 0.0184681 | 7.0686 | 525.5778 | 0.00174346 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2551 | Chlorophyta | Tetraedron | caudatum | 8 | 4.1308 | 0.00102601 | 59.9879 | 247.7962 | 0.000822 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 2554 | Chlorophyta | Tetraedron | minimum | 8 | 8.2615 | 0.002052 | 128 | 1057.4773 | 0.0035079 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 8332 | Chlorophyta | Tetraedron | muticum | 12 | 4.1308 | 0.00102601 | 300 | 1239.2312 | 0.00411081 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 1590 | Chrysophyta | Chromulina | . | 4 | 4.1308 | 0.00102601 | 33.5103 | 138.4234 | 0.00045918 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 20 | 8.2615 | 0.002052 | 1105.8406 | 9135.9475 | 0.03030604 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 10 | 24.7846 | 0.00615602 | 94.2478 | 2335.8962 | 0.0077487 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 123.9231 | 0.03078014 | 33.5103 | 4152.7008 | 0.01377546 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 4332 | Cyanophyta | Anabaena | aphanizomenoides | 100 | 1.8287 | 0.00757035 | 1256.6371 | 2298.0411 | 0.00762313 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 1000393 | Cyanophyta | Aphanizomenon | gracile | 240 | 4.1308 | 0.04104019 | 1696.46 | 7007.6869 | 0.02324611 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 4046 | Cyanophyta | Aphanizomenon | issatschenkoi | 160 | 4.1308 | 0.02736016 | 2010.6193 | 8305.4069 | 0.02755094 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 4054 | Cyanophyta | Aphanocapsa | delicatissima | 8 | 8.2615 | 0.01641607 | 4.1888 | 34.6059 | 0.0001148 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 4023 | Cyanophyta | Cylindrospermopsis | raciborskii | 240 | 4.1308 | 0.04104019 | 3015.9289 | 12458.1102 | 0.04132642 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 520.4771 | 0.12927662 | 1.7671 | 919.7351 | 0.00305097 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 4.1308 | 0.00102601 | 603.1858 | 2491.6221 | 0.00826528 |
| 060 | Onondaga Lake | 2712072 | 10/24/2007 | South | Grab | Upper Mixed | 0-6m | 6044 | Pyrrhophyta | Peridinium | umbonatum | 16 | 4.1308 | 0.00102601 | 603.1858 | 2491.6221 | 0.00826528 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 14 | 18.9327 | 0.00195054 | 1077.5663 | 20401.2375 | 0.03935622 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 6 | 37.8654 | 0.00390107 | 84.823 | 3211.8565 | 0.00619602 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 9045 | Bacillariophyta | Fragilaria | construens | 60 | 2.7431 | 0.00211954 | 2261.9467 | 6204.7108 | 0.01196957 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 1477 | Bacillariophyta | Synedra | filiformis | 82 | 18.9327 | 0.00195054 | 738 | 13972.3313 | 0.02695416 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 5.1429 | 416.5194 | 0.0429118 | 80.7838 | 33648.0167 | 0.06491071 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6.8571 | 113.5962 | 0.01170322 | 215.5671 | 24487.6011 | 0.04723927 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2171 | Chlorophyta | Coelastrum | microporum | 12 | 18.9327 | 0.01560429 | 268.0826 | 5075.527 | 0.00979125 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2175 | Chlorophyta | Coelastrum | pseudomicroporum | 20 | 2.7431 | 0.00226085 | 904.7787 | 2481.8844 | 0.00478783 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 8 | 75.7308 | 0.03120858 | 64 | 4846.7707 | 0.00934995 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 8041 | Chlorophyta | Monoraphidium | capricornutum | 4 | 37.8654 | 0.00390107 | 7.8108 | 295.759 | 0.00057055 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 10 | 18.9327 | 0.00195054 | 188.4956 | 3568.7303 | 0.00688447 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2371 | Chlorophyta | Pandorina | morum | 48 | 2.7431 | 0.00452169 | 13527.4466 | 37106.9281 | 0.07158333 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 17.333 | 75.7308 | 0.02080598 | 16.7552 | 1268.8846 | 0.00244782 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2488 | Chlorophyta | Scenedesmus | denticulatus | 12.667 | 56.7981 | 0.01170322 | 79.9361 | 4540.2182 | 0.00875858 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 8303 | Chlorophyta | Scenedesmus | opoliensis | 16 | 18.9327 | 0.00780215 | 40.8407 | 773.2246 | 0.00149164 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 4 | 1476.7505 | 0.30428363 | 8.3776 | 12371.6246 | 0.02386622 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 5 | 37.8654 | 0.00390107 | 18.4939 | 700.2789 | 0.00135091 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2538 | Chlorophyta | Staurastrum | hexacerum | 32 | 2.7431 | 0.00028261 | 723.8229 | 1985.5073 | 0.00383026 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 851.9714 | 0.08777412 | 7.0686 | 6022.2452 | 0.01161757 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 10 | 37.8654 | 0.01560429 | 50.6844 | 1919.1849 | 0.00370232 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 23.2 | 94.6635 | 0.00975268 | 1158.6194 | 109678.9571 | 0.21158274 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 1211.6927 | 0.12483431 | 147.6549 | 178912.3621 | 0.34514157 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 851.9714 | 0.08777412 | 46.2076 | 39367.5545 | 0.07594433 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 4170 | Cyanophyta | Oscillatoria | . | 24 | 2.7431 | 0.00226085 | 169.646 | 465.3533 | 0.00089772 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 1931.1352 | 0.19895468 | 1.7671 | 3412.509 | 0.0065831 |
| 060 | Onondaga Lake | 2712611 | 11/8/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 2.7431 | 0.00028261 | 603.1858 | 1654.5896 | 0.00319188 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 1013 | Bacillariophyta | Achnanthes | minutissima | 12 | 4.5438 | 0.0026813 | 56.5487 | 256.9487 | 0.00161271 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 9363 | Bacillariophyta | Cyclotella | ocellata | 10 | 4.5438 | 0.0026813 | 392.6991 | 1784.3648 | 0.0111994 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 9045 | Bacillariophyta | Fragilaria | construens | 8 | 4.5438 | 0.00536267 | 75.3982 | 342.5979 | 0.00215028 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 26 | 4.5438 | 0.0026813 | 6902.0791 | 31361.9953 | 0.1968406 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 5.5 | 49.9823 | 0.02949465 | 89.2736 | 4462.1019 | 0.02800596 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 100 | 2.1945 | 0.00129498 | 167.5516 | 367.6865 | 0.00230775 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 5.5 | 13.6315 | 0.00804397 | 85.3052 | 1162.8415 | 0.00729846 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2175 | Chlorophyta | Coelastrum | pseudomicroporum | 20 | 4.5438 | 0.04290135 | 1047.1976 | 4758.3063 | 0.02986506 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 6 | 4.5438 | 0.01072534 | 60.8 | 276.2659 | 0.00173396 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 6 | 4.5438 | 0.0026813 | 25.1327 | 114.1992 | 0.00071676 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 7 | 9.0877 | 0.00536267 | 47.6475 | 433.006 | 0.00271772 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2371 | Chlorophyta | Pandorina | morum | 26 | 4.5438 | 0.04290135 | 4077.5359 | 18527.7016 | 0.11628737 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 12.5 | 27.2631 | 0.03619797 | 24.1183 | 657.5393 | 0.00412698 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 6 | 9.0877 | 0.01072534 | 20.4204 | 185.5744 | 0.00116474 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2488 | Chlorophyta | Scenedesmus | denticulatus | 14 | 9.0877 | 0.01608801 | 43.9823 | 399.6977 | 0.00250866 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 8226 | Chlorophyta | Scenedesmus | intermedius | 20 | 4.5438 | 0.01072534 | 75.3982 | 342.5979 | 0.00215028 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 8303 | Chlorophyta | Scenedesmus | opoliensis | 40 | 2.1945 | 0.0025899 | 301.5929 | 661.8358 | 0.00415395 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 20 | 4.5438 | 0.01072534 | 134.0413 | 609.0632 | 0.00382273 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 4 | 40.8946 | 0.04826402 | 8.3776 | 342.5988 | 0.00215029 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 6 | 9.0877 | 0.00536267 | 44.6333 | 405.6138 | 0.0025458 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 40.8946 | 0.02413198 | 7.0686 | 289.0678 | 0.00181431 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 10 | 4.5438 | 0.01072534 | 63.6696 | 289.305 | 0.0018158 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 1731 | Chrysophyta | Erkenia | subaequiciliata | 4 | 18.1754 | 0.01072534 | 30.2431 | 549.6801 | 0.00345002 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 22 | 31.8069 | 0.01876931 | 1102.35 | 35062.3726 | 0.22006567 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 286.2624 | 0.16892397 | 58.9049 | 16862.2579 | 0.10583437 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 368.0517 | 0.21718798 | 94.2478 | 34688.0586 | 0.21771632 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 4321 | Cyanophyta | Synechococcus | elongatus | 3 | 4.5438 | 0.0026813 | 1.5708 | 7.1375 | 0.0000448 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 395.3147 | 0.23327593 | 1.7671 | 698.5607 | 0.00438445 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 4 | 22.7192 | 0.01340664 | 30.2431 | 687.1002 | 0.00431252 |
| 060 | Onondaga Lake | 2712958 | 11/20/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 4.5438 | 0.0026813 | 603.1858 | 2740.7843 | 0.01720227 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 24 | 2.7431 | 0.00074552 | 5428.6721 | 14891.3059 | 0.03373729 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 9363 | Bacillariophyta | Cyclotella | ocellata | 6 | 7.0998 | 0.00192958 | 84.823 | 602.2231 | 0.00136438 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 1720 | Bacillariophyta | Gyrosigma | . | 90 | 2.7431 | 0.00074552 | 12960 | 35550.3742 | 0.08054185 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 28 | 7.0998 | 0.00192958 | 8620.5302 | 61203.7112 | 0.13866128 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 9818 | Bacillariophyta | Stephanodiscus | medius | 24 | 7.0998 | 0.00192958 | 5428.6721 | 38542.2789 | 0.08732022 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 9776 | Bacillariophyta | Synedra | ulna | 216 | 2.7431 | 0.00074552 | 7776 | 21330.2245 | 0.04832511 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 5.1429 | 49.6983 | 0.01350698 | 76.7446 | 3814.0787 | 0.00864106 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 6 | 42.5986 | 0.01157743 | 100.0786 | 4263.2053 | 0.00965859 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2171 | Chlorophyta | Coelastrum | microporum | 16 | 2.7431 | 0.00596412 | 2144.6606 | 5882.9851 | 0.01332831 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 6.6667 | 21.2993 | 0.02315483 | 49.4733 | 1053.7459 | 0.00238733 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2853 | Chlorophyta | Lagerheimia | quadriseta | 8 | 7.0998 | 0.00192958 | 67.0206 | 475.8303 | 0.00107803 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2861 | Chlorophyta | Monomastix | astigmata | 4 | 35.4988 | 0.00964785 | 9.4248 | 334.5692 | 0.00075799 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2340 | Chlorophyta | Mougeotia | . | 80 | 7.0998 | 0.00385913 | 4021.2386 | 28549.8363 | 0.06468165 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2363 | Chlorophyta | Oocystis | parva | 16.5 | 28.399 | 0.01543656 | 289.0265 | 8208.0772 | 0.01859597 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 17.333 | 21.2993 | 0.01543675 | 34.5575 | 736.0501 | 0.00166757 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2483 | Chlorophyta | Scenedesmus | bijuga | 5 | 7.0998 | 0.00385913 | 17.017 | 120.8166 | 0.00027372 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2488 | Chlorophyta | Scenedesmus | denticulatus | 16 | 21.2993 | 0.02315483 | 128.4562 | 2736.0253 | 0.00619866 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 8226 | Chlorophyta | Scenedesmus | intermedius | 20 | 14.1995 | 0.01543656 | 25.1327 | 356.8724 | 0.00080852 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 8303 | Chlorophyta | Scenedesmus | opoliensis | 50 | 7.0998 | 0.00771827 | 268.0826 | 1903.3226 | 0.00431211 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 30 | 7.0998 | 0.00192958 | 50.2655 | 356.8731 | 0.00080852 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 5.4 | 170.3943 | 0.09261938 | 22.0435 | 3756.0864 | 0.00850968 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2491 | Chlorophyta | Schroederia | judayi | 40 | 7.0998 | 0.00192958 | 67.0206 | 475.8303 | 0.00107803 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2501 | Chlorophyta | Selenastrum | minutum | 7 | 21.2993 | 0.00578871 | 79.348 | 1690.0557 | 0.00382894 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2538 | Chlorophyta | Staurastrum | hexacerum | 40 | 7.0998 | 0.00192958 | 613.2389 | 4353.8501 | 0.00986395 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 681.5771 | 0.18523874 | 7.0686 | 4817.7961 | 0.01091505 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 8332 | Chlorophyta | Tetraedron | muticum | 12 | 7.0998 | 0.00192958 | 424.8 | 3015.9788 | 0.00683291 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 2561 | Chlorophyta | Tetrastrum | staurogeniaeforme | 12 | 7.0998 | 0.00771827 | 63.6696 | 452.039 | 0.00102413 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 25 | 56.7981 | 0.01543656 | 1206.3716 | 68519.6082 | 0.15523595 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 553.7814 | 0.15050648 | 33.5103 | 18557.3816 | 0.04204304 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 11 | 851.9714 | 0.23154843 | 117.6788 | 100258.9742 | 0.2271437 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 404.6864 | 0.1099855 | 1.7671 | 715.1214 | 0.00162016 |
| 060 | Onondaga Lake | 2712974 | 11/20/2007 | North | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 4 | 127.7957 | 0.03473226 | 30.2431 | 3864.9385 | 0.00875629 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 1013 | Bacillariophyta | Achnanthes | minutissima | 12 | 5.6798 | 0.00186255 | 75.3982 | 428.2474 | 0.00176711 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 9212 | Bacillariophyta | Cocconeis | placentula | 20 | 5.6798 | 0.00186255 | 251.3274 | 1427.4917 | 0.00589037 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 1076 | Bacillariophyta | Cyclotella | meneghiniana | 10 | 5.6798 | 0.00186255 | 392.6991 | 2230.4561 | 0.00920371 |

| Job ID | Lake | Site | Date | Station | Sample Type | Depth | Depth Note | Taxa Code | Division | Genus | Species | GALD | Concentration (natural unit/ml) | Relative Concentration (%) | Biovolume (um3/unit) | Total Biovolume (um3/ml) | Relative Total Biovolume (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 9363 | Bacillariophyta | Cyclotella | ocellata | 8 | 5.6798 | 0.00186255 | 201.0619 | 1141.9933 | 0.0047123 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 9361 | Bacillariophyta | Cyclotella | pseudostelligera | 6 | 5.6798 | 0.00186255 | 84.823 | 481.7785 | 0.001988 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 1210 | Bacillariophyta | Navicula | . | 24 | 5.6798 | 0.00186255 | 603.1858 | 3425.9804 | 0.01413689 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 1222 | Bacillariophyta | Nitzschia | gracilis | 40 | 5.6798 | 0.00186255 | 565.4867 | 3211.8567 | 0.01325334 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 1468 | Bacillariophyta | Stephanodiscus | alpinus | 20 | 16.4585 | 0.00539716 | 3141.5927 | 51705.9241 | 0.21335824 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 9818 | Bacillariophyta | Stephanodiscus | medius | 16 | 5.6798 | 0.00186255 | 1608.4954 | 9135.9474 | 0.03769838 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 2683 | Chlorophyta | . | . | 6 | 34.0789 | 0.01117533 | 113.0973 | 3854.2267 | 0.015904 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 1000031 | Chlorophyta | Ankistrodesmus | falcatus | 30 | 5.6798 | 0.00186255 | 28.2743 | 160.5926 | 0.00066267 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 2080 | Chlorophyta | Chlamydomonas | . | 10 | 5.6798 | 0.00186255 | 502.8643 | 2856.1734 | 0.01178565 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 2193 | Chlorophyta | Crucigenia | tetrapedia | 8 | 5.6798 | 0.0074502 | 60.8 | 345.3324 | 0.00142497 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 2484 | Chlorophyta | Scenedesmus | abundans | 16 | 5.6798 | 0.00186255 | 50.2655 | 285.4985 | 0.00117808 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 2884 | Chlorophyta | Scenedesmus | quadricauda | 16 | 5.6798 | 0.0074502 | 56.5487 | 321.1858 | 0.00132533 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 8308 | Chlorophyta | Scenedesmus | serratus | 6 | 11.3596 | 0.0074502 | 28.2743 | 321.1853 | 0.00132533 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 2910 | Chlorophyta | Stichococcus | . | 4 | 408.9463 | 0.13410376 | 7.0686 | 2890.6777 | 0.01192803 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 1180 | Chrysophyta | Mallomonas | . | 16 | 5.6798 | 0.00186255 | 1206.3716 | 6851.9608 | 0.02827379 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 3020 | Cryptophyta | Chroomonas | . | 6 | 5.6798 | 0.00186255 | 94.2478 | 535.3095 | 0.00220889 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 3015 | Cryptophyta | Cryptomonas | erosa | 20 | 62.4779 | 0.02048807 | 898.4955 | 56136.1156 | 0.23163888 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 3069 | Cryptophyta | Cryptomonas | rostratiformis | 36 | 5.6798 | 0.00186255 | 3769.9112 | 21412.3773 | 0.08835558 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 3043 | Cryptophyta | Rhodomonas | minuta | 8 | 567.9809 | 0.1862552 | 33.5103 | 19033.2119 | 0.07853824 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 3041 | Cryptophyta | Rhodomonas | minuta | 12 | 363.5078 | 0.11920334 | 94.2478 | 34259.8109 | 0.14136896 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 4285 | Cyanophyta | Synechocystis | . | 1.5 | 1363.1543 | 0.44701252 | 1.7671 | 2408.8299 | 0.00993974 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 7140 | Miscellaneous | . | . | 6 | 68.1577 | 0.02235062 | 105.6832 | 7203.1253 | 0.02972282 |
| 060 | Onondaga Lake | 2713469 | 12/13/2007 | South | Grab | Upper Mixed | 0-6m | 6033 | Pyrrhophyta | Gymnodinium | sp. 2 | 16 | 17.0394 | 0.00558765 | 603.1858 | 10277.9412 | 0.04241068 |

Appendix B. Abundance (#/L) x $10^{-3}$ and biomass (µg/L) of microflagellates, Cyanophyta, Chlorophyta, Pyrrophyta, Cryptophyta, Bacillariophyta Euglenophyta, and Chrysophyta for each sampling date at both north ("N") and south ("S") stations, when taken. Samples taken were integrated upper mixed layer samples. (Data for the sample collected 12/28/06 were received after the 2006 report was completed.)

| Date | Depth | Station | Variable | Bacillario | Chloro | Chryso | Crypto | Eugleno | Cyano | Misc. Micro | Pyrrho |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12/28/06 | UML | S | Abund | 79.324 | 164.71 | 653.18 | 1147.3 | 2.7431 | | 204.47 | 22.719 |
| | | | BM | 126.74 | 8.0095 | 20.404 | 158.78 | 8.5832 | | 6.1839 | 10.828 |
| 02/13/07 | UML | N | Abund | 833.80 | 147.60 | 272.63 | 592.97 | | 481.65 | 245.37 | 49.982 |
| | | | BM | 557.18 | 5.3185 | 8.2452 | 157.90 | | 0.94906 | 25.931 | 25.543 |
| 02/21/07 | UML | N | Abund | 637.78 | 109.05 | 190.84 | 381.68 | | 636.14 | 27.263 | 45.438 |
| | | | BM | 474.56 | 4.0806 | 5.7716 | 77.631 | | 1.1319 | 1.3704 | 25.952 |
| 02/28/07 | UML | N | Abund | 786.09 | 154.49 | 204.47 | 381.68 | | 218.10 | 381.68 | 15.826 |
| | | | BM | 395.08 | 7.7783 | 4.9471 | 80.935 | | 0.38541 | 25.940 | 30.315 |
| 03/07/07 | UML | N | Abund | 3705.2 | 251.85 | 113.60 | 221.90 | | 1397.2 | | 11.360 |
| | | | BM | 1132.8 | 7.9814 | 2.7063 | 42.680 | | 2.4691 | | 1.9033 |
| 03/13/07 | UML | N | Abund | 1319.9 | 518.00 | 190.84 | 127.23 | | 1099.6 | 54.526 | 9.0877 |
| | | | BM | 743.38 | 18.146 | 7.1946 | 12.934 | | 1.9604 | 4.0232 | 5.4816 |
| 04/10/07 | UML | S | Abund | 655.39 | 382.98 | 19.474 | 1103.5 | | 707.54 | 6.4912 | 58.421 |
| | | | BM | 383.14 | 76.322 | 1.1211 | 409.37 | | 1.3476 | 0.68601 | 122.08 |
| 04/10/07 | UML | N | Abund | 655.92 | 87.090 | 30.292 | 795.17 | | 3.7865 | 3.7865 | 30.292 |
| | | | BM | 462.22 | 15.240 | 0.91613 | 180.10 | | 0.00198 | 0.15861 | 139.93 |
| 04/24/07 | UML | S | Abund | 4074.3 | 378.65 | 45.439 | 2771.7 | | | 15.146 | 151.46 |
| | | | BM | 2644.2 | 71.952 | 1.3720 | 632.03 | | | 0.45807 | 681.04 |
| 05/08/07 | UML | S | Abund | 2692.8 | 229.39 | 166.61 | 3014.1 | | | 30.292 | 4.3890 |
| | | | BM | 1190.9 | 40.951 | 8.6728 | 263.11 | | | 0.34299 | 19.031 |
| 05/22/07 | UML | S | Abund | 3185.1 | 90.877 | 4011.0 | 3544.2 | | 408.95 | | 27.108 |
| | | | BM | 1516.8 | 5.4820 | 159.13 | 149.03 | | 0.00072 | | 103.93 |
| 06/05/07 | UML | S | Abund | 2271.9 | 236.28 | 5152.7 | 1254.1 | | 381.68 | | 22.564 |
| | | | BM | 1419.4 | 44.549 | 167.30 | 118.36 | | 0.67447 | | 58.027 |
| 06/19/07 | UML | S | Abund | 13.632 | 504.37 | 904.23 | 849.70 | | 22.719 | | 4.5438 |
| | | | BM | 2.1645 | 33.943 | 73.689 | 60.471 | | | | 95.166 |
| 06/19/07 | UML | N | Abund | 74.896 | 2378.5 | 1508.6 | 590.70 | | 81.789 | | 0 |
| | | | BM | 17.252 | 79.885 | 68.697 | 47.247 | | 0.14453 | | |
| 07/03/07 | UML | S | Abund | 54.216 | 38104 | 112.82 | 1999.3 | | | | 4.3889 |
| | | | BM | 30.657 | 532.52 | 42.937 | 355.54 | | | | 6.4713 |
| 07/17/07 | UML | S | Abund | 424.09 | 4007.4 | 4976.7 | 3211.0 | | 454.38 | | 8.7778 |
| | | | BM | 88.124 | 254.57 | 151.33 | 471.24 | | 0.80294 | | 22.061 |
| 07/31/07 | UML | S | Abund | 1709.4 | 3539.4 | 3100.4 | 519.30 | | 782.08 | | 3.1350 |
| | | | BM | 216.59 | 113.52 | 103.12 | 281.37 | | 5.2353 | | 7.8790 |
| 08/14/07 | UML | S | Abund | 349.57 | 5043.7 | 3997.8 | 545.26 | | 1049.5 | | 68.158 |
| | | | BM | 93.028 | 125.68 | 126.30 | 220.71 | | 16.473 | | 26.266 |
| 08/28/07 | UML | S | Abund | 28.901 | 1706.0 | 6087.4 | 2246.7 | | 555.36 | | 28.901 |
| | | | BM | 4.1163 | 62.157 | 191.48 | 73.401 | | 16.446 | | 37.661 |
| 09/11/07 | UML | S | Abund | 738.38 | 1763.7 | 454.38 | 2754.7 | | 259.02 | | 85.197 |
| | | | BM | 231.39 | 404.18 | 15.884 | 1973.8 | | 29.185 | | 442.11 |
| 09/25/07 | UML | S | Abund | 241.30 | 3626.1 | 11.360 | 874.69 | | 224.06 | 102.24 | 56.798 |
| | | | BM | 134.13 | 1024.1 | 0.34355 | 354.11 | | 12.341 | | 162.26 |
| 10/09/07 | UML | S | Abund | 275.05 | 2604.5 | 562.30 | 920.13 | | 172.81 | 22.719 | 68.158 |
| | | | BM | 159.85 | 885.27 | 17.006 | 592.86 | | 65.611 | 2.4010 | 27.408 |
| 10/09/07 | UML | N | Abund | 249.91 | 3538.3 | 56.798 | 897.41 | | 593.44 | 11.360 | 34.079 |
| | | | BM | 88.779 | 565.77 | 1.7178 | 189.93 | | 57.399 | 0.47583 | 58.955 |
| 10/24/07 | UML | S | Abund | 66.092 | 1158.0 | 4.1308 | 156.97 | | 542.96 | | 8.2616 |
| | | | BM | 15.431 | 231.54 | 725.52 | 15.625 | | 31.024 | | 4.9832 |
| 11/08/07 | UML | S | Abund | 78.474 | 3245.7 | | 2158.3 | | 1933.9 | | 2.7431 |
| | | | BM | 43.790 | 141.09 | | 327.96 | | 3.8779 | | 1.6546 |
| 11/20/07 | UML | S | Abund | 18.175 | 245.21 | 18.175 | 686.12 | | 399.86 | 22.719 | 4.5438 |
| | | | BM | 33.746 | 34.285 | 0.54968 | 86.613 | | 0.70570 | 0.68710 | 2.7408 |
| 11/20/07 | UML | N | Abund | 29.529 | 1174.2 | 0 | 1462.6 | 0 | 404.69 | 127.80 | 0 |
| | | | BM | 172.12 | 77.354 | | 187.34 | | 0.71512 | 3.8649 | |
| 12/13/07 | UML | S | Abund | 61.897 | 482.78 | 5.6798 | 1005.3 | | 1363.2 | 68.158 | 17.039 |
| | | | BM | 73.190 | 11.035 | 6.8520 | 131.38 | | 2.4088 | 7.2031 | 10.278 |

Appendix C (A). Summary statistics for the zooplankton community of Onondaga Lake sampled 12/29/06 through 12/13/07. Density (#/L), average size (mm), and biomass (μg/L) of the total zooplankton community and density and biomass of cladocerans and copepods.

## (A). Total Zooplankton Community, Cladocerans and Copepods

| | | Total Zooplankton Community | | | Cladocerans | | Copepods | |
|---|---|---|---|---|---|---|---|---|
| **Site** | **Date** | **Density** | **Size** | **Biomass** | **Density** | **Biomass** | **Density** | **Biomass** |
| North Integrated | 4/10/07 | 10.427 | 0.338 | 12.375 | 0.282 | 0.366 | 10.145 | 12.008 |
| North Integrated | 6/19/07 | 237.003 | 0.313 | 199.329 | 200.839 | 156.614 | 36.164 | 42.715 |
| North Integrated | 10/9/07 | 34.026 | 0.419 | 40.562 | 33.405 | 39.768 | 0.621 | 0.794 |
| North Integrated | 11/20/07 | 22.922 | 0.294 | 17.630 | 16.072 | 15.195 | 6.850 | 2.435 |
| South Integrated | 4/10/07 | 16.252 | 0.571 | 46.448 | 0.431 | 0.760 | 15.822 | 45.688 |
| South Integrated | 4/24/07 | 20.856 | 0.329 | 22.531 | 0.115 | 0.176 | 20.741 | 22.355 |
| South Integrated | 5/8/07 | 39.127 | 0.389 | 40.874 | 0.498 | 0.645 | 38.628 | 40.228 |
| South Integrated | 5/22/07 | 24.299 | 0.468 | 32.884 | 1.882 | 1.606 | 22.417 | 31.278 |
| South Integrated | 6/5/07 | 113.955 | 0.329 | 94.551 | 69.391 | 49.382 | 44.563 | 45.169 |
| South Integrated | 6/19/07 | 396.883 | 0.294 | 313.963 | 371.592 | 278.717 | 25.292 | 35.246 |
| South Integrated | 7/3/07 | 318.505 | 0.278 | 214.580 | 294.316 | 199.297 | 24.189 | 15.283 |
| South Integrated | 7/17/07 | 12.274 | 0.467 | 16.754 | 9.353 | 12.723 | 2.921 | 4.031 |
| South Integrated | 7/31/07 | 14.803 | 0.363 | 15.100 | 13.564 | 14.035 | 1.239 | 1.064 |
| South Integrated | 8/14/07 | 12.217 | 0.298 | 9.327 | 11.275 | 8.225 | 0.943 | 1.103 |
| South Integrated | 8/28/07 | 27.824 | 0.323 | 26.719 | 27.488 | 26.539 | 0.335 | 0.181 |
| South Integrated | 9/11/07 | 17.611 | 0.352 | 14.815 | 13.790 | 12.415 | 3.821 | 2.400 |
| South Integrated | 9/25/07 | 61.330 | 0.357 | 58.117 | 57.350 | 53.806 | 3.980 | 4.311 |
| South Integrated | 10/9/07 | 30.967 | 0.456 | 36.107 | 30.267 | 35.491 | 0.700 | 0.617 |
| South Integrated | 10/24/07 | 15.685 | 0.391 | 17.202 | 13.072 | 14.240 | 2.613 | 2.962 |
| South Integrated | 11/8/07 | 22.289 | 0.345 | 22.650 | 19.090 | 19.102 | 3.198 | 3.548 |
| South Integrated | 11/20/07 | 9.215 | 0.300 | 6.925 | 6.325 | 5.471 | 2.889 | 1.454 |
| South Integrated | 12/13/07 | 13.595 | 0.392 | 15.983 | 6.444 | 6.611 | 7.150 | 9.372 |
| South Integrated | 12/29/06 | 30.169 | 0.301 | 23.208 | 17.946 | 16.367 | 12.224 | 6.841 |
| North Upper Mixed Layer | 2/13/07 | 1.910 | 0.261 | 0.725 | 0.191 | 0.168 | 1.719 | 0.558 |
| North Upper Mixed Layer | 2/21/07 | 1.840 | 0.285 | 0.966 | 0.144 | 0.162 | 1.696 | 0.803 |
| North Upper Mixed Layer | 2/28/07 | 1.431 | 0.394 | 1.502 | 0.180 | 0.276 | 1.251 | 1.226 |
| North Upper Mixed Layer | 3/7/07 | 1.079 | 0.416 | 1.264 | 0.131 | 0.157 | 0.948 | 1.107 |
| North Upper Mixed Layer | 3/13/07 | 0.332 | 0.448 | 0.451 | 0.097 | 0.120 | 0.235 | 0.331 |
| North Upper Mixed Layer | 4/10/07 | 11.400 | 0.570 | 27.735 | 0.649 | 0.844 | 10.750 | 26.891 |
| North Upper Mixed Layer | 6/19/07 | 817.927 | 0.269 | 564.318 | 801.120 | 561.971 | 16.807 | 2.347 |
| North Upper Mixed Layer | 10/9/07 | 55.938 | 0.396 | 61.458 | 54.283 | 59.145 | 1.655 | 2.312 |
| North Upper Mixed Layer | 11/20/07 | 42.577 | 0.272 | 29.778 | 36.465 | 29.290 | 6.112 | 0.488 |
| South Upper Mixed Layer | 4/10/07 | 14.724 | 0.684 | 49.817 | 0.250 | 0.411 | 14.474 | 49.406 |
| South Upper Mixed Layer | 4/24/07 | 46.218 | 0.226 | 14.071 | 2.241 | 3.037 | 43.978 | 11.034 |
| South Upper Mixed Layer | 5/8/07 | 59.842 | 0.250 | 19.032 | 2.865 | 2.374 | 56.977 | 16.658 |
| South Upper Mixed Layer | 5/22/07 | 32.165 | 0.358 | 25.693 | 7.764 | 5.925 | 24.401 | 19.768 |
| South Upper Mixed Layer | 6/5/07 | 172.091 | 0.262 | 87.321 | 101.044 | 64.817 | 71.047 | 22.503 |
| South Upper Mixed Layer | 6/19/07 | 1377.575 | 0.257 | 862.854 | 1309.964 | 855.644 | 67.611 | 7.210 |
| South Upper Mixed Layer | 7/3/07 | 1029.604 | 0.267 | 646.793 | 967.319 | 606.357 | 62.285 | 40.436 |
| South Upper Mixed Layer | 7/17/07 | 15.547 | 0.537 | 27.351 | 15.014 | 26.295 | 0.533 | 1.056 |
| South Upper Mixed Layer | 7/31/07 | 56.381 | 0.309 | 45.082 | 54.449 | 39.983 | 1.932 | 5.099 |
| South Upper Mixed Layer | 8/14/07 | 17.656 | 0.315 | 15.360 | 16.100 | 11.985 | 1.556 | 3.375 |
| South Upper Mixed Layer | 8/28/07 | 155.157 | 0.289 | 120.918 | 154.294 | 119.567 | 0.862 | 1.350 |
| South Upper Mixed Layer | 9/11/07 | 63.962 | 0.425 | 73.021 | 62.591 | 70.810 | 1.372 | 2.211 |
| South Upper Mixed Layer | 9/25/07 | 128.798 | 0.346 | 116.789 | 127.118 | 114.053 | 1.681 | 2.735 |
| South Upper Mixed Layer | 10/9/07 | 66.089 | 0.424 | 59.968 | 66.089 | 59.968 | 0.000 | 0.000 |
| South Upper Mixed Layer | 10/24/07 | 18.454 | 0.405 | 21.582 | 16.024 | 17.455 | 2.430 | 4.127 |
| South Upper Mixed Layer | 11/8/07 | 23.319 | 0.303 | 20.485 | 22.899 | 20.347 | 0.420 | 0.138 |
| South Upper Mixed Layer | 11/20/07 | 52.807 | 0.302 | 43.080 | 38.964 | 37.275 | 13.843 | 5.806 |
| South Upper Mixed Layer | 12/13/07 | 43.417 | 0.381 | 49.948 | 18.674 | 19.351 | 24.743 | 30.597 |
| South Upper Mixed Layer | 12/29/06 | 28.445 | 0.331 | 27.519 | 21.384 | 21.224 | 7.061 | 6.295 |

Appendix C. (B) Summary statistics for the zooplankton community of Onondaga Lake sampled 12/29/06 through 12/13/07. Density (#/L), average size (mm), and biomass (µg/L) of individual zooplankton species/taxa.

| | | *Bosmina longirostris* | | | *Diacyclops thomasi* | | |
|---|---|---|---|---|---|---|---|
| **Site** | **Date** | **Density** | **Size** | **Biomass** | **Density** | **Size** | **Biomass** |
| North Integrated | 4/10/07 | 0.282 | 0.358 | 0.366 | 2.630 | 0.862 | 11.682 |
| North Integrated | 6/19/07 | 200.194 | 0.285 | 156.375 | 23.894 | 0.619 | 42.133 |
| North Integrated | 10/9/07 | 21.033 | 0.315 | 20.154 | 0.619 | 0.527 | 0.794 |
| North Integrated | 11/20/07 | 15.677 | 0.309 | 14.753 | 1.317 | 0.585 | 2.104 |
| South Integrated | 4/10/07 | 0.431 | 0.437 | 0.760 | 8.072 | 0.977 | 45.269 |
| South Integrated | 4/24/07 | 0.115 | 0.444 | 0.176 | 4.240 | 0.926 | 21.269 |
| South Integrated | 5/8/07 | 0.498 | 0.345 | 0.645 | 16.199 | 0.673 | 38.568 |
| South Integrated | 5/22/07 | 1.882 | 0.295 | 1.606 | 14.888 | 0.642 | 30.878 |
| South Integrated | 6/5/07 | 69.391 | 0.270 | 49.382 | 24.191 | 0.615 | 43.751 |
| South Integrated | 6/19/07 | 370.943 | 0.280 | 278.265 | 16.861 | 0.646 | 34.799 |
| South Integrated | 7/3/07 | 288.259 | 0.268 | 194.193 | 10.079 | 0.547 | 14.360 |
| South Integrated | 7/17/07 | 3.906 | 0.287 | 3.003 | 1.766 | 0.635 | 3.680 |
| South Integrated | 7/31/07 | 9.793 | 0.294 | 8.339 | 0.496 | 0.649 | 1.038 |
| South Integrated | 8/14/07 | 10.253 | 0.270 | 7.191 | 0.236 | 0.570 | 0.302 |
| South Integrated | 8/28/07 | 24.373 | 0.288 | 18.548 | 0.168 | 0.538 | 0.168 |
| South Integrated | 9/11/07 | 7.532 | 0.278 | 5.672 | 1.638 | 0.557 | 2.286 |
| South Integrated | 9/25/07 | 43.578 | 0.289 | 35.790 | 1.885 | 0.548 | 2.573 |
| South Integrated | 10/9/07 | 13.297 | 0.312 | 12.469 | 0.467 | 0.525 | 0.598 |
| South Integrated | 10/24/07 | 8.807 | 0.293 | 7.549 | 0.871 | 0.645 | 1.834 |
| South Integrated | 11/8/07 | 18.129 | 0.314 | 17.464 | 2.132 | 0.554 | 3.492 |
| South Integrated | 11/20/07 | 6.091 | 0.300 | 5.333 | 0.469 | 0.636 | 0.911 |
| South Integrated | 12/13/07 | 6.444 | 0.318 | 6.611 | 4.061 | 0.659 | 9.107 |
| South Integrated | 12/29/06 | 17.946 | 0.301 | 16.367 | 3.901 | 0.564 | 6.357 |
| North Upper Mixed Layer | 2/13/07 | 0.191 | 0.290 | 0.168 | 0.267 | 0.577 | 0.434 |
| North Upper Mixed Layer | 2/21/07 | 0.144 | 0.326 | 0.162 | 0.361 | 0.586 | 0.628 |
| North Upper Mixed Layer | 2/28/07 | 0.168 | 0.339 | 0.188 | 0.649 | 0.583 | 1.181 |
| North Upper Mixed Layer | 3/7/07 | 0.131 | 0.350 | 0.157 | 0.513 | 0.633 | 1.075 |
| North Upper Mixed Layer | 3/13/07 | 0.097 | 0.361 | 0.120 | 0.174 | 0.578 | 0.324 |
| North Upper Mixed Layer | 4/10/07 | 0.649 | 0.361 | 0.844 | 6.421 | 0.859 | 26.617 |
| North Upper Mixed Layer | 6/19/07 | 801.120 | 0.271 | 561.971 | 2.801 | 0.393 | 1.618 |
| North Upper Mixed Layer | 10/9/07 | 38.077 | 0.312 | 36.176 | 1.103 | 0.638 | 2.305 |
| North Upper Mixed Layer | 11/20/07 | 36.058 | 0.285 | 29.072 | 0.204 | 0.433 | 0.118 |
| South Upper Mixed Layer | 4/10/07 | 0.250 | 0.393 | 0.411 | 9.733 | 0.944 | 49.131 |
| South Upper Mixed Layer | 4/24/07 | 2.241 | 0.362 | 3.037 | 4.762 | 0.595 | 8.368 |
| South Upper Mixed Layer | 5/8/07 | 2.865 | 0.304 | 2.374 | 11.459 | 0.502 | 13.092 |
| South Upper Mixed Layer | 5/22/07 | 7.764 | 0.290 | 5.925 | 12.200 | 0.570 | 18.811 |
| South Upper Mixed Layer | 6/5/07 | 101.044 | 0.259 | 64.817 | 17.367 | 0.499 | 18.517 |
| South Upper Mixed Layer | 6/19/07 | 1309.964 | 0.260 | 855.644 | 8.451 | 0.368 | 4.055 |
| South Upper Mixed Layer | 7/3/07 | 960.514 | 0.262 | 602.054 | 29.503 | 0.506 | 38.310 |
| South Upper Mixed Layer | 7/17/07 | 3.942 | 0.296 | 3.322 | 0.213 | 0.512 | 0.228 |
| South Upper Mixed Layer | 7/31/07 | 47.734 | 0.266 | 32.474 | 1.932 | 0.708 | 5.099 |
| South Upper Mixed Layer | 8/14/07 | 15.201 | 0.275 | 10.782 | 0.359 | 0.506 | 0.376 |
| South Upper Mixed Layer | 8/28/07 | 148.353 | 0.274 | 104.408 | 0.862 | 0.637 | 1.350 |
| South Upper Mixed Layer | 9/11/07 | 31.206 | 0.295 | 26.369 | 0.686 | 0.761 | 2.179 |
| South Upper Mixed Layer | 9/25/07 | 103.366 | 0.293 | 86.742 | 0.840 | 0.816 | 2.670 |
| South Upper Mixed Layer | 10/9/07 | 29.197 | 0.311 | 27.658 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 10/24/07 | 11.542 | 0.306 | 10.908 | 1.367 | 0.518 | 1.816 |
| South Upper Mixed Layer | 11/8/07 | 22.269 | 0.297 | 19.643 | 0.210 | 0.413 | 0.121 |
| South Upper Mixed Layer | 11/20/07 | 37.939 | 0.312 | 36.521 | 2.563 | 0.616 | 4.952 |
| South Upper Mixed Layer | 12/13/07 | 18.674 | 0.319 | 19.351 | 11.905 | 0.684 | 29.589 |
| South Upper Mixed Layer | 12/29/06 | 21.182 | 0.315 | 21.149 | 3.631 | 0.583 | 6.089 |

Appendix C (B). Continued

| Site | Date | Nauplii | | | *Daphnia mendotae* | | |
|---|---|---|---|---|---|---|---|
| | | Density | Size | Biomass | Density | Size | Biomass |
| North Integrated | 4/10/07 | 7.515 | 0.153 | 0.326 | 0.000 | | 0.000 |
| North Integrated | 6/19/07 | 12.270 | 0.158 | 0.582 | 0.000 | | 0.000 |
| North Integrated | 10/9/07 | 0.002 | 0.132 | 0.000 | 0.000 | | 0.000 |
| North Integrated | 11/20/07 | 5.533 | 0.169 | 0.331 | 0.000 | | 0.000 |
| South Integrated | 4/10/07 | 7.749 | 0.157 | 0.419 | 0.000 | | 0.000 |
| South Integrated | 4/24/07 | 16.501 | 0.175 | 1.086 | 0.000 | | 0.000 |
| South Integrated | 5/8/07 | 22.429 | 0.184 | 1.660 | 0.000 | | 0.000 |
| South Integrated | 5/22/07 | 7.529 | 0.166 | 0.400 | 0.000 | | 0.000 |
| South Integrated | 6/5/07 | 20.372 | 0.193 | 1.418 | 0.000 | | 0.000 |
| South Integrated | 6/19/07 | 8.431 | 0.159 | 0.448 | 0.000 | | 0.000 |
| South Integrated | 7/3/07 | 14.111 | 0.192 | 0.924 | 0.000 | | 0.000 |
| South Integrated | 7/17/07 | 1.094 | 0.200 | 0.097 | 0.000 | | 0.000 |
| South Integrated | 7/31/07 | 0.744 | 0.163 | 0.026 | 0.000 | | 0.000 |
| South Integrated | 8/14/07 | 0.471 | 0.150 | 0.022 | 0.000 | | 0.000 |
| South Integrated | 8/28/07 | 0.168 | 0.225 | 0.013 | 0.000 | | 0.000 |
| South Integrated | 9/11/07 | 2.183 | 0.162 | 0.114 | 0.000 | | 0.000 |
| South Integrated | 9/25/07 | 1.676 | 0.199 | 0.130 | 0.419 | 0.619 | 0.491 |
| South Integrated | 10/9/07 | 0.233 | 0.182 | 0.018 | 0.000 | | 0.000 |
| South Integrated | 10/24/07 | 1.548 | 0.190 | 0.102 | 0.000 | | 0.000 |
| South Integrated | 11/8/07 | 1.066 | 0.170 | 0.056 | 0.000 | | 0.000 |
| South Integrated | 11/20/07 | 2.265 | 0.187 | 0.168 | 0.000 | | 0.000 |
| South Integrated | 12/13/07 | 3.090 | 0.194 | 0.265 | 0.000 | | 0.000 |
| South Integrated | 12/29/06 | 8.323 | 0.176 | 0.484 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 2/13/07 | 1.451 | 0.199 | 0.124 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 2/21/07 | 1.317 | 0.191 | 0.117 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 2/28/07 | 0.601 | 0.194 | 0.045 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 3/7/07 | 0.435 | 0.181 | 0.032 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 3/13/07 | 0.061 | 0.212 | 0.006 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 4/10/07 | 4.329 | 0.174 | 0.274 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 6/19/07 | 14.006 | 0.150 | 0.730 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 10/9/07 | 0.552 | 0.129 | 0.008 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 11/20/07 | 5.908 | 0.178 | 0.370 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 4/10/07 | 4.742 | 0.168 | 0.275 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 4/24/07 | 39.216 | 0.174 | 2.666 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 5/8/07 | 45.518 | 0.183 | 3.566 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 5/22/07 | 12.200 | 0.189 | 0.956 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 6/5/07 | 53.680 | 0.190 | 3.986 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 6/19/07 | 59.160 | 0.161 | 3.155 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 7/3/07 | 32.782 | 0.193 | 2.126 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 7/17/07 | 0.213 | 0.141 | 0.003 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 7/31/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 8/14/07 | 0.359 | 0.147 | 0.013 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 8/28/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 9/11/07 | 0.686 | 0.161 | 0.031 | 1.029 | 0.781 | 2.959 |
| South Upper Mixed Layer | 9/25/07 | 0.840 | 0.152 | 0.065 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 10/9/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 10/24/07 | 0.607 | 0.217 | 0.047 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 11/8/07 | 0.210 | 0.215 | 0.016 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 11/20/07 | 11.279 | 0.179 | 0.853 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 12/13/07 | 12.84 | 0.19 | 1.01 | 0.00 | | 0.00 |
| South Upper Mixed Layer | 12/29/06 | 3.43 | 0.16 | 0.21 | 0.20 | 0.45 | 0.07 |

Appendix C(B). Continued

| Site | Date | *Cercopagis pengoi* Density | *Cercopagis pengoi* Size | *Cercopagis pengoi* Biomass | *Daphnia retrocurva* Density | *Daphnia retrocurva* Size | *Daphnia retrocurva* Biomass |
|---|---|---|---|---|---|---|---|
| North Integrated | 4/10/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Integrated | 6/19/07 | 0.000 | | 0.000 | 0.646 | 0.422 | 0.239 |
| North Integrated | 10/9/07 | 0.293 | 1.161 | 2.424 | 10.223 | 0.609 | 15.325 |
| North Integrated | 11/20/07 | 0.000 | | 0.000 | 0.263 | 0.493 | 0.184 |
| South Integrated | 4/10/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Integrated | 4/24/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Integrated | 5/8/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Integrated | 5/22/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Integrated | 6/5/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Integrated | 6/19/07 | 0.000 | | 0.000 | 0.649 | 0.496 | 0.453 |
| South Integrated | 7/3/07 | 0.009 | 1.340 | 0.102 | 4.032 | 0.494 | 3.954 |
| South Integrated | 7/17/07 | 0.712 | 1.054 | 4.879 | 3.390 | 0.528 | 3.469 |
| South Integrated | 7/31/07 | 0.177 | 1.215 | 1.660 | 1.363 | 0.578 | 2.140 |
| South Integrated | 8/14/07 | 0.078 | 1.022 | 0.482 | 0.353 | 0.419 | 0.131 |
| South Integrated | 8/28/07 | 0.582 | 1.270 | 5.950 | 0.503 | 0.477 | 0.321 |
| South Integrated | 9/11/07 | 0.033 | 1.164 | 0.276 | 1.748 | 0.550 | 1.822 |
| South Integrated | 9/25/07 | 0.152 | 1.100 | 1.132 | 8.172 | 0.605 | 11.222 |
| South Integrated | 10/9/07 | 0.169 | 1.153 | 1.419 | 14.702 | 0.572 | 18.514 |
| South Integrated | 10/24/07 | 0.101 | 1.197 | 0.927 | 3.390 | 0.604 | 4.849 |
| South Integrated | 11/8/07 | 0.001 | 1.238 | 0.009 | 0.961 | 0.652 | 1.629 |
| South Integrated | 11/20/07 | 0.000 | | 0.000 | 0.234 | 0.453 | 0.138 |
| South Integrated | 12/13/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Integrated | 12/29/06 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 2/13/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 2/21/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 2/28/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 3/7/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 3/13/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 4/10/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 6/19/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| North Upper Mixed Layer | 10/9/07 | 0.204 | 1.172 | 1.717 | 13.795 | 0.599 | 18.456 |
| North Upper Mixed Layer | 11/20/07 | 0.000 | | 0.000 | 0.407 | 0.426 | 0.218 |
| South Upper Mixed Layer | 4/10/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 4/24/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 5/8/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 5/22/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 6/5/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 6/19/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 7/3/07 | 0.248 | 1.109 | 1.875 | 6.556 | 0.391 | 2.428 |
| South Upper Mixed Layer | 7/17/07 | 1.572 | 1.072 | 10.947 | 7.147 | 0.572 | 9.648 |
| South Upper Mixed Layer | 7/31/07 | 0.447 | 1.103 | 3.351 | 3.375 | 0.431 | 1.794 |
| South Upper Mixed Layer | 8/14/07 | 0.060 | 1.085 | 0.423 | 0.242 | 0.422 | 0.097 |
| South Upper Mixed Layer | 8/28/07 | 1.629 | 1.044 | 10.544 | 1.725 | 0.444 | 0.921 |
| South Upper Mixed Layer | 9/11/07 | 1.199 | 1.190 | 10.563 | 15.432 | 0.568 | 17.983 |
| South Upper Mixed Layer | 9/25/07 | 0.217 | 1.045 | 1.444 | 18.492 | 0.575 | 19.595 |
| South Upper Mixed Layer | 10/9/07 | 0.146 | 1.094 | 1.080 | 35.236 | 0.517 | 30.137 |
| South Upper Mixed Layer | 10/24/07 | 0.075 | 1.147 | 0.636 | 4.406 | 0.588 | 5.911 |
| South Upper Mixed Layer | 11/8/07 | 0.000 | | 0.000 | 0.420 | 0.510 | 0.293 |
| South Upper Mixed Layer | 11/20/07 | 0.000 | | 0.000 | 0.769 | 0.465 | 0.453 |
| South Upper Mixed Layer | 12/13/07 | 0.000 | | 0.000 | 0.000 | | 0.000 |
| South Upper Mixed Layer | 12/29/06 | 0.000 | | 0.000 | 0.000 | | 0.000 |

# APPENDIX 4: 2007 MACROPHYTE MONITORING RESULTS AND MACROALGAE DATA SUMMARY

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FINAL
Revised April 2009

# 2007 MACROPHYTE MONITORING RESULTS

***EcoLogic Memorandum***

**TO**: Dave Snyder
**FROM**: Mark Arrigo
**RE**: Onondaga Lake 2007 Macrophyte Monitoring Results
**DATE**: 11/26/07

This memorandum is a summary of the 2007 Onondaga Lake macrophyte monitoring results. The annual macrophyte monitoring program consists of a combination of aerial photographs and ground truthing. Aerial photographs were taken in August 2007 by Airphotographics Inc. Ten ground truthing sites were marked with large buoys, intending to be visible in the photographs, prior to the flight. The photographs were transferred to digital format, georeferenced and copied to a DVD that was sent to EcoLogic. The digitized photographs were imported into Arcview and the margins of beds delineated.

Within one week of shooting the aerial photographs, a ground truth sampling effort occurred. Onondaga County Department of Water Environment Protection (OCDWEP) staff visited each of the ten ground truthing sites (Map 1) and collected data on species composition and relative abundance. These data were used to verify that objects delineated in the air photographs were macrophyte beds.

In 2007 dense beds were evident along the north and south shores as well as at the mouth of Ninemile Creek. Macrophyte growth appeared to be poorest along the east shore from just north of Ley Creek to the Marina (Maps 2 and 6). The wastebeds also had poor growth compared to past years.

A total of 210 acres of macrophytes were delineated in the 2007 air photographs (Figure 1; Maps 2 through 6). This is slightly more than the 183 acres delineated in August 2006 but less than was delineated in 2005 (378 acres) or 2003 (267 acres). One possible explanation for the reduced amount of macrophyte growth is the effect of taking the photographs in August instead of June or early July like past years. Observations by OCDWEP staff suggest that macrophyte growth during the June/July time period of both 2006 and 2007 was much more extensive than in August. Because of the complications associated with interpreting photos taken during different times of the years it is recommended that the 2008 photos be collected in June or early July.

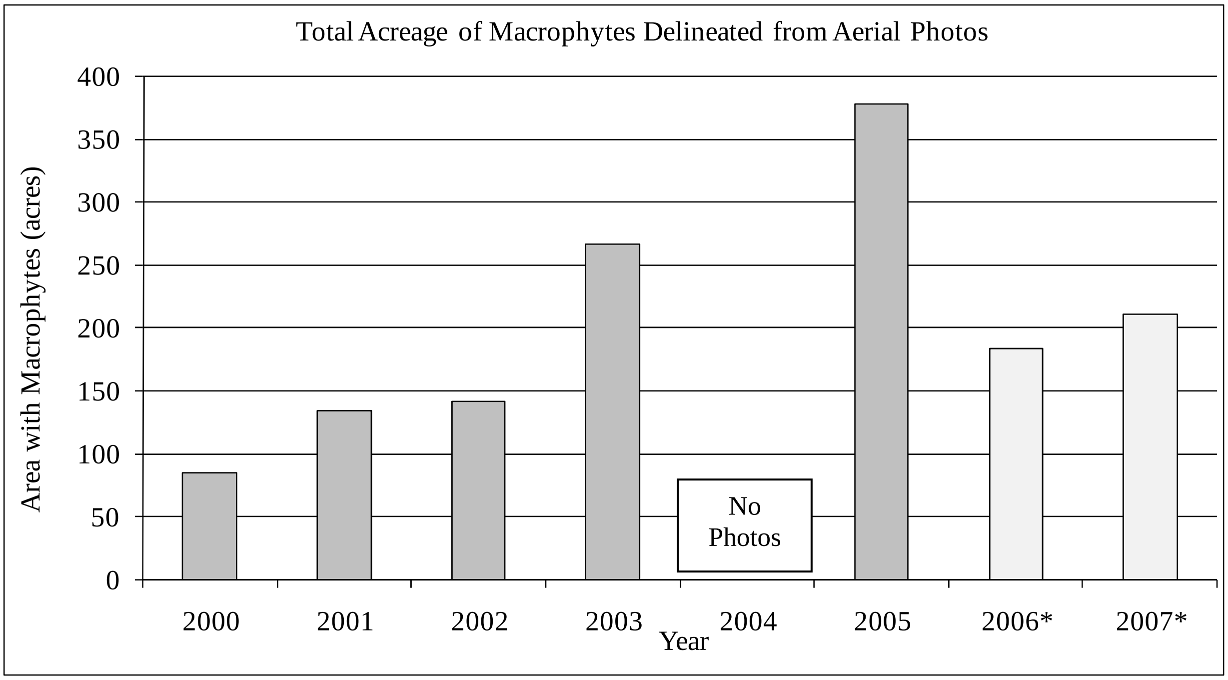



**FIGURE 1.** Total acreage of macrophytes in Onondaga Lake from 2000 to 2007 based on areas delineated as macrophytes from digitized aerial photographs. * Note 2006 and 2007 photographs were taken in August, all others were taken in June or early July; this adds an unknown level of variability to the analysis so those two years are depicted seperatly. Observations by OCDWEP staff indicated that macrophyte growth in June and early July of both 2006 and 2007 was comparable to 2003 and 2005.

The ground truthing effort identified eight taxa at ten sites (Table 1). Elodea was the most widely distributed and abundant species, being found at nine of the ten sites and with an overall relative abundance of 30%. Other commonly encountered species (found at greater than 50% of sites) were coontail, curly leaf pondweed (an exotic), and Eurasian water milfoil (an exotic).

**Table 1.** 2007 ground truthing results.

| **Species** | **Percent of Sites** | **Relative Abundance When Present** | **Overall Relative Abundance** |
|---|---|---|---|
| Elodea | 90% | 33% | 30% |
| Coontail | 50% | 29% | 14% |
| Curly leaf pondweed | 50% | 13% | 7% |
| Eurasian watermilfoil | 50% | 28% | 14% |
| Small pondweed | 40% | 1% | 0.4% |
| Sago pondweed | 30% | 64% | 19% |
| Southern naiad | 30% | 24% | 7% |
| Water stargrass | 10% | 90% | 9% |

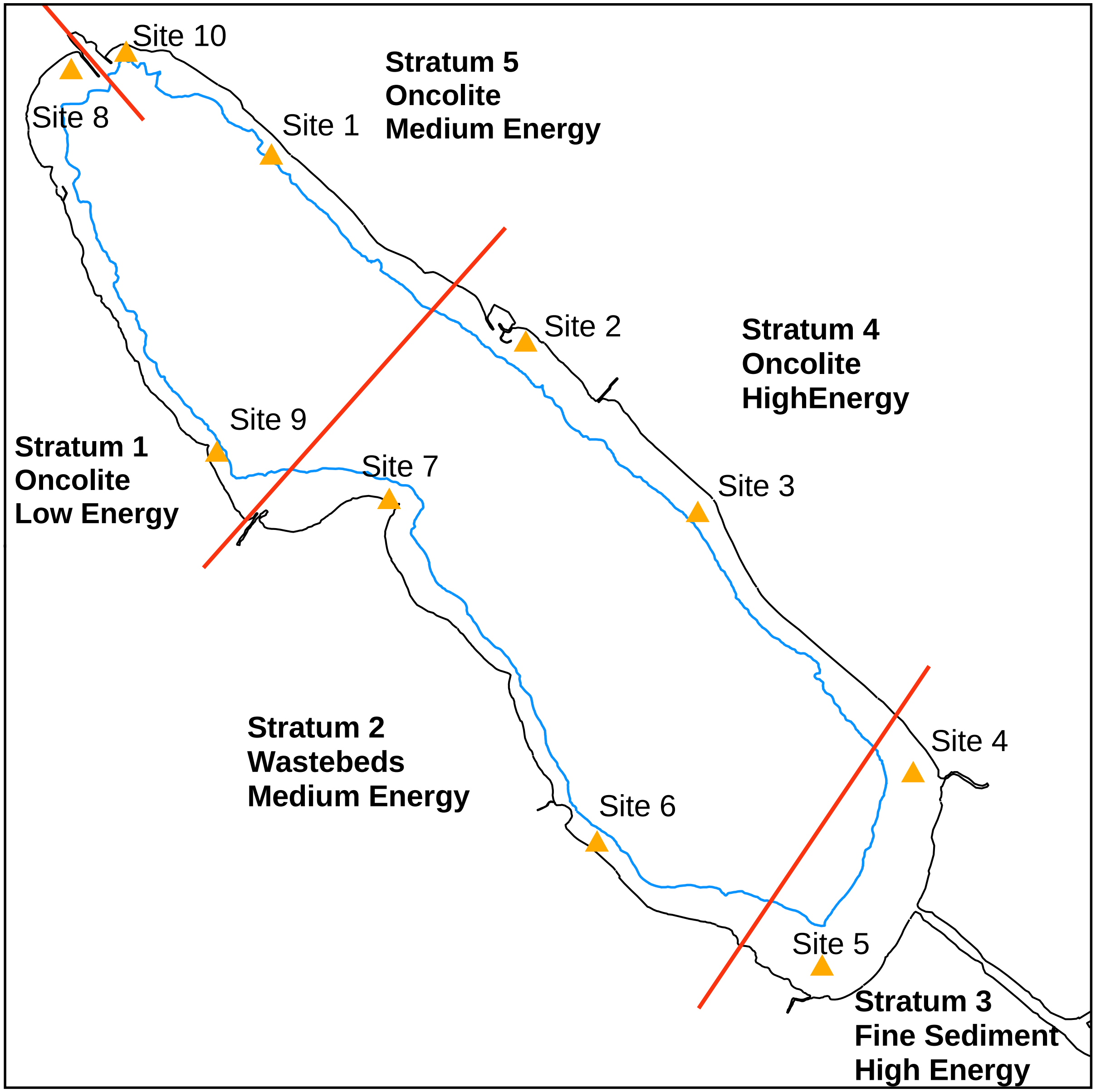
Results of the ground truthing were compared to the digitized macrophytes (Maps 7 through 16). There was good agreement between what was identified as macrophytes on the photographs and what was observed on the ground. Areas delineated as having either sparse or no growth in the aerial photographs were observed to have sparse growth during ground truthing. Since ground observations are more detailed than photos it is not unexpected that some area delineated as having no growth in the photos were observed to have some plants present. Areas identified as dense growth from the air were documented with moderate growth on the ground. This is also not unexpected as the photos are delineated at a rather course scale, the only options are no growth, sparse growth or dense growth.

One of the purposes of the ground truthing was to determine if areas where metaphyton was growing on the sediment were being mistakenly delineated as macrophytes in the photos. At Site 2 (Map 8) ground observations indicated that only sparse macrophyte growth was present around the sample point and that the bottom was mostly composed of Cladophera. The Cladophera can be seen in the photos as a greenish tint on the sediment. The area around the sample point was delineated as having no growth in the photos, indicating that the difference between macrophytes and metaphyton was successfully differentiated.

Overall, the ground truthing seems to verify that the photo delineations are a reasonable interpretation of lake macrophyte distribution.

# Map 1

## Location of Ground Truth Buoys Onondaga Lake, August 2007




N

**Legend**

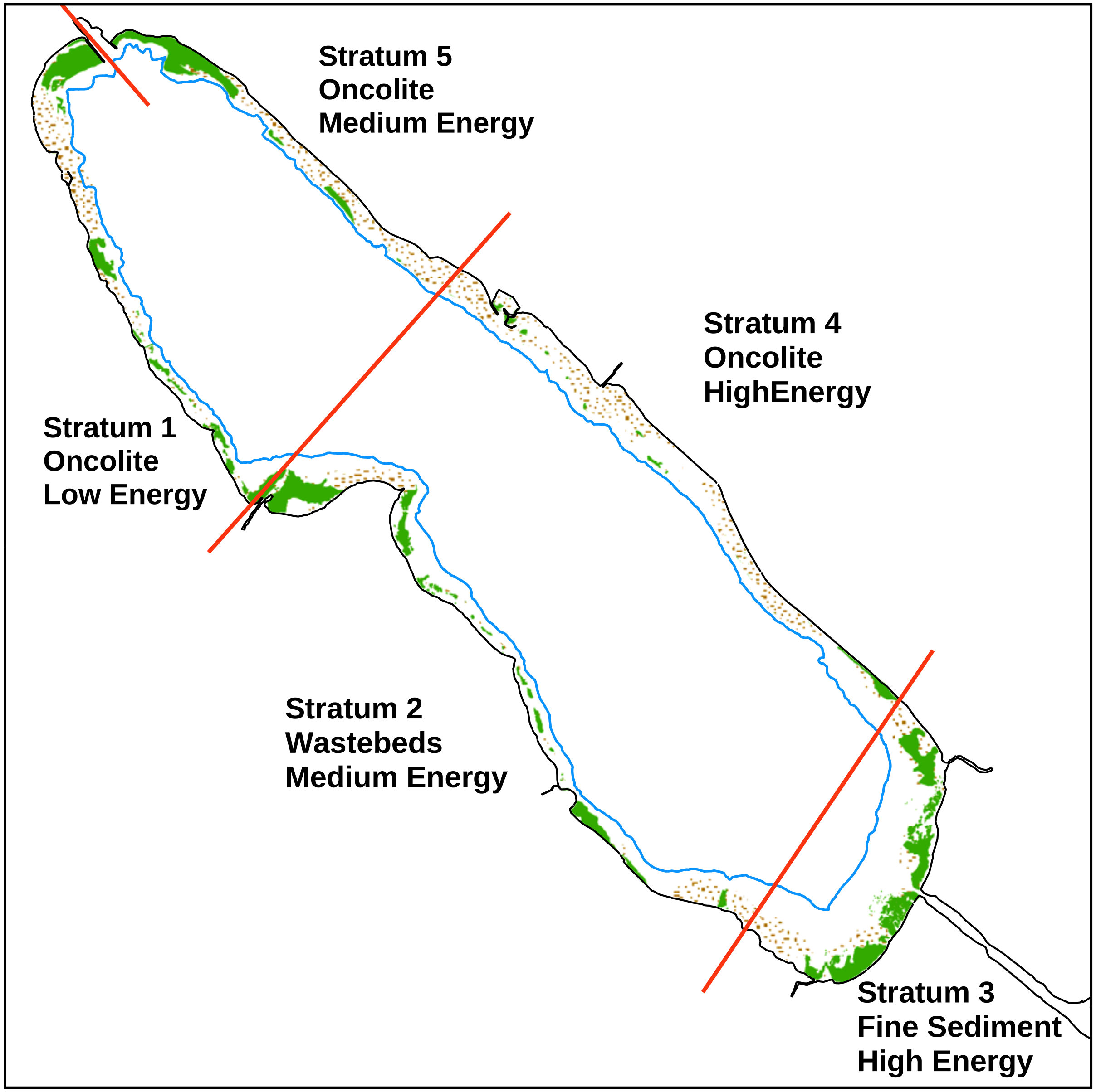
- Strata borders
- 6-meter depth
- Buoys

Source: Shoreline and buoys digitized from aerial photographs provided by Airphotographics.

Miles: 0, 0.25, 0.5, 1, 1.5, 2

Onondaga County Department Water Environment Protection
2007 Onondaga Lake Aquatic Macrophyte Survey

EcoLogic




# Map 2

## Lakewide Macrophyte Distribution Onondaga Lake, August 2007

N

**Legend**

- Strata borders
- 6-meter depth
- Dense macrophyte growth
- Sparse macrophyte growth

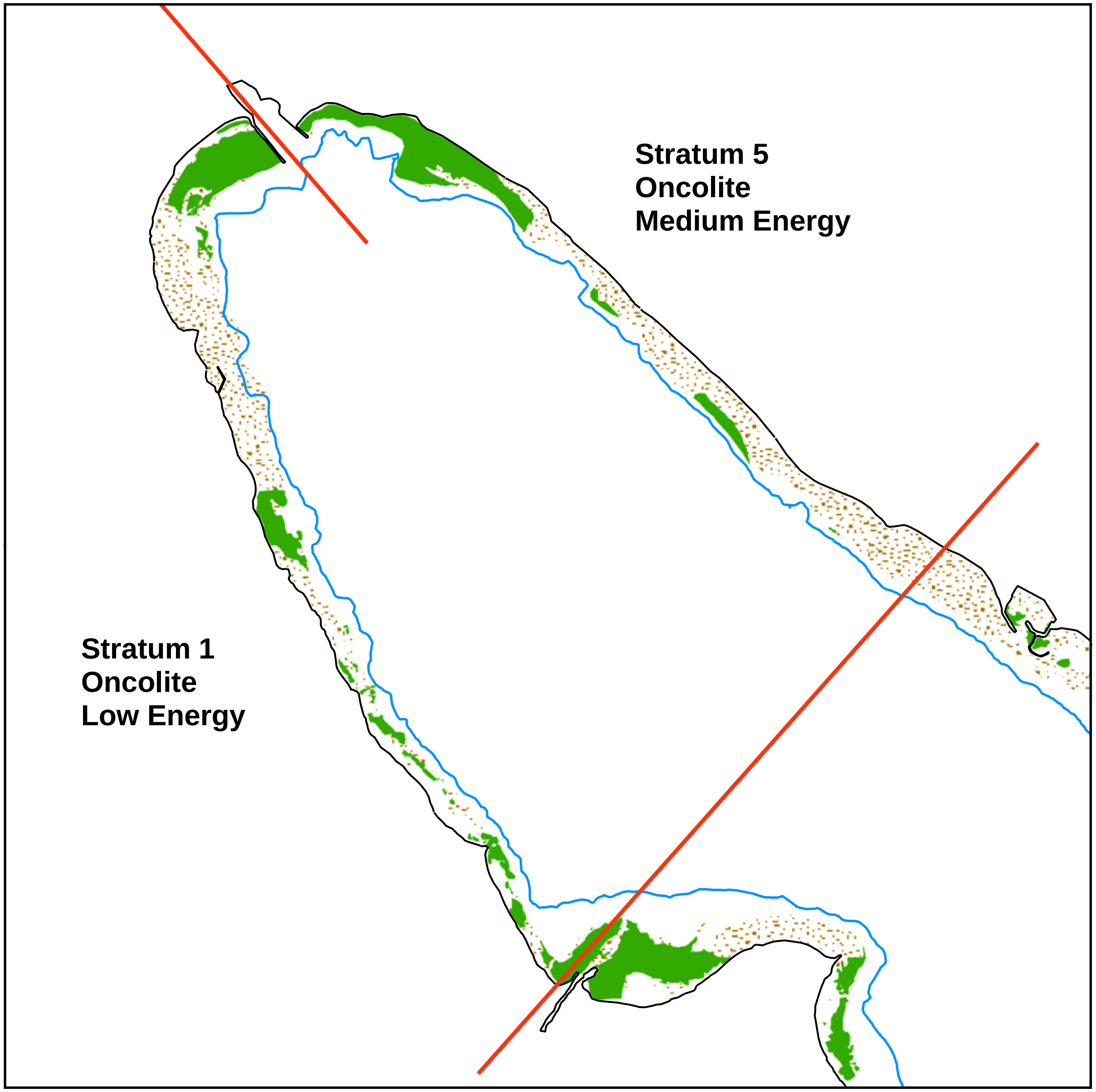
Estimated macrophyte area: 210 acres

Source: Shoreline, macrophyte beds and sparse growth digitized from aerial photographs provided by Airphotographics.

0 0.25 0.5 1 1.5 2 Miles

Onondaga County Department Water Environment Protection
2007 Onondaga Lake Aquatic Macrophyte Survey

EcoLogic




## Map 3

## Strata 1 and 5
## Macrophyte Distribution
## Onondaga Lake, August 2007

N

**Legend**

- Strata borders
- 6-meter depth
- Dense macrophyte growth
- Sparse macrophyte growth

Source: Shoreline, macrophyte beds and sparse growth digitized from aerial photographs provided by Airphotographics.

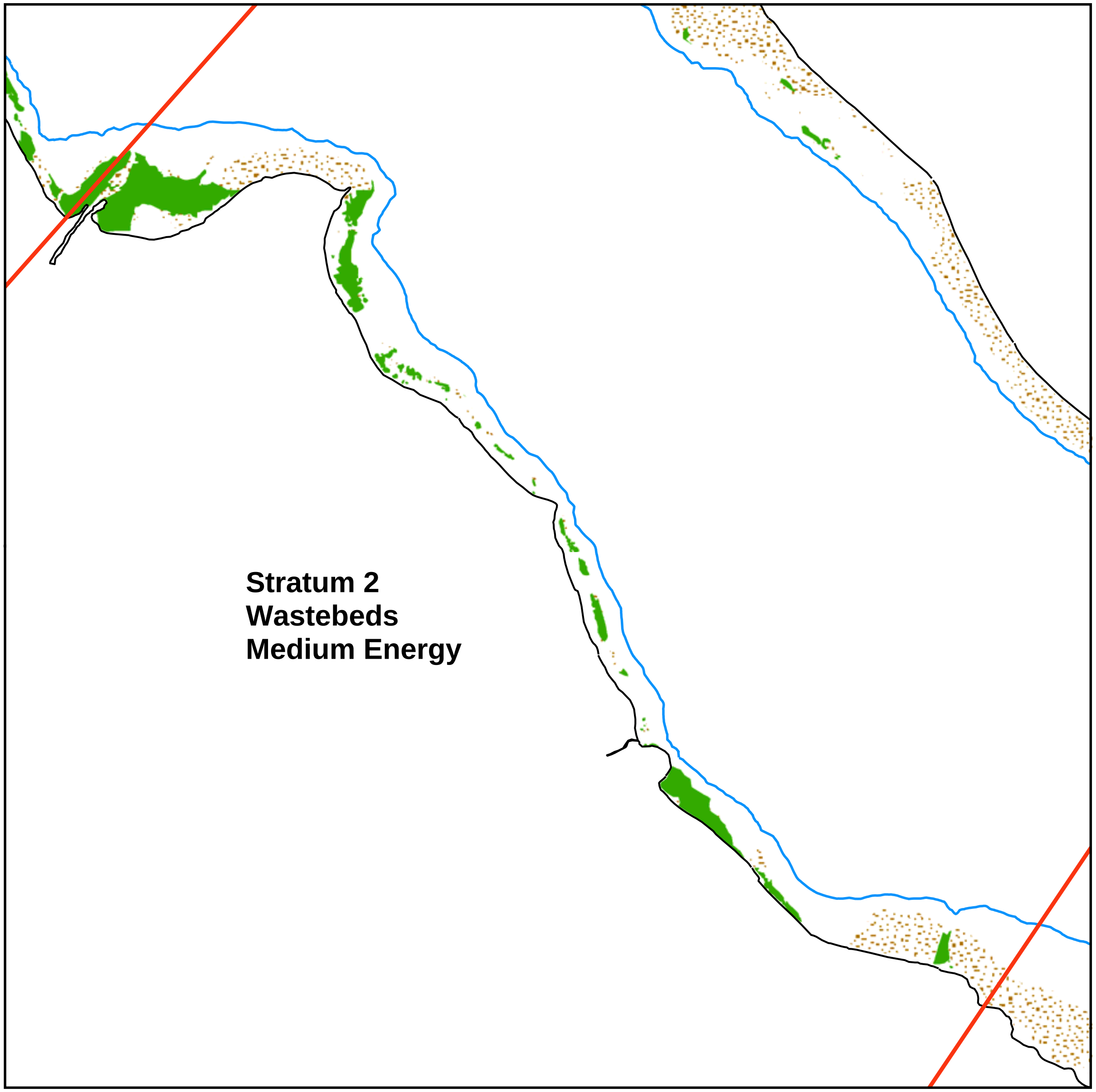
Miles
0 0.125 0.25 0.5 0.75 1

Onondaga County Department Water Environment Protection
2007 Onondaga Lake Aquatic Macrophyte Survey

EcoLogic

# Map 4

## Stratum 2
## Macrophyte Distribution
## Onondaga Lake, August 2007




N

**Legend**

- Strata borders
- 6-meter depth
- Dense macrophyte growth
- Sparse macrophyte growth

Source: Shoreline, macrophyte beds and sparse growth digitized from aerial photographs provided by Airphotographics.

Miles: 0 0.125 0.25 0.5 0.75 1

Onondaga County Department Water Environment Protection
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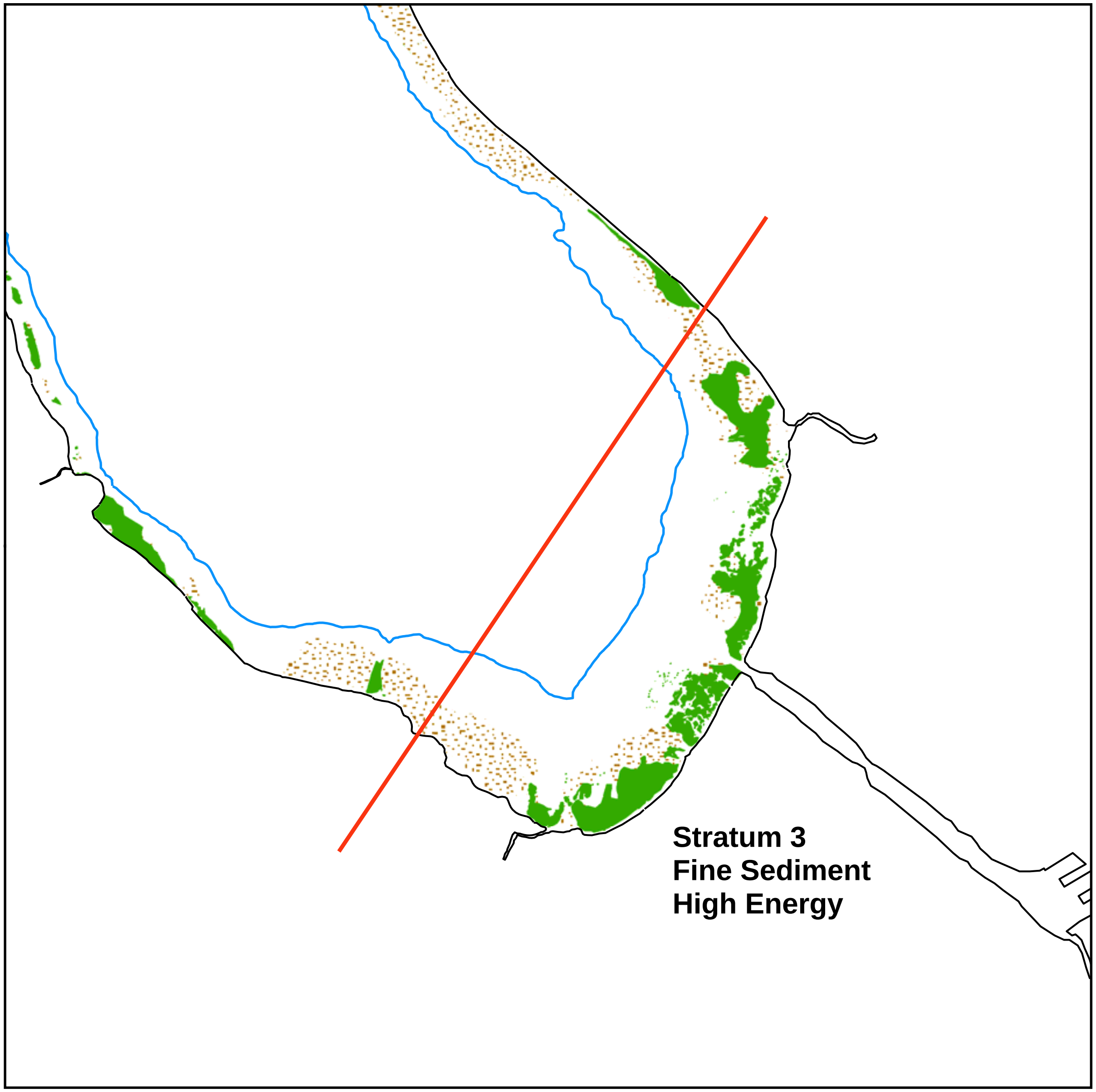



# Map 5

## Stratum 3
## Macrophyte Distribution
## Onondaga Lake, August 2007

N

**Legend**

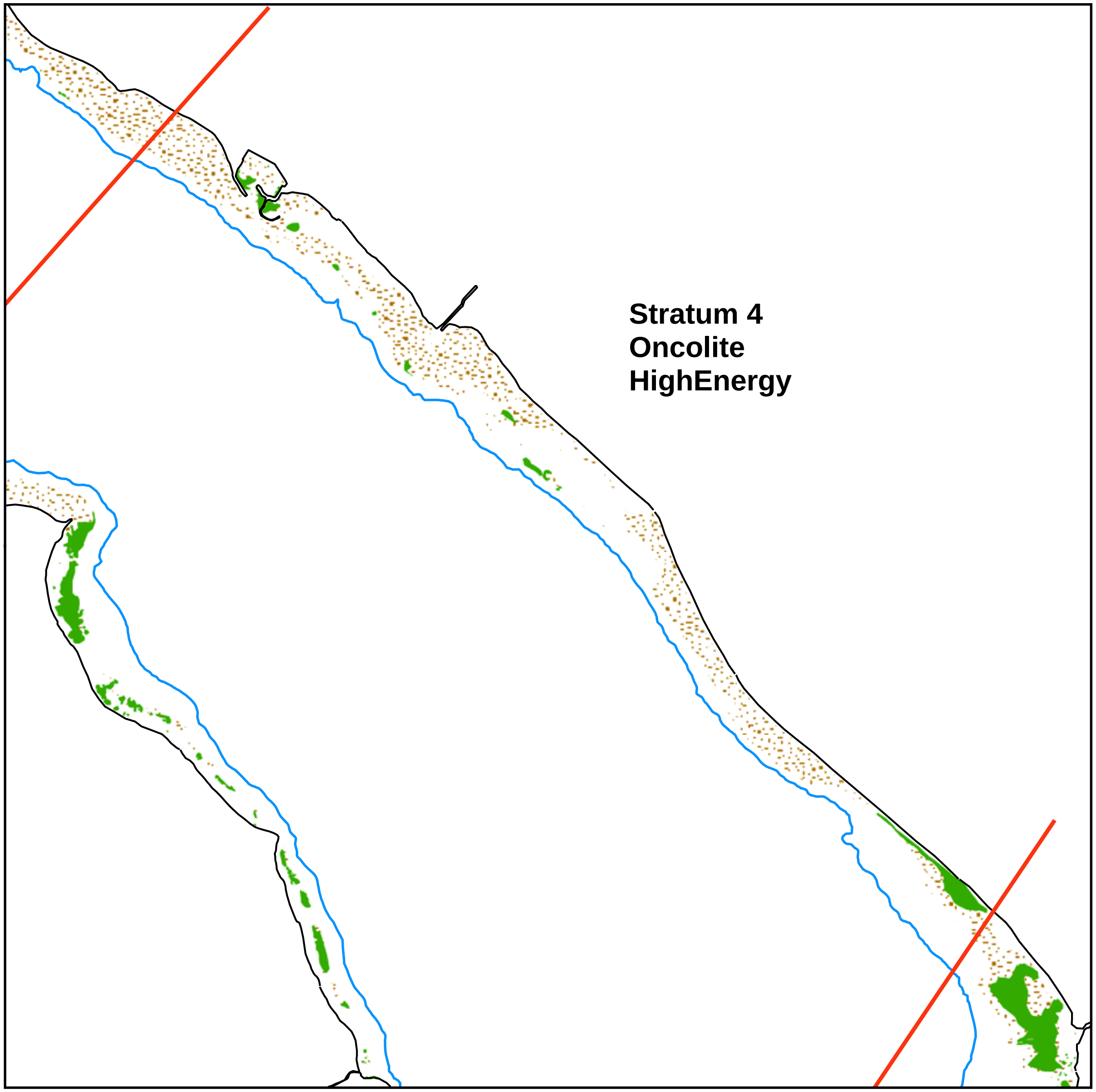
- Strata borders
- 6-meter depth
- Dense macrophyte growth
- Sparse macrophyte growth

Source: Shoreline, macrophyte beds and sparse growth digitized from aerial photographs provided by Airphotographics.

0 0.125 0.25 0.5 0.75 1 Miles

Onondaga County Department Water Environment Protection
2007 Onondaga Lake Aquatic Macrophyte Survey

EcoLogic




## Map 6

## Stratum 4
## Macrophyte Distribution
## Onondaga Lake, August 2007

N

**Legend**

- Strata borders
- 6-meter depth
- Dense macrophyte growth
- Sparse macrophyte growth

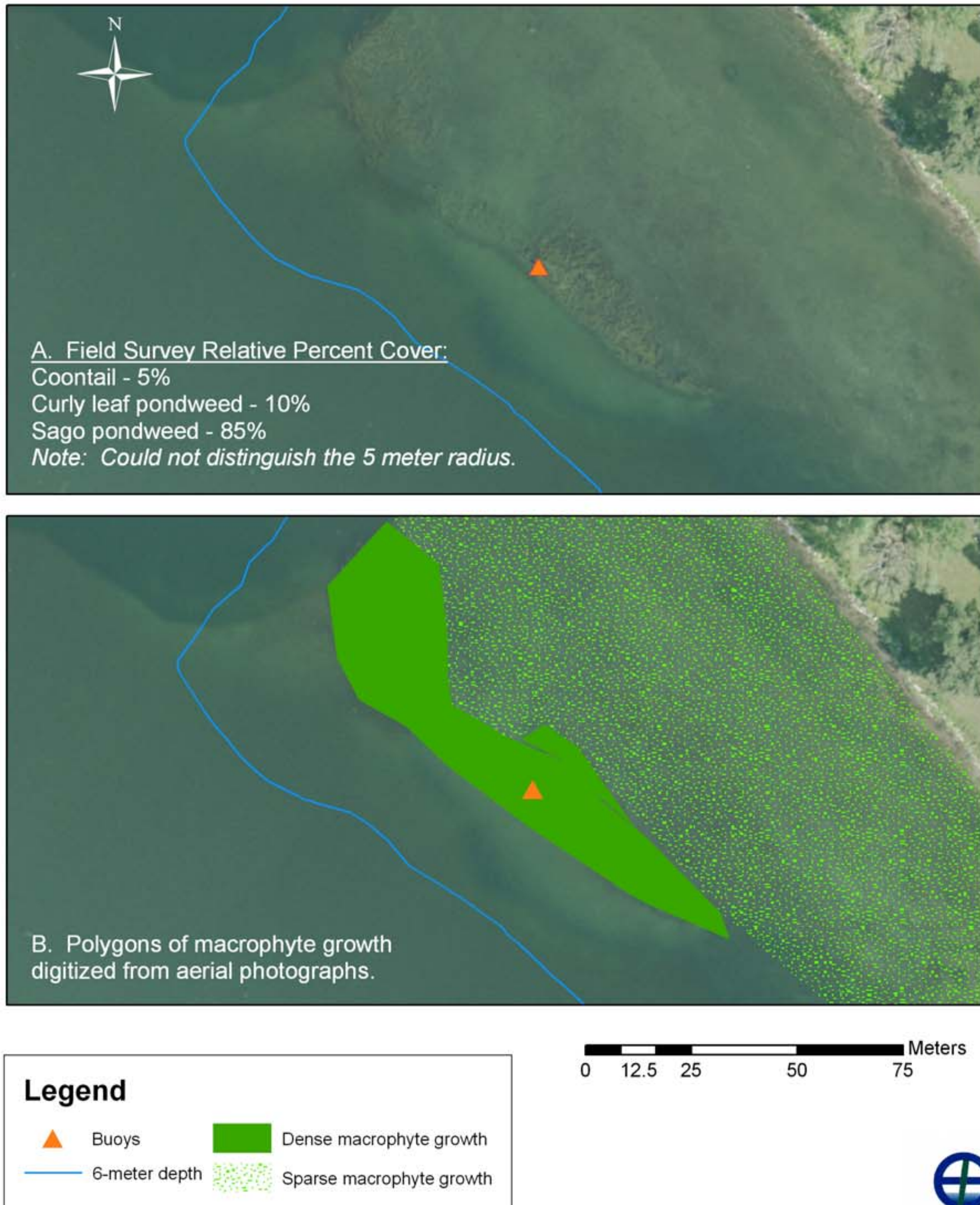
Source: Shoreline, macrophyte beds and sparse growth digitized from aerial photographs provided by Airphotographics.

0 0.125 0.25 0.5 0.75 1 Miles

Onondaga County Department Water Environment Protection
2007 Onondaga Lake Aquatic Macrophyte Survey

EcoLogic

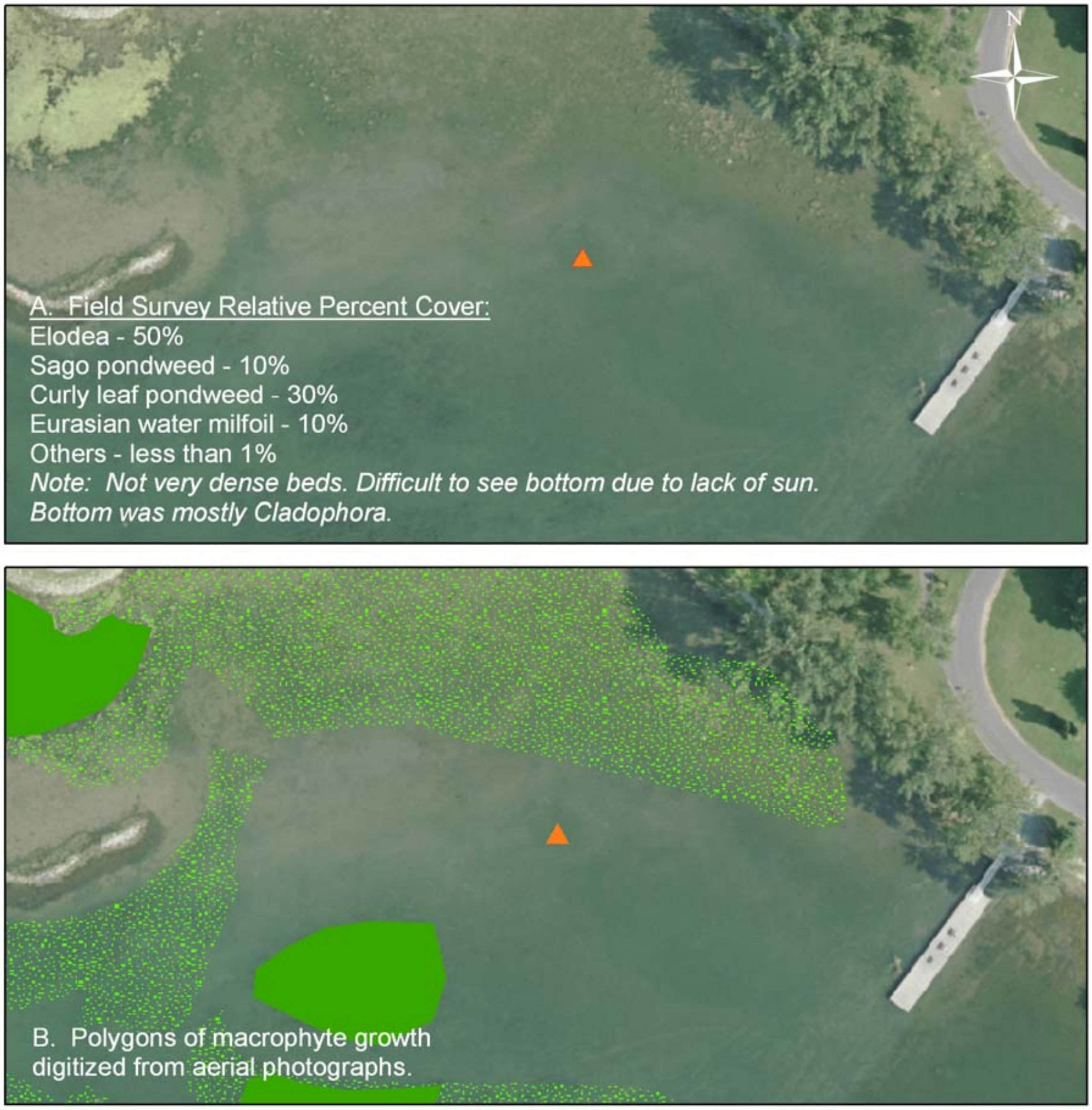
# Map 7
# Ground Truth Buoy Site 1
# August 2007, Onondaga Lake




Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

# Map 8
# Ground Truth Buoy Site 2
# August 2007, Onondaga Lake




Meters
0 12.5 25 50 75

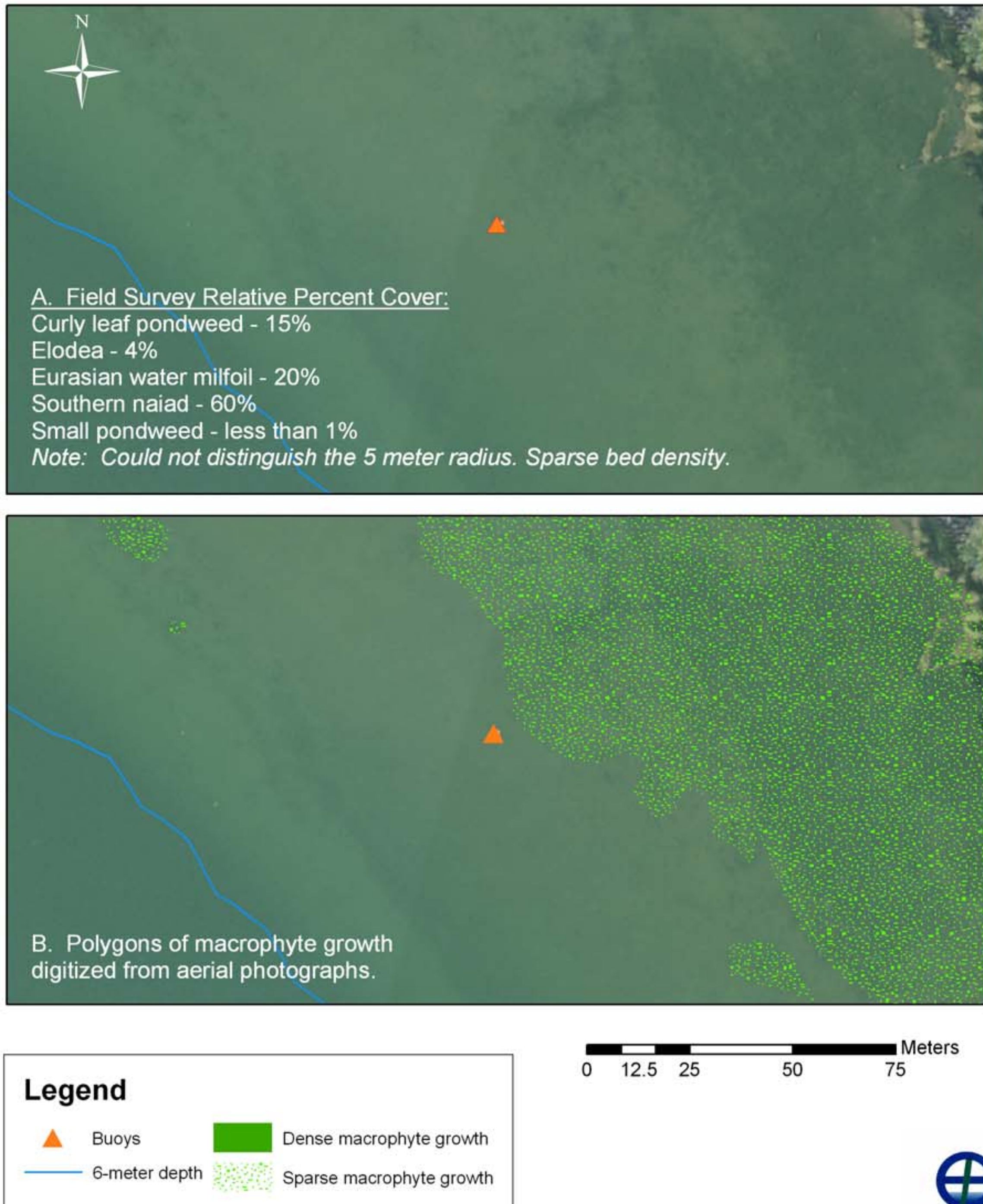
**Legend**

- Buoys
- 6-meter depth
- Dense macrophyte growth
- Sparse macrophyte growth

Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

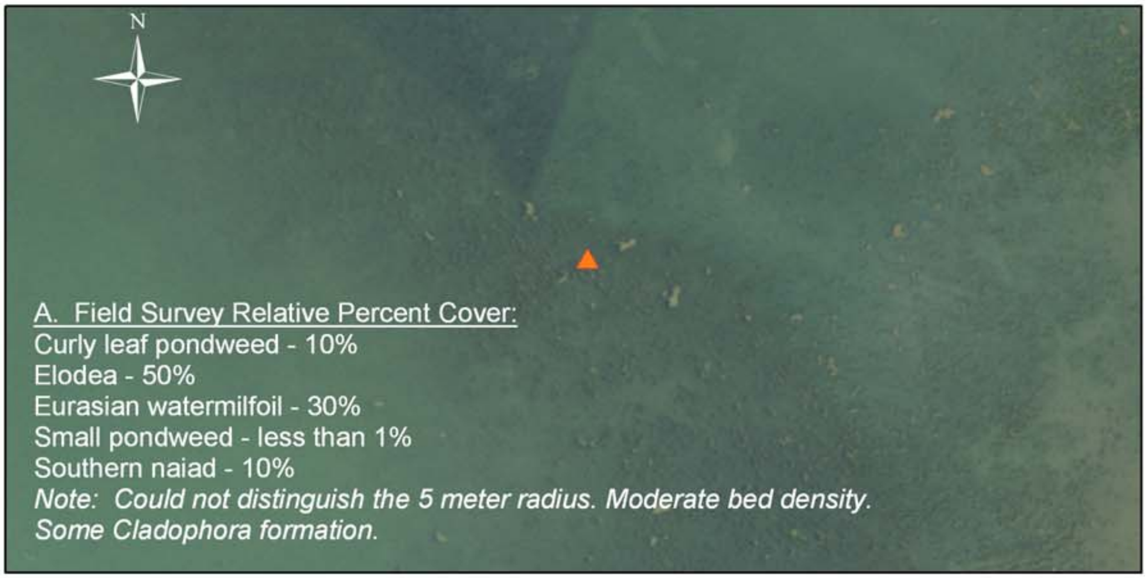
# Map 9
# Ground Truth Buoy Site 3
# August 2007, Onondaga Lake

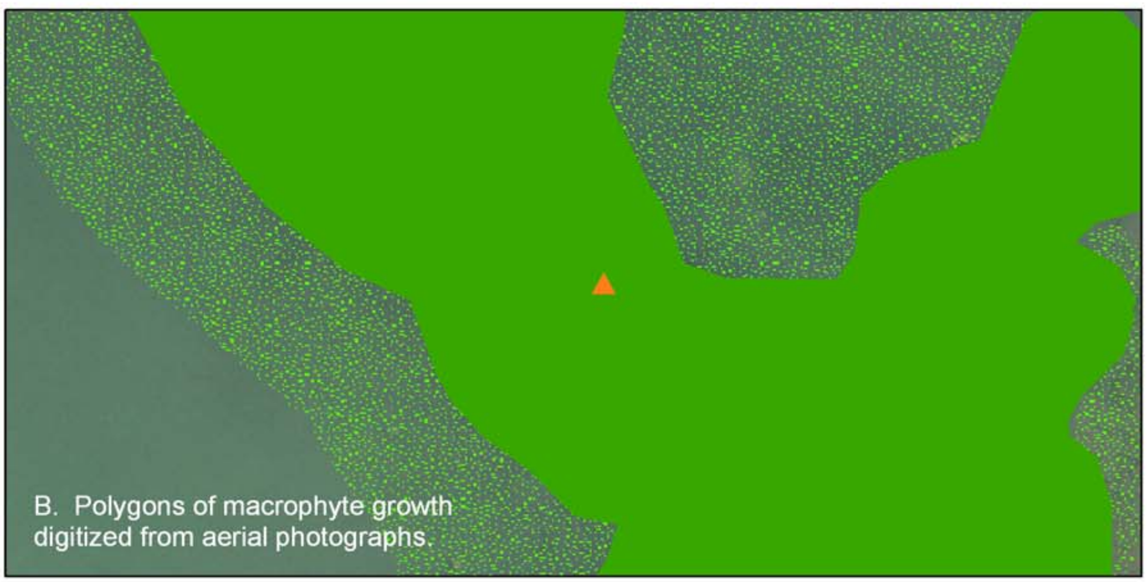



Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

# Map 10
# Ground Truth Buoy Site 4
# August 2007, Onondaga Lake




Meters
0 12.5 25 50 75

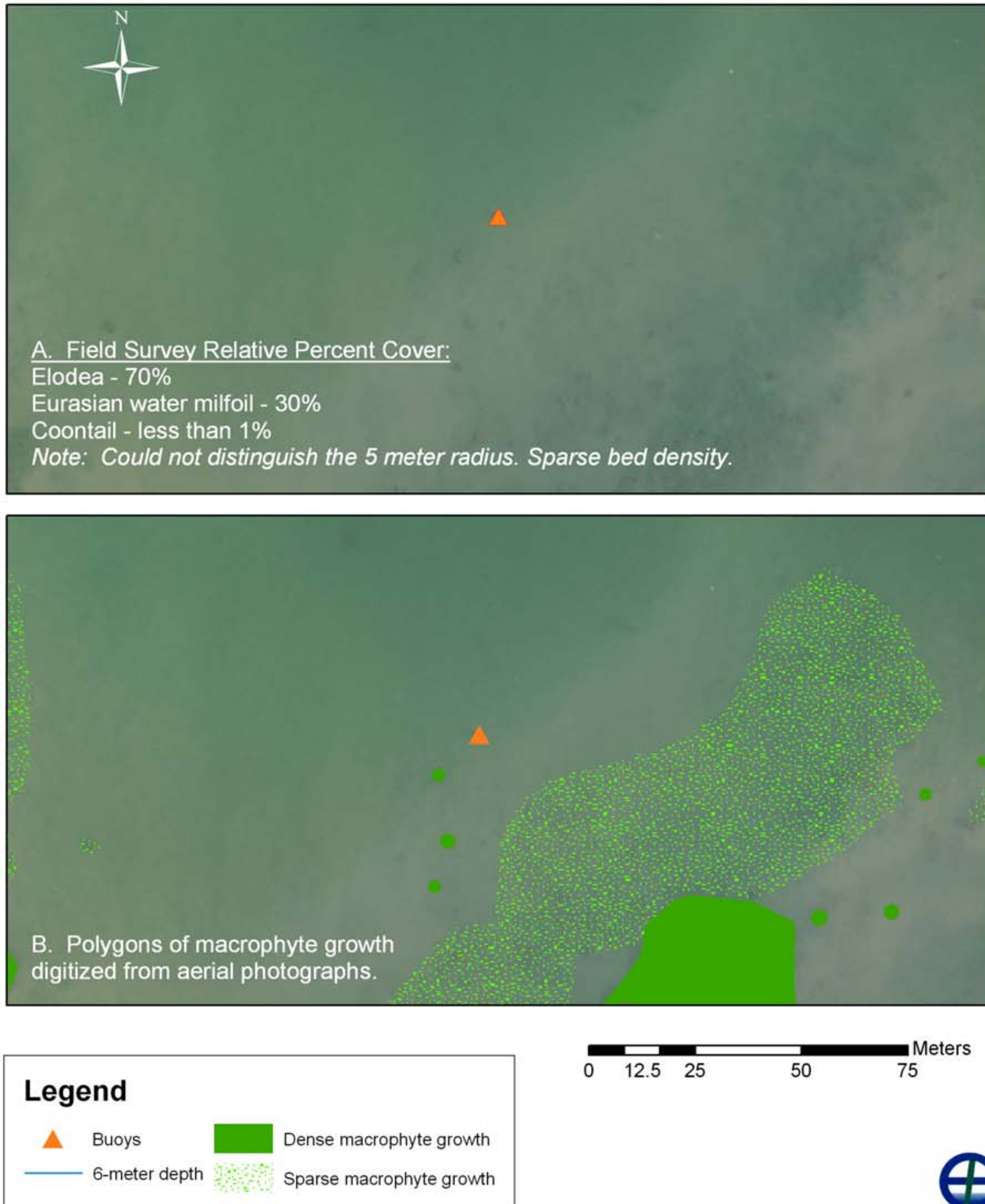
**Legend**

Buoys | Dense macrophyte growth
6-meter depth | Sparse macrophyte growth

Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

# Map 11
# Ground Truth Buoy Site 5
# August 2007, Onondaga Lake




Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

# Map 12
# Ground Truth Buoy Site 6
# August 2007, Onondaga Lake


0 12.5 25 50 75 Meters

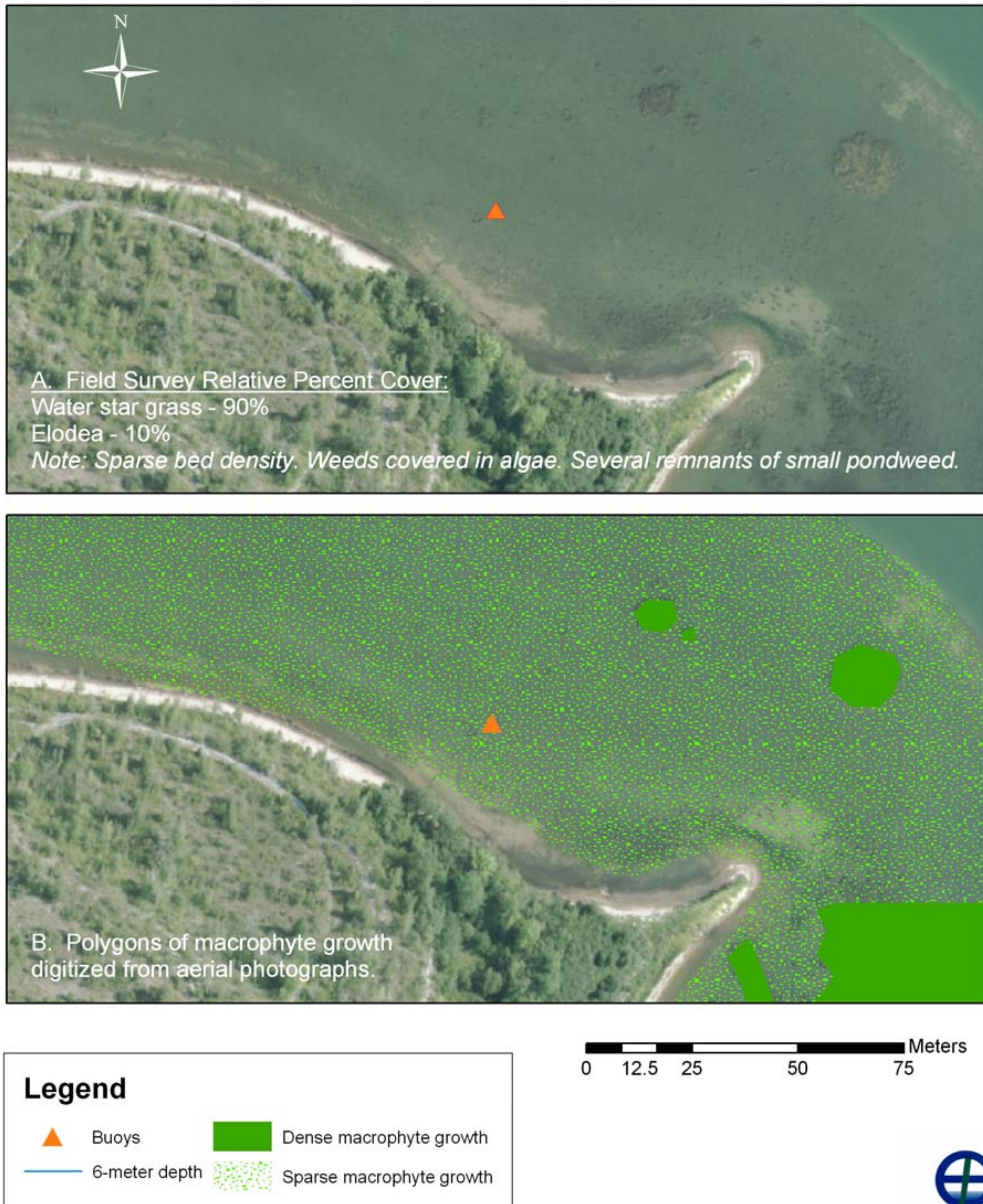
**Legend**

- Buoys
- 6-meter depth
- Dense macrophyte growth
- Sparse macrophyte growth

Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

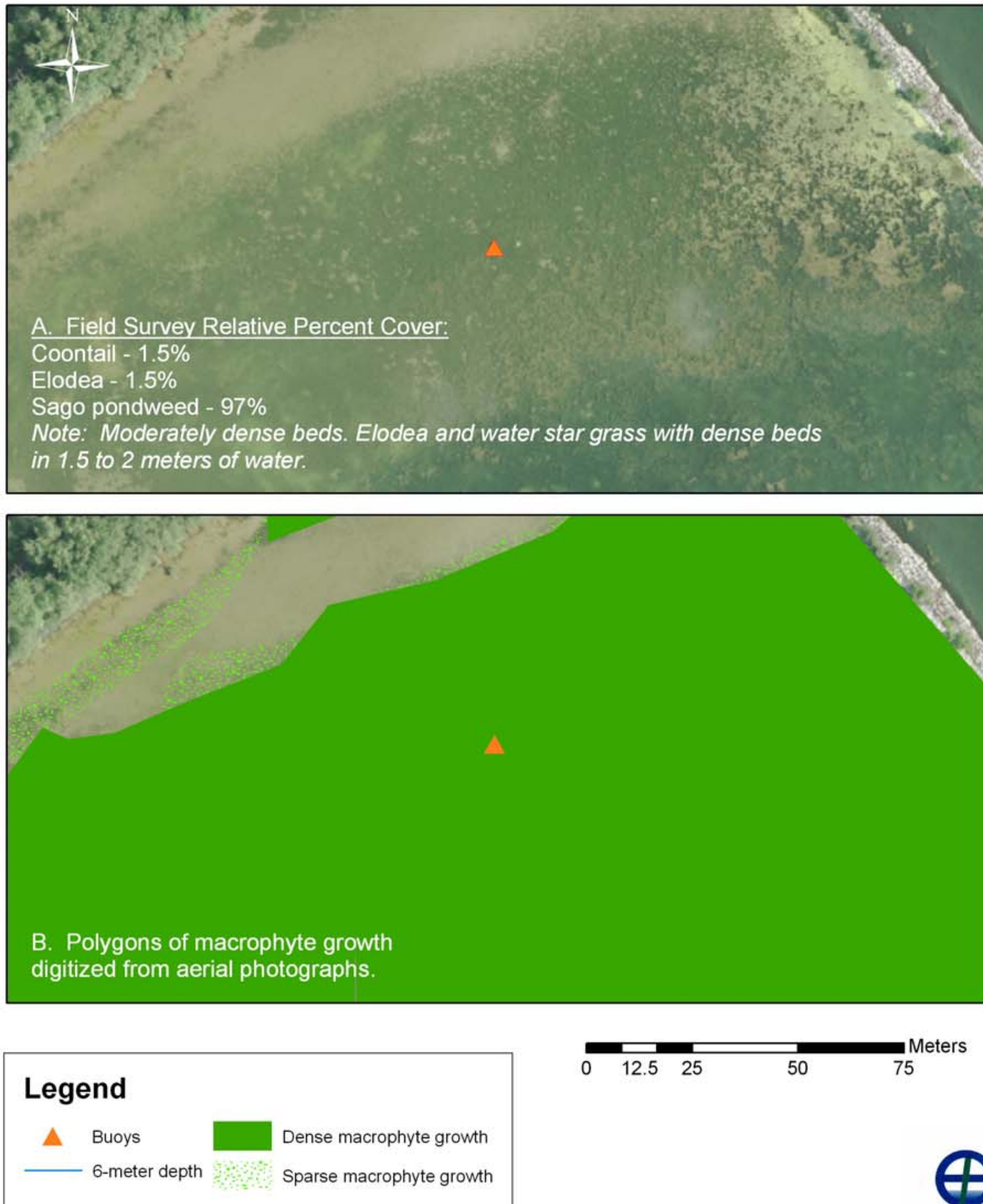
# Map 13
# Ground Truth Buoy Site 7
# August 2007, Onondaga Lake




Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

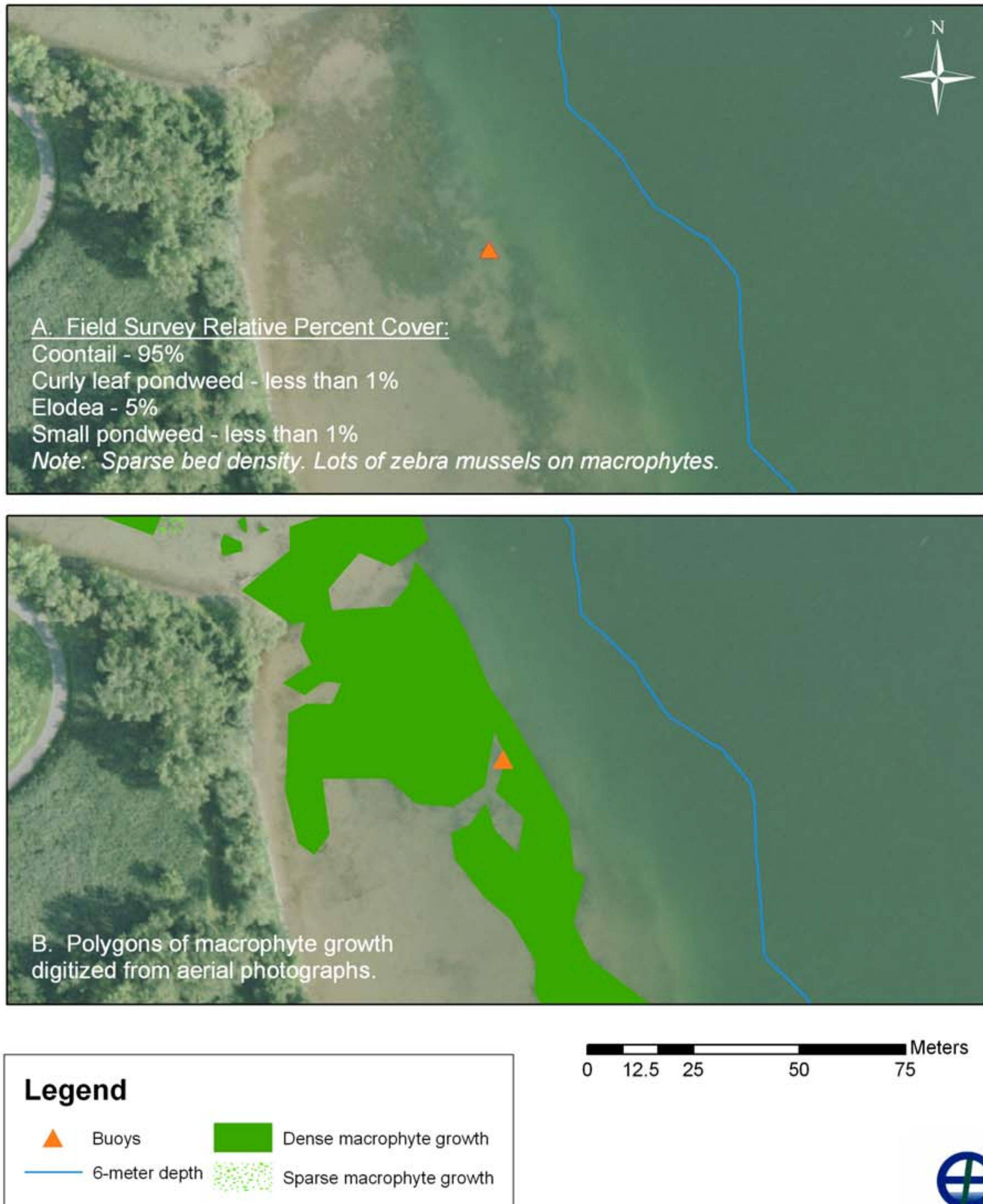
# Map 14
# Ground Truth Buoy Site 8
# August 2007, Onondaga Lake




Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

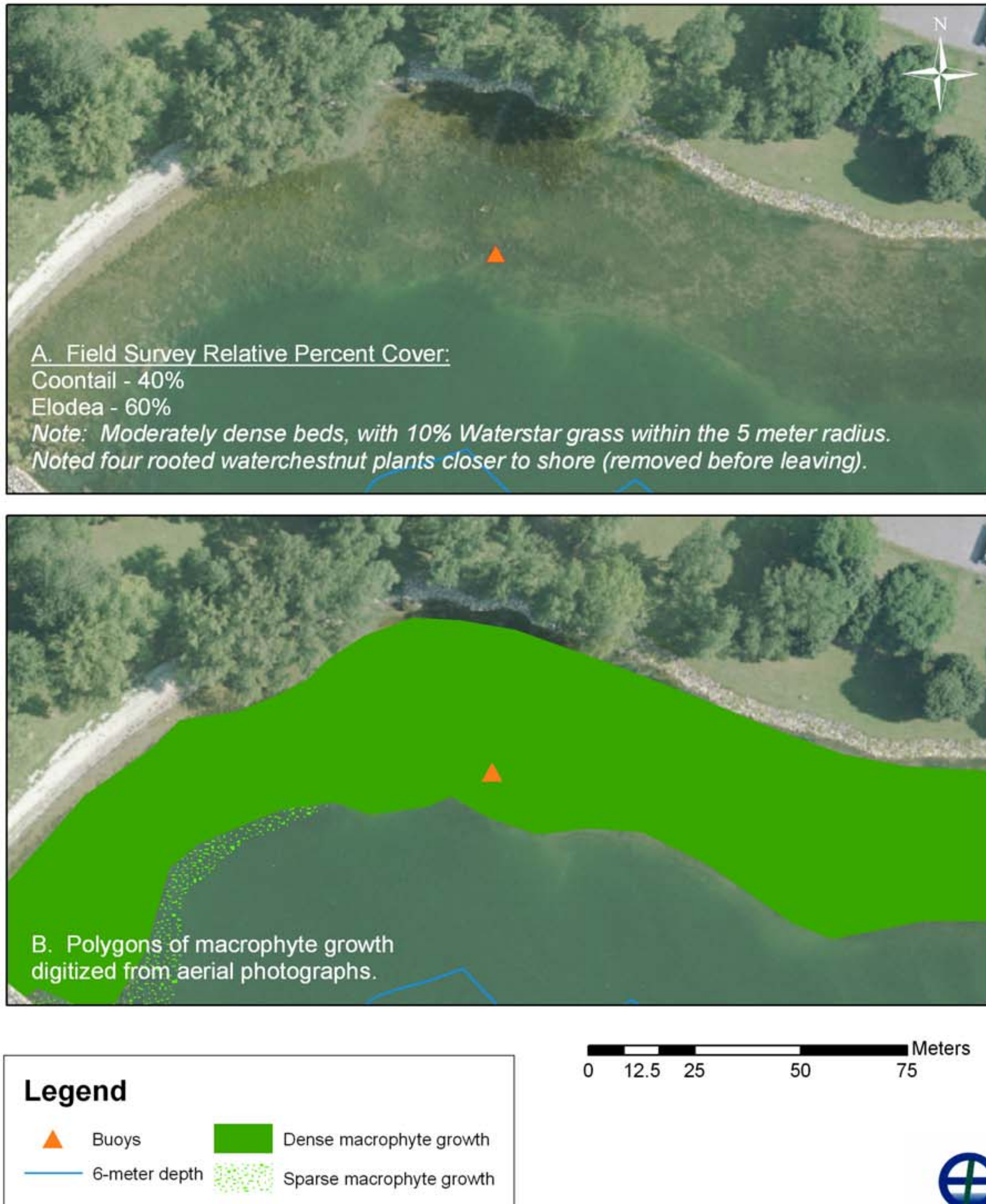
# Map 15
# Ground Truth Buoy Site 9
# August 2007, Onondaga Lake




Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

EcoLogic

# Map 16
# Ground Truth Buoy Site 10
# August 2007, Onondaga Lake




Source: Buoy locations and macrophyte polygons digitized from aerial photographs provided by Airphotographics.

# MACROALGAE DATA SUMMARY

**Site 1 - Lake Nearshore (Nine Mile Creek)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-25-07 | 10 | 8 | 10 | 61-80% | 61-80% | 61-80% |
| 07-03-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-13-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-17-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-23-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-31-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-06-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-14-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-20-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

**Site 2 - Lake Nearshore (Harbor Brook)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-25-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-03-07 | 20 | 0 | 0 | 1-20% | -- | -- |
| 07-13-07 | 40 | 0 | 0 | 21-40% | -- | -- |
| 07-17-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-23-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-31-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-06-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-14-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-20-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

**Site 3 - Lake Nearshore (Metro/Outfall)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-25-07 | 155 | 120 | 203 | 41-60% | 41-60% | 61-80% |
| 07-03-07 | 140 | 154 | 184 | 21-40% | 61-80% | 61-80% |
| 07-13-07 | 140 | 140 | 112 | 41-60% | 61-80% | 61-80% |
| 07-17-07 | 125 | 129 | 119 | 41-60% | 81-100% | 41-60% |
| 07-23-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-31-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-06-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-14-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-20-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

**Site 4 - Lake Nearshore (Ley Creek)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-25-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-03-07 | 123 | 129 | 128 | 1-20% | 1-20% | 1-20% |
| 07-13-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-17-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-23-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-31-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-06-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-14-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-20-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

**Site 5 - Lake Nearshore (Eastside)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 36 | 20 | 10 | 21-40% | 41-60% | 41-60% |
| 06-25-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-03-07 | 0 | 0 | 10 | -- | -- | 1-20% |
| 07-13-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-17-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-23-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-31-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-06-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-14-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-20-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

**Site 6 - Lake Nearshore (Willow Bay)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-25-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-03-07 | 113 | 110 | 102 | 1-20% | 21-40% | 1-20% |
| 07-13-07 | 15 | 20 | 0 | 61-80% | 61-80% | -- |
| 07-17-07 | 50 | 47 | 51 | 21-40% | 81-100% | 61-80% |
| 07-23-07 | 91 | 76 | 88 | 1-20% | 1-20% | 1-20% |
| 07-31-07 | 52 | 39 | 0 | 41-60% | 41-60% | -- |
| 08-06-07 | 30 | 25 | 0 | 21-40% | 21-40% | -- |
| 08-14-07 | 15 | 10 | 15 | 81-100% | 81-100% | 81-100% |
| 08-20-07 | 10 | 10 | 0 | 61-80% | 61-80% | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

**Site 7 - Lake Nearshore (Maple Bay)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-25-07 | 20 | 0 | 0 | 1-20% | -- | -- |
| 07-03-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-13-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-17-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-23-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-31-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-06-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-14-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-20-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

**Site 8 - Lake Nearshore (Bloody Brook)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-25-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-03-07 | | 220 | | -- | 81-100% | -- |
| 07-13-07 | 30 | 30 | 30 | 61-80% | 61-80% | 61-80% |
| 07-17-07 | 165 | 170 | 155 | 81-100% | 81-100% | 81-100% |
| 07-23-07 | 193 | 188 | 178 | 21-40% | 21-40% | 21-40% |
| 07-31-07 | 140 | 126 | 135 | 41-60% | 41-60% | 41-60% |
| 08-06-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-14-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-20-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

**Site 9 - Lake Nearshore (Wastebeds)**

| Observation Date | Distance to Edge of Algae Mat to Shoreline Bench Mark (m) | | | Estimated Percent Cover (Range) | | |
|---|---|---|---|---|---|---|
| | Left | Middle | Right | Left | Middle | Right |
| 05-29-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 06-25-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-03-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-13-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-17-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-23-07 | 0 | 0 | 0 | -- | -- | -- |
| 07-31-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-06-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-14-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-20-07 | 0 | 0 | 0 | -- | -- | -- |
| 08-28-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-04-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-11-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-19-07 | 0 | 0 | 0 | -- | -- | -- |
| 09-25-07 | 0 | 0 | 0 | -- | -- | -- |

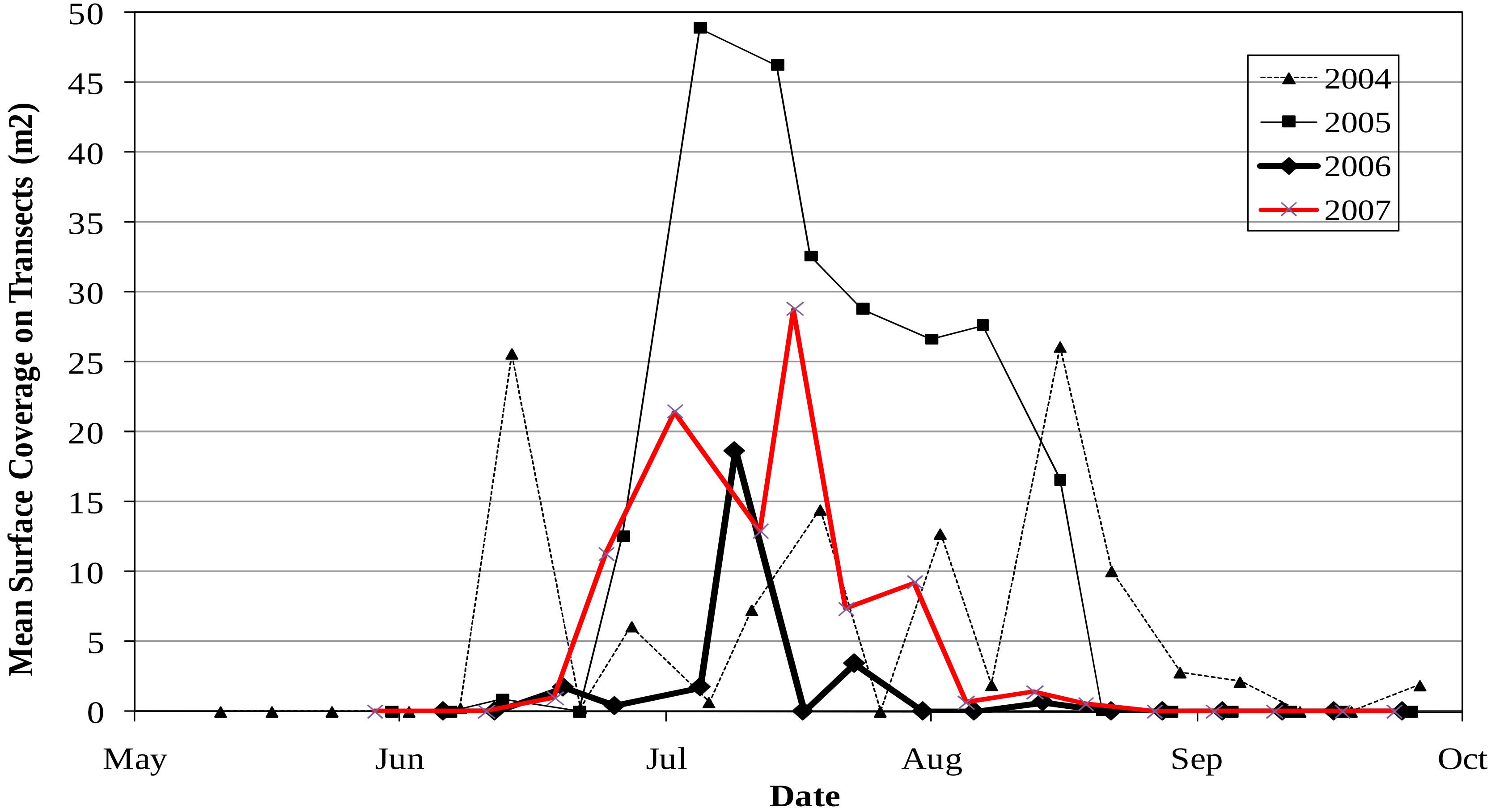



**Figure A4-1.** Temporal pattern of macroalgae abundance at nearshore sample locations in Onondaga Lake.

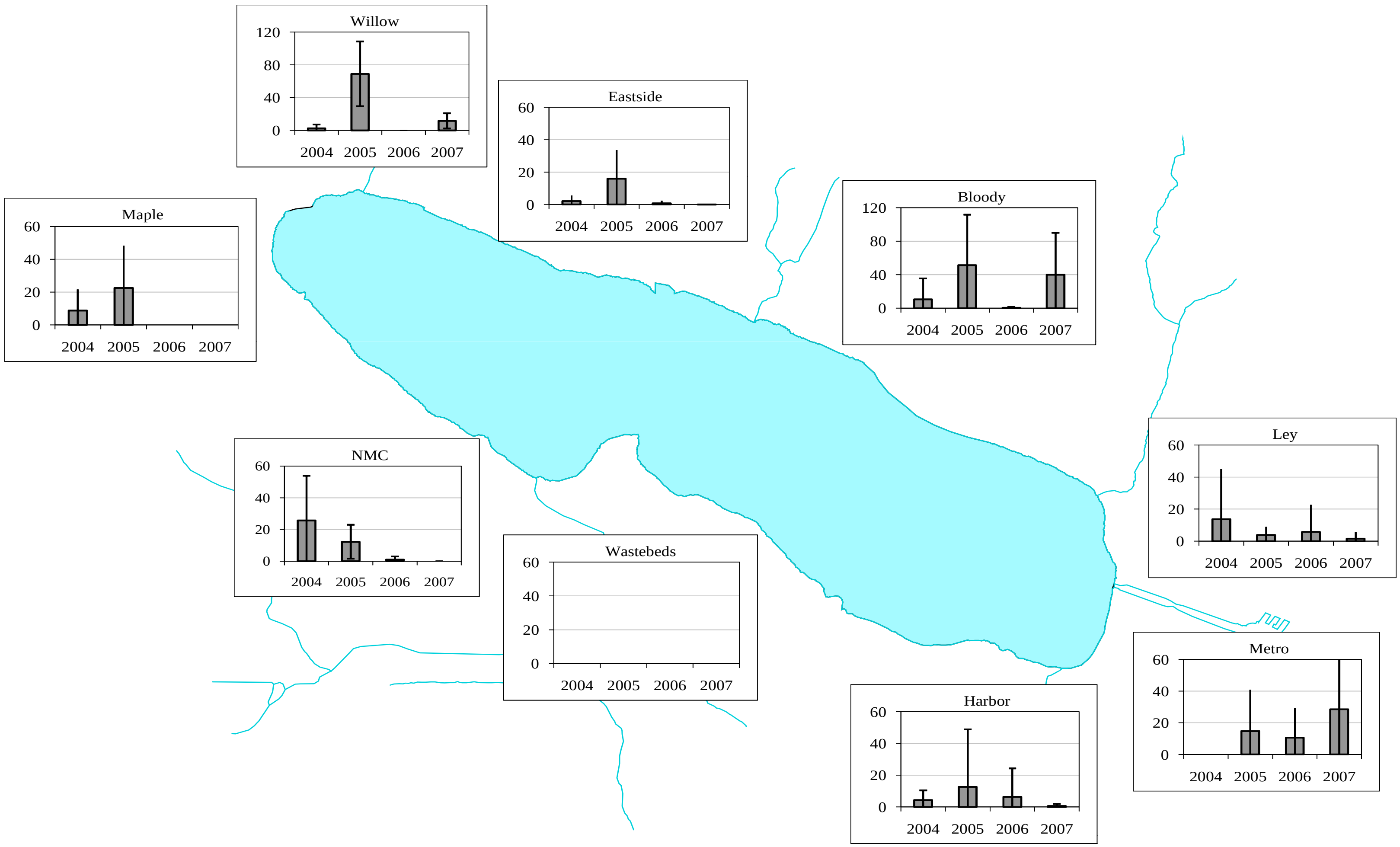



**Figure A4-2.** Spatial variability (mean square meters with standard deviation, July and August) of macroalgae and nearshore sampling locations.

# APPENDIX 5: DAIP

# Appendix 5

# Data Analysis and Interpretation Plan

# Onondaga Lake and Watershed

# Ambient Monitoring Program

Onondaga County Department of Water Environment Protection
650 Hiawatha Boulevard West
Syracuse, New York 13204-1194

**Version 2.5**
**June 2008**

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# Appendix 5. Data Analysis and Interpretation Plan (DAIP)

## A5.1. OBJECTIVE OF THE DAIP

Each year Onondaga County Department of Water Environment Protection (OCDWEP) collects and analyzes more than 20,000 water quality samples and hundreds of biological samples collected from Onondaga Lake and its watershed. Results are used to evaluate water quality conditions and assess whether the waters are in compliance with applicable standards, criteria, and guidance values. The biological samples are used to evaluate the nature of the biological community and assess change.

This Data Analysis and Interpretation Plan (DAIP) was prepared to guide program managers and advisors regarding how these thousands of measurements will be analyzed and interpreted. It is a roadmap of how data become information (refer to **Figure 1-1** in the 2007 Annual AMP report: flow chart of decisions and responsibilities). This document will be revised and updated as new information becomes available, new issues emerge, or new tools are developed to help with data analysis and interpretation.

## A5.2. REGULATORY BACKGROUND – AMENDED CONSENT JUDGMENT

In January 1998, Onondaga County signed an Amended Consent Judgment (ACJ) committing to a phased program of upgrades and improvements to the County's wastewater collection and treatment system. The ACJ includes three major elements:

1. Improvements to the wastewater and stormwater collection systems to abate Combined Sewer Overflows (CSOs).

2. Improvements to the Metropolitan Syracuse Wastewater Treatment Plant (Metro) to reduce the concentration of ammonia N, phosphorus, BOD, solids, and bacteria in treated effluent prior to discharge.

3. Monitoring Onondaga Lake, the lake tributaries, and the Seneca River to track their response to the pollution abatement actions.

Improvements to Metro and the CSOs are phased over a 15-year period. One of the factors considered in developing the phasing plan was uncertainty regarding how Onondaga Lake would respond to reductions in the loading of wastewater-related contaminants. Onondaga County was required to design, fund, and implement a monitoring program that would provide the data and information needed to support key decisions regarding adequacy of the pollution abatement measures and the need for additional actions. These key decisions relate to the level of treatment and the location of the Metro discharge; results will provide the foundation for the Metro SPDES permit, which will include the CSOs.

### A5.2.1. Required Actions by Onondaga County and NYSDEC

Specific compliance requirements for Onondaga Lake and its watershed are referenced in the ACJ. The following summary was prepared by John Ferrante of Central New York Regional Planning and Development Board; Dr. Ferrante is working under contract to NYSDEC on Onondaga Lake issues.

********************************************************************************

**COMPLIANCE REQUIREMENTS FOR THE AMENDED CONSENT JUDGMENT**

The following list contains the primary legal and programmatic actions that are required in the Amended Consent Judgment. This list is not meant to be comprehensive of all ACJ requirements but identifies only those of a technical nature. The Party responsible for implementing each action and bringing it to an acceptable conclusion is identified after each requirement. The source document is the Amended Consent Judgment signed and entered into the Court on January 20, 1998.

**SOURCE** **REQUIREMENT**

Page 4-5: Insure that Onondaga Lake and its tributaries achieve best usage designated for Class B and C water pursuant to 6 New York Code of Rules and Regulations (NYCRR) Parts 701 and 703. Applicable NY State Water Quality Standards and Guidelines:

1. Dissolved Oxygen: 6NYCRR Sec. 703.3
2. Ammonia: 6 NYCRR Sec. 703.5
3. Turbidity: 6 NYCRR Sec. 703.2
4. Floatable Solids: 6 NYCRR Sec. 703.2
5. Phosphorus: 6 NYCRR Sec. 703.2
6. Technical & Operational Guidance Series (TOGS) 1.1.1 Water Quality Standards and Guidelines
7. Nitrogen: 6 NYCRR Sec. 703.2
8. Bacteria: 6 NYCRR Sec. 703.4

**Responsible Party: New York State Department of Environmental Conservation**

Page 5: The State is required "…to determine, as soon as sufficient data and other information are available, whether water quality standards and guidelines for Onondaga Lake can be achieved with the continued discharge of Metro's effluent into the Lake;…"

**Responsible Party: New York State Department of Environmental Conservation**

Paragraph 9: Onondaga County is responsible for complying with the following Stage III effluent discharge limits from the Metro wastewater treatment plant (*or as amended based on revised Total Maximum Daily Load (TMDL))*

1. Ammonia: 1.2 mg/l (June 1 – October 31 [30 day average])
   2.4 mg/l (November 1 – May 31 [30 day average])
2. Phosphorus: 0.02 mg/l [12 month rolling average]

**Responsible Party: Onondaga County**

Paragraph 10: Report on the ability of the County (based on demonstrated information) to achieve compliance with effluent limitations specified in ACJ, paragraph 9, or as amended based on a revised TMDL allocation.

**Responsible Party: Onondaga County**

Paragraph 11: Failure to demonstrate ability (per paragraph 10) by February 1, 2009, cease causing or contributing to the violation of water quality standards in Onondaga Lake by diverting

Metro's effluent to the Seneca River or by implementing another engineering alternative which fully complies with the water quality standards no later than December 1, 2012.

**Responsible Party: Onondaga County**

Paragraph 12: Reassess Total Maximum Daily Load (TMDL) allocation for Onondaga Lake "on or about" January 1, 2009 and modify Stage III effluent limits as needed to reflect revised TMDL.

**Responsible Party: New York State Department of Environmental Conservation**

Paragraph 13: Metro construction compliance requirements and schedule per paragraphs 5 – 11, Appendix A

**Responsible Party: Onondaga County**

Paragraph 14: Design, construct, and maintain and modify and/or supplement, as necessary, a CSO control and upgrade program in accordance with DEC CSO guidance, as set forth in TOGS 1.6.3 (CSO Control Strategy).

**Responsible Party: Onondaga County**

Paragraph 15: Develop and implement an oxygenation demonstration project in Onondaga Lake.

**Responsible Party: Onondaga County** ***{note: this requirement has been suspended pending stipulation that it be withdrawn from the ACJ based on current water quality conditions}.***

Paragraph 16: Monitor conditions in the Lake and its tributaries, and evaluate the effect that alterations in Metro and CSO operations are having on the water quality.

**Responsible Party: Onondaga County**

Paragraph 24: Enter into an agreement with CNYRPDB and provide funding for an Environmental Benefits Project (as set forth in Paragraph 25.C)

**Responsible Party: Onondaga County**

******************************************************************************

### A5.2.2. Water Quality Classification and Designated Use

Lakes and streams are classified according to their designated best use (for example, water supply, swimming, fish propagation, aesthetic enjoyment, and fish survival). Onondaga Lake is classified as B and C waters (**Figure A5-1** and **Table A5-1**) The Class B segment encompasses the northern basin; the Class C segments include much of the southern basin and a small area around the mouth of Ninemile Creek. Both B and C waters must exhibit water quality conditions suitable for fish survival and propagation. Class B waters are to be suitable for primary water contact recreation (e.g. swimming) and secondary water contact recreation (e.g. boating). Class C waters shall be suitable for primary and secondary water contact recreation, although other factors may limit the use for these purposes.

The main stems of the lake tributaries are primarily classified as C waters (suitable for fish propagation and secondary water contact recreation) but several small segments are Class B. The Seneca River segment in the vicinity of the Onondaga Lake outflow and downstream is Class B. As summarized in **Table A5-1**, several Class C stream segments within the subwatersheds are required to comply with Class C(T) water quality standards, meaning that dissolved oxygen and ammonia levels shall be suitable for salmonids.

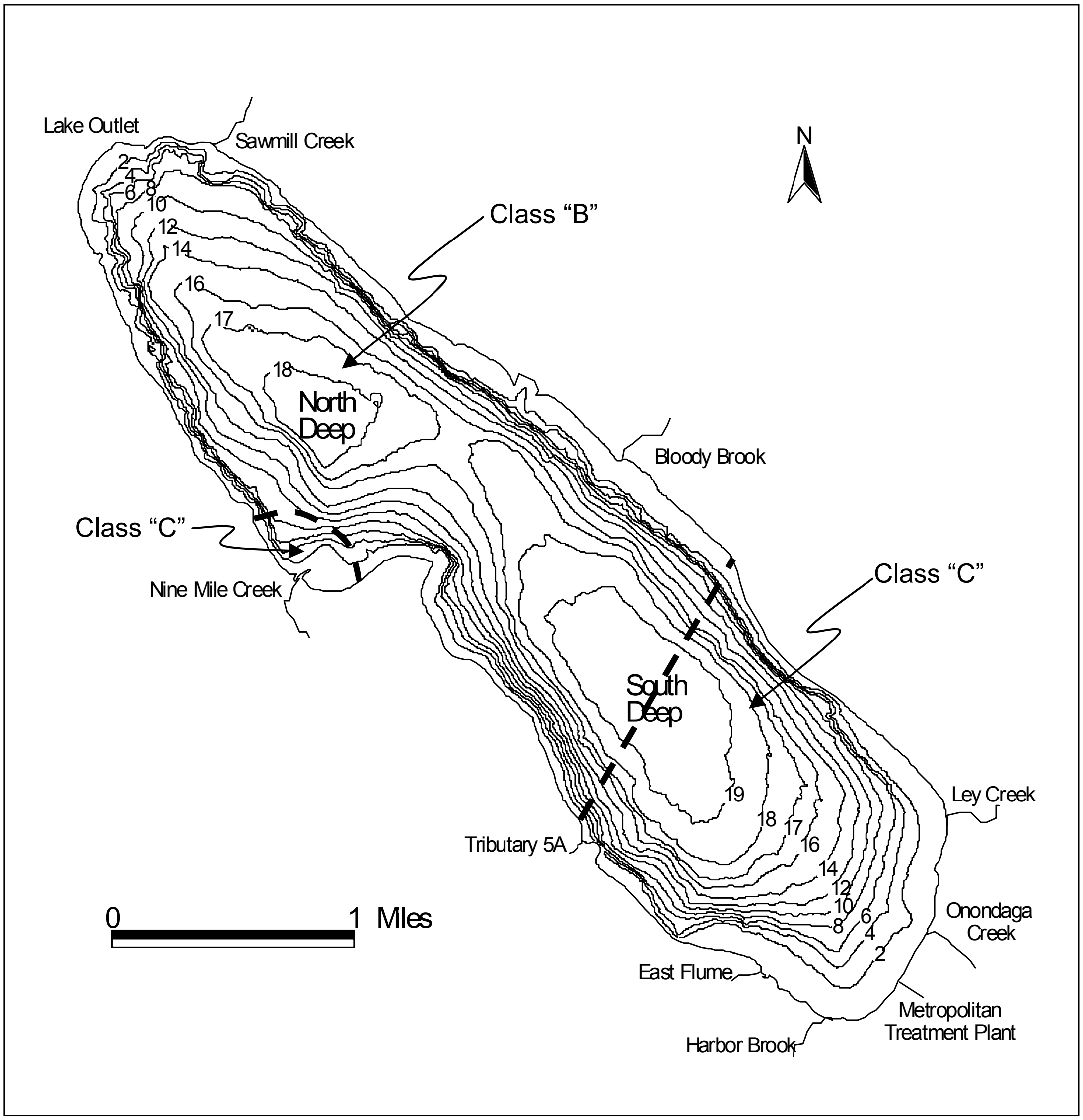


**Figure A5-1**. Regulatory Classifications and Bathymetry of Onondaga Lake.. (Note: Contour lines are in meters.)

**Table A5-1.** Summary of Regulatory Classification of Onondaga Lake and Tributary Streams.

| Water body | Description of Segment | Regulatory Classification | Standards |
|---|---|---|---|
| Onondaga Creek | Enters Onondaga Lake at southeastern end. Mouth to upper end of Barge Canal terminal (0.85 miles) | C | C |
| | Upper end of Barge Canal terminal to Temple Street (1.7 miles) | C | C |
| | From Temple Street, Syracuse to Tributary 5B (4.4 miles) | B | B |
| | From Tributary 5B to Commissary Creek (1.9 miles) | C | C |
| | From Commissary Creek to source | C | C(T) |
| Ninemile Creek | Enters Onondaga Lake from south. From mouth to Allied Chemical Corp. water intake located on creek to point mid-way between Airport Rd and Rt. 173 bridge at Amboy (3.4 miles). | C | C |
| | From point mid-way between Airport Rd and Rt. 173 to outlet of Otisco Lake | C | C(T) |
| Harbor Brook | Enters Onondaga Lake at the southern most point of the lake and within the City of Syracuse. From mouth to upper end of underground section, at Gifford Street (approx. 1.9 miles) | C | C |
| | From upper end of underground section to City of Syracuse line (1.3 miles) | B | B |
| | From City of Syracuse City line to source | C | C(T) |
| Ley Creek | Enters Onondaga Lake 0.2 mile southeast of point where City of Syracuse line intersects east shore of lake. From mouth to Ley Creek sewage treatment plant outfall sewer. | C | C |
| | From Ley Creek sewage treatment plant outfall sewer to South Branch. Tribs. 3-1A and 3-lB enter from north approximately 3.0 and 3.1 miles above mouth respectively. | B | B |
| Bloody Brook | Enters Onondaga Lake 2.25 miles southeast of outlet. From mouth to trib. 1 of Bloody Brook (approximately 0.37 miles from mouth) | B | B |
| | From trib. 1 of Bloody Brook to source. | C | C |
| Onondaga Lake (1) | Northwest of a line extending from a point located on the west shore 0.25 miles northwest of the mouth of trib. 5A to a point on the east shore located at a point 0.6 miles southeast of the mouth of Bloody Brook, except portions of the lake designated as items no. 2 and 3. | B | B |
| Onondaga Lake (2) | Southeast of a line extending from a point located on the west shore 0.25 miles northwest of the mouth of trib. 5A to a point on the east shore located at a point 0.6 miles southeast of the mouth of Bloody Brook, except portions of the lake designated as items numbered 1 and 3. | C | C |
| Onondaga Lake (3) | Area within 0.25 mile radius of the mouth of Ninemile Creek, except portions designated as items numbered 1 and 2. | C | C |

*Source: NYSDEC (classifications as of July 2004); on-line linkage* http://www.dec.ny.gov/regs/4539.html#17588

### A5.2.3. Compliance Assessment

The regulatory goal of the ACJ is to bring Onondaga Lake and its tributaries into compliance with best usage designated for Class B and C waters pursuant to 6 NYCRR Parts 701 and 703. Applicable NY State Water Quality Standards and Guidance that will be used to assess the extent to which these actions are successful include the following:

1. Dissolved Oxygen: 6NYCRR Sec. 703.3
2. Ammonia: 6 NYCRR Sec. 703.5
3. Turbidity: 6 NYCRR Sec. 703.2
4. Floatable Solids in CSO Discharges: 6 NYCRR Sec. 703.2
5. Phosphorus: 6 NYCRR Sec. 703.2
6. Water Quality Standards & Guidelines (NYSDEC Technical & Operational Guidance Series TOGS 1.1.1)
7. Nitrogen: 6 NYCRR Sec. 703.2
8. Bacteria: 6 NYCRR Sec. 703.4

## A5.3. Summary of the Onondaga County Ambient Monitoring Program (AMP)

Onondaga County is required by the ACJ to design and implement an annual monitoring program of the lake, the lake tributaries, and portions of the Seneca River adjacent to the Onondaga Lake Outlet. The objective of the Ambient Monitoring Program (AMP) is to provide the data and information needed to assess the effectiveness of the controls at Metro and the CSOs and determine if additional remedial measures are required to bring the waters into compliance with applicable state standards and guidelines and federal criteria.

Onondaga County and its partners rely on an integrated program of monitoring and modeling to determine whether the planned improvements to the Onondaga County wastewater collection and treatment infrastructure are effective in bringing the surface water system into compliance with state and federal requirements. Monitoring is used to measure conditions over the 15-year period of phased improvements to the wastewater collection and treatment system. Modeling is used to describe the interrelationships between physical, chemical, and biological characteristics of the lake and watershed. Models are also valuable tools for interpreting data and understanding underlying mechanisms. Once verified, models can be used to predict future conditions under a range of management scenarios and environmental conditions.

The interrelationship between the management questions, monitoring and modeling, and the spatial and temporal designation of compliance is summarized in **Table A5-2**.

**Table A5-2.** Summary of management questions and decision analysis.

| Management Question: | Decision Analysis Components and Regulatory References | Spatial and Temporal Scale of Assessment | Tools for Assessment |
|---|---|---|---|
| Can ambient water quality standards be achieved with continued Metro discharge to Onondaga Lake?<br><br>**Decision date: February 1, 2009** | Dissolved Oxygen:<br>6NYCRR Sec. 703.3<br>Ammonia:<br>6 NYCRR Sec. 703.5<br>Turbidity:<br>6 NYCRR Sec. 703.2<br>Floatables:<br>6 NYCRR Sec. 703.2<br>Phosphorus:<br>6 NYCRR Sec. 703.2<br>TOG 1.1.1 Water Quality Standards & Guidelines<br>Nitrogen:<br>6 NYCRR Sec. 703.2<br>Bacteria:<br>6 NYCRR Sec. 703.4 | Dissolved Oxygen: Upper waters, fall mixing, South Deep<br>Ammonia and nitrite: Upper waters; South Deep, year-round<br>Bacteria: Class B portions of lake | Monitoring: AMP data<br>Modeling CSOs: Use SWMM to confirm: system-wide annual average capture of 85% of combined sewage volume.<br>Modeling Lake: Onondaga Lake model (development began in 2005) |
| Must Metro effluent meet the Stage III phosphorus and ammonia limits for discharge to Onondaga Lake or the Seneca River in order for the receiving water to achieve compliance with ambient water quality standards?<br><br>**Decision date: February 1, 2009** | Phosphorus:<br>6 NYCRR Sec. 703.2<br>(*possibly modified by site-specific guidance value)*<br>Trophic state indicators:<br>frequency, intensity and duration of algal blooms<br>Ammonia:<br>TOG 1.1.1 Water Quality Standards & Guidelines (*latest revision to NYS standards*)<br>NYSDEC revised TMDL for phosphorus and ammonia: **January 1, 2009** | Phosphorus and other trophic state parameters: Summer average, upper waters, South Deep (per NYSDEC guidance).<br>Dissolved Oxygen: Upper waters, fall mixing, South Deep<br>Ammonia: Upper waters; South Deep, year-round | For lake discharge:<br>• AMP data:<br>Ammonia: effects of Stage 3 limits, met in 2004<br>TP: effects of Stage 2 limits, met in 2006<br>• Use lake model to project compliance under critical conditions<br>For Seneca River discharge: TRWQM |
| Are additional measures needed to ensure compliance with dissolved oxygen standards during fall mixing?<br><br>**Decision date: December 1, 2012** | Feasibility analysis of hypolimnetic oxygenation (ENSR 2004).<br><br>*Status: on hold* | Focus of compliance for dissolved oxygen: fall mixing, upper waters | • AMP data: profiles and buoy<br>• Mass-balance model<br>• Onondaga Lake model |

### A5.3.1. History of Onondaga County Monitoring Efforts

The AMP is not Onondaga County's first monitoring effort. Following completion of a baseline State of the Lake Report in 1970, Onondaga County conducted an annual program from 1970–1997 to monitor tributaries, quantify external loading, and track lake water quality conditions and trends in response to pollution abatement efforts. When the ACJ was signed in 1998, Onondaga County modified its historical monitoring program to ensure that the data collected would be adequate to evaluate the response of the lake, streams, and river to the planned improvements to the CSOs and Metro. This process of evaluation and modification was a collaborative effort of Onondaga County, Onondaga Lake Technical Advisory Committee (OLTAC), U.S. Geological Survey (USGS), New York State Department of Environmental Conservation (NYSDEC), Environmental Protection Agency (EPA) and Atlantic States Legal Foundation (ASLF). The AMP began in August 1998 and is scheduled to continue through 2012.

The AMP differs from the historical program in several important ways:

- Storm Event Monitoring: The AMP incorporated a storm event program on the CSO-affected tributaries (Onondaga Creek, Harbor Brook, Ley Creek), plus Ninemile Creek. Storm event data are used to evaluate the effectiveness of the CSO remedial measures.

- Stream Mapping: A stream mapping component was added to the AMP to document habitat quality along the CSO-affected tributaries; this program will support evaluation of the effectiveness of CSO controls and has provided additional information regarding nonpoint sources of pollution (particularly sediment).

- Recreational Indices: The AMP was expanded to include monitoring for indices of recreational quality (bacteria and water transparency) at a network of eight nearshore stations (a ninth station was added in 2006).

- In-Situ Buoy: A monitoring buoy has been placed at the South Deep station to provide high-frequency measurements of water temperature, dissolved oxygen and related parameters.

- Precipitation Stations: Onondaga County has expanded its network of precipitation gauging stations.

- Biological Monitoring: The most significant change, however, has been the addition of an extensive biological monitoring program.

### A5.3.2. Design of the AMP: Required Elements

The AMP was designed to provide data and information needed to guide management decisions regarding the level of treatment of municipal wastewater (including CSOs) and the location of the Metro discharge.

The AMP includes Onondaga Lake, the lake's tributaries, and the Seneca River in the region of the Onondaga Lake outlet. The program includes measures to evaluate physical and habitat conditions, chemical water quality, and the nature of the biota as summarized in the language from the ACJ listing the required elements of the AMP.

These required elements from Appendix D of the ACJ include measures to:

- Assess compliance with ambient water quality standards in the lake and tributary streams
- Estimate loading of materials to the lake, including the volume and loading of materials from the combined sewer overflows
- Evaluate physical habitat conditions in the lake and tributaries
- Evaluate the lake's trophic state (level of productivity)
- Model the assimilative capacity of the Seneca River in the region of the Onondaga Lake outlet to support a decision regarding diversion of Metro effluent
- Characterize the lake's biological community.

In addition to these specific measures, Appendix D of the ACJ includes requirements to document data integrity (for example, preparation of a detailed Quality Assurance Project Plan). Onondaga County is required to consult with technical experts to ensure that the AMP is designed and implemented in a defensible manner. Data interpretation and reporting is to be open and subject to rigorous technical review. Finally, Appendix D includes specific requirements to ensure that Onondaga County's monitoring program collects data related to habitat quality. The addition of attributes to measure habitat quality highlights the expansion of the program from a traditional water quality monitoring program to one that aims at a more holistic assessment of ecological integrity. Appendix D of the ACJ is abstracted below.

OCDWEP also has an expanded monitoring program on the Seneca River that is not part of the AMP; this program extends into the Oneida River and is used to evaluate performance of other Onondaga County wastewater treatment plants.

An overview of how the AMP is designed to meet ACJ requirements is provided in **Table A5-3**. While the AMP is designed to assure compliance with the specific requirements in the ACJ, Onondaga County collects and analyzes additional data to meet related program objectives. In many cases, additional data are collected that enable a more integrated analysis of water quality conditions and the response of the biota. Details of how data collected through the AMP are used and interpreted is included in **Table A5-4**, which is subdivided into these sections:

A. Onondaga Lake Chemical/Water Quality Monitoring Program
B. Onondaga Lake Physical Parameters
C. Onondaga Lake Chlorophyll-a, Phaeophytin-a, Phytoplankton, Zooplankton, Macrophytes and Littoral Macroinvertebrates.
D. Onondaga Lake Fisheries Program
E. Tributary Program Summary
F. Seneca River Program Summary

# AMBIENT MONITORING PROGRAM REQUIREMENTS
# (Appendix D of the ACJ)

*Abstracted from the Amended Consent Judgment, January 1998*

## I. Tributaries and Lake Water Quality Monitoring Program

1. Assess compliance with ambient water quality standards and progress toward use attainment.
2. Assess physical habitat for stream and lake biota, and indicators of the biotic response.
3. Incorporate flexibility to assess additional chemicals or potential sources as needed
4. Concentrate data collection during critical ecological periods (e.g. spring spawning of dominant lake fishes, onset of thermal stratification, fall mixing).
5. Define monitoring as a priority at the Department and commit adequate resources
6. Increase participation of outside technical experts, e.g., Onondaga Lake Technical Advisory Committee in design and implementation of AMP and interpretation of results.
7. Incorporate appropriate QA/QC.
8. Maintain data in an electronic format that facilitates summarizing data, reporting results, and depicting results (including graphical depiction)

## II. Tributary Monitoring Program

1. Quantify external loadings of phosphorus, nitrogen, suspended solids, indicator bacteria, heavy metals, and salts. Utilize FLUX. Events-based schedule.
2. High flow monitoring to partition point and nonpoint sources of phosphorus to the Lake (minimum of 5 days).
3. Collect storm event data upstream and downstream of CSO discharges to Onondaga Creek, Harbor Brook and Ley Creek.
4. Assess compliance with water quality standards in Onondaga Cr, Harbor Br, and Ley Cr.
5. Measure attributes of the physical environment in tributaries: (a) velocity; (b) cross-sectional area to map erosional and depositional sections; (c) survey for presence and character of sludge deposits in depositional areas and map; (d) map physical characteristics of the stream bed that could affect spawning habitat from mouth to first barrier; (e) sample macroinvertebrate communities and calculate NYSDEC rapid field biotic index throughout tributaries' length.
6. Continue cooperative arrangements with USGS to gauge discharge of the major tributaries.
7. Continue data collection, analysis and reporting consistent with historical database (1970 to 1997) to enable statistical trend analysis.

## III. Onondaga Lake Monitoring Program

1. Assess compliance with ambient water quality standards including bacterial concentrations in nearshore areas.
2. Assess trophic status of the Lake.
3. Continue data collection, analysis, and reporting consistent with the long-term lake database (1970 – 1997) to enable statistical trend analysis.
4. Complement chemical program with a biological monitoring effort to assess the densities and species composition of phytoplankton, zooplankton, macrophytes, macroinvertebrate, and fish.
5. Evaluate success of walleye, bass, and sunfish propagation (quantitative lake-wide nest surveys, recruitment estimates, and juvenile community structure). Coordinate with NYSDEC fisheries management activities on the lake.
6. Establish sharing protocols with NYSDEC for County to track contaminants in fish flesh.
7. Acquire and track data by others regarding nature of littoral (shallow area) sediments in Onondaga Lake.

## IV. Seneca River Program

1. Evaluate current water quality of the Seneca River and compliance with water quality standards upstream and downstream of the Onondaga Lake outlet.
2. Evaluate and quantify the assimilative capacity of the Seneca River and quantify effects of zebra mussels.
3. Monitor critical conditions of warm weather and low flows.
4. Test temporal and spatial variability (e.g., diurnal variations in river water quality, and the extent of chemical stratification).

**Table A5-3.** Elements of the AMP in relation to ACJ-Required Monitoring Objectives.

| ACJ Statement of Required Program Objective | Ambient Monitoring Program Elements | Data Used To |
|---|---|---|
| Quantify external loading of phosphorus, nitrogen, suspended solids, indicator bacteria, and salts.<br>Assess the reduction in loading achieved by the CSO improvements.<br>Design program to evaluate the relative contribution of point and nonpoint sources of pollution to the lake. | Tributary monitoring (Annual Program): biweekly and high flow events – includes locations upstream and downstream of CSOs, urban and rural segments of subwatersheds.<br>Storm event program (Periodic): higher frequency sampling on CSO-affected streams during storms. | Estimate annual external loading to Onondaga Lake<br>Calculate loading from CSO-affected tributaries and compare pre-and post-remedial load of phosphorus, suspended sediment, and bacteria |
| Assess the tributaries' physical habitat and macroinvertebrate community | Stream mapping using NRCS Visual Stream Assessment Protocol in CSO-subwatersheds (Periodic): Onondaga, Ley and Harbor Brook. Baseline, 2000 and 2002; post-improvements scheduled for 2008 and 2012; note: may be modified based on CSO construction schedule or major hydrologic event<br>Macroinvertebrate surveys (Periodic): CSO-affected subwatersheds every 2 years, even years. | Quantify baseline conditions and provide basis to measure change.<br>Calculate standard indices (using NYSDEC protocols) that use numbers and types of benthic macroinvertebrates to indicate status of water quality and habitat conditions. Test for improvement over time. |
| Gather data on an adequate temporal and spatial scale to assess compliance with ambient water quality standards | Lake monitoring program (Annual): South Deep Station and nine nearshore stations<br>Tributary monitoring program (Annual)<br>Seneca River monitoring program (Annual) | Assess compliance with numerical and narrative standards for substances listed in TOGS 1.1.1<br>Calibrate and verify models |

**Table A5-3.** Elements of the AMP in relation to ACJ-Required Monitoring Objectives. (continued)

| ACJ Statement of Required Program Objective | Ambient Monitoring Program Elements | Data Used To |
|---|---|---|
| Evaluate changes in the water quality and trophic state of Onondaga Lake in response to reductions in external loading achieved by the improvements to Metro and the CSOs. | Lake monitoring program (Annual): phosphorus, chlorophyll-a, water clarity, DO status of lower waters<br>Tributary and Metro effluent monitoring (Annual): loads (esp. nutrients)<br>Seneca River monitoring (Annual) | Assess conditions in relation to inputs and trends<br>Calibrate USGS watershed model of land use and nutrient export (using AMP tributary data)<br>Construct conceptual model and mass-balance model<br>Calculate “fish space metrics” to track changes in available habitat for cold water, cool water and warm water fish<br>Develop and calibrate Onondaga Lake model |
| Through interaction with NYSDEC and appropriate peer reviewers, coordinate data collection and analysis to provide data at an adequate spatial and temporal scale to use in existing or revised lake models | Annual program and supplemental investigations, NYSDEC review and approvals<br>Meetings with OLTAC and work groups | Support conceptual and empirical (mass-balance) model; AMP data will be used to calibrate and verify new lake model (begun in 2005) |
| Define ambient water quality conditions in the Seneca River between Cross Lake and the Three Rivers junction. | Annual surveys during low flow conditions at Seneca River Buoy 316. | Assess current conditions, provide data for model verification<br>Assess compliance with ambient water quality standards |
| Evaluate and quantify the assimilative capacity of the Seneca River and quantify effects of zebra mussels.<br>Quantitative Environmental Analysis, LLC. *Final Phase 2 Report Three Rivers Water Quality Model.* Prepared for: Onondaga County Department of Water Environment Protection Syracuse, NY, Onondaga Lake Cleanup Corp., Syracuse, NY. Job Number: ONOsen: 227. August 2005. | River modeling work group and peer review<br>(Annual program)<br>Surveys during low flow conditions in the fall (depends on hydrologic conditions) | Assess current conditions, data set for model verification |
| | Periodic zebra mussel assessment (surveys completed in spring and summer 2007) | Support TRWQM model of assimilative capacity of River, including zebra mussel activity. Domain is Cross Lake to Phoenix Dam.<br>Assess current conditions, compile data for model verification |

**Table A5-4**. Detailed Reporting of AMP Program, Data Analysis and Interpretation Strategy.

***A. Onondaga Lake Chemical/Water Quality Monitoring Program***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Alkalinity, Total | Concentration | • Charge Balance<br>• Trends<br>• Compute Hardness | South Deep<br>North Deep | UML1 composite<br>LWL composite | South Deep:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br><br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Wildco Beta horizontal sampler/ Churn |
| Bacteria<br>Fecal Coliform,<br>E. Coli | • Abundance of indicator organisms<br>• Percent of measurements meeting swimming standards | • Potential presence of pathogens<br>• Compliance with standards<br>• Use attainment.<br>• Trend analysis<br>• Effectiveness of CSO control measures.<br>• Model support | South Deep<br>North Deep<br>Nearshore sites | 0m | South Deep:<br>Biweekly (Oct-Apr) and weekly (May-Sept)<br><br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake")<br><br>Nearshore:<br>Weekly (May-Sept) | Grab sample into sterile bottle |

1 UML and LWL composite samples are based on the thermocline depth determined through the field profile (temperature, pH, dissolved oxygen, and specific conductance). Two periods are defined as default conditions that vary depending on the lake's annual stratification and mixing: October 1 – May 31, (not strongly stratified) and June 1 – Sept 30 (strongly stratified). During the October 1 – May 31 period, default UML includes the 0, 3 and 6 m depths; default LWL includes the 9, 12, 15 and 18 m depths. During the June 1 – September 30 period, default UML includes 0 and 3 m depths (always); 6 m may be excluded based on field conditions. The LWL during the summer period typically includes 12, 15, and 18 m; 9m is excluded as it is consistently in the metalimnion. Occasionally, the thermal structure during summer leads the field team to exclude the 12 m depth as well.

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***A. Onondaga Lake Chemical/Water Quality Monitoring Program (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| BOD-5 | Concentration | • Indicator of oxygen-demanding material<br>• Model support<br>• Trends | South Deep<br>North Deep | UML composite<br>LWL composite | South Deep:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br><br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Wildco Beta horizontal sampler/ Churn |
| Carbon:<br>TOC, TOC-F, TIC | Concentration | • Trends<br>• Trophic Status.<br>• Indicator of oxygen demanding material.<br>• Support models | South Deep<br>North Deep | Discrete depths (0m, 6m, 12m, 18m) | South Deep:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br><br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Submersible Pump |
| Mercury:<br>Total and Methyl Mercury (low-level) | Concentration | • Compliance<br>• Trends | South Deep<br>North Deep | 3m & 18m | April, June, August, October | Teflon Dunker Modified USEPA Method 1669 |
| Metals:<br>Cd, Cr, Cu, Ni, Pb, Se, Zn, As, K | Concentration | • Compliance<br>• Charge balance computations (K) | South Deep<br>North Deep | UML composite<br>LWL composite | Quarterly | Wildco Beta horizontal sampler/ Churn |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***A. Onondaga Lake Chemical/Water Quality Monitoring Program (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Metals/Salts:<br>Ca, Na, Mg, Mn, Fe, Cl, $SO_4$ | Concentration | • Charge Balance (data quality)<br>• Trends<br>• Geochemical Analysis<br>• Electrochemical (redox)<br>• Density stratification<br>• Phytoplankton community structure | South Deep<br>North Deep | UML composite<br>LWL composite | <u>South Deep</u>:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br><br><u>North Deep</u>:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Wildco Beta horizontal sampler/ Churn |
| Nitrogen**:**<br>$NO_3$, $NO_2$ | • Concentration<br>• Compliance with NYS standard (100 ug/l Nitrite in upper waters for warmwater fishery) | • Compliance with AWQS[2].<br>• Measure in-lake nitrification and nitrogen cycling<br>• Use attainment (warm water fishery) | South Deep<br>North Deep | UML composite<br>LWL composite | <u>South Deep</u>:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br><br><u>North Deep</u>:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Wildco Beta horizontal sampler/ Churn |

[2] AWQS – Ambient Water Quality Standard

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***A. Onondaga Lake Chemical/Water Quality Monitoring Program (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Nitrogen:<br>TKN, NH3-N, Org-N, TKN-Filtered | Concentration | • Compliance with standards<br>• Measure in-lake nitrification, nitrogen cycling<br>• Compute N:P ratios<br>• Habitat for biota<br>• Trend analysis<br>• TMDL. Analysis<br>• Model support | South Deep<br>North Deep | Discrete Depths (0m, 3m, 6m, 9m, 12m, 15m, 18m) | South Deep:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Submersible Pump |
| Phosphorus:<br>TP, SRP, TDP | Concentration | • Trophic status<br>• Trends<br>• Compliance with NYS guidance value of 20 µg/l summer average, upper waters guidance value (support for site-specific analysis)<br>• TMDL analysis<br>• Model support<br>• Bioavailability | South Deep<br>North Deep | Discrete Depths (0m, 3m, 6m, 9m, 12m, 15m, 18m)<br>plus 1m, biweekly, June 1 – Sept 30 (NYS guidance value) | South Deep:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Submersible Pump |

**Table A5-4** Detailed Reporting of AMP Program. (continued)

***A. Onondaga Lake Chemical/Water Quality Monitoring Program (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Silica | Concentration | Trophic levels interaction (potential for silica to limit diatom production) | South Deep<br>North Deep | Discrete depths (0m, 6m, 12m, 18m) | South Deep: Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br><br>North Deep: Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Submersible Pump |
| Solids:<br>TS, TSS, VSS, TVS, TDS | Concentration | • Compliance<br>• Trend analysis<br>• Chemical stratification<br>• Correlation with turbidity (water clarity) | South Deep<br>North Deep | Discrete depths (0m, 6m, 12m, 18m) | South Deep: Biweekly (Apr-Dec)<br><br>North Deep: Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Submersible Pump |
| Sulfides | Concentration | • Anoxia<br>• Model support (diagenesis) | South Deep<br>North Deep | Discrete depths (12m, 15m, 18m) | Only when anoxic conditions are present<br><br>South Deep: Biweekly<br><br>North Deep: Quarterly | Wildo Beta horizontal sampler |

**Table A5-4** Detailed Reporting of AMP Program. (continued)

***B. Onondaga Lake Physical Parameters***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Turbidity | Light scattering (NTU) | • Trend analysis<br>• Correlation with other indices affecting water clarity | South Deep | Discrete depths (2m, 6m) | Daily at 15 minute intervals (Apr-Dec) | YSI Buoy |
| | | | South Deep<br>North Deep | South Deep:<br>UML composite<br>Discrete depth (0m)<br><br>North Deep:<br>UML composite | South Deep UML:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br><br>South Deep 0m:<br>Weekly May-Sept<br><br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | Wildco Beta horizontal sampler/ Churn |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)
***B. Onondaga Lake Physical Parameters (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Field data:<br>pH, Temperature, Salinity, Conductivity, Dissolved Oxygen, ORP | • Volume-days of Anoxia<br>• Rate of depletion from LWL<br>• DO during fall mixing<br>• Volume-days of hypoxia<br>• Fish-space metrics | • Compliance<br>• Stratification (thermal and chemical)<br>• Model support<br>• Trend analysis<br>• Ammonia toxicity.<br>• Use attainment.(habitat)<br>• Concentration of reduced substances and oxidation status of lake (ORP data)<br>• pH indicator of CO2 production and decomposition. | South Deep<br>North Deep | 0.5 m intervals through water column | South Deep:<br>Biweekly (Apr-Dec) and monthly in winter, as conditions allow<br><br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) ("winter lake") | YSI<br>(In-situ) |
| | | • Compliance with DO and pH standards.<br>• Evidence of mixing processes (seiche) | South Deep | Discrete depths (2m, 6m, 12m, 15m) | Daily at 15 minute intervals (Apr-Dec) | YSI Buoy |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)
***B. Onondaga Lake Physical Parameters (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Secchi Disk Transparency | • Average Secchi, percent of measurements meeting 1.2 m (nearshore), 1.5 m (South Deep) | • Secchi disk transparency: Compliance with NYSDOH[3] guidance value for bathing beaches (1.2 m or 4 ft).<br>• Trends<br>• Trophic Status<br>• Indicator of water clarity<br>• Aesthetics (1.5 m or 5 ft)<br>• Use attainment | South Deep<br>North Deep<br>Nearshore sites | Depth at which the disk is no longer visible from the surface | South Deep:<br>Weekly (May-Sep)<br>Biweekly (Apr, Oct-Dec)<br><br>North Deep:<br>Quarterly<br>Weekly (Feb-Mar) (“winter lake”)<br><br>Nearshore:<br>Weekly (May–Sep) | Secchi Disk |
| LiCor Underwater Illumination Profile | • Extinction coefficient | • Trends<br>• Trophic Status<br>• Indicator of water clarity<br>• Aesthetics (1.5 m or 5 ft)<br>• Use attainment | South Deep<br>North Deep | From lake surface to depth at which light is 1% of surface illumination | Biweekly (Apr-Dec) | LiCor Datalogger |

[3] NYSDOH – New York State Department of Health

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***C. Onondaga Lake chlorophyll-a, phaeophytin-a, phytoplankton, zooplankton, macrophytes, and littoral macroinvertebrates***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Chlorophyll-*a* & Phaeophytin-*a* | • Concentration<br>• Magnitude and frequency of bloom conditions | • Use attainment.<br>• Aesthetic quality<br>• Site-specific guidance<br>• Assess trophic status and algal productivity.<br>• Trends<br>• Compare to phytoplankton and zooplankton.<br>• Evaluate variability.<br>• Lake model calibration and validation | South Deep<br>North Deep | UML composite and Photic Zone[4] | South Deep:<br>In duplicate weekly (May-Sept) and biweekly (April; Oct – Dec)<br><br>North Deep:<br>Quarterly | ¾" Tygon tube sampler (Depth-integrated tube samples) |
| Phytoplankton | • Biovolume<br>• Abundance<br>• Species composition<br>• Annual succession<br>• Percent blue green | • Assess community structure, importance of cyanobacteria<br>• Trends in abundance and biomass<br>• Aesthetic quality<br>• Correlation with chlorophyll<br>• Relationship to light penetration | South Deep<br>North Deep | UML composite | South Deep:<br>Biweekly (Apr–Nov) and monthly in winter, as conditions allow<br><br>North Deep:<br>Quarterly | ¾" Tygon tube sampler (Depth-integrated tube samples) |

4 The Photic Zone is defined as two times the Secchi disk transparency depth measured the day of sampling.

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***C. Onondaga Lake chlorophyll-a, phaeophytin-a, plankton, macrophytes, and littoral macroinvertebrates (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Zooplankton | • Count<br>• Dry weight biomass<br>• Identification<br>• Abundance<br>• Species composition<br>• Annual succession<br>• Size | • Trends in abundance and biomass<br>• Assess community structure<br>• Size structure<br>• Correlate data with other regional lakes (Oneida Lake)<br>• Test relationship to fish community<br>• Infer food web impacts | South Deep<br>North Deep | UML composite and<br>15 m tow | South Deep:<br>Biweekly (Apr–Nov) and monthly in<br>winter, as conditions allow<br><br>North Deep:<br>Quarterly | Vertical Haul<br>0.5 m diameter net,<br>80 μm mesh |
| Macrophytes | Plant distribution | Used to track percent cover during years without field surveys | Entire Lake | - | Annual | Digitize beds from aerial photographs using GIS software |
| | Lakewide and by strata:<br>• Species richness<br>• Biomass<br>• Percent cover | • Percent cover compared with optimal levels for warmwater fish community (bass) nursery and cover<br>• Biomass to support lake model<br>• Richness compared with regional lakes<br>• Trends | Transects in littoral strata | From shoreline to depth where plant growth stops (6 m contour standard) | 2000, 2005, 2010 (August surveys) | Field surveys |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)
***C. Onondaga Lake chlorophyll-a, phaeophytin-a, plankton, macrophytes, and littoral macroinvertebrates (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Littoral macroinverte-brates | Lakewide and by strata:<br>• NYSDEC indices<br>• Percent oligochaetes and chironomids<br>• Species richness | Change from baseline conditions, lakewide and by strata | 18 samples, in 5 strata (90 total) | From shoreline to 1.5 m depth | 2000, 2005, 2010 (June surveys) | Field surveys |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)
***D. Onondaga Lake Fisheries Program***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Nesting survey | Count<br>Where possible, identify species | Change over time: lakewide and at five strata used for biological programs | Entire Lake divided into 24 sections | 1 m | June | Visual Count around entire littoral zone (along depth contour) |
| Pelagic Larvae | • Species identification<br>• Length frequency | • Community Structure<br>• Growth rate, compared to regional lakes and to historical Onondaga Lake data<br>• Condition factor<br>• Species Richness<br>• Pollution tolerance | South basin<br>North basin | 5.5 meter double oblique tow | Biweekly (April-August) | Miller Trawl |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***D. Onondaga Lake Fisheries Program (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Littoral Juvenile | • Number and species of juveniles captured<br>• Catch per unit effort | • Community Structure<br>• Size/length distribution<br>• Species Richness<br>• Evidence of recruitment<br>• Pollution tolerance | 15 sites lakewide | ~ 1m | Every three weeks (July-October) | ¼” mesh bag seine sweep |
| Littoral Adults | • Number and species captured<br>• Catch per unit effort | • Community Structure<br>• Size/length distribution<br>• Species Richness<br>• Evidence of recruitment<br>• Pollution tolerance<br>• Index of Biological Integrity | 24 sections | < 1m | May, September, October | Night Electrofishing Angler diary program |
| Pelagic Adults | • Number and species captured<br>• Catch per unit effort | • Community Structure<br>• Size/length distribution<br>• Species Richness<br>• Evidence of recruitment<br>• Pollution tolerance | 5 sites (1 per station) | 4-5 m water (2 hour set) | May, October | Littoral - Profundal Gill Nets<br>Experimental: hydroacoustics<br>Angler diary program |
| Deformities, Erosions, Lesions, Tumors, Fungal and Multiple Anomalies (DELT-FM) | Number and types of anomalies | Change over time (trend) | Lakewide | All (most are adults captured by electrofishing) | Screening on all captured fish | Visual analysis by trained field teams |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***E. Tributary Program Summary***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|
| Alkalinity | Concentration | • Calculate bicarbonate (charge balance)<br>• Trends | Routine[5]: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Spencer; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| Bacteria: Fecal Coliform | Abundance | • Potential presence of pathogens<br>• Trends<br>• Effectiveness of CSO control measures | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet (2ft)<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| BOD-5 | Concentration | • Load<br>• Indicator of oxygen-demanding material | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Wildco Beta horizontal sampler/churn |

5 Ninemile – Ninemile Creek at Route 48
Hiawatha, Velasko – Harbor Brook
Kirkpatrick, Dorwin, Spencer, Adams – Onondaga Creek
Ley – Ley Creek at Park
Sawmill – Sawmill Creek
Bloody – Bloody Brook;
Trib5A – Tributary 5A at State Fair Boulevard
Metro - Outfalls 001 and 002
EF – Allied East Flume
Outlet - Onondaga Lake outlet at 2 ft and 12 ft depths

**Table A5-4.** Detailed Reporting of AMP Program. (continued)
***E. Tributary Program Summary (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|
| Carbon: TOC, TOC-F, TIC | Concentration | • Trends<br>• Trophic status<br>• Oxygen demand<br>• Load | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| Chlorophyll-a | Concentration | Boundary condition for river model | Outlet | Biweekly (January-December) | Discrete samples at 2 ft and 12 ft |
| Cyanide | Concentration | Compliance | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Quarterly<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| Metals: Cd, Cr, Cu, Ni, Pb, Hg, Zn, As, K | Concentration | • Compliance (if AWQS)<br>• Load<br>• Data quality (K used in charge balance) | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody<br><br>Spencer location monitored for K only | Quarterly<br><br>High flow events as occur | Depth Integrated Sampling Techniques |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***E. Tributary Program Summary (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|
| Metals/Salts: Ca, Na, Mg, Mn, Fe, Cl, SO4, SiO2 | Concentration | • Compliance (if AWQS)<br>• Load<br>• Data quality (major ions used in charge balance)<br>• Geochemical analysis | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody<br><br>Spencer location monitored for Ca, Na, Mg, Cl and $SO_4$ only | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| Nitrogen: TKN, $NH_3$-N, Org-N, TKN-Filtered | Concentration | • Trends<br>• Support TMDL<br>• Load | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Spencer; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| Nitrogen: $NO_3$, $NO_2$ | Concentration | • Compliance with AWQS<br>• Load<br>• Trends | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| Phosphorus: TP, SRP, TDP | Concentration | • Trends<br>• Support TMDL<br>• Load<br>• Bioavailability | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***E. Tributary Program Summary (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|
| Solids:<br>TSS, TDS | Concentration | Compliance with AWQS | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| Turbidity | Concentration | Transport dynamics | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | Depth Integrated Sampling Techniques |
| Field data:<br>pH, Temperature, Salinity, Specific conductance, Redox potential, dissolved oxygen | • Fish-space metrics | • Compliance<br>• Model support<br>• Trend analysis.<br>• Use attainment.(habitat)<br>• pH indicator of CO2 production and decomposition. | Routine: Ninemile; Hiawatha; Velasko; Kirkpatrick; Dorwin; Spencer; Adams; Ley; Trib5A; Metro; EF; Outlet<br><br>High flow: Routine plus Sawmill and Bloody | Biweekly (January-December)<br><br>High flow events as occur | |
| Stream benthic Macroinvertebrates (BMI) & Stream Characteristics | • NYSDEC water quality Index<br>• NRCS Visual Stream Assessment Protocol | Change from baseline conditions | 4 sites in Onondaga Creek<br>3 sites in Ley Creek<br>3 sites in Harbor Brook | BMI: every other year, from 1998 – 2012<br><br>Stream mapping: baseline assessment in 2000 and 2002, to be repeated in 2008 and 2012 | Various methods, most BMI collected using kick screens |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***F. Seneca River Program Summary***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| BOD-5 | Concentration | • Indicator of oxygen-demanding material<br>• Model support | 16 sites (Seneca, Oneida & Oswego Rivers) | 1 meter below water surface<br><br>1 meter above the river sediments | Monthly (July – September) | Wildco Beta horizontal sampler |
| Carbon: TOC, TDC | Concentration | • Trends<br>• Trophic status<br>• Indicator of oxygen-demanding material<br>• Model support | 16 sites (Seneca, Oneida & Oswego Rivers) | 1 meter below water surface<br><br>1 meter above the river sediments | Monthly (July – September) | Wildco Beta horizontal sampler |
| Chlorophyll-*a* | Concentration | • Trophic status<br>• Trends<br>• Model support | 16 sites (Seneca, Oneida & Oswego Rivers) | Through the water column. Tube composite through the photic zone and a grab at 1-meter above the river sediments. | Monthly (July – September) | Tube sampler "Depth Integrated Tube samples" |
| | | | Buoy 316 (Seneca River) | Upper waters: 0.86m<br><br>Lower waters: 3.80 m | Daily at 15 minute intervals (April- Nov) | YSI Buoy |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***F. Seneca River Program Summary (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Metals/Salts:<br>Cl | Concentration | • Trends<br>• Geochemical analysis<br>• Model support | 16 sites (Seneca, Oneida & Oswego Rivers) | 1 meter below water surface<br><br>1 meter above the river sediments | Monthly (July – September) | Wildco Beta horizontal sampler |
| Nitrogen:<br>TKN, NH3-N, TKN-Filtered, NO3, NO2 | Concentration | • Compliance<br>• N dynamics<br>• N:P ratios<br>• Trends<br>• Model support | 16 sites (Seneca, Oneida & Oswego Rivers) | 1 meter below water surface<br><br>1 meter above the river sediments | Monthly (July – September) | Wildco Beta horizontal sampler |
| Phosphorus:<br>TP, SRP, TDP | Concentration | • Trophic status and algal productivity<br>• Trends<br>• Model support | 16 sites (Seneca, Oneida & Oswego Rivers) | 1 meter below water surface<br><br>1 meter above the river sediments | Monthly (July – September) | Wildco Beta horizontal sampler |
| Solids:<br>TSS, VSS | Concentration | • Trends<br>• Model support<br>• Indicator of water clarity | 16 sites (Seneca, Oneida & Oswego Rivers) | 1 meter below water surface<br><br>1 meter above the river sediments | Monthly (July –September) | Wildco Beta horizontal sampler |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)
***F. Seneca River Program Summary (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| Turbidity | Light scattering (NTU) | • Trends<br>• Model support<br>• Indicator of water clarity | 16 sites (Seneca, Oneida & Oswego Rivers) | 1 meter below water surface<br><br>1 meter above the river sediments | Monthly (July – September) | Wildco Beta horizontal sampler |
| | | | Buoy 316 (Seneca River) | Upper waters: 0.86m<br><br>Lower waters: 3.80 m | Daily at 15 minute intervals (April- Nov) | YSI Buoy |
| Field data: pH, Temperature, Salinity, Conductivity, Dissolved Oxygen, ORP | Concentration | • Compliance<br>• Stratification regime.<br>• Trends<br>• Ammonia toxicity.<br>• Redox status<br>• pH indicator of CO2 production/decomposition.<br>• DO indicator of suitability of aquatic biota/zebra mussel activity.<br>• Support river model and evaluate assimilative capacity | 16 sites (Seneca, Oneida & Oswego Rivers) | 0.5 m increments | Monthly (July – September) | YSI (in-situ) |
| | | | Buoy 316 (Seneca River) | Upper waters: 0.86m<br><br>Lower waters: 3.80 m | Daily at 15 minute intervals (April- Nov) | YSI Buoy |
| Secchi Disk Transparency | | • Model support<br>• Indicator of water clarity<br>• Use attainment | 16 sites (Seneca, Oneida & Oswego Rivers) | Depth at which the disk is no longer visible from the surface | | Secchi Disk |

**Table A5-4.** Detailed Reporting of AMP Program. (continued)

***F. Seneca River Program Summary (continued)***

| Parameter | Data Analysis and Reporting | Data Interpretation Strategy | Sites | Depths | Frequency Sampling Interval | Method |
|---|---|---|---|---|---|---|
| LiCor Underwater Illumination Profile | | • Trends<br>• Model support<br>• Indicator of water clarity | 16 sites (Seneca, Oneida & Oswego Rivers) | Licor data – 20 cm intervals from river surface to depth at which light is 1% of surface illumination | Monthly (July – September) & with diurnal cycles | LiCor Datalogger |

### A5.3.3. Design of the AMP: Underlying Assumptions

Design of the AMP builds on decades of monitoring within the lake and its watershed. Several important assumptions underlie the monitoring program; these assumptions are based on analysis of the historical data and mass-balance calculations. Among the assumptions are:

- South Deep is representative of lake-wide conditions.

  *This assumption has been evaluated by comparing data collected at North Deep on a quarterly frequency with the South Deep data. A t-test of paired samples was used to compare data from 1999-2007. There is no systematic difference in trophic status indicator parameters (chlorophyll-a, phytoplankton biomass, and Secchi disk transparency) measured at North and South Deep. Of the other parameters, the N species and Fe are higher at South Deep, which is likely due to the Metro discharge. Fecal coliform bacteria are higher at South Deep; this is attributed to the proximity of major sources (storm water and CSO discharges). Specific conductance and pH were higher at North Deep, likely reflecting the influence of Ninemile Creek. (Appendix 10)*

- External loading to the lake is assessed by monitoring discharge and concentration of six tributaries plus Metro effluent. In total, approximately 95% of the water flow into the lake is gauged and sampled. It is assumed that this monitoring is sufficient to provide a robust estimate of external loading.

  *This assumption was tested in 2003, when storm event samples were obtained from two small streams draining the nearshore (ungauged) portion of the watershed. The concentrations of monitored parameters in the two streams, Bloody Brook and Sawmill Creek, were less than or comparable to concentrations measured in the gauged streams. With the very low flow contribution, it was determined that the loading from the* *nearshore (ungauged) portion of the lake watershed was minimal. That is, the ungauged areas do not contribute a disproportionate load given their drainage area.*

- Deposition onto the lake surface (including precipitation and dry fall) accounts for a small fraction of the total external nutrient load and can be adequately characterized from regional data.

*The mass balance framework developed by Dr. William Walker provides a basis for evaluating the magnitude and importance of precipitation within the lake's phosphorus budget. The lake surface area comprises a very small fraction of the overall drainage basin, and precipitation onto the lake surface represents about 2% of the total water inflow. The concentration of phosphorus in rainwater is variable, but typically well below the concentrations measured in the tributary streams, and an order of magnitude less than the concentration in the Metro effluent. Again looking to Dr. Walker's mass balance framework, precipitation represents < 1% of the total P loading to the lake assuming the regional average TP concentration in precipitation of 30 µg/l. Doubling this estimated concentration still represents less than 1% of the current total annual TOP load; for this reason site-specific sampling has not been recommended. The magnitude and importance of atmospheric loading of mercury has not been quantified as part of the AMP.*

- Groundwater does not represent a significant component of the lake's hydrologic budget.

*This assumption can be examined by evaluating the extent to which water and chloride models show reasonable agreement between inputs, outputs, and retention in the lake. Onondaga Creek is influenced by groundwater seepage into the downstream reaches just above the Inner Harbor. Likewise, groundwater flux into Ninemile Creek has been documented. A chloride model of the lake, assuming no groundwater contribution, was* *constructed (Doerr et al. 1994) and predicted measured concentrations within about 5%. This implies that groundwater input to the lake is likely a minor component (<5%) of the hydrologic budget.*

- Water quality of the lake may be adequately characterized by examining the lake as a two-layer system during the period of thermal stratification, which typically extends from late May through late October. Furthermore, the photic zone does not extend into the lower water layer.

  *This assumption will be examined through the Onondaga Lake modeling project, which began in 2005.*

### A5.3.4. Design of the AMP: Hypothesis Testing and Statistical Power

The elements of the monitoring program were distilled into a series of testable hypotheses. This work product was used as a basis for evaluating the AMP design, allowing the project team and the advisors to determine whether the correct parameters were being measured. A summary of the hypotheses for elements of the monitoring program is presented in **Table A5-5**. There are three types of hypotheses to be tested using data generated by the AMP:

- Is Onondaga County in compliance with the effluent limits required by the State Pollution Discharge Elimination System (SPDES) permit?
- Have ambient water quality standards or guidance values in the receiving water been met?
- Is there a trend or shift in the monitoring data, in both water quality and biological programs?

It is evident from the list of hypotheses that a major focus of the AMP is to differentiate actual trends from natural variability. OLTAC member Dr. William W. Walker Jr. examined the historical monitoring data to characterize the variability of the parameters used to assess progress (for example, concentrations of ammonia-N, bacteria, chlorophyll-a at the lake's South Deep station). The AMP design was then evaluated to determine what magnitude of "true" change in concentration could be detected at a given level of statistical certainty. The AMP was modified to increase the monitoring frequency for certain parameters that are highly variable (e.g. chlorophyll-a). For the majority of lake water quality parameters the biweekly sampling program was found to be adequate. Dr. Walker summarized his analysis of the power of the water quality monitoring program in the Phase 1 Statistical Framework (January 1999) and an updated Phase 1 Statistical Framework (January 2002). His report evaluating the design of the biological programs and their power to detect change was issued as the Phase 2 Statistical Framework (February 2000) and an update to the Phase 2 Statistical Framework (August 2002).

Dr. Walker has updated the statistical framework for both the water quality and biological programs using recent data. The update was structured to reference these specific hypotheses.

**Table A5-5.** Summary of Hypotheses Underlying the AMP.

| Monitoring Parameter | Hypothesis | Type of Hypothesis | | | Data Used for Assessment |
|---|---|---|---|---|---|
| | | Compliance with SPDES permit | Compliance with AWQS or guidance value | Significant Trend or Shift in Monitoring Data | |
| Ammonia-N | Improvements at Metro enable the County to meet Stage III effluent limits for ammonia N | * | | | Outfall 001 effluent concentrations, calculated for summer and winter (seasonal limits apply) |
| | Reduced ammonia load results in compliance with ambient water quality standards and federal criteria for ammonia in Onondaga Lake | | * | * | South Deep station, biweekly monitoring, discrete samples collected at 3-m intervals, with temperature and pH |
| Nitrite-N | Achievement of Stage III effluent limits for ammonia results in compliance with the NYS ambient water quality standard for nitrite (warm water fish community) | | * | * | UML, LWL composite samples, biweekly at South Deep |
| Phosphorus | Improvements at Metro enable the County to meet final SPDES effluent limits (as set forth in a revised TMDL on or before Jan 1 2009) | * | | | Outfall 001 effluent concentrations |
| | Reduced phosphorus load from Metro reduces concentration of phosphorus in Onondaga Lake | | * | * | South Deep station Biweekly monitoring TP, SRP and TDP, discrete samples collected at 3-m intervals |
| | Reduced phosphorus load from Metro brings the lake into compliance with guidance value (or site-specific guidance value) | | * | * | TP at South Deep, 1-m depth (biweekly measurements, June – Sept) |

**Table A5-5**. Summary of Hypotheses Underlying the AMP. (continued)

| Monitoring Parameter | Hypothesis | Type of Hypothesis | | | Data Used for Assessment |
|---|---|---|---|---|---|
| | | Compliance with SPDES permit | Compliance with AWQS or guidance value | Significant Trend or Shift in Monitoring Data | |
| Dissolved Oxygen | Improvements at Metro enable the County to meet interim effluent limits for BOD | * | | | Outfall 001 effluent concentrations |
| | Improvements at Metro and related nonpoint source phosphorus load reductions bring the lake into compliance with NYS AWQS for DO during fall mixing. | | * | * | Weekly or biweekly measurements through water column and high-frequency measurements at buoy at South Deep station |
| | Improvements at Metro and related nonpoint source phosphorus load reductions reduce the volume-days of anoxia and hypoxia. | | | * | Weekly or biweekly measurements through water column and high-frequency measurements at buoy at South Deep station |
| | Improvements at Metro and related nonpoint source phosphorus load reductions reduce the areal hypolimnetic oxygen depletion rate. | | | * | Weekly or biweekly measurements through water column and high-frequency measurements at buoy at South Deep station |
| Indicator bacteria | CSO remedial measures and improved stormwater management reduce the loading of fecal coliform bacteria entering the lake from tributaries during high flow conditions. | * | | * | Storm event data: baseline and post-improvement rating curves for fecal coliform bacteria (load as a function of total precipitation, and total storm flow) |
| | Implementation of Stage I and II improvements to the wastewater collection and treatment system (including CSO projects) and progress with stormwater management will reduce concentration of indicator organisms in Onondaga Lake | * | * | * | Indicator bacteria abundance at nearshore stations during summer and following storms. Annual average concentration at South Deep, 0m depth |

**Table A5-5**. Summary of Hypotheses Underlying the AMP. (continued)

| Monitoring Parameter | Hypothesis | Type of Hypothesis | | | Data Used for Assessment |
|---|---|---|---|---|---|
| | | Compliance with SPDES permit | Compliance with AWQS or guidance value | Significant Trend or Shift in Monitoring Data | |
| Chlorophyll-*a* | Metro improvements and watershed phosphorus load reductions result in lower chlorophyll-a concentrations in the lake. | | | * | Weekly or biweekly measurements at South Deep, photic zone and UML |
| Secchi disk transparency | Metro improvements and related nutrient load reductions result in improved water clarity (as measured by Secchi disk transparency) in Onondaga Lake | | | * | Weekly or Biweekly measurements at South Deep and nearshore stations. |
| Phytoplankton community | Metro improvements and watershed phosphorus load reductions result in lower biomass of phytoplankton in Onondaga Lake | | | * | Biweekly samples of UML phytoplankton community, numbers, size and identifications (PhycoTech) |
| | Metro improvements and watershed phosphorus load reductions result in reduced relative abundance of cyanobacteria to the lake's phytoplankton community (measured by percent of total biomass) | | | * | Biweekly composite samples of UML phytoplankton abundance, biomass, and ID (PhycoTech) |
| Zooplankton community | Metro improvements and watershed phosphorus load reductions reduce the biomass of zooplankton in Onondaga Lake by reducing the algal food supply | | | * | Biweekly composite samples of UML and tow (0-15 m), zooplankton abundance, size, biomass, ID (Cornell) |
| Macroalgae | Metro improvements and watershed phosphorus load reductions result in reduced areal coverage of macroalgae in nearshore areas of Onondaga Lake | | | * | Weekly surveys during recreational period (June –Sept) at nine nearshore stations. |

**Table A5-5**. Summary of Hypotheses Underlying the AMP. (continued)

| Monitoring Parameter | Hypothesis | Type of Hypothesis | | | Data Used for Assessment |
|---|---|---|---|---|---|
| | | Compliance with SPDES permit | Compliance with AWSQ or guidance value | Significant Trend or Shift in Monitoring Data | |
| Macrophytes | Metro improvements and watershed phosphorus load reductions indirectly result in increased areal coverage of macrophytes in the littoral zone of Onondaga Lake | | | * | Percent cover, biomass, and maximum depth of growth. Surveys: 2000, 2005, 2010 plus annual aerial photo evaluation (% cover) |
| | Metro improvements and watershed phosphorus load reductions indirectly result in increased number of macrophyte species in Onondaga Lake | | | * | Macrophyte species richness Detailed surveys: 2000, 2005, 2010 |
| Littoral macroinvertebrates<br>*Note: effects may be in strata 2, 3, and 4* | Implementation of load reductions at Metro and CSO remediation will increase species richness of littoral benthic macroinvertebrates | | | * | Littoral macroinvertebrate species richness. Detailed surveys: 2000, 2005, 2010 |
| | Implementation of load reductions at Metro and CSO remediation will decrease the relative abundance of oligochaetes | | | * | Littoral macroinvertebrate dominance, percent oligochaetes. Detailed surveys: 2000, 2005, 2010 |
| | Implementation of load reductions at Metro and CSO remediation will improve the NYSDEC Biological Assessment Profile as compared to baseline conditions. | | | * | NYSDEC calculated index Detailed surveys: 2000, 2005, 2010 |
| | Implementation of load reductions at Metro and CSO remediation will improve the littoral macroinvertebrate HBI as compared to baseline conditions, indicating increased importance of pollution-sensitive organisms in the community | | | * | Hilsenhoff Biotic Index (HBI) Detailed surveys: 2000, 2005, 2010 |

**Table A5-5**. Summary of Hypotheses Underlying the AMP. (continued)

| **Monitoring Parameter** | **Hypothesis** | **Type of Hypothesis** | | | **Data Used for Assessment** |
|---|---|---|---|---|---|
| | | **Compliance with SPDES permit** | **Compliance with AWQS or guidance value** | **Significant Trend or Shift in Monitoring Data** | |
| Fish community | Implementation of nutrient load reductions at Metro and nonpoint sources, including CSO remediation, will indirectly increase the number of fish species present in Onondaga Lake | | | * | Annual monitoring program: Species richness, electrofishing, gill nets, seines |
| | Implementation of point and nonpoint nutrient load reductions will indirectly increase the number of fish species that are sensitive to pollution in Onondaga Lake | | | * | Annual monitoring program: Electrofishing, pollution tolerance index (Whittier and Hughes 1998) |
| | Implementation of point and nonpoint nutrient load reductions will increase the reproductive success of fish in Onondaga Lake | | | * | Annual monitoring program: Nesting survey, larval tows, larval light traps, littoral seines |
| | Implementation of point and nonpoint nutrient load reductions will improve the lake's IBI. Note effects may be more evident in Strata 2,3, and 4. | | | * | Annual monitoring program: Electrofishing |
| | Implementation of point and nonpoint nutrient load reductions will increase the habitat available for the coolwater fish community | | | * | Fish space metrics: dissolved oxygen and temperature profiles at South Deep station |

### A5.3.5. Design of the AMP: Data Management

The AMP produces an extensive dataset; more than 20,000 water quality measurements are obtained each year in Onondaga Lake, its tributary streams, and the Seneca River. Dr. Walker has developed an integrated database to manage the data. This effort has resulted in a powerful tool for the County and other stakeholders to evaluate specific results by parameter, depth, and date. The database is also used to screen for outliers and test for trends; it generates plots for data exploration and reporting.

### A5.3.6. Design of the AMP: Metrics to Measure and Report Progress

Analytical and field data are submitted on a quarterly basis to the NYSDEC. Screened and validated data are provided annually and are included in the OCDWEP Annual AMP Report. The process of turning data into information occurs continually through the year and is formalized in the Annual AMP report. Results and findings of the complete monitoring effort are documented in this report is reviewed by OLTAC members and NYSDEC. The County is required to submit an approvable annual AMP report to NYSDEC by December 1 each year.

A series of metrics have been developed to organize and report the extensive AMP dataset. As defined by EPA, metrics are attributes of the physical, chemical and/or biological ecosystem that respond to human disturbance. For the Onondaga Lake watershed, metrics are designed to indicate progress towards compliance with applicable standards and guidelines, and progress towards attaining a desired use.

Selected metrics may relate directly to an impairment of the lake or watershed; relate to a resource of interest; or correspond to a published standard that, in turn, reflects the requirements of public health or the aquatic biota. Candidate metrics can be measured and interpreted with relative ease to answer basic questions such as: “is the lake getting better?” and “is it safe for my family to swim here?”

Metrics selected to interpret and report on the AMP data are listed in **Table A5-6**. Note that the metrics are grouped into categories that address human uses and ecosystem function:

(1) water contact recreation;
(2) aesthetics;
(3) aquatic life protection; and
(4) sustainable recreational fishery

Metrics for water contact recreation are straightforward: New York State Department of Health and EPA have standards and guidance values for indicator bacteria and water clarity that are designed to be protective of human health and safety. Selecting metrics for aesthetics is slightly more judgmental, as they relate to perceived attributes such as water color and clarity, odors, and the visible extent of weed and algal growth. Water quality conditions needed to support aquatic life are fairly well defined in federal criteria and state standards. Onondaga County AMP metrics are designed to track water quality and habitat conditions during critical periods for reproduction and survival of young animals.

**Table A5-6.** Summary of Metrics.

| Desired Use | Metrics | Measured By |
|---|---|---|
| Water contact recreation | Indicator Bacteria | Fecal coliform bacteria abundance measured at stations within the Class B segment of Onondaga Lake (includes nearshore and North Deep station) |
| | Water Clarity | Secchi disk transparency at nearshore stations. |
| Aesthetics | Water Clarity | Secchi disk transparency at South Deep. |
| | Bloom frequency and magnitude | Percent of chlorophyll-*a* measurements greater than 15 µg/l (USEPA threshold for public perception as impaired for recreational use) |
| | | Percent of chlorophyll-*a* measurements greater than 30 µg/l (threshold for public perception of nuisance bloom). |
| | Algal community structure | Percent of algal community represented by cyanobacteria (blue-green taxa) |
| | Macroalgae proliferation | Percent cover of littoral zone, measured at nine nearshore stations June 1 – August 31 annually |
| Aquatic Life Protection | Ammonia N | Percent of measurements in compliance with standards. |
| | Nitrite N | Percent of measurements in compliance with standards. |
| | Dissolved Oxygen | DO at fall mixing. |
| | | Duration of DO concentrations < 4 mg/l (data source: measurements at 15-minute intervals from probe on buoy) |
| | Integrated metrics | "Fish space" metrics, volume-days with suitable conditions of DO and temperature for cold water and cool water fish communities<br><br>*(Note: this metric does not account for other requirements such as habitat and forage base)* |
| | Species assemblage | Percent intolerant or moderately intolerant of pollution |
| Fish Reproduction | Number of species with documented reproduction and recruitment[6] | Nesting surveys, larval sampling (Miller tows), young-of-year sampling (littoral and pelagic) adult survey (electrofishing, gill netting), hydroacoustical survey. |
| | Habitat quality | Percent cover of macrophytes: scaled to optimal level for largemouth bass (40 - 60% cover is target). |

[6] Sampling captures young-of-the-year (YOY) fish in the lake. It is assumed that the majority of these small fish originated in the lake, given their size and limited mobility of the early life stages. However, the presence of YOY fish that originated in the Seneca River or tributaries to Onondaga Lake cannot be ruled out.

## A5.4. Data interpretation for the biological programs

Analysis and interpretation of the biological components of the AMP is challenging. There are no equivalent promulgated standards as cited for the water quality parameters. The plan for analysis and interpretation of the biological data is primarily focused on changes over time. There are also limited comparisons with reference systems such as Oneida Lake, and comparisons to benchmark conditions considered desirable for various functions and values of the aquatic ecosystem.

One way to interpret the fish data is to compare the current community to the fish community present in Onondaga Lake at two critical periods: (1) during the early years of European settlement, and (2) during the early 1960s. The nature of the early fish community can provide insight into the natural condition, while the community during the 1960s likely represents the worst conditions of water quality and habitat degradation.

However, the biological data, including fish, must be evaluated with respect to the rest of the ecosystem. For example, the reproductive success of some fish species is influenced by macrophyte coverage, planktivorous fish can alter zooplankton community assemblages, and zebra mussels can alter trophic interactions. In order to fully understand and interpret changes to one aspect of the biological community it is necessary to describe the biological components that interact and influence the community in question. This important effort will continue as the AMP progresses through 2012.

### A5.4.1. Sampling design

Biological sampling in Onondaga Lake occurs both nearshore (fish, macroinvertebrates, macrophytes) and offshore (larval fish, zooplankton, phytoplankton). Because of the variability of the lake's nearshore habitat conditions, the littoral habitat was divided into five strata based on a combination of substrate type and wave energy, both of which influence aquatic macrophytes and macroinvertebrates and, in turn, fish distribution. These five strata are displayed in **Figure A5-2**:

Stratum 1. Oncolite substrate with low wave energy (NW portion of the lake).

Stratum 2. Wastebed substrate with moderate wave energy (SW shore)

Stratum 3. Soft substrate with high wave energy (South end)

Stratum 4. Oncolite substrate with high wave energy (SE shore)

Stratum 5. Oncolite substrate with medium wave energy (NE shore)

The current schedule for biological monitoring through the 15-year AMP program is summarized in **Table A5-7**. This schedule may change as completion dates for CSO projects become firm or new issues arise. This table will be updated with subsequent revisions of the DAIP.

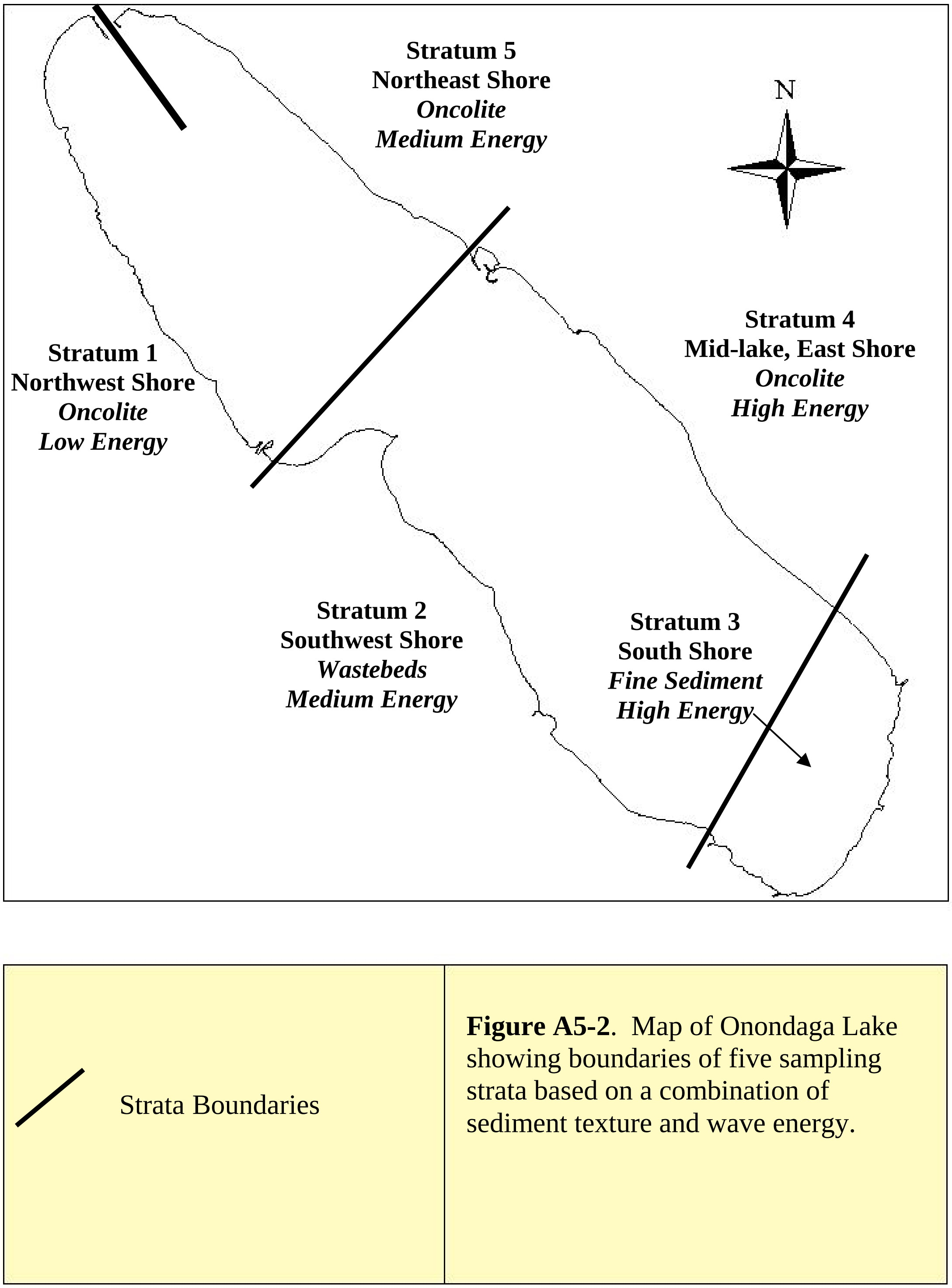


**Figure A5-2**. Map of Onondaga Lake showing boundaries of five sampling strata based on a combination of sediment texture and wave energy.

**Table A5-7.** Summary of Schedule and Methodologies Used for the Biological Monitoring Program *(Subject to annual NYSDEC review and approval; last updated March 2005)*

| Program | Component | Methods | Schedule | Comments |
|---|---|---|---|---|
| **Fish** | Adult | Littoral Electrofishing | Annual | Entire lake shoreline, transects alternate between collecting all fish encountered and gamefish only, 2 surveys; May, Sept. |
| | | Littoral-profundal Gill Nets | Annual | One net each stratum, set on bottom at 5m depth, 2 events; May, Sept. |
| | | Angler Diaries | Annual | Dependant on number of diaries returned |
| | Young-of-the-Year | Littoral Seines | Annual | 15 sites, three sites per stratum, every 3 weeks, May-Oct, 8 events total |
| | Larvae | Pelagic Miller High Speed Trawls | Annual | Daytime samples, 4 transects N/S, oblique tows, ~surface to 5m depth, bi-weekly, May-Aug., 8 events total |
| | Nests | Visual Observation | Annual | Entire Shoreline, June |
| **Macroinvertebrates** | Lake Littoral Zone | Petite Ponar | 2000<br>2005<br>2010 | Five sites, one in each stratum, June, 18 replicates, identified to species level |
| | Tributary | Kick Net and Jab Net | Bi-annual | Four sites in Onondaga Creek, three sites in Ley Creek and Harbor Brook, July samples, 4 replicates, identified to species level |
| | As part of Tributary Mapping | Kick Net | 2000<br>2008<br>2012 | One site per mile of stream, 26 sites in Onondaga Creek, 9 in Ley Creek, 7 in Harbor Brook, one sample per site, identified to family level in the field |
| **Macrophytes** | Field Survey | Quadrats along Line Transects | 2000<br>2005<br>2010 | 20 line transects, four per stratum, 1/2$m^2$, quadrats spaced every other m along the transect, from shore to 6m depth, species presence, percent coverage and biomass, August |
| | Lakewide Survey of Cover | Aerial Survey | Annual (if water clarity permits) | Low altitude aerial photographs of entire lake, color film, digital images. Includes ground-truthing. Images are imported to GIS and areas of macrophyte growth delineated. |

**Table A5-7.** Summary of Schedule and Methodologies Used for the Biological Monitoring Program. (continued)

| Program | Component | Methods | Schedule | Comments |
|---|---|---|---|---|
| **Zooplankton** | Lake | Vertical Net Haul | Annual | Bi-weekly at South Deep, April to Nov., Quarterly at North Deep, UML sample plus 15m vertical net haul. Winter sampling if possible. |
| **Phytoplankton** | Lake | Tygon tube | Annual | Bi-weekly at South Deep, April to Nov., Quarterly at North Deep, UML sample. Monthly in winter, as conditions allow |

### A5.4.2. Species Data

Species data collected during the biological monitoring programs are used to evaluate pollution tolerance of the biological community, the presence of exotic or invasive species, nuisance species that affect best usage of the lake, and evaluate the status of those species highlighted in the ACJ.

- Pollution tolerance. Organisms have varying degrees of sensitivity to disturbances in their environment. Those most sensitive to disturbance are the first to be extirpated and the last to re-colonize. Dominance and distribution of pollution-tolerant or pollution-sensitive organisms can indicate relative degree of impact between locations. Changes in the distribution of these communities can be tracked over time. The AMP utilizes several ways of examining pollution tolerance, including metrics specifically derived to quantify this property of the community (**Table A5-8**).

- Exotic/invasive species. Onondaga Lake is directly connected to the Barge Canal system, therefore it is highly susceptible to invasion by exotic species. Invasive species often take advantage of disturbance to establish populations. Once established they can dramatically alter habitat, water quality, and trophic structure. The AMP has detected the early stages of invasion of several important species. For example, the exotic zooplankton Cercopagis pengoi was first detected in Onondaga Lake during routine sampling in 2000. Once exotic species are detected, the program can be tailored to track their progress and effects on the ecosystem.

- Associated with nuisance conditions. Some species can be considered to be a nuisance to humans. Some of these are directly perceptible, such as blue-green algal blooms, others become apparent to lake users through indirect effects in the food web. For example, the recent dramatic increase in the fish species alewife (Alosa pseudoharengus) has reduced the population of large-sized zooplankton (their preferred food source) in the lake; this reduction in large-sized zooplankton decreased the effective grazing pressure on algae. As a result, water clarity has declined.

- Included in management/rehabilitation plan. Some species have special meaning within the context of the ACJ and/or future management plans. This is most common with the fish program. For example, the ACJ states the County should "evaluate the success of walleye, bass and sunfish propagation (quantitative lakewide nest surveys, survival and recruitment estimates, and juvenile community structure) in the lake" (ACJ Appendix D, IV.5). These species are given special consideration within the biological monitoring program.

**Table A5-8**. Summary of Pollution Tolerance Metrics Used for the Biological Monitoring Program.

| Program | Component | Pollution Tolerance Metric | Comments |
|---|---|---|---|
| **Fish** | Adult | Pollution Tolerance Index | Based on the Index published by Whittier and Hughes (1998). These investigators compiled data from 169 lakes to develop an overall rating based on tolerance to eutrophication, turbidity, human activity in the watershed and species introductions. Their tolerance categories include: intolerant, moderately intolerant, moderate, moderately tolerant, and tolerant. |
| | | Indicator Species | Indicator species are those that can be used to assess environmental condition. Presence of organisms known to be tolerant or sensitive to environmental degradation offer important information. Adult fish as indicator species are most useful if populations exist and are less useful if only a few individuals are encountered. |
| | Young-of-the-Year | Indicator Species | Young-of-the-year organisms are excellent indicators of environmental change, as the early life history stages are usually most susceptible to disturbance and pollution. |
| **Macroinvertebrates** | Lake Littoral Zone & Tributary | NYSDEC Biological Assessment Profiles | NYSDEC Biological Assessment Profiles are an Index of Biotic Integrity developed specifically for macroinvertebrates in New York State. An overall assessment of water quality for each site is calculated by averaging results of four individual metrics obtained through a scaled ranking of the index values. After all index values for a site are converted to a common scale value, they are averaged to obtain a score denoting overall assessment of water quality.<br>The score results in a designation of one of four categories: non-impacted, slightly impacted, moderately impacted, or severely impacted. |
| | | HBI | The Hilsenhoff Biotic Index (HBI) is considered by many investigators to be the most reliable index of composition of the macroinvertebrate community and water quality status (Novak and Bode 1992). HBI indicates the effects of organic pollution and is based on species-specific tolerance levels. |
| | | Percent Oligochaetes | As oligochaetes are often found in high relative proportions in areas impaired by organic enrichment, their percent contribution to the community can be a good measure of the relative amount of organic enrichment at different locations. More importantly, the change in the percent contribution of oligochaetes over time, will be a good measure of the change in organic enrichment at the study sites. |

**Table A5-8**. Summary of Pollution Tolerance Metrics Used for the Biological Monitoring Program. (continued)

| Program | Component | Pollution Tolerance Metric | Comments |
|---|---|---|---|
| **Macroinvertebrates (continued)** | As part of Tributary Mapping | FBI | The Family Level Index (FBI) is based upon the tolerance values and theories the HBI but is conducted in the field with family level identifications. |
| **Macrophytes** | Field Survey | Indicator Species | Determination of environmental impact based on macrophytes is difficult. However some species have known tolerances to water quality variables. For example *Potamogeton pectinatus* (a species that has been common in Onondaga Lake since at least the early 1990's) is more tolerant of salinity than many other macrophytes. Knowledge of these types of tolerances can help in understanding the current lake community as well as the changes that occur. |

### A5.4.3. Population Data

Population data collected during the biological monitoring programs are used to evaluate individual size, abundance and reproductive success in Onondaga Lake and the tributaries.

- Average size of individuals. Size of individuals is monitored for fish and zooplankton in the AMP. The size that animals attain is a function of both the genetics of the organism as well as the environmental conditions the organism has been subjected to throughout its life. Changes in the ecosystem are often reflected by changes in growth, thus making analysis of size of certain organisms a potential valuable monitoring tool. For example, growth may be density dependant, so populations with poor recruitment may be characterized by fast-growing individuals. In addition, the size structure of some organisms can have dramatic cascading effects throughout the trophic structure of the lake. Average size of some organisms can also be compared to other regional lakes.

- Abundance. Abundance measures are difficult to quantify in biological populations due to their inherent spatial and temporal variability. However, changes in abundance can provide useful information in the AMP because change in population size is the mechanism underlying changes in many community metrics. Expected changes in abundance due to improving water quality or habitat may not always be positive. Some species exploit disturbed conditions and their abundance can be expected to decrease with improving conditions. As the dynamics of the lake community change, the lake will become more hospitable to some species and less to others, gradually abundance of species will change to reflect the new lake condition.

- Reproductive success. Monitoring reproduction and recruitment of the fish community is particularly useful because the early life history stages are often very sensitive to disturbance. Reproductive success is affected by both biotic and abiotic factors. For example, reduction in ammonia concentration in the water column during the spring is likely to increase survival of sensitive early life stages (abiotic factor). Any effects of improved water quality on the fish community will likely first be reflected in the early life history stages. However, the food web effects must also be considered. Predation by fish such as alewife will reduce survival of larval fishes (biotic factor). The AMP monitors nesting of fish, larval fish, and juveniles.

### A5.4.4. Community Data

Community data collected during the biological monitoring programs are used to evaluate richness, diversity, and relative abundance of indicator species in Onondaga Lake and the tributaries.

- Richness. Richness, the number of different taxa (usually species) found in a community, is calculated for all components of the biological monitoring program. Richness may not be correlated with water or habitat quality. In fact, richness can increase with disturbance; for example, invasive species may become established without eliminating native species. Richness measurements can be used to detect substantial changes in community structure, if the sampling effort is held relatively constant. If changes in richness are detected, the underlying mechanism will be investigated to analyze the potential significance.

- Diversity. The distribution and abundance of different organisms, and how these attributes vary both spatially and temporally, play a major role in determining how an ecosystem functions to process energy and materials (Hooper et al. 2005). The numbers and types of organisms present (sometimes referred to as biodiversity) act together with the effects of climate, resource availability, and disturbance regimes to influence ecosystem properties (Hooper et al. 2005). Species composition, richness, evenness, and interactions respond to and influence ecosystem properties (Hooper et al. 2005). A high biodiversity can be interpreted as indicating functional stability (Karr 1968, Margalef 1968, Odum 1969). Biodiversity can be expressed in terms of numbers of entities (how many genotypes, species, or ecosystems), the evenness of their distribution, the differences in their functional traits, and their interactions (Hooper et al. 2005).

  The Onondaga Lake biological monitoring program utilizes the Shannon-Weiner diversity index as a measure of biodiversity. Shannon-Weiner diversity is a function of both the number of species present (richness) and the equitability of distribution of individuals within these species (evenness) (Washington 1984). Shannon-Weiner diversity is greatest when large numbers of taxa are represented in equal proportions. Shannon-Weiner diversity can help determine if disparity occurs between different sites within the same waterbody or over time. However, care should be taken to not compare Shannon-Weiner diversity values between waterbodies as this metric is expected to differ depending on size and connectedness of the waterbody. Shannon-Weiner diversity is usually utilized with other more descriptive indices that, taken together, can yield a more complete view of the community. This group of metrics is used to document change at the community level. If changes are observed, species-level information is examined to determine the source of those changes and whether they might be attributed to changes in habitat or water quality.

- Presence and relative abundance of indicator organisms. One important characteristic of macroinvertebrates is their differential tolerance to various types of pollution; these different tolerances can influence the species composition and relative abundance of organisms in stream segments affected by various types of pollution. Several indices have been developed to examine the macroinvertebrate community and infer water quality and habitat conditions. Benthic macroinvertebrates are good indicators of localized conditions due to their limited migration patterns and sessile mode of life.

  The tolerance of benthic macroinvertebrates to various types of pollution has been investigated, including organic (oxygen-demanding) waste, nutrients, sediment, salts, metals, and temperature. Both point sources and nonpoint sources (runoff) can cause these types of pollution to reach streams and rivers.

  The AMP includes two macroinvertebrate sampling efforts to evaluate if the stream biota changes as CSO improvements are brought on line. The first is the biennial tributary macroinvertebrate program; macroinvertebrates are collected and identified to the lowest possible taxon (ideally, the species level) at three or four sites on the CSO-affected streams (Onondaga Creek, Ley Creek, and Harbor Brook). The second effort is associated with the periodic stream mapping program; macroinvertebrates are collected and identified to family at one site per stream mile on the three CSO-affected streams. Results are used to calculate standard indices that assess whether a stream segment is impaired, and what type of pollution is most likely responsible.

## A5.5. MODELING

An integrated program of monitoring and modeling will provide the information needed to determine whether the improvements to Metro and the CSOs are sufficient to bring the surface waters (Onondaga Lake, the tributary streams, and a segment of the Seneca River) into compliance with state and federal requirements. Data from the AMP are used to construct and verify models. There are conceptual models of the lake and its watershed that describe how energy and materials cycle. Mathematical models, which are quantitative formulations of mechanisms and interactions that affect water quality, are under development.

### A5.5.1. Conceptual Model

A conceptual model describes the interrelationships between physical, chemical, and biological characteristics of the lake and watershed; it provides a tool for interpreting data and understanding underlying mechanisms. The conceptual model also provides a valuable tool to evaluate the adequacy of the monitoring program itself and determine whether the appropriate questions are being asked of the ecosystem and the data set. Finally, the conceptual model provides the foundation for development of a predictive mathematical model.

A conceptual model of the phosphorus, nitrogen, and dissolved oxygen dynamics in Onondaga Lake was drafted by QEA, LLC and first presented in the Onondaga County 2001 Annual AMP report. Figures from the 2001 AMP Annual Report are included below:

- **Figure A5-3** is the phosphorus cycle
- **Figure A5-4** is the nitrogen cycle
- **Figure A5-5** is the dissolved oxygen (DO) cycle.

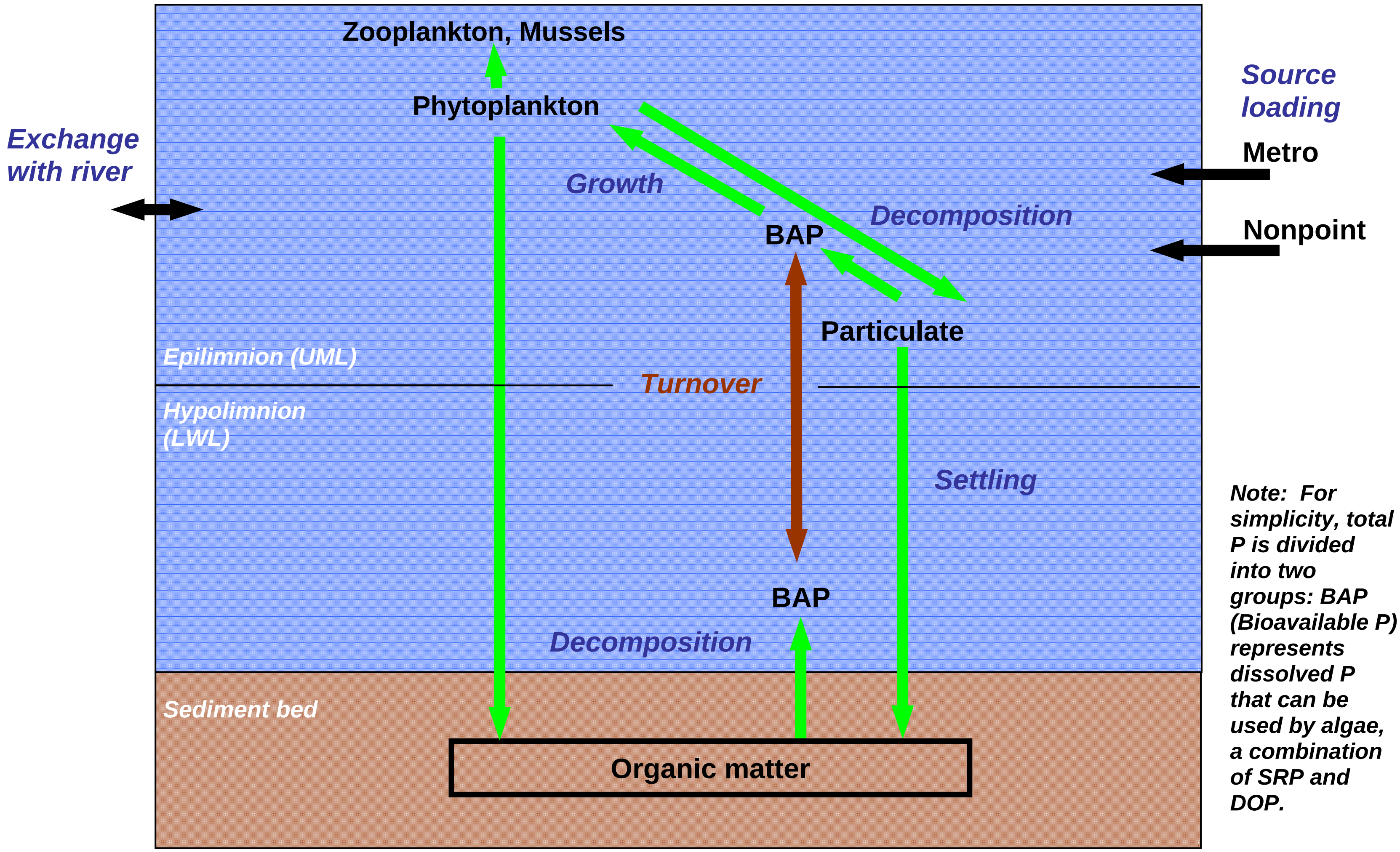


**Figure A5-3.** Conceptual model of phosphorus dynamics in Onondaga Lake under present conditions. Seasonal importance of primary pathways indicated by colors: Summer, Fall.

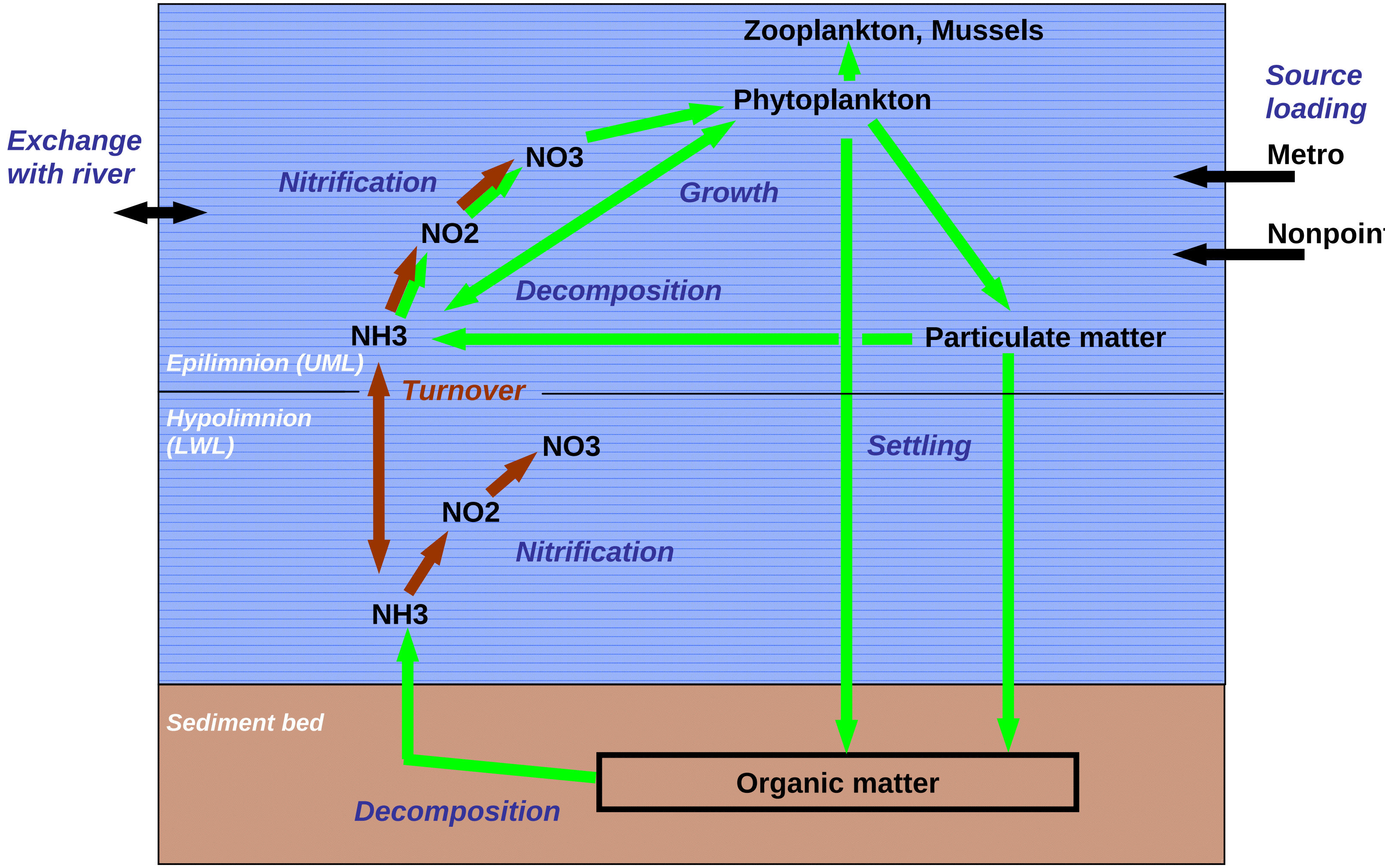


**Figure A5-4.** Conceptual model of nitrogen dynamics in Onondaga Lake under present conditions. Seasonal importance of primary pathways indicated by colors: Summer, Fall.

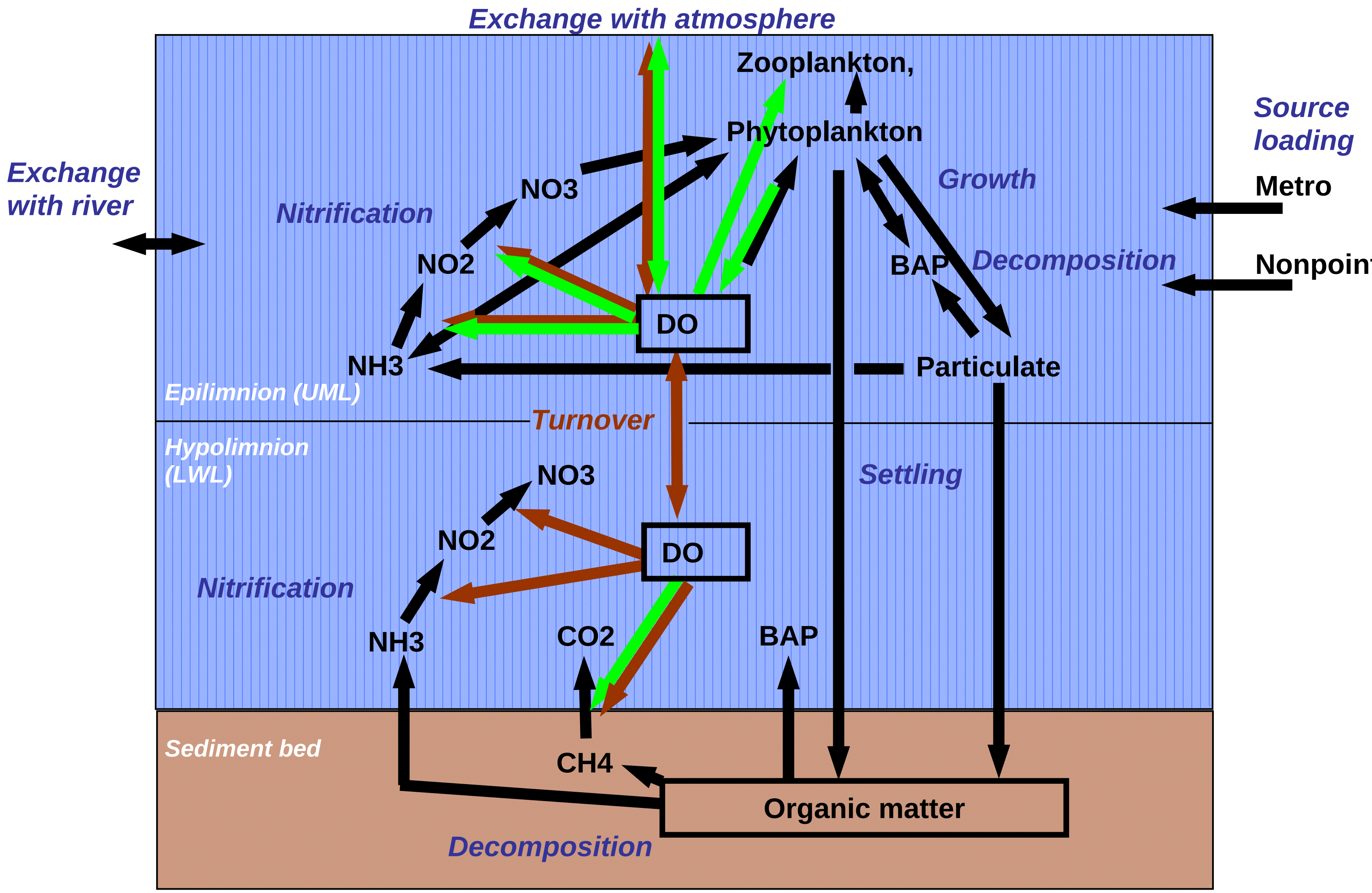


**Figure A5-5**. Conceptual model of dissolved oxygen dynamics in Onondaga Lake under present conditions. Seasonal importance of primary pathways indicated by colors: Summer, Fall.

### A5.5.2. Mass-balance Model

The development and structure of a mass-balance modeling framework for Onondaga Lake is described in the Onondaga County AMP Annual Reports. The framework facilitates computation and analysis of mass balances for nutrients and other water quality components using hydrologic and water quality data collected in the Lake and its tributaries since 1986. Lake water and mass balances are formulated on yearly and seasonal (May-September) time scales. Results provide a basis for:

1. Estimating the magnitude and precision of loads from each source;
2. Assessing long-term trends in load and inflow concentration from each source and source category (point, nonpoint, total);
3. Evaluating the adequacy of the monitoring program, based on the precision of loads computed from concentration and flow data;
4. Developing and updating an empirical nutrient loading model that predicts eutrophication-related water quality conditions (as measured by nutrient concentrations, chlorophyll-a, algal bloom frequency, transparency, and hypolimnetic oxygen depletion) as a function of yearly nutrient loads, inflows, and lake morphometry;
5. Developing simple input/output models for other constituents; and
6. Developing data summaries to support integration and interpretation of monitoring results in the County's annual AMP reports.

### A5.5.3. NYSDEC Total Maximum Daily Load (TMDL) Allocation

The ACJ requires that NYSDEC issue a revised Total Maximum Daily Load (TMDL) allocation for ammonia and phosphorus inputs to Onondaga Lake on or about January 1, 2009. The TMDL will define the total loading of ammonia and phosphorus that can be assimilated by the lake while maintaining compliance with water quality standards. The total required reductions in point and nonpoint source loading will be defined. To complete this task, NYSDEC requires a reliable model of how the lake responds to loading, plus an accurate allocation of the sources of ammonia and phosphorus.

### A5.5.4. USGS Onondaga Lake Watershed Model

One of the projects funded by the Onondaga Lake Partnership is a watershed model of the lake. USGS is developing this model which will be used to estimate nonpoint source loads of materials to Onondaga Lake under various hydrologic conditions and land use practices. The tributary loading estimates developed through the AMP are the basis for model calibration.

### A5.5.5. Three Rivers Water Quality Model (TRWQM)

A water quality model of the Three Rivers system was developed by QEA, LLC to assess the waste load assimilative capacity of the Seneca River. The model quantifies the River's assimilative capacity and accommodates respiration of zebra mussels, as set forth in the AMP Requirements (ACJ Appendix D, item IV.2). The model will serve as the basis for a TMDL allocation for oxygen-demanding materials and will be used to determine if diversion of Metro effluent to the Seneca River is a viable alternative.

Onondaga County funded development of the TRWQM. The model domain extends from Cross Lake to the Phoenix Dam. A peer review of the TRWQM has been completed.

The model simulates water quality conditions in the river in response to various environmental conditions, including upstream water quality conditions, point source discharges, water temperature, and zebra mussel growth.

### A5.5.6. Onondaga Lake Model

Onondaga County has completed a Request for Proposals and selection process for development of a water quality/eutrophication model of Onondaga Lake. QEA, LLC will complete the lake model that will be used for the NYSDEC TMDL allocation and final effluent limits. This water quality model will link the watershed model and the TRWQM. The model will be developed using data from the AMP and will be the primary means of determining the level of treatment and location of the Metro discharge. Model development will be a collaborative effort that includes Onondaga Lake Partnership as well as expert peer reviewers. While the primary focus is on water quality, the model will incorporate biological influences on the lake ecosystem. The overall goal will be to develop a tool that can help assess water quality improvements from both the bottom-up effects (i.e. reduced loading of nutrients and organic material) and the top-down effects (i.e. food web interactions).

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# APPENDIX 6: 2007 DREISSENID MUSSEL SURVEY

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**APPENDIX 6 – Seneca River and Onondaga Lake Dreissenid Mussel Survey (Revised)**

During the fall of 2007, OCDWEP staff completed a Seneca River and Onondaga Lake dreissenid mussel survey in support of the model and/or validation needs for the Three Rivers Water Quality Model (TRWQM) and Onondaga Lake Water Quality Model (OLWQM). The Dreissenid mussels include both zebra and quagga mussels.

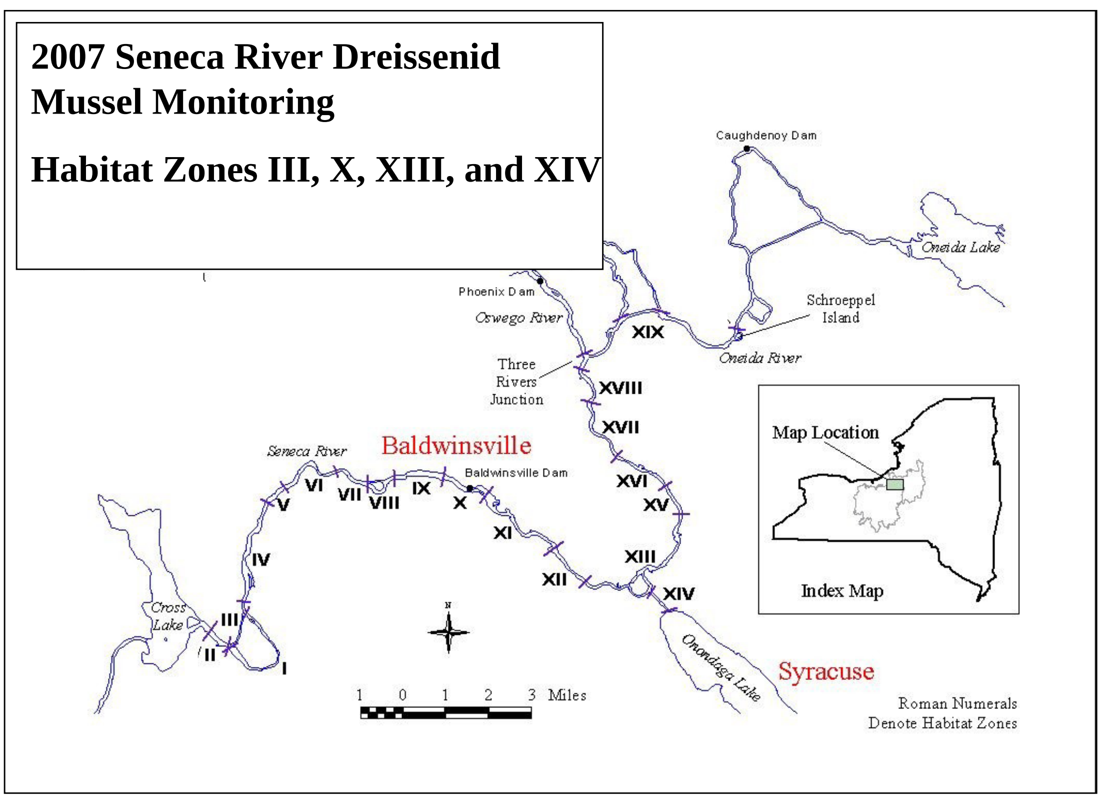
Note: A re-evaluation of the 2007 Dreissenid Mussel Survey was performed due to the identification of an abundant quagga mussel (*Dreissena bugensis*) population in both the Seneca River and Onondaga Lake samples collected during the 2008 Dreissenid Mussel survey. A review of the archived samples from 2007 identified several transects that contained quagga mussels, requiring modification to the tables and figures contained herein.

### A6-1 Seneca River

The October 10, 2007, monitoring event included the collection and estimation of dreissenid mussels at key locations recommended by QEA to provide a measure of length frequency distribution and density (#/m$^2$ and grams/m$^2$). The monitoring locations include the following four (4) habitat zones:

- Zone III – State Ditch Cut – 3 Transects, 3 samples per transect.
- Zone X – Near Buoy Marker 334– 3 Transects, 3 samples per transect.
- Zone XIII – Near Buoy Marker 260 – 5 Transects, 3 samples per transect.
- Zone XIV – Onondaga Lake Outlet– 2 Transects, 3 samples per transect.

*Map of General Seneca River Dreissenid Mussel Transect Locations*



Three (3) samples were collected along each transect. One (1) at approximately mid-channel (Middle), and one (1) between the channel marker buoy and shoreline on each side of the river (Red and Green). The boat was anchored to provide a fixed position, and the technicians record the date, time, water depth (ft), composition of the field crew, general weather conditions, and GPS coordinates. The Green and Red locations are designated by the channel marker buoys.

A single grab sample was collected at each depth interval with a petit ponar dredge, which has a sample area of 35 $in^2$ (226 $cm^2$). The impact with the bottom activates the closing mechanism, and the dredge is then slowly brought to the surface.

Once at the surface, all substrate within the sampler is carefully placed into the wash bucket with the mesh screen. Lake water is used to rinse any remaining material into the wash bucket. Fine sediments were rinsed through the wash bucket, and all remaining material was placed in a labeled zip-lock bag. Following field sample collection, all samples were placed in a cooler with ice until transported to a refrigerator at the HCBF laboratory. Label information included date and location (i.e. Zone III, Transect A, Location G).

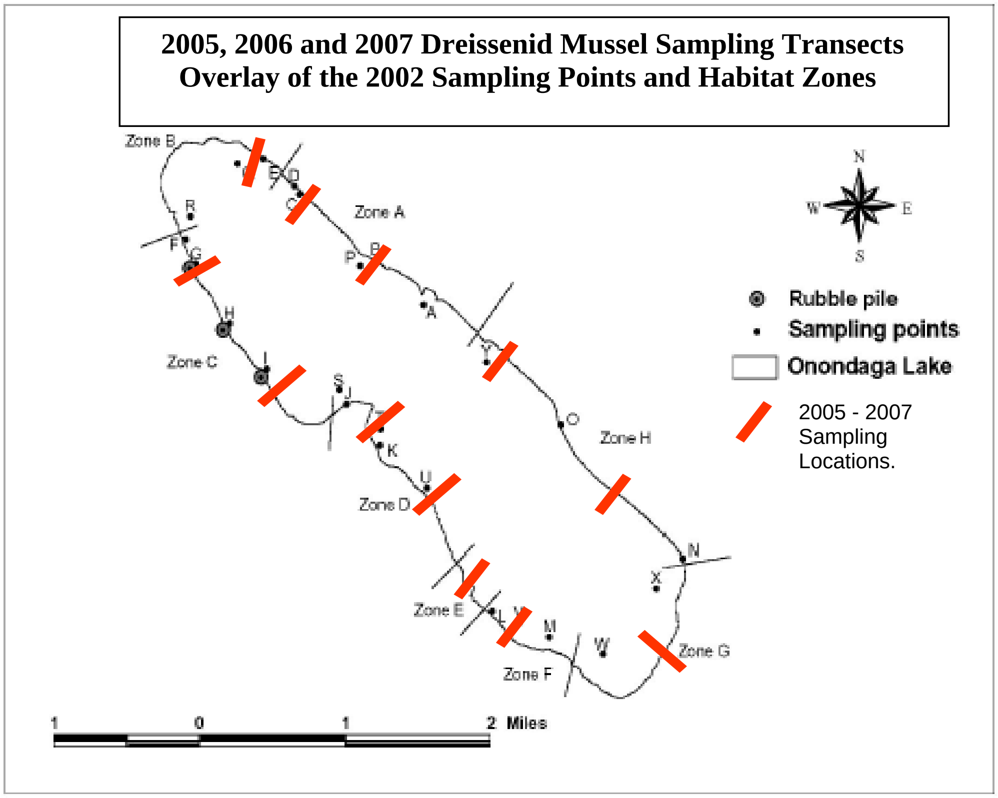
Thirty-nine (39) samples were collected from the Seneca River during the 2007 field effort.

**A6-2 Onondaga Lake**

The October 19 and 25, 2007, monitoring event on Onondaga Lake included the collection and estimation of dreissenid mussels within habitat zones identified by Stantec during the 2002 Onondaga Lake Zebra Mussel Assessment Program, and transects and water depth intervals recommended by QEA in 2005. The 2007 effort provided a limited measure of length frequency distribution and density ($\#/m^2$ and $grams/m^2$) in Onondaga Lake. The monitoring locations include the following eight (8) habitat zones:

- Zone A – 2 Transects, 3 samples per transect, at 0-1.5 m, 1.5 – 3 m, and 3 – 4.5 m.
- Zone B – 1 Transect, 3 samples per transect, at 0-1.5 m, 1.5 – 3 m, and 3 – 4.5 m.
- Zone C – 2 Transects, 3 samples per transect, at 0-1.5 m, 1.5 – 3 m, and 3 – 4.5 m.
- Zone D – 2 Transects, 3 samples per transect, at 0-1.5 m, 1.5 – 3 m, and 3 – 4.5 m.
- Zone E – 1 Transect, 3 samples per transect, at 0-1.5 m, 1.5 – 3 m, and 3 – 4.5 m.
- Zone F – 1 Transect, 3 samples per transect, at 0-1.5 m, 1.5 – 3 m, and 3 – 4.5 m.
- Zone G – 1 Transect, 3 samples per transect, at 0-1.5 m, 1.5 – 3 m, and 3 – 4.5 m.
- Zone H – 2 Transects, 3 samples per transect, at 0-1.5 m, 1.5 – 3 m, and 3 – 4.5 m.

*Map of General Onondaga Dreissenid Mussel Transect Locations*




Three (3) samples were collected along each transect. The first at a water depth of approximately 0 to 1.5 meters, the second at a water depth of approximately 1.5 to 3.0 meters, and the third at a water depth of approximately 3.0 to 4.5 meters. The boat was anchored to provide a fixed position, and technicians recorded the date, time, actual water depth (ft), field crew, general weather conditions, and GPS coordinates.

A single grab sample was collected at each depth interval with a petit ponar dredge, which has a sample area of 35 $in^2$ (226 $cm^2$). The impact with the bottom activates the closing mechanism, and the dredge is then slowly brought to the surface.

Once at the surface, all substrate within the sampler is carefully placed into the wash bucket with the mesh screen. Lake water is used to rinse any remaining material into the wash bucket. Fine sediments were rinsed through the wash bucket, and all remaining material was placed in a labeled zip-lock bag. Following field sample collection, all samples were placed in a cooler with ice until transported to refrigerator at the HCBF laboratory.

The sample was rejected if the dredge was only partially filled with substrate sediment. Possible causes of less than a full sample included non-vertical deployment, premature triggering of the closing mechanism, an object stuck in the jaws of the ponar, or hard sediments that are impenetrable by the petite ponar. If the sampling team observed bottom material draining from the dredge as it is brought out of the water, the sample was rejected. If a sample was rejected, the procedure was repeated.

Thirty-six (36) samples were collected in Onondaga Lake during the 2007 field effort.

## A6-3 River and Lake Biological Laboratory Processing

At the HCBF biological laboratory, all mussels in the sample were carefully removed from the substrate material. Laboratory measurements of the collected samples were completed within two (2) weeks of sample collection. The entire sample was sorted to remove the live mussels. Care was taken to distinguish between zebra and quagga mussels that are similar in appearance for young-of-year mussels. The mussels were then blotted dry with paper towels.

Note: For those locations that contained quagga mussel, only the lengths were re-measured for each species as part of this revision. The weights were not re-evaluated since the specimens had been preserved. As a result, the data tables provide weight, and weight based density (g/m$^2$), for combined Dreissenid Mussels (quagga and zebra mussels). Where length frequency and quantity based density (no./m$^2$), was calculated for each species.

### A6-3.1 Length Frequency

Using the blotted samples, technicians randomly select 100 mussels from the sample for length measurement. Using the digital caliper, the technicians recorded the length of each mussel (nearest 1 mm) on the Log Sheet for Mussel Length. If a sample results in less than 150 mussels for any given transect (because of the lack of mussels in some individual samples), additional randomly selected mussels were then measured in those samples within the transect with more than 100 mussels (if such were available), with the goal of at least 150 measurements per transect.

### A6-3.2 Weight and Density Determination (Estimate)

Upon completion of the length measurements for the sample, technicians used the 100 randomly selected mussels (or using all the mussels samples that were measured for those sample locations that did not contain 100 mussels) for a batch weigh per sub-sample. Technicians recorded the number of mussels in the sub-sample and the weight of the sub-sample on the Log Sheet for Weight and Density Determination (weight was recorded to the nearest 0.1 grams). The technicians then combined the sub-sample mussels with the remaining mussels in the sample for a total weight for the entire sample. The calculation for the estimated total number of mussels per sample as follows:

$$\text{Total \# of Mussels per Sample} = \frac{(\text{\# mussels per sub-sample} * \text{weight per entire sample})}{\text{weight per sub-sample}}$$

Note: For those locations where quagga mussels were present, the actual counts (number of each species) were used in the density (no./m$^2$) determination/calculation.

## A6-4 Seneca River Data

On October 10, 2007, OCDWEP technicians collected the dreissenid mussel samples at the designated locations. Samples were collected and measured in accordance with the standard procedures unless otherwise noted. In general, all locations sampled contained a significant quantity of dreissenid mussel shell fragments requiring considerable laboratory effort to distinguish between the dead and live mussels.

During 2007, the survey identified several locations that contained quagga mussels. Quagga mussels were identified in four (4) of the Seneca River Transects (IIIA, XB, XIIIA, and XIIIE), and both of the Lake outlet locations (XIVA and XIVB). The quagga mussels represented 6% of the number of Seneca River dreissenid mussels sampled, and nearly 15% of the number of Lake Outlet dreissenid mussels sampled.

The Seneca River and Onondaga Lake outlet locations have continued to identify fluctuating dreissenid mussel densities and numbers. Particularly noteworthy during 2007, is the decline ($g/m^2$ and $\#/m^2$) in all zones (except XIIIA) outside of the lake outlet (XIVA and XIVB). The lake outlet locations had a 101% increase in the estimated $\#/m^2$ and a 40% increase in the $g/m^2$ from the 2004 mean values (following considerable declines in 2005 and 2006).

The fluctuation in dreissenid mussel density may be a function of annual variability in the mussel populations (mortality vs. distribution of year classes), a change in water quality conditions (increased clarity), a function of comparing results from different sampling methodologies (SCUBA diver collected vs. petit ponar dredge), or a combination of each.

Note: The 2004 data utilized scuba divers for sample collection, and the 2005, 2006 and 2007 data utilized the petit ponar dredge for sample collection.

**A6-5 Onondaga Lake Data**

On October 19 and 25, 2007, OCDWEP technicians collected the dreissenid mussel samples at the designated locations. Two (2) days were necessary to collect the samples due to a change in weather conditions during the first day of sampling. Samples were collected and measured in accordance with the procedures unless otherwise noted. In general, most locations sampled contained a significant quantity of dreissenid mussel shell fragments requiring considerable laboratory effort to distinguish between the dead and live mussels.

During 2007, the survey identified several zones that contained quagga mussels. Quagga mussels were identified in three (3) of the zones (A, C, and D), with water depths ranging from 0 to 4.5 meters. Although the greatest densities were in the 3 to 4.5 meter depth range. The quagga mussels represented 3.5% of the number of Onondaga Lake dreissenid mussel samples.

Particularly noteworthy is that in one year the lake had a 434% increase in the mean estimated number of mussels per $m^2$, and a 667% increase in the mean weight ($g/m^2$). The largest increase was in the 1.5 to 3.0 m and the 3.0 to 4.5 m ranges. Zone C (NW Shore above Ninemile Creek), Zone D (Wastebeds 1-8), Zone F (Wastebed B) and Zone G (Southern End/Metro) had the greatest increase in the number of dreissenid mussels compared to the 2006 data.

The fluctuation in dreissenid mussel density may be a function of annual variability in mussel populations (mortality vs. distribution of year classes), a change in water quality conditions (increased clarity), a function of comparing results from different sampling methodologies (SCUBA diver collected vs. petit ponar dredge), or a combination of each.

Note: The 2002 data utilized scuba divers for sample collection, and the 2005, 2006 and 2007 data utilized the petit ponar dredge for sample collection.

TABLES

**Table A6-1. Seneca River Dreissenid Mussel Survey Fall 2007 - Length and Weight Data Summary**

| Zone | Transect | Transect Coordinates | Channel Location | Water Depth (m) | Number of Mussels Per Sub-Sample | Weight Per Sub-Sample (g) | Weight Per Entire Sample (g) | Total Weight (g/m$^2$) | Mean Weight (g/m$^2$) per Transect | Median Mussel Length (mm) | Mean Mussel Length (mm) | Total Number of Mussels Per Sample | Estimated Total Number of Mussels per m$^2$ | Mean Estimated Number of Mussels per m$^2$ by Transect |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Green | 4.4 | 58 | 0.2 | 0.2 | 8.8 | 8.8 | 3 | 2.9 | 58.0 | 2566.4 | 1608 |
| III | A | N 43 06.480, W 76 26.440 | Middle | 13.7 | 48 | 0.3 | 0.3 | 13.3 | | 3 | 3.5 | 48.0 | 2123.9 | |
| | | | Red | 4.1 | 3 | 0.1 | 0.1 | 4.4 | | 3 | 3.8 | 3.0 | 132.7 | |
| | | | Green | 3.7 | 52 | 0.3 | 0.3 | 13.3 | 61.9 | 3 | 3.1 | 52.0 | 2300.9 | 4241 (74) |
| III | B | N 43 06.606, W 76 26.426 | Middle | 12.8 | 100 | 2.8 | 3.0 | 132.7 | | 3 (7) | 3.5 (7.7) | 107 (5) | 4734.5 (221.2) | |
| | | | Red | 5.1 | 100 | 0.7 | 0.9 | 39.8 | | 3 | 3.5 | 128.6 | 5689.0 | |
| | | | Green | 4.6 | 38 | 0.2 | 0.2 | 8.8 | 10.3 | 3 | 3.1 | 38.0 | 1681.4 | 1740 |
| III | C | N 43 06.741, W 76 26.379 | Middle | 14.3 | 7 | 0.1 | 0.1 | 4.4 | | 4 | 3.4 | 7.0 | 309.7 | |
| | | | Red | 5.6 | 73 | 0.4 | 0.4 | 17.7 | | 3 | 3.0 | 73.0 | 3230.1 | |
| | | | Green | 9.0 | 1 | 0.1 | 0.1 | 4.4 | 1.5 | 4 | 3.9 | 1.0 | 44.2 | 15 |
| X | A | N 43 09.682, W 76 20.697 | Middle | 13.9 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Red | 5.8 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Green | 8.7 | 0 | 0.0 | 0.0 | 0.0 | 8.8 | 0 | 0.0 | 0.0 | 0.0 | 88.5 (15) |
| X | B | N 43 09.572, W 76 19.759 | Middle | 13.5 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Red | 8.7 | 7 | 0.6 | 0.6 | 26.5 | | 7 (14) | 7.4 (13.6) | 6 (1) | 265.5 (44.2) | |
| | | | Green | 12.4 | 0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 0 |
| X | C | N 43 09.336, W 76 19.747 | Middle | 12.7 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Red | 9.3 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Green | 5.5 | 1 | 0.1 | 0.1 | 4.4 | 308.3 | 0 (17) | 0 (17) | 0 (1) | 0 (44.2) | 959 (251) |
| XIII | A | N 43 09.472, W 76 16.738 | Middle | 18.4 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Red | 6.0 | 81 | 20.8 | 20.8 | 920.4 | | 10 (16) | 10.6 (16.7) | 65 (16) | 2876.1 (708.0) | |
| | | | Green | 4.1 | 0 | 0.0 | 0.0 | 0.0 | 1.5 | 0 | 0.0 | 0.0 | 0.0 | 29 |
| XIII | B | N 43 07.482, W 76 15.496 | Middle | 20.7 | 2 | 0.1 | 0.1 | 4.4 | | 9 | 9.0 | 2.0 | 88.5 | |
| | | | Red | 14.9 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Green | 8.1 | 3 | 0.4 | 0.4 | 17.7 | 19.2 | 6 | 8.0 | 3.0 | 132.7 | 118 |
| XIII | C | N 43 07.596, W 76 15.489 | Middle | 15.7 | 5 | 0.9 | 0.9 | 39.8 | | 12 | 12.0 | 5.0 | 221.2 | |
| | | | Red | 4.9 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Green | 6.7 | 0 | 0.0 | 0.0 | 0.0 | 1.5 | 0 | 0.0 | 0.0 | 0.0 | 29 |
| XIII | D | N 43 07.307, W 76 15.538 | Middle | 15.5 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Red | 5.6 | 2 | 0.1 | 0.1 | 4.4 | | 6 | 5.9 | 2.0 | 88.5 | |
| | | | Green | 10.3 | 100 | 15.6 | 29.0 | 1283.2 | 427.7 | 9 (15) | 9.3 (14.7) | 154 (28) | 6814.2 (1238.9) | 2271 (413) |
| XIII | E | N 43 07.475, W 76 15.101 | Middle | 17.1 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Red | 8.6 | 0 | 0.0 | 0.0 | 0.0 | | 0 | 0.0 | 0.0 | 0.0 | |
| | | | Green | 6.1 | 100 | 12.3 | 34.6 | 1531.0 | 2166.7 | 7 (10) | 8.2 (9.9) | 417 (21) | 18451.3 (929.2) | 21211 (811) |
| XIV | A | N 43 07.245, W 76 14.979 | Middle | 15.9 | 100 | 15.2 | 102.0 | 4513.3 | | 7 (12) | 8.2 (11.7) | 897 (34) | 39690.3 (1504.4) | |
| | | | Red | 5.9 | 100 | 8.3 | 10.3 | 455.8 | | 7 | 7.4 | 124.1 | 5491.0 | |
| | | | Green | 6.4 | 100 | 13.9 | 69.8 | 3088.5 | 4246.3 | 9 (15) | 9.0 (14.0) | 556 (22) | 24601.8 (973.5) | 24676 (929) |
| XIV | B | N 43 07.038, W 76 14.712 | Middle | 15.3 | 100 | 13.5 | 137.9 | 6101.8 | | 9 (13) | 10.1 (12.4) | 810 (24) | 35840.7 (1061.9) | |
| | | | Red | 7.3 | 100 | 19.5 | 80.2 | 3548.7 | | 8 (13) | 11.0 (13.5) | 307 (17) | 13584.0 (752.2) | |

Note: Petit Ponar Dredge Sample Area is 226 cm$^2$.
Results expressed as Zebra mussel (Quagga mussel) when Quagga mussels are present.
Samples were preserved before a recount for quagga mussels. Therefore, the weight represents the combined Dreissenid, Zebra and Quagga Mussel, weight.
Number of Mussels per sample are actual counts when quagga mussels were present.

*Samples were collected on October 10, 2007.*

**Table A6.2. Seneca River Dreissenid Mussel Survey - Fall 2004, Fall 2005, Fall 2006 and Fall 2007 Comparison of Mean Weight ($g/m^2$) and Mean Density ($\#/m^2$)**

| Zone | Transect | Mean Weight ($g/m^2$) per Transect | | | | Mean Estimated Number of Mussels per $m^2$ by Transect | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2004 | 2005 | 2006 | 2007 | 2004 | 2005 | 2006 | 2007[1)] |
| III | A | 4025.8 | 140.7 | 808.0 | 8.8 | 11987 | 15433 | 5760 | 1608 |
| III | B | 2569.0 | 327.1 | 789.1 | 61.9 | 9691 | 5525 | 6638 | 4241 (74) |
| III | C | 1392.2 | 66.2 | 413.0 | 10.3 | 17860 | 12133 | 6449 | 1740 |
| X | A | 549.0 | 284.4 | 236.0 | 1.5 | 1500 | 1796 | 546 | 15 |
| X | B | 444.9 | 176.5 | 311.2 | 8.8 | 1692 | 546 | 619 | 88.5 (15) |
| X | C | 0.0 | 1.8 | 0.0 | 0 | 0 | 88 | 0 | 0 |
| XIII | A | 477.2 | 0.0 | 19.2 | 308.3 | 1909 | 0 | 44 | 959 (251) |
| XIII | B | 563.3 | 151.9 | 272.9 | 1.5 | 2012 | 826 | 560 | 29 |
| XIII | C | 0.0 | 14.4 | 35.4 | 19.2 | 0 | 162 | 2581 | 118 |
| XIII | D | 308.6 | 0.3 | 2.9 | 1.5 | 1815 | 59 | 162 | 29 |
| XIII | E | 958.0 | 1272.8 | 986.7 | 427.7 | 5042 | 3290 | 4869 | 2271 (413) |
| XIV | A | 1532.1 | 0.0 | 23.6 | 2166.7 | 8157 | 0 | 3053 | 21211 (811) |
| XIV | B | 3042.7 | 146.2 | 1991.2 | 4246.3 | 15445 | 796 | 10041 | 24676 (929) |

[1)] The 2007 results are expressed as Zebra mussel (Quagga mussel) when Quagga mussels are present.

Note: The 2004 data utilized scuba divers for sample collection, and the 2005, 2006 and 2007 data utilized the petit ponar dredge for sample collection.

## Table A6-3a. Seneca River Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data

| Zone | Zone III | | | Zone III | | | Zone III | | | Zone X | | | Zone X | | | Zone X | | | Zone XIII | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect A | | | Transect B | | | Transect C | | | Transect A | | | Transect B | | | Transect C | | | Transect A | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| **Median Length** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **4** | **3** | **4** | **0** | **0** | **0** | **0** | **7** | **0** | **0** | **0** | **0** | **0** | **10** |
| **Mean Length** | **2.9** | **3.5** | **3.8** | **3.1** | **3.5** | **3.5** | **3.1** | **3.4** | **3.0** | **3.9** | **0.0** | **0.0** | **0.0** | **0.0** | **7.4** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **10.6** |
| 1 | 4.2 | 3.8 | 5.4 | 7.2 | 5.2 | 2.9 | 2.8 | 6.3 | 2.9 | 3.9 | 0 | 0 | 0 | 0 | 11.3 | 0 | 0 | 0 | 0 | 0 | 8.6 |
| 2 | 2 | 2.5 | 3.3 | 6.2 | 1.2 | 2.9 | 2.8 | 4.4 | 4.8 | | | | | | 8.3 | | | | | | 9.7 |
| 3 | 3.6 | 2.3 | 2.8 | 6.3 | 3 | 2.6 | 4.4 | 3.7 | 6.2 | | | | | | 7.6 | | | | | | 8.9 |
| 4 | 4.6 | 4.9 | | 6.1 | 4.8 | 5 | 2.1 | 3.5 | 3.4 | | | | | | 7.3 | | | | | | 11.1 |
| 5 | 3.9 | 2.7 | | 4.7 | 2.7 | 3 | 2.6 | 2.1 | 4.8 | | | | | | 6 | | | | | | 11.8 |
| 6 | 3.8 | 3.9 | | 4.5 | 2.5 | 5.3 | 2.5 | 2.4 | 5.7 | | | | | | 3.9 | | | | | | 8.5 |
| 7 | 6 | 1.5 | | 4.5 | 4.9 | 3.3 | 3.9 | 1.7 | 6.7 | | | | | | | | | | | | 6.4 |
| 8 | 3.5 | 4.5 | | 3.8 | 2.7 | 3.7 | 2.6 | | 4.2 | | | | | | | | | | | | 8.3 |
| 9 | 3 | 2.8 | | 3.9 | 3.9 | 3.4 | 4.2 | | 2.5 | | | | | | | | | | | | 6.4 |
| 10 | 2.8 | 7 | | 4.4 | 2.4 | 4.1 | 2.7 | | 3.1 | | | | | | | | | | | | 7.6 |
| 11 | 2.7 | 3.3 | | 3.5 | 2.4 | 4.7 | 3.2 | | 4.7 | | | | | | | | | | | | 10.3 |
| 12 | 7.2 | 3.2 | | 2.9 | 3.7 | 3.6 | 3.8 | | 2.8 | | | | | | | | | | | | 10.3 |
| 13 | 5.2 | 3.5 | | 3 | 2.3 | 7.4 | 2.5 | | 2.2 | | | | | | | | | | | | 9.4 |
| 14 | 2.8 | 2.9 | | 4 | 3.2 | 2.7 | 5.3 | | 2.8 | | | | | | | | | | | | 11.3 |
| 15 | 1.9 | 2.6 | | 3.7 | 2.4 | 4.3 | 4.1 | | 4 | | | | | | | | | | | | 11.1 |
| 16 | 2 | 3.2 | | 3.2 | 2.5 | 6.3 | 1.9 | | 3.7 | | | | | | | | | | | | 8.8 |
| 17 | 2.7 | 5.7 | | 3.1 | 2.2 | 6.7 | 1.8 | | 3.5 | | | | | | | | | | | | 11.8 |
| 18 | 2.7 | 4.8 | | 2.9 | 3.1 | 4 | 3 | | 2.7 | | | | | | | | | | | | 11.6 |
| 19 | 2.5 | 4.5 | | 2.6 | 1.1 | 4.6 | 3.7 | | 6.9 | | | | | | | | | | | | 10 |
| 20 | 4 | 4.3 | | 3.2 | 3 | 2.8 | 3.9 | | 1.8 | | | | | | | | | | | | 14.1 |
| 21 | 3.9 | 4.3 | | 3.9 | 2.4 | 2.3 | 4.6 | | 3.5 | | | | | | | | | | | | 6.7 |
| 22 | 3.4 | 4.6 | | 2.4 | 2.4 | 5.1 | 3.9 | | 2.7 | | | | | | | | | | | | 11.3 |
| 23 | 3.5 | 3.2 | | 2.2 | 3.4 | 3.3 | 2.8 | | 3.9 | | | | | | | | | | | | 11.6 |
| 24 | 2.2 | 5.1 | | 2.4 | 2.4 | 3 | 3.2 | | 3 | | | | | | | | | | | | 6 |
| 25 | 3.7 | 3.4 | | 2.9 | 1.7 | 3.4 | 4.3 | | 3.4 | | | | | | | | | | | | 10.4 |
| 26 | 4.5 | 2.1 | | 2.6 | 4.6 | 3.9 | 2.5 | | 3.3 | | | | | | | | | | | | 7.2 |
| 27 | 4.1 | 3.2 | | 2.8 | 2.5 | 3.2 | 2.1 | | 3.1 | | | | | | | | | | | | 22.5 |
| 28 | 2.1 | 3.1 | | 3.2 | 2.3 | 3.1 | 1.9 | | 1.6 | | | | | | | | | | | | 23.6 |
| 29 | 6.1 | 3.9 | | 4 | 15.4 | 2.1 | 2.1 | | 1.9 | | | | | | | | | | | | 12.8 |
| 30 | 1.2 | 4.3 | | 2.9 | 2.8 | 3 | 2.8 | | 2.7 | | | | | | | | | | | | 10 |
| 31 | 2 | 1.7 | | 2.7 | 4.5 | 3.2 | 3.2 | | 1.6 | | | | | | | | | | | | 8.8 |
| 32 | 2.4 | 2.7 | | 3.1 | 1.8 | 3.1 | 2.8 | | 1.6 | | | | | | | | | | | | 9.3 |
| 33 | 1.6 | 4.1 | | 2.4 | 3.3 | 2.8 | 2.7 | | 5.2 | | | | | | | | | | | | 13.1 |
| 34 | 1.4 | 3.7 | | 2.4 | 3.8 | 2.6 | 2.8 | | 3.8 | | | | | | | | | | | | 10.7 |
| 35 | 2.1 | 2.5 | | 1.9 | 2.5 | 5.6 | 3.3 | | 5.9 | | | | | | | | | | | | 14.6 |
| 36 | 1.4 | 2.3 | | 2.2 | 3.6 | 3.2 | 4.3 | | 4.6 | | | | | | | | | | | | 11.3 |
| 37 | 2.5 | 3 | | 2.9 | 2.9 | 4 | 3.1 | | 3.7 | | | | | | | | | | | | 10.7 |
| 38 | 1.2 | 4.2 | | 2.9 | 3.6 | 2.8 | 1.9 | | 2.2 | | | | | | | | | | | | 11.6 |
| 39 | 2.6 | 4.8 | | 3 | 2.6 | 4 | | | 3 | | | | | | | | | | | | 10.4 |
| 40 | 1.9 | 3.6 | | 1.6 | 3.9 | 4.1 | | | 4.5 | | | | | | | | | | | | 10.1 |
| 41 | 2.4 | 3.2 | | 2 | 3 | 4.6 | | | 2.8 | | | | | | | | | | | | 12.6 |
| 42 | 2.6 | 2.7 | | 2.1 | 1.6 | 2.7 | | | 3 | | | | | | | | | | | | 14 |
| 43 | 3.7 | 2.7 | | 1.5 | 3.9 | 4.1 | | | 2.6 | | | | | | | | | | | | 12.8 |
| 44 | 2.2 | 2.2 | | 2.2 | 2.9 | 2.4 | | | 2.9 | | | | | | | | | | | | 10.1 |

**Table A6-3a. Seneca River Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data**

| Zone | Zone III | | | Zone III | | | Zone III | | | Zone X | | | Zone X | | | Zone X | | | Zone XIII | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect A | | | Transect B | | | Transect C | | | Transect A | | | Transect B | | | Transect C | | | Transect A | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| 45 | 2 | 2.4 | | 2.3 | 2.1 | 3.1 | | | 2.2 | | | | | | | | | | | | 8.7 |
| 46 | 3.3 | 5.8 | | 2.2 | 2 | 3.3 | | | 3.3 | | | | | | | | | | | | 7.4 |
| 47 | 3 | 1.7 | | 2.1 | 2.9 | 3.4 | | | 1.2 | | | | | | | | | | | | 8.2 |
| 48 | 2.2 | 1.4 | | 2.7 | 2.1 | 2.8 | | | 1.3 | | | | | | | | | | | | 10.4 |
| 49 | 2.1 | | | 2.6 | 4.6 | 4.9 | | | 4.5 | | | | | | | | | | | | 9.2 |
| 50 | 2.2 | | | 1.6 | 3.3 | 5.3 | | | 2 | | | | | | | | | | | | 8 |
| 51 | 2.4 | | | 1.5 | 3.2 | 3.2 | | | 3.3 | | | | | | | | | | | | 10.2 |
| 52 | 2.5 | | | 1.4 | 2.8 | 2.9 | | | 5.3 | | | | | | | | | | | | 10.7 |
| 53 | 2.7 | | | | 3.7 | 3.3 | | | 2.5 | | | | | | | | | | | | 12.3 |
| 54 | 2.7 | | | | 2.4 | 2.3 | | | 1.9 | | | | | | | | | | | | 17.1 |
| 55 | 2 | | | | 2.3 | 3.3 | | | 1.6 | | | | | | | | | | | | 10.3 |
| 56 | 1.7 | | | | 2.1 | 2 | | | 2.7 | | | | | | | | | | | | 6.3 |
| 57 | 1.7 | | | | 4.4 | 2.5 | | | 2.6 | | | | | | | | | | | | 7.7 |
| 58 | 1.9 | | | | 12.6 | 3.1 | | | 2.6 | | | | | | | | | | | | 9.1 |
| 59 | | | | | 10 | 3.3 | | | 2.1 | | | | | | | | | | | | 12.9 |
| 60 | | | | | 11.3 | 4.6 | | | 1.4 | | | | | | | | | | | | 8.8 |
| 61 | | | | | 2.3 | 3.4 | | | 2.6 | | | | | | | | | | | | 9.2 |
| 62 | | | | | 3.4 | 2.8 | | | 1.6 | | | | | | | | | | | | 9.8 |
| 63 | | | | | 2.2 | 5 | | | 1.2 | | | | | | | | | | | | 9.1 |
| 64 | | | | | 3.5 | 2.9 | | | 1.3 | | | | | | | | | | | | 11.8 |
| 65 | | | | | 4 | 2 | | | 2 | | | | | | | | | | | | 10.4 |
| 66 | | | | | 4.3 | 3 | | | 3.6 | | | | | | | | | | | | |
| 67 | | | | | 5.4 | 6.1 | | | 2.1 | | | | | | | | | | | | |
| 68 | | | | | 4.6 | 3.9 | | | 2.9 | | | | | | | | | | | | |
| 69 | | | | | 1.2 | 3.2 | | | 2.7 | | | | | | | | | | | | |
| 70 | | | | | 5.4 | 2.4 | | | 1.3 | | | | | | | | | | | | |
| 71 | | | | | 3.1 | 4.6 | | | 1.3 | | | | | | | | | | | | |
| 72 | | | | | 1.6 | 2.9 | | | 1.3 | | | | | | | | | | | | |
| 73 | | | | | 3 | 3.9 | | | 1.9 | | | | | | | | | | | | |
| 74 | | | | | 1.8 | 2.1 | | | | | | | | | | | | | | | |
| 75 | | | | | 2.3 | 3.1 | | | | | | | | | | | | | | | |
| 76 | | | | | 2.2 | 5.7 | | | | | | | | | | | | | | | |
| 77 | | | | | 1.5 | 3.6 | | | | | | | | | | | | | | | |
| 78 | | | | | 3.1 | 2.4 | | | | | | | | | | | | | | | |
| 79 | | | | | 2.7 | 2.2 | | | | | | | | | | | | | | | |
| 80 | | | | | 4.4 | 2.5 | | | | | | | | | | | | | | | |
| 81 | | | | | 9.7 | 2.6 | | | | | | | | | | | | | | | |
| 82 | | | | | 2.2 | 3.2 | | | | | | | | | | | | | | | |
| 83 | | | | | 3.4 | 2.5 | | | | | | | | | | | | | | | |
| 84 | | | | | 3.1 | 2.3 | | | | | | | | | | | | | | | |
| 85 | | | | | 3.3 | 6.1 | | | | | | | | | | | | | | | |
| 86 | | | | | 2.4 | 2.4 | | | | | | | | | | | | | | | |
| 87 | | | | | 2 | 3.5 | | | | | | | | | | | | | | | |
| 88 | | | | | 7.2 | 2.6 | | | | | | | | | | | | | | | |
| 89 | | | | | 4.1 | 2.2 | | | | | | | | | | | | | | | |
| 90 | | | | | 3.3 | 3 | | | | | | | | | | | | | | | |

**Table A6-3a. Seneca River Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data**

| Zone | Zone III | | | Zone III | | | Zone III | | | Zone X | | | Zone X | | | Zone X | | | Zone XIII | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect A | | | Transect B | | | Transect C | | | Transect A | | | Transect B | | | Transect C | | | Transect A | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| 91 | | | | | 4.2 | 3.6 | | | | | | | | | | | | | | | |
| 92 | | | | | 5.6 | 2.7 | | | | | | | | | | | | | | | |
| 93 | | | | | 3 | 4.2 | | | | | | | | | | | | | | | |
| 94 | | | | | 2.1 | 4.8 | | | | | | | | | | | | | | | |
| 95 | | | | | 1.1 | 4 | | | | | | | | | | | | | | | |
| 96 | | | | | 2 | 3.7 | | | | | | | | | | | | | | | |
| 97 | | | | | 1.6 | 3.5 | | | | | | | | | | | | | | | |
| 98 | | | | | 2.3 | 1.7 | | | | | | | | | | | | | | | |
| 99 | | | | | 4.1 | 2 | | | | | | | | | | | | | | | |
| 100 | | | | | 2.2 | 1.4 | | | | | | | | | | | | | | | |
| 101 | | | | | | | | | | | | | | | | | | | | | |
| 102 | | | | | | | | | | | | | | | | | | | | | |
| 103 | | | | | | | | | | | | | | | | | | | | | |
| 104 | | | | | | | | | | | | | | | | | | | | | |
| 105 | | | | | | | | | | | | | | | | | | | | | |
| 106 | | | | | | | | | | | | | | | | | | | | | |
| 107 | | | | | | | | | | | | | | | | | | | | | |
| 108 | | | | | | | | | | | | | | | | | | | | | |
| 109 | | | | | | | | | | | | | | | | | | | | | |
| 110 | | | | | | | | | | | | | | | | | | | | | |
| 111 | | | | | | | | | | | | | | | | | | | | | |
| 112 | | | | | | | | | | | | | | | | | | | | | |
| 113 | | | | | | | | | | | | | | | | | | | | | |
| 114 | | | | | | | | | | | | | | | | | | | | | |
| 115 | | | | | | | | | | | | | | | | | | | | | |
| 116 | | | | | | | | | | | | | | | | | | | | | |
| 117 | | | | | | | | | | | | | | | | | | | | | |
| 118 | | | | | | | | | | | | | | | | | | | | | |
| 119 | | | | | | | | | | | | | | | | | | | | | |
| 120 | | | | | | | | | | | | | | | | | | | | | |
| 121 | | | | | | | | | | | | | | | | | | | | | |
| 122 | | | | | | | | | | | | | | | | | | | | | |
| 123 | | | | | | | | | | | | | | | | | | | | | |
| 124 | | | | | | | | | | | | | | | | | | | | | |
| 125 | | | | | | | | | | | | | | | | | | | | | |
| 126 | | | | | | | | | | | | | | | | | | | | | |
| 127 | | | | | | | | | | | | | | | | | | | | | |
| 128 | | | | | | | | | | | | | | | | | | | | | |
| 129 | | | | | | | | | | | | | | | | | | | | | |
| 130 | | | | | | | | | | | | | | | | | | | | | |
| 131 | | | | | | | | | | | | | | | | | | | | | |
| 132 | | | | | | | | | | | | | | | | | | | | | |
| 133 | | | | | | | | | | | | | | | | | | | | | |
| 134 | | | | | | | | | | | | | | | | | | | | | |
| 135 | | | | | | | | | | | | | | | | | | | | | |
| 136 | | | | | | | | | | | | | | | | | | | | | |

**Table A6-3a. Seneca River Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data**

| Zone | Zone III | | | Zone III | | | Zone III | | | Zone X | | | Zone X | | | Zone X | | | Zone XIII | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect A | | | Transect B | | | Transect C | | | Transect A | | | Transect B | | | Transect C | | | Transect A | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| 137 | | | | | | | | | | | | | | | | | | | | | |
| 138 | | | | | | | | | | | | | | | | | | | | | |
| 139 | | | | | | | | | | | | | | | | | | | | | |
| 140 | | | | | | | | | | | | | | | | | | | | | |
| 141 | | | | | | | | | | | | | | | | | | | | | |
| 142 | | | | | | | | | | | | | | | | | | | | | |
| 143 | | | | | | | | | | | | | | | | | | | | | |
| 144 | | | | | | | | | | | | | | | | | | | | | |
| 145 | | | | | | | | | | | | | | | | | | | | | |
| 146 | | | | | | | | | | | | | | | | | | | | | |
| 147 | | | | | | | | | | | | | | | | | | | | | |
| 148 | | | | | | | | | | | | | | | | | | | | | |
| 149 | | | | | | | | | | | | | | | | | | | | | |
| 150 | | | | | | | | | | | | | | | | | | | | | |

## Table A6-3a. Seneca River Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data

| Zone | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIV | | | Zone XIV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect B | | | Transect C | | | Transect D | | | Transect E | | | Transect A | | | Transect B | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| **Median Length** | **0** | **9** | **0** | **6** | **12** | **0** | **0** | **0** | **6** | **9** | **0** | **0** | **7** | **7** | **7** | **9** | **9** | **8** |
| **Mean Length** | **0.0** | **9.0** | **0.0** | **8.0** | **12.0** | **0.0** | **0.0** | **0.0** | **5.9** | **9.3** | **0.0** | **0.0** | **8.2** | **8.2** | **7.4** | **9.0** | **10.1** | **11.0** |
| 1 | 0 | 5.4 | 0 | 14.7 | 18.7 | 0 | 0 | 0 | 7.9 | 9.7 | 0 | 0 | 25.5 | 25.3 | 21 | 24.1 | 23.8 | 26.5 |
| 2 | | 12.5 | | 5.8 | 14.4 | | | | 3.9 | 11.3 | | | 25.7 | 10.9 | 14.3 | 14.7 | 19.5 | 21.2 |
| 3 | | | | 3.5 | 11.8 | | | | | 23.3 | | | 13.9 | 6.7 | 12.8 | 18.7 | 28.9 | 8.5 |
| 4 | | | | | 10.6 | | | | | 15.7 | | | 14.4 | 4.3 | 10.6 | 25.1 | 21.8 | 12.7 |
| 5 | | | | | 4.6 | | | | | 17.1 | | | 16.6 | 4.4 | 12.4 | 18.6 | 15.1 | 15.4 |
| 6 | | | | | | | | | | 11.3 | | | 14.2 | 5.9 | 12.1 | 11.6 | 26.4 | 9.8 |
| 7 | | | | | | | | | | 11.5 | | | 9.6 | 6.7 | 19.6 | 13.3 | 17.5 | 10.2 |
| 8 | | | | | | | | | | 8.7 | | | 11.9 | 9.9 | 12.6 | 13.8 | 17.7 | 6.8 |
| 9 | | | | | | | | | | 11.1 | | | 12 | 1.2 | 11.6 | 18.1 | 14.8 | 7.4 |
| 10 | | | | | | | | | | 15.2 | | | 11.8 | 4.4 | 11.8 | 14.5 | 13.7 | 8.8 |
| 11 | | | | | | | | | | 15.9 | | | 7.4 | 3.5 | 6.9 | 11 | 11.5 | 7.3 |
| 12 | | | | | | | | | | 8.8 | | | 7.1 | 7.7 | 7.2 | 9.4 | 9.3 | 7.3 |
| 13 | | | | | | | | | | 8.7 | | | 12.3 | 1.9 | 12 | 11.9 | 7.2 | 5.9 |
| 14 | | | | | | | | | | 8.5 | | | 14.4 | 2.3 | 6.7 | 9.8 | 8.6 | 5 |
| 15 | | | | | | | | | | 9.1 | | | 7.1 | 2.3 | 9.8 | 7.2 | 9.5 | 4.6 |
| 16 | | | | | | | | | | 10.6 | | | 6.4 | 4.7 | 11.1 | 8.5 | 14.2 | 6.5 |
| 17 | | | | | | | | | | 11.5 | | | 9.8 | 12.3 | 3.9 | 11.8 | 11.1 | 3.2 |
| 18 | | | | | | | | | | 9.7 | | | 3.6 | 20.9 | 6.3 | 10.3 | 9.4 | 6.7 |
| 19 | | | | | | | | | | 15 | | | 4.8 | 11.6 | 8.7 | 9.1 | 5.6 | 11.9 |
| 20 | | | | | | | | | | 6.4 | | | 5.1 | 24.3 | 10.6 | 9.4 | 18.2 | 26.9 |
| 21 | | | | | | | | | | 12.1 | | | 4.1 | 6.4 | 9.3 | 10.7 | 5.4 | 17.5 |
| 22 | | | | | | | | | | 9.1 | | | 4.7 | 11.1 | 12.1 | 7.4 | 12.4 | 7.7 |
| 23 | | | | | | | | | | 9.2 | | | 4.3 | 13.6 | 10.5 | 12.5 | 6.6 | 7.5 |
| 24 | | | | | | | | | | 11.7 | | | 8.9 | 15.7 | 5.6 | 9.9 | 9.8 | 12 |
| 25 | | | | | | | | | | 9.7 | | | 7.4 | 19.5 | 3.6 | 9 | 12.2 | 6.6 |
| 26 | | | | | | | | | | 8.6 | | | 14.5 | 5.5 | 2.7 | 13.4 | 2.4 | 13.6 |
| 27 | | | | | | | | | | 11 | | | 12.9 | 6.1 | 6.9 | 7.6 | 11.5 | 19.7 |
| 28 | | | | | | | | | | 10.7 | | | 5 | 4.8 | 6.1 | 10 | 18.3 | 6.3 |
| 29 | | | | | | | | | | 10.3 | | | 5.9 | 3.3 | 11.3 | 10.6 | 3.4 | 10.6 |
| 30 | | | | | | | | | | 8.2 | | | 9.9 | 6.4 | 7.7 | 7.9 | 9.6 | 6.1 |
| 31 | | | | | | | | | | 11.9 | | | 4.8 | 11.1 | 11.2 | 7.7 | 18.8 | 4.9 |
| 32 | | | | | | | | | | 8.2 | | | 15.6 | 15.7 | 5.2 | 10.5 | 2.1 | 21.3 |
| 33 | | | | | | | | | | 13.4 | | | 14.5 | 10.3 | 4.9 | 11.8 | 15.6 | 23.3 |
| 34 | | | | | | | | | | 5.4 | | | 12.5 | 6.7 | 5.2 | 8.7 | 11.7 | 18.7 |
| 35 | | | | | | | | | | 5.2 | | | 10.3 | 6.6 | 11.3 | 8.8 | 4.3 | 12.7 |
| 36 | | | | | | | | | | 9.4 | | | 4.2 | 10.5 | 7.8 | 8.4 | 3.4 | 20.4 |
| 37 | | | | | | | | | | 10.7 | | | 3.1 | 16.7 | 6.6 | 7.3 | 8.2 | 23.4 |
| 38 | | | | | | | | | | 9.7 | | | 3.1 | 4.3 | 6.5 | 4.6 | 10.1 | 6.2 |
| 39 | | | | | | | | | | 7.7 | | | 5.6 | 7.6 | 9 | 5.2 | 7.4 | 7.7 |
| 40 | | | | | | | | | | 4.8 | | | 4.9 | 8.8 | 9.6 | 5.1 | 9.3 | 6.5 |
| 41 | | | | | | | | | | 8 | | | 2.1 | 2.9 | 8.7 | 10.2 | 4.7 | 3 |
| 42 | | | | | | | | | | 6.5 | | | 2.3 | 15.4 | 10.3 | 9.6 | 11.2 | 3.9 |
| 43 | | | | | | | | | | 10.1 | | | 7.1 | 19.4 | 3.8 | 10.8 | 12 | 21.9 |
| 44 | | | | | | | | | | 5.9 | | | 2.6 | 4.5 | 3.9 | 7.9 | 9.2 | 21.7 |

**Table A6-3a. Seneca River Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data**

| Zone | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIV | | | Zone XIV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect B | | | Transect C | | | Transect D | | | Transect E | | | Transect A | | | Transect B | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| 45 | | | | | | | | | | 6.3 | | | 4.7 | 3.3 | 3.2 | 8.3 | 6.9 | 5.3 |
| 46 | | | | | | | | | | 4 | | | 3.6 | 3.2 | 3.3 | 4.4 | 7.8 | 6.6 |
| 47 | | | | | | | | | | 9.3 | | | 14.7 | 5.5 | 2.8 | 5.6 | 11 | 5.9 |
| 48 | | | | | | | | | | 8.6 | | | 12.3 | 6.1 | 6.5 | 4.9 | 7.6 | 4.6 |
| 49 | | | | | | | | | | 9.5 | | | 13.6 | 7.4 | 3.7 | 7.7 | 7.3 | 22.1 |
| 50 | | | | | | | | | | 7.6 | | | 8.8 | 8.3 | 5.7 | 8.2 | 4 | 7.2 |
| 51 | | | | | | | | | | 8 | | | 8.8 | 8.8 | 6 | 8.9 | 9.4 | 6.9 |
| 52 | | | | | | | | | | 9.5 | | | 4.5 | 8.3 | 4 | 8.5 | 11.1 | 7 |
| 53 | | | | | | | | | | 11.5 | | | 3.3 | 9.9 | 4.2 | 7 | 6.2 | 5.1 |
| 54 | | | | | | | | | | 8.4 | | | 2.6 | 12.3 | 9.9 | 5 | 5.5 | 19.6 |
| 55 | | | | | | | | | | 9.9 | | | 2.1 | 2.6 | 4.3 | 6.5 | 8 | 5.9 |
| 56 | | | | | | | | | | 7.8 | | | 3.4 | 3.3 | 6.4 | 9.6 | 7.1 | 4.2 |
| 57 | | | | | | | | | | 10.5 | | | 5.7 | 6.6 | 7.3 | 7.6 | 4.8 | 11 |
| 58 | | | | | | | | | | 10.6 | | | 7.6 | 7.2 | 6.2 | 6 | 6.9 | 15.1 |
| 59 | | | | | | | | | | 12.7 | | | 8.1 | 5.3 | 6.6 | 6 | 6.1 | 7.8 |
| 60 | | | | | | | | | | 9.9 | | | 8 | 5.2 | 5.8 | 6.2 | 8.1 | 10.7 |
| 61 | | | | | | | | | | 10.1 | | | 13.8 | 4.3 | 6.8 | 5.3 | 10.7 | 19.7 |
| 62 | | | | | | | | | | 7.1 | | | 15.4 | 6.7 | 5.5 | 4.5 | 12 | 20.4 |
| 63 | | | | | | | | | | 9.6 | | | 7.3 | 7.5 | 5.7 | 5.8 | 9.3 | 7.7 |
| 64 | | | | | | | | | | 14.2 | | | 6 | 8.1 | 10.9 | 4.9 | 21.9 | 4.7 |
| 65 | | | | | | | | | | 12.2 | | | 5.4 | 6.9 | 8.4 | 7.4 | 28 | 6.5 |
| 66 | | | | | | | | | | 10 | | | 6.3 | 4.1 | 6.2 | 4.7 | 11 | 11.9 |
| 67 | | | | | | | | | | 9.8 | | | 3 | 9.8 | 4.9 | 5.1 | 7.1 | 22.7 |
| 68 | | | | | | | | | | 7.5 | | | 1.3 | 10.7 | 4.4 | 8.9 | 11.7 | 20.6 |
| 69 | | | | | | | | | | 10.8 | | | 1.9 | 10.2 | 2.1 | 10.3 | 8.4 | 20 |
| 70 | | | | | | | | | | 6.8 | | | 2.4 | 25.6 | 4.7 | 11 | 10 | 16.5 |
| 71 | | | | | | | | | | 6 | | | 3.5 | 4.1 | 5.7 | 3.7 | 10.2 | 9.2 |
| 72 | | | | | | | | | | 4.7 | | | 7.1 | 6 | 8.6 | 5.1 | 8.3 | 9.5 |
| 73 | | | | | | | | | | 6.6 | | | 5.4 | 7.3 | 6.2 | 11.6 | 6.1 | 6.4 |
| 74 | | | | | | | | | | 14 | | | 7.2 | 3.5 | 5 | 5.2 | 9.1 | 21.1 |
| 75 | | | | | | | | | | 15.7 | | | 6.8 | 7.7 | 3.9 | 11 | 7 | 5.4 |
| 76 | | | | | | | | | | 10.7 | | | 10.6 | 7.7 | 3.9 | 8.6 | 3.5 | 13.2 |
| 77 | | | | | | | | | | 9.9 | | | 12.7 | 3.5 | 4.3 | 10 | 8.1 | 20.9 |
| 78 | | | | | | | | | | 11.6 | | | 4.7 | 6.7 | 10.1 | 11.6 | 4 | 19.9 |
| 79 | | | | | | | | | | 8 | | | 5.4 | 6.2 | 7.7 | 10.5 | 8.8 | 8.4 |
| 80 | | | | | | | | | | 11.2 | | | 3.4 | 8.2 | 3.3 | 7 | 11.5 | 11.8 |
| 81 | | | | | | | | | | 10.1 | | | 2.9 | 12.6 | 5.8 | 10.9 | 12.2 | 12.8 |
| 82 | | | | | | | | | | 13.2 | | | 5.6 | 1.3 | 2.7 | 7.8 | 9.4 | 11.4 |
| 83 | | | | | | | | | | 10.9 | | | 3.7 | 8.9 | 4.9 | 10.1 | 7.7 | 18.3 |
| 84 | | | | | | | | | | 12.6 | | | 11.3 | 4.4 | 3.1 | 7.6 | 9.3 | 7.4 |
| 85 | | | | | | | | | | 10.5 | | | 12.2 | 16.7 | 4.6 | 7.4 | 4.7 | 4.7 |
| 86 | | | | | | | | | | 11.6 | | | 8.8 | 10 | 6.5 | 9.7 | 3.1 | 12.9 |
| 87 | | | | | | | | | | 15.5 | | | 7.8 | 13.4 | 4.5 | 7.7 | 5.8 | 5.9 |
| 88 | | | | | | | | | | 8.6 | | | 12.8 | 4.4 | 10 | 10.1 | 5.6 | 4.4 |
| 89 | | | | | | | | | | 8.1 | | | 6.8 | 3.8 | 5.2 | 6.5 | 10.6 | 6.5 |
| 90 | | | | | | | | | | 8.4 | | | 6 | 5.2 | 5.2 | 7 | 12.8 | 7.1 |

**Table A6-3a. Seneca River Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data**

| Zone | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIV | | | Zone XIV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect B | | | Transect C | | | Transect D | | | Transect E | | | Transect A | | | Transect B | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| 91 | | | | | | | | | | 9.3 | | | 4.3 | 4.7 | 9.7 | 7.4 | 9.1 | 3.9 |
| 92 | | | | | | | | | | 8.5 | | | 3.7 | 7.9 | 5.6 | 8 | 5.6 | 8.6 |
| 93 | | | | | | | | | | 7.7 | | | 4.4 | 8.4 | 10.8 | 4.8 | 7.8 | 10 |
| 94 | | | | | | | | | | 9.1 | | | 12.9 | 8.4 | 12.1 | 7.1 | 2.2 | 18.4 |
| 95 | | | | | | | | | | 5.7 | | | 14.7 | 7.6 | 4.8 | 8.5 | 15.4 | 3.4 |
| 96 | | | | | | | | | | 4.9 | | | 16.1 | 3.2 | 7.6 | 6.1 | 12.6 | 6.5 |
| 97 | | | | | | | | | | 9.9 | | | 12.3 | 4.7 | 7.7 | 2.9 | 13.5 | 4.3 |
| 98 | | | | | | | | | | 10 | | | 7.7 | 8.8 | 9.3 | 2.5 | 5.9 | 5.2 |
| 99 | | | | | | | | | | 11.7 | | | 11.5 | 21.4 | 5.6 | 10 | 3 | 5.6 |
| 100 | | | | | | | | | | 12.3 | | | 11.6 | 5.9 | 7.7 | 6.8 | 6.7 | 5.2 |
| 101 | | | | | | | | | | 5.6 | | | | | | | | |
| 102 | | | | | | | | | | 10.7 | | | | | | | | |
| 103 | | | | | | | | | | 12.9 | | | | | | | | |
| 104 | | | | | | | | | | 10.6 | | | | | | | | |
| 105 | | | | | | | | | | 6.6 | | | | | | | | |
| 106 | | | | | | | | | | 8.9 | | | | | | | | |
| 107 | | | | | | | | | | 8.8 | | | | | | | | |
| 108 | | | | | | | | | | 10.1 | | | | | | | | |
| 109 | | | | | | | | | | 7.6 | | | | | | | | |
| 110 | | | | | | | | | | 8 | | | | | | | | |
| 111 | | | | | | | | | | 6.8 | | | | | | | | |
| 112 | | | | | | | | | | 6.9 | | | | | | | | |
| 113 | | | | | | | | | | 8.2 | | | | | | | | |
| 114 | | | | | | | | | | 4.2 | | | | | | | | |
| 115 | | | | | | | | | | 4.3 | | | | | | | | |
| 116 | | | | | | | | | | 5.9 | | | | | | | | |
| 117 | | | | | | | | | | 10.7 | | | | | | | | |
| 118 | | | | | | | | | | 5.2 | | | | | | | | |
| 119 | | | | | | | | | | 4.5 | | | | | | | | |
| 120 | | | | | | | | | | 10.6 | | | | | | | | |
| 121 | | | | | | | | | | 7.7 | | | | | | | | |
| 122 | | | | | | | | | | 9.1 | | | | | | | | |
| 123 | | | | | | | | | | 5.6 | | | | | | | | |
| 124 | | | | | | | | | | 10.1 | | | | | | | | |
| 125 | | | | | | | | | | 8.3 | | | | | | | | |
| 126 | | | | | | | | | | 8.9 | | | | | | | | |
| 127 | | | | | | | | | | 6.1 | | | | | | | | |
| 128 | | | | | | | | | | 8.6 | | | | | | | | |
| 129 | | | | | | | | | | 6.5 | | | | | | | | |
| 130 | | | | | | | | | | 9.8 | | | | | | | | |
| 131 | | | | | | | | | | 14.2 | | | | | | | | |
| 132 | | | | | | | | | | 9.3 | | | | | | | | |
| 133 | | | | | | | | | | 6.9 | | | | | | | | |
| 134 | | | | | | | | | | 10.5 | | | | | | | | |
| 135 | | | | | | | | | | 6.8 | | | | | | | | |
| 136 | | | | | | | | | | 10.2 | | | | | | | | |

**Table A6-3a. Seneca River Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data**

| Zone | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIV | | | Zone XIV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect B | | | Transect C | | | Transect D | | | Transect E | | | Transect A | | | Transect B | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| 137 | | | | | | | | | | 9.7 | | | | | | | | |
| 138 | | | | | | | | | | 9.6 | | | | | | | | |
| 139 | | | | | | | | | | 7.4 | | | | | | | | |
| 140 | | | | | | | | | | 9.3 | | | | | | | | |
| 141 | | | | | | | | | | 12 | | | | | | | | |
| 142 | | | | | | | | | | 4.2 | | | | | | | | |
| 143 | | | | | | | | | | 5.2 | | | | | | | | |
| 144 | | | | | | | | | | 10.1 | | | | | | | | |
| 145 | | | | | | | | | | 6.7 | | | | | | | | |
| 146 | | | | | | | | | | 5.6 | | | | | | | | |
| 147 | | | | | | | | | | 4.1 | | | | | | | | |
| 148 | | | | | | | | | | 3.5 | | | | | | | | |
| 149 | | | | | | | | | | 6 | | | | | | | | |
| 150 | | | | | | | | | | 8.9 | | | | | | | | |

**Table A6-3b. Seneca River Dreissenid Mussel Survey Fall 2007 - Quagga Mussel Raw Length (mm) Data**

| Zone | Zone III | | | Zone III | | | Zone III | | | Zone X | | | Zone X | | | Zone X | | | Zone XIII | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect A | | | Transect B | | | Transect C | | | Transect A | | | Transect B | | | Transect C | | | Transect A | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| **Median Length** | **0** | **0** | **0** | **0** | **7** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **14** | **0** | **0** | **0** | **17** | **0** | **16** |
| **Mean Length** | **0.0** | **0.0** | **0.0** | **0.0** | **7.7** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **13.6** | **0.0** | **0.0** | **0.0** | **17.0** | **0.0** | **16.7** |
| 1 | 0 | 0 | 0 | 0 | 16.5 | 0 | 0 | 0 | 0 | 0.0 | 0 | 0 | 0 | 0 | 13.6 | 0 | 0 | 0 | 17 | 0 | 30.7 |
| 2 | | | | | 9.5 | | | | | | | | | | | | | | | | 13.5 |
| 3 | | | | | 6.5 | | | | | | | | | | | | | | | | 18.1 |
| 4 | | | | | 5 | | | | | | | | | | | | | | | | 18.4 |
| 5 | | | | | 0.8 | | | | | | | | | | | | | | | | 15.8 |
| 6 | | | | | | | | | | | | | | | | | | | | | 16.7 |
| 7 | | | | | | | | | | | | | | | | | | | | | 14.7 |
| 8 | | | | | | | | | | | | | | | | | | | | | 21.1 |
| 9 | | | | | | | | | | | | | | | | | | | | | 17.7 |
| 10 | | | | | | | | | | | | | | | | | | | | | 15.6 |
| 11 | | | | | | | | | | | | | | | | | | | | | 17.2 |
| 12 | | | | | | | | | | | | | | | | | | | | | 16.1 |
| 13 | | | | | | | | | | | | | | | | | | | | | 13.6 |
| 14 | | | | | | | | | | | | | | | | | | | | | 14.1 |
| 15 | | | | | | | | | | | | | | | | | | | | | 14.8 |
| 16 | | | | | | | | | | | | | | | | | | | | | 9.1 |
| 17 | | | | | | | | | | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | | | | | | | | | | |
| 19 | | | | | | | | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | | | |
| 22 | | | | | | | | | | | | | | | | | | | | | |
| 23 | | | | | | | | | | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | | | | | | | | | | |
| 25 | | | | | | | | | | | | | | | | | | | | | |
| 26 | | | | | | | | | | | | | | | | | | | | | |
| 27 | | | | | | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | | | | | | | | | | | |
| 29 | | | | | | | | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | | | | | | | | | |

Note: No transect loction sample area had greater than thirty-four (34) quagga mussels.

**Table A6-3b. Seneca River Dreissenid Mussel Survey Fall 2007 - Quagga Mussel Raw Length (mm) Data**

| Zone | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIII | | | Zone XIV | | | Zone XIV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect B | | | Transect C | | | Transect D | | | Transect E | | | Transect A | | | Transect B | | |
| Location | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red | Green | Middle | Red |
| **Median Length** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **15** | **0** | **0** | **10** | **12** | **7** | **15** | **13** | **13** |
| **Mean Length** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **14.7** | **0.0** | **0.0** | **9.9** | **11.7** | **7.4** | **14.0** | **12.4** | **13.5** |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14.8 | 0 | 0 | 16.7 | 15.1 | 7.4 | 15.5 | 10.1 | 20.8 |
| 2 | | | | | | | | | | 18.1 | | | 13.6 | 13.4 | | 16.2 | 9.4 | 18.8 |
| 3 | | | | | | | | | | 13.8 | | | 13.5 | 13.1 | | 13.6 | 14.6 | 14.2 |
| 4 | | | | | | | | | | 17.3 | | | 14.3 | 13.4 | | 14.8 | 16.7 | 14.1 |
| 5 | | | | | | | | | | 14.6 | | | 17.2 | 10.6 | | 15.1 | 12.8 | 11.2 |
| 6 | | | | | | | | | | 16.9 | | | 12.2 | 8.6 | | 10 | 11.7 | 18.4 |
| 7 | | | | | | | | | | 13.7 | | | 13.9 | 13.5 | | 15.2 | 12.4 | 13.8 |
| 8 | | | | | | | | | | 19.3 | | | 12.6 | 14.3 | | 14.7 | 14.1 | 13.1 |
| 9 | | | | | | | | | | 19.4 | | | 8.7 | 15.2 | | 16.9 | 14.3 | 12.1 |
| 10 | | | | | | | | | | 18.4 | | | 7.7 | 13.3 | | 16.1 | 12.8 | 11.6 |
| 11 | | | | | | | | | | 14 | | | 7.9 | 12.2 | | 11.4 | 13.4 | 14.4 |
| 12 | | | | | | | | | | 16.2 | | | 9.8 | 11.2 | | 17.5 | 12.8 | 13 |
| 13 | | | | | | | | | | 14.7 | | | 7.1 | 14.9 | | 13.4 | 12.3 | 12.8 |
| 14 | | | | | | | | | | 17.4 | | | 5.6 | 12.9 | | 12.7 | 13.5 | 9.3 |
| 15 | | | | | | | | | | 20.6 | | | 4.2 | 13.2 | | 14.5 | 8.5 | 9.9 |
| 16 | | | | | | | | | | 14.8 | | | 3.1 | 14.1 | | 10.4 | 13.6 | 10.7 |
| 17 | | | | | | | | | | 14.5 | | | 2.4 | 14.1 | | 15.9 | 9.4 | 10.6 |
| 18 | | | | | | | | | | 14.5 | | | 16.6 | 12.9 | | 12.6 | 12.1 | |
| 19 | | | | | | | | | | 11.1 | | | 13.6 | 11.4 | | 7.3 | 10.9 | |
| 20 | | | | | | | | | | 17.9 | | | 2.6 | 6.2 | | 13.5 | 6.3 | |
| 21 | | | | | | | | | | 13.5 | | | 3.8 | 11.1 | | 14.8 | 15.6 | |
| 22 | | | | | | | | | | 13.9 | | | | 13.4 | | 15 | 16 | |
| 23 | | | | | | | | | | 12.6 | | | | 12.1 | | | 14.2 | |
| 24 | | | | | | | | | | 11.5 | | | | 14.6 | | | 10.5 | |
| 25 | | | | | | | | | | 16.7 | | | | 12 | | | | |
| 26 | | | | | | | | | | 9.3 | | | | 11.3 | | | | |
| 27 | | | | | | | | | | 7.7 | | | | 11.7 | | | | |
| 28 | | | | | | | | | | 3.9 | | | | 9.5 | | | | |
| 29 | | | | | | | | | | | | | | 10.6 | | | | |
| 30 | | | | | | | | | | | | | | 9.9 | | | | |
| 31 | | | | | | | | | | | | | | 10.9 | | | | |
| 32 | | | | | | | | | | | | | | 3.4 | | | | |
| 33 | | | | | | | | | | | | | | 7.7 | | | | |
| 34 | | | | | | | | | | | | | | 6.7 | | | | |

Note: No transect loction sample area had greater than thirty-four (34) quagga mussels.

**Table A6.4. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Length and Weight Data Summary**

| Zone | Transect | Transect Coordinates | Water Depth at Sample Collection (m) | Water Depth Section/Range (m) | Number of Mussels Per Sub-Sample | Weight Per Sub-Sample (g) | Weight Per Entire Sample (g) | Total Weight ($g/m^2$) | Mean Weight ($g/m^2$) per Transect | Mean Weight ($g/m^2$) per Zone | Median Mussel Length (mm) | Mean Mussel Length (mm) | Total Number of Mussels Per Sample | Estimated Total Number of Mussels per $m^2$ | Mean Estimated Number of Mussels per $m^2$ by Transect | Mean Estimated Number of Mussels per $m^2$ by Zone |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 1 | N 43 06.238, W 76 13.193 | 0.9 | 0-1.5 | 100 | 11.9 | 29.3 | 1296.46 | 470.5 | 1150.4 | 5 | 7.4 | 246.2 | 10894.6 | 5578 | 14559 (229) |
| | | | 2.5 | 1.5-3.0 | 17 | 0.3 | 0.3 | 13.27 | | | 4 | 4.2 | 17.0 | 752.2 | | |
| | | | 4.0 | 3.0-4.5 | 100 | 2.0 | 2.3 | 101.77 | | | 5 | 5.1 | 115.0 | 5088.5 | | |
| A | 2 | N 43 06.630, W 76 13.732 | 1.2 | 0-1.5 | 100 | 6.6 | 45.2 | 2000.00 | 1830.4 | | 7 (13) | 7.8 (13.3) | 554 (9) | 24513.3 (398.2) | 23540 (457) | |
| | | | 2.4 | 1.5-3.0 | 100 | 15.1 | 77.5 | 3429.20 | | | 12 (14) | 12.3 (13.7) | 936 (18) | 41415.9 (796.5) | | |
| | | | 3.9 | 3.0-4.5 | 100 | 1.4 | 1.4 | 61.95 | | | 4 (4) | 4.1 (4.0) | 106 (4) | 4690.3 (177.0) | | |
| B | 1 | N 43 06.884, W 76 14.236 | 1.0 | 0-1.5 | 100 | 6.0 | 20.2 | 893.81 | 337.8 | 337.8 | 6 | 6.4 | 336.7 | 14896.8 | 12148 | 12148 |
| | | | 2.4 | 1.5-3.0 | 100 | 0.5 | 2.4 | 106.19 | | | 3 | 3.1 | 480.0 | 21238.9 | | |
| | | | 4.1 | 3.0-4.5 | 7 | 0.3 | 0.3 | 13.27 | | | 4 | 5.6 | 7.0 | 309.7 | | |
| C | 1 | N 43 06.366, W 76 14.539 | 0.8 | 0-1.5 | 13 | 0.6 | 0.6 | 26.55 | 3215.3 | 1747.8 | 7 | 7.1 | 13.0 | 575.2 | 19366 (2316) | 12396 (2522) |
| | | | 2.8 | 1.5-3.0 | 100 | 12.8 | 93.0 | 4115.04 | | | 9 (16) | 9.5 (16.3) | 581 (48) | 25708.0 (2123.9) | | |
| | | | 4.0 | 3.0-4.5 | 100 | 12.6 | 124.4 | 5504.42 | | | 9 (16) | 9.4 (15.5) | 732 (109) | 32389.4 (4823.0) | | |
| C | 2 | N 43 05.548, W 76 13.909 | 0.7 | 0-1.5 | 100 | 8.1 | 13.6 | 601.77 | 280.2 | | 7 | 7.1 | 167.9 | 7429.3 | 5426 (206) | |
| | | | 2.0 | 1.5-3.0 | 100 | 3.1 | 4.0 | 176.99 | | | 5 (5) | 5.1 (5.2) | 143 (11) | 6327.4 (486.7) | | |
| | | | 4.3 | 3.0-4.5 | 61 | 1.4 | 1.4 | 61.95 | | | 4 (7) | 4.6 (6.7) | 57 (3) | 2522.1 (132.7) | | |
| D | 1 | N 43 05.256, W 76 13.049 | 0.5 | 0-1.5 | 37 | 8.1 | 8.1 | 358.41 | 318.6 | 1442.5 | 9 | 9.9 | 37.0 | 1637.2 | 26032 (89) | 18791 (281) |
| | | | 2.3 | 1.5-3.0 | NA | NA | NA | NA | | | 7 (6) | 6.8 (9.1) | 153 (6) | 6769.9 (265.5) | | |
| | | | 3.8 | 3.0-4.5 | 100 | 0.4 | 6.3 | 278.76 | | | 2 | 2.6 | 1575.0 | 69690.3 | | |
| D | 2 | N 43 04.897, W 76 12.618 | 0.6 | 0-1.5 | 100 | 51.5 | 87.5 | 3871.68 | 2191.7 | | 15 (16) | 16.3 (15.2) | 185 (6) | 8185.8 (265.5) | 11549 (472) | |
| | | | 2.1 | 1.5-3.0 | 41 | 0.8 | 0.8 | 35.40 | | | 5 | 5.3 | 41.0 | 1814.2 | | |
| | | | 4.0 | 3.0-4.5 | 100 | 10.9 | 60.3 | 2668.14 | | | 14 (6) | 14.6 (6.2) | 557 (26) | 24646.0 (1150.4) | | |
| E | 1 | N 43 04.319, W 76 12.292 | 0.9 | 0-1.5 | 100 | 4.5 | 20.8 | 920.35 | 348.1 | 348.1 | 5 | 6.1 | 462.2 | 20452.3 | 7806 | 7806 |
| | | | 2.3 | 1.5-3.0 | 14 | 1.3 | 1.3 | 57.52 | | | 4 | 3.8 | 14.0 | 619.5 | | |
| | | | 4.2 | 3.0-4.5 | 53 | 1.5 | 1.5 | 66.37 | | | 5 | 5.7 | 53.0 | 2345.1 | | |
| F | 1 | N 43 04.118, W 76 11.736 | 1.0 | 0-1.5 | 100 | 17.8 | 27.2 | 1203.54 | 2585.5 | 2585.5 | 9 | 9.6 | 152.8 | 6761.5 | 13211 | 13211 |
| | | | 2.3 | 1.5-3.0 | 100 | 23.5 | 142.0 | 6283.19 | | | 8 | 9.6 | 604.3 | 26737.0 | | |
| | | | 3.8 | 3.0-4.5 | 100 | 4.4 | 6.1 | 269.91 | | | 7 | 6.6 | 138.6 | 6134.4 | | |
| G | 1 | N 43 04.046, W 76 10.903 | 1.3 | 0-1.5 | 8 | 0.1 | 0.1 | 4.42 | 64.9 | 64.9 | 4 | 4.0 | 8.0 | 354.0 | 2383 | 2383 |
| | | | 2.0 | 1.5-3.0 | 100 | 2.8 | 4.3 | 190.27 | | | 4 | 3.8 | 153.6 | 6795.2 | | |
| | | | 3.5 | 3.0-4.5 | 0 | 0.0 | 0.0 | 0.00 | | | 0 | 0.0 | 0.0 | 0.0 | | |
| H | 1 | N 43 04.862, W 76 11.115 | 1.4 | 0-1.5 | 74 | 11.5 | 11.5 | 508.85 | 551.6 | 457.2 | 6 | 7.3 | 74.0 | 3274.3 | 3127 | 2463 |
| | | | 1.7 | 1.5-3.0 | 45 | 7.5 | 7.5 | 331.86 | | | 10 | 10.0 | 45.0 | 1991.2 | | |
| | | | 3.8 | 3.0-4.5 | 93 | 18.4 | 18.4 | 814.16 | | | 10 | 10.4 | 93.0 | 4115.0 | | |
| H | 2 | N 43 05.603, W 76 12.076 | 1.1 | 0-1.5 | 83 | 16.4 | 16.4 | 725.66 | 362.8 | | 12 | 10.4 | 83.0 | 3672.6 | 1799 | |
| | | | 2.1 | 1.5-3.0 | 13 | 3.7 | 3.7 | 163.72 | | | 7 | 6.8 | 13.0 | 575.2 | | |
| | | | 4.1 | 3.0-4.5 | 26 | 4.5 | 4.5 | 199.12 | | | 7 | 8.2 | 26.0 | 1150.4 | | |

Note: Petit Ponar Dredge Sample Area is 226 $cm^2$.
Results expressed as Zebra mussel (Quagga mussel) when Quagga mussels are present.
Samples were preserved before a recount for quagga mussels. Therefore, the weight represents the combined Dreissenid, Zebra and Quagga Mussel, weight.
Number of Mussels per sample are actual counts when quagga mussels were present.

Note: Samples were collected on October 19, 2007 and October 25, 2007.

**Table A6.5. Onondaga Lake Dreissenid Mussel Survey - Fall 2002, Fall 2005, Fall 2006 and Fall 2007 Comparison of Density (#/$m^2$)**

| Zone | Water Depth Section/Range (m) | Mean Estimated Total Number of Mussels per $m^2$ by Depth | | | | Mean Estimated Number of Mussels per $m^2$ by Zone | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 2002 | 2005 | 2006 | 2007 | | 2002 (0-4.5 M) | 2005 (0-4.5 M) | 2006 (0-4.5 M) | 2007 (0-4.5 M) |
| A | 0 -1.5 | 2036.2 | 66.4 | 774.4 | 17704.0 (199.1) | | 1834 | 1187 | 5465 | 14559 (229) |
| | 1.5 - 3.0 | 3465.5 | 3385.0 | 6216.4 | 21084.2 (398.3) | | | | | |
| | 3.0 - 4.5 | 0.0 | 110.6 | 9403.5 | 4889.4 (88.5) | | | | | |
| B | 0 -1.5 | 0.0 | 0.0 | 13877.7 | 14896.8 | | 0 | 133 | 4803 | 12148 |
| | 1.5 - 3.0 | 0.0 | 221.2 | 531.0 | 21238.9 | | | | | |
| | 3.0 - 4.5 | 0.0 | 177.0 | 0.0 | 309.7 | | | | | |
| C | 0 -1.5 | 754.7 | 44.8 | 3340.7 | 4002.3 | | 514 | 1040 | 1991 | 12396 (2522) |
| | 1.5 - 3.0 | 788.6 | 2013.3 | 2522.2 | 16017.7 (1305.3) | | | | | |
| | 3.0 - 4.5 | 0.0 | 951.3 | 110.6 | 17455.8 (2477.9) | | | | | |
| D | 0 -1.5 | 3941.9 | 1017.7 | 199.1 | 4911.5 (132.8) | | 1356 | 907 | 774 | 18791 (281) |
| | 1.5 - 3.0 | 124.8 | 774.4 | 221.2 | 4292.1 (132.8) | | | | | |
| | 3.0 - 4.5 | 0.0 | 929.2 | 1902.7 | 47168.2 (575.2) | | | | | |
| E | 0 -1.5 | 225.0 | 575.2 | 2522.1 | 20452.3 | | 1460 | 752 | 1549 | 7806 |
| | 1.5 - 3.0 | 4154.5 | 442.5 | 619.5 | 619.5 | | | | | |
| | 3.0 - 4.5 | 0.0 | 1238.9 | 1504.4 | 2345.1 | | | | | |
| F | 0 -1.5 | 3069.8 | 929.2 | 88.5 | 6761.5 | | 1141 | 3319 | 59 | 13211 |
| | 1.5 - 3.0 | 351.7 | 8274.3 | 88.5 | 26737 | | | | | |
| | 3.0 - 4.5 | 0.0 | 752.2 | 0.0 | 6134.4 | | | | | |
| G | 0 -1.5 | 0.0 | 0.0 | 0.0 | 354 | | 0 | 15 | 0 | 2383 |
| | 1.5 - 3.0 | 0.0 | 44.2 | 0.0 | 6795.2 | | | | | |
| | 3.0 - 4.5 | 0.0 | 0.0 | 0.0 | 0 | | | | | |
| H | 0 -1.5 | 2650.6 | 22.1 | 2500.0 | 3473.5 | | 1102 | 789 | 1667 | 2463 |
| | 1.5 - 3.0 | 655.9 | 2256.7 | 1371.7 | 1283.2 | | | | | |
| | 3.0 - 4.5 | 0.0 | 88.5 | 1128.3 | 2632.7 | | | | | |
| **Total 0-1.5 M** | | 12678 | 2655 | 23302 | 72556 (332) | | | | | |
| **Total 1.5 to 3.0 M** | | 9541 | 17411 | 11570 | 98068 (1836) | | | | | |
| **Total 3.0 to 4.5 M** | | 0 | 4248 | 14049 | 80935 (3142) | | | | | |
| **Total 0 to 3.0 M** | | 22219 | 20067 | 34873 | 170624 (2168) | | | | | |
| **Total 0 to 4.5 M** | | 22219 | 24314 | 48922 | 251559 (5310) | **Sum** | 7406 | 8142 | 16307 | 83757 (3032) |

Note: Results expressed as Zebra mussel (Quagga mussel) when Quagga mussels are present.
The 2002 data utilized scuba divers for sample collection, and the 2005, 2006 and 2007 data utilized the petit ponar dredge for sample collection.

**Table A6.6a. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data.**

| Zone | Zone A | | | Zone A | | | Zone B | | | Zone C | | | Zone C | | | Zone D | | | Zone D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| **Median Length** | **5** | **4** | **5** | **7** | **12** | **4** | **6** | **3** | **4** | **7** | **9** | **9** | **7** | **5** | **4** | **9** | **7** | **2** | **15** | **5** | **14** |
| **Mean Length** | **7.4** | **4.2** | **5.1** | **7.8** | **12.3** | **4.1** | **6.4** | **3.1** | **5.6** | **7.1** | **9.5** | **9.4** | **7.1** | **5.1** | **4.6** | **9.9** | **6.8** | **2.6** | **16.3** | **5.3** | **14.6** |
| 1 | 16 | 3.7 | 9.4 | 23.5 | 23.2 | 4.6 | 3.9 | 2.1 | 7.9 | 6.6 | 13.2 | 16.5 | 6.3 | 3.3 | 11.4 | 21.1 | 13.7 | 6.2 | 22.1 | 9.6 | 25.1 |
| 2 | 16 | 3.8 | 3.9 | 20.8 | 12.2 | 4.4 | 17.3 | 1.9 | 3.9 | 8.6 | 14.3 | 19.2 | 10.1 | 10.8 | 8.8 | 20.1 | 13 | 1.7 | 22.8 | 5.3 | 20.6 |
| 3 | 3.6 | 3.9 | 7.7 | 7.8 | 18.9 | 5.4 | 9.6 | 4.3 | 3.9 | 6.6 | 9.5 | 11 | 2.7 | 1 | 10.1 | 20 | 12.8 | 1 | 24.7 | 5 | 18.5 |
| 4 | 2.9 | 5.2 | 2.7 | 6.7 | 22.4 | 5.6 | 12.2 | 6.8 | 0.8 | 9.4 | 6.7 | 13.6 | 5.9 | 1.4 | 8.2 | 17.8 | 9.2 | 1.4 | 23 | 3.8 | 15.5 |
| 5 | 4.5 | 5.4 | 6.9 | 14.9 | 16.6 | 4.6 | 9.2 | 2.4 | 8.5 | 8.1 | 11.8 | 11.3 | 9 | 1.2 | 8.3 | 16.7 | 10.7 | 1.6 | 16.1 | 5.3 | 19.6 |
| 6 | 13.8 | 4 | 9.7 | 7.9 | 16.2 | 10.3 | 5.3 | 2.6 | 3.6 | 8.4 | 12.4 | 9.1 | 12.4 | 7.2 | 8.4 | 15.6 | 10.8 | 1.2 | 10.8 | 5.8 | 22.2 |
| 7 | 3.7 | 3.6 | 3.8 | 7.2 | 17.3 | 2.1 | 7.6 | 3.1 | 10.3 | 6.4 | 10.8 | 10.6 | 5.3 | 4 | 8.6 | 6.7 | 9.7 | 3.3 | 23.8 | 5.1 | 17.6 |
| 8 | 17.7 | 3.9 | 5 | 9.5 | 15.4 | 5.9 | 3.9 | 1.7 | | 9.3 | 7.7 | 10.3 | 9.1 | 4.3 | 7.9 | 2.5 | 10.1 | 2 | 24.9 | 4.7 | 13.7 |
| 9 | 1.7 | 5.6 | 6.7 | 6.5 | 19.5 | 2.3 | 2.6 | 1.9 | | 5.2 | 12.7 | 10.8 | 11.5 | 14.3 | 7.4 | 13.1 | 4.9 | 1.9 | 16.6 | 5.8 | 14.9 |
| 10 | 17.9 | 4.4 | 9.3 | 8.8 | 19.1 | 1.8 | 10.7 | 5.3 | | 6.4 | 10.5 | 18.1 | 4.2 | 9.6 | 7.7 | 3.8 | 6.4 | 2.6 | 13.6 | 4.9 | 14.1 |
| 11 | 2.2 | 5.1 | 6 | 5.4 | 19.2 | 9.4 | 6.4 | 6.6 | | 6.6 | 6.3 | 10.3 | 6.9 | 1.1 | 7.8 | 12.5 | 5.2 | 6.3 | 23.2 | 8.5 | 15.9 |
| 12 | 12.8 | 2.1 | 6.8 | 6.7 | 19.3 | 5.1 | 7.7 | 6.6 | | 5.9 | 7 | 7.7 | 3.7 | 5.9 | 8.2 | 12.2 | 7.6 | 1 | 26.3 | 4.9 | 16.5 |
| 13 | 2.3 | 3.4 | 7.9 | 13.3 | 10.5 | 2.2 | 12.6 | 3.7 | | 4.7 | 9.8 | 9.6 | 6 | 1.6 | 7.4 | 11.1 | 10.9 | 1.4 | 16.8 | 5.8 | 19.9 |
| 14 | 2.9 | 6.7 | 6.2 | 11.3 | 17.9 | 1.7 | 2.1 | 2.6 | | | 12.2 | 8.7 | 7.2 | 6 | 7.1 | 8.3 | 8 | 1.7 | 28 | 6.3 | 20.3 |
| 15 | 17 | 4.5 | 7.4 | 11 | 15.6 | 2.9 | 2.1 | 1.7 | | | 6.4 | 19 | 7.4 | 8.8 | 7.2 | 5.1 | 8.7 | 2 | 27.4 | 7.6 | 17 |
| 16 | 6.7 | 2.5 | 7.6 | 9 | 6.2 | 3.5 | 12 | 2.8 | | | 11 | 8.6 | 6.8 | 3 | 6.2 | 11.2 | 11.2 | 1.2 | 24.2 | 5.9 | 16.3 |
| 17 | 11.6 | 4.4 | 7.9 | 11.2 | 18.4 | 3.4 | 7.2 | 1.6 | | | 9.8 | 17.4 | 5.2 | 4.4 | 5.9 | 9.5 | 9.7 | 1 | 26.1 | 2 | 16.4 |
| 18 | 4.6 | | 9.6 | 6.3 | 18.2 | 8.8 | 5.7 | 2.7 | | | 8.3 | 5.1 | 6 | 2.4 | 6.2 | 10.6 | 10.1 | 3.2 | 22.8 | 2.1 | 18.4 |
| 19 | 5.2 | | 6.6 | 8.6 | 16.3 | 5.1 | 3.8 | 3.2 | | | 7.6 | 9.9 | 6.5 | 8 | 6.5 | 6.6 | 4.4 | 1.6 | 17.2 | 7 | 14.8 |
| 20 | 3.5 | | 5.5 | 12.6 | 11.6 | 5.7 | 5.4 | 4.2 | | | 9.4 | 6.7 | 3.6 | 6.5 | 5.7 | 9.1 | 6.1 | 1.6 | 4.5 | 5.5 | 14.8 |
| 21 | 10.1 | | 3.6 | 10 | 8 | 2.9 | 2.9 | 1.9 | | | 10 | 8.5 | 4.8 | 10.1 | 5.4 | 6.5 | 8.7 | 1 | 14 | 4 | 17.3 |
| 22 | 5.5 | | 7.1 | 7.4 | 14.7 | 4.4 | 7.2 | 2 | | | 8.6 | 4.5 | 5.2 | 0.8 | 4.7 | 8.3 | 11.3 | 3.1 | 12.5 | 7.4 | 17 |
| 23 | 3.3 | | 7.5 | 3.6 | 16.9 | 4 | 11.9 | 2.5 | | | 10.9 | 11.4 | 8 | 4.7 | 4.9 | 9.3 | 14.2 | 2.6 | 13.4 | 5.2 | 18.4 |
| 24 | 9.5 | | 7.5 | 8 | 4.7 | 4.8 | 4.7 | 2.7 | | | 5.8 | 13.7 | 4.9 | 1.8 | 4.1 | 8.3 | 10.5 | 2.1 | 27.6 | 5.9 | 17.4 |
| 25 | 6.7 | | 2.4 | 7 | 5.2 | 1.6 | 6.7 | 1.6 | | | 11.7 | 7.7 | 7.1 | 4.9 | 4.6 | 3.5 | 2.3 | 4.5 | 23.3 | 6.2 | 14.8 |
| 26 | 2.7 | | 2.2 | 7 | 19.6 | 1.6 | 3.8 | 4.2 | | | 4.9 | 10.8 | 7.9 | 7 | 5.1 | 12.6 | 10.3 | 1.9 | 14.4 | 4.1 | 16.2 |
| 27 | 2 | | 4.8 | 6.7 | 14 | 2.3 | 2.2 | 2.6 | | | 7.9 | 5.6 | 5.6 | 2.4 | 4.8 | 5.8 | 12.2 | 4 | 14.8 | 4.3 | 16.7 |
| 28 | 12.9 | | 6.3 | 5.4 | 16.8 | 2.6 | 8.1 | 2.8 | | | 7.1 | 7.3 | 5.3 | 3.3 | 3.8 | 5.4 | 9.5 | 2 | 11.7 | 4 | 15.2 |
| 29 | 2.2 | | 6.2 | 9.3 | 11.2 | 1.9 | 7.9 | 1.6 | | | 7.9 | 9.2 | 7.2 | 6.3 | 4 | 5.9 | 9.1 | 2 | 10.6 | 3.6 | 15.7 |
| 30 | 3.1 | | 1.7 | 6.7 | 14.9 | 3.5 | 4.3 | 2.7 | | | 8.4 | 10.1 | 8.4 | 9.5 | 3.1 | 1.9 | 10 | 9.3 | 17.8 | 3.6 | 17.6 |
| 31 | 16.8 | | 2.7 | 5.4 | 10.5 | 2.1 | 3.8 | 3.1 | | | 16.7 | 6 | 5.7 | 7.7 | 3.9 | 11.7 | 9.4 | 2.6 | 13.7 | 5.4 | 14.1 |
| 32 | 2 | | 4.4 | 7.3 | 12.3 | 5.7 | 4.3 | 3.9 | | | 11 | 10.6 | 15.7 | 2.3 | 3.1 | 7.6 | 3.2 | 2.3 | 11.8 | 9.2 | 16 |
| 33 | 12.8 | | 2.7 | 15.9 | 3.2 | 4.3 | 7.8 | 1.6 | | | 12.9 | 10 | 5.3 | 6.4 | 3 | 6 | 9.3 | 1.9 | 14.6 | 4.3 | 16.1 |
| 34 | 4.6 | | 2.5 | 8.1 | 2.4 | 1.9 | 3 | 1.3 | | | 5.3 | 6.1 | 7.9 | 2.4 | 3.2 | 14.5 | 7.2 | 1.6 | 16.4 | 4.9 | 14.4 |
| 35 | 7.4 | | 5.1 | 5.3 | 24.4 | 2.7 | 5.4 | 2.1 | | | 8.6 | 6.8 | 9.1 | 5.6 | 2.6 | 8.7 | 9.2 | 2 | 14.5 | 6.1 | 15.7 |
| 36 | 2.6 | | 4.5 | 6.6 | 13.9 | 1.6 | 1.8 | 2.9 | | | 8.7 | 9.1 | 4.7 | 5.2 | 2.7 | 6.4 | 9.5 | 1 | 16.1 | 6.2 | 13.3 |
| 37 | 2.5 | | 5.1 | 12.6 | 10.7 | 2.2 | 3.4 | 3.3 | | | 7.9 | 13.5 | 16.4 | 5.9 | 2.1 | 9.3 | 6.5 | 1.6 | 13.2 | 4 | 14.1 |
| 38 | 1.8 | | 6.2 | 6.4 | 12.9 | 4.6 | 3 | 2.1 | | | 10.5 | 10.2 | 7.1 | 11.8 | 2.1 | | 11.6 | 2.7 | 21.6 | 3.3 | 14.7 |
| 39 | 4.4 | | 8.9 | 8.2 | 8.9 | 11.2 | 2.9 | 2.6 | | | 8.8 | 9.1 | 6.2 | 2.7 | 2.3 | | 5.3 | 2.8 | 28.4 | 3.9 | 16.5 |
| 40 | 6.1 | | 4.8 | 5.4 | 18.3 | 7.1 | 2.3 | 3.8 | | | 7.4 | 9.2 | 4.5 | 1.3 | 2.2 | | 8.8 | 4.2 | 26.9 | 3.6 | 14.7 |
| 41 | 2.4 | | 6.7 | 7.1 | 5.8 | 2.6 | 2.5 | 3 | | | 8 | 8.3 | 6.4 | 13.1 | 2.6 | | 12.3 | 1.7 | 19.2 | 5.9 | 16.9 |
| 42 | 11 | | 3.4 | 6 | 8.6 | 5.8 | 3.4 | 1.9 | | | 9.3 | 9.6 | 9.4 | 2.4 | 2.3 | | 11.4 | 1.9 | 14 | | 15 |

**Table A6.6a. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data.**

| Zone | Zone A | | | Zone A | | | Zone B | | | Zone C | | | Zone C | | | Zone D | | | Zone D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| 43 | 12.7 | | 3.8 | 6.5 | 8.6 | 3.6 | 2.9 | 1.6 | | | 11 | 5.6 | 7.2 | 7.1 | 2.4 | | 4.8 | 4.7 | 22.8 | | 15.2 |
| 44 | 3.1 | | 3.7 | 6.1 | 14.4 | 6.5 | 2 | 1.5 | | | 8.3 | 10.1 | 8.4 | 7.6 | 2.5 | | 3.9 | 2.3 | 13.4 | | 14.4 |
| 45 | 11.8 | | 5 | 11 | 18.1 | 3.2 | 5.6 | 1.8 | | | 6.3 | 13.5 | 11.9 | 12.9 | 2.6 | | 4.1 | 2 | 15.3 | | 14.9 |
| 46 | 18.9 | | 4.7 | 12.8 | 16.2 | 3.5 | 10.1 | 1.5 | | | 14.1 | 16.4 | 3.1 | 7 | 1.8 | | 8.3 | 1.5 | 7.4 | | 15.1 |
| 47 | 2 | | 4.4 | 6.7 | 9.3 | 6.8 | 10.8 | 5.2 | | | 9.9 | 14.1 | 6.7 | 5.8 | 2.4 | | 3.2 | 2 | 15.6 | | 16.4 |
| 48 | 15.7 | | 4.6 | 5.8 | 17 | 5 | 7.2 | 5.6 | | | 7.6 | 10.6 | 4.2 | 13.4 | 2.6 | | 2.9 | 1.3 | 20.5 | | 15.1 |
| 49 | 2.6 | | 3.9 | 8.1 | 6.7 | 1.8 | 9.8 | 5.9 | | | 7.5 | 10.3 | 7.5 | 12.9 | 1.9 | | 4.6 | 3.2 | 13.5 | | 16.3 |
| 50 | 14.1 | | 8 | 9.3 | 13.3 | 1.8 | 3.6 | 6.7 | | | 8.6 | 11.6 | 3.4 | 2.6 | 1.6 | | 2.2 | 1.2 | 14.1 | | 14.4 |
| 51 | 6.9 | | 5.4 | 5.1 | 17.2 | 5.3 | 14.6 | 2.3 | | | 3.2 | 7.2 | 6.3 | 0.8 | 2.3 | | 11.1 | 2.4 | 11.3 | | 12.7 |
| 52 | 5.5 | | 7 | 9.1 | 12.5 | 6.9 | 4.7 | 2.9 | | | 7 | 7.6 | 1.8 | 11.5 | 1.9 | | 8.5 | 1.8 | 8.7 | | 13.4 |
| 53 | 3.2 | | 3.2 | 7 | 17 | 7.4 | 9.1 | 2.6 | | | 8.6 | 9.9 | 16.9 | 1.3 | 2.4 | | 11.3 | 2 | 23.9 | | 14.3 |
| 54 | 13 | | 2.7 | 8.7 | 7.7 | 2.7 | 2.1 | 2.9 | | | 8.9 | 12.9 | 4.7 | 1.2 | 1.8 | | 5.6 | 4.3 | 18.8 | | 15 |
| 55 | 2.2 | | 5.3 | 9.6 | 11.5 | 3.5 | 4.6 | 2.9 | | | 8.6 | 8.8 | 1.8 | 1.1 | 1.7 | | 2.9 | 1.9 | 21.3 | | 13.9 |
| 56 | 1.9 | | 3.6 | 13.8 | 14.7 | 2.6 | 9 | 2.7 | | | 10.3 | 13.3 | 4.9 | 1.8 | 1.8 | | 3.3 | 1.6 | 13.8 | | 15.8 |
| 57 | 15.7 | | 3.5 | 8.5 | 10.9 | 1.5 | 4.2 | 3.3 | | | 7 | 11.1 | 6.4 | 1.4 | 1.4 | | 2.8 | 2.3 | 18 | | 11.4 |
| 58 | 13.7 | | 4 | 10.7 | 13.3 | 2.7 | 5.9 | 2.2 | | | 6.5 | 9.5 | 2.4 | 0.8 | | | 2.2 | 2.7 | 17 | | 15.4 |
| 59 | 9 | | 5.1 | 4.9 | 6.3 | 6 | 8.7 | 4.7 | | | 7.4 | 7.4 | 12.9 | 0.7 | | | 5.5 | 8.2 | 14.6 | | 14.6 |
| 60 | 7.9 | | 4.5 | 9.3 | 13.1 | 4.4 | 5.8 | 3.3 | | | 10 | 7.3 | 7 | 0.6 | | | 3.2 | 2 | 16.7 | | 13.8 |
| 61 | 5.9 | | 5.3 | 6.7 | 5.6 | 2.5 | 9.9 | 3.3 | | | 12.8 | 8.2 | 13.5 | 5.3 | | | 6.6 | 1 | 13.7 | | 12.7 |
| 62 | 12 | | 3.8 | 7.6 | 3.6 | 3.6 | 4.7 | 2.8 | | | 9.4 | 7 | 13 | 2.2 | | | 2.9 | 3.6 | 18.1 | | 14.4 |
| 63 | 4.8 | | 6.7 | 7.1 | 14.7 | 2.7 | 1.9 | 2.6 | | | 10.6 | 7.1 | 7.2 | 9.6 | | | 6.4 | 1.9 | 15.9 | | 12.5 |
| 64 | 15 | | 5 | 8.4 | 16.8 | 3.2 | 5.6 | 5.4 | | | 11.7 | 9.5 | 3.8 | 5.4 | | | 2.9 | 1.2 | 12.9 | | 12.9 |
| 65 | 13.1 | | 5.1 | 9.1 | 9.9 | 3.1 | 6.9 | 4 | | | 7.4 | 7.5 | 2.2 | 1.3 | | | 8.7 | 3.9 | 13.3 | | 13.8 |
| 66 | 4.8 | | 4.3 | 8.3 | 15.4 | 4.8 | 2.9 | 2.1 | | | 13 | 10 | 11.8 | 5.3 | | | 7.4 | 3.5 | 13.9 | | 12.6 |
| 67 | 2.5 | | 4.9 | 7.1 | 3.3 | 2.8 | 12.5 | 2.6 | | | 10.5 | 10.8 | 10.1 | 3.8 | | | 2.6 | 1.8 | 12.7 | | 13 |
| 68 | 2.4 | | 6.4 | 8.2 | 4.3 | 2.6 | 8.4 | 3.5 | | | 5.5 | 9.7 | 11.5 | 6.4 | | | 8.9 | 2.4 | 15.5 | | 13.3 |
| 69 | 16.5 | | 3.7 | 6.2 | 11 | 5.1 | 4.5 | 1.9 | | | 7.5 | 9.9 | 4.2 | 2.7 | | | 4.6 | 1.7 | 15.6 | | 15.6 |
| 70 | 6.7 | | 4.2 | 3.9 | 11.9 | 5.8 | 2.1 | 1.9 | | | 11.2 | 11 | 2.7 | 6.3 | | | 6.6 | 2 | 14 | | 15 |
| 71 | 1.9 | | 3.9 | 4.3 | 10.3 | 4.1 | 2.1 | 3.7 | | | 13.8 | 7.8 | 2.5 | 4.8 | | | 5.3 | 1 | 13.9 | | 14.3 |
| 72 | 7.1 | | 6.1 | 6.9 | 7.6 | 1.5 | 5.9 | 5 | | | 11 | 6.4 | 11.4 | 3.8 | | | 8.8 | 2.4 | 11.4 | | 14 |
| 73 | 8.1 | | 4.9 | 4.4 | 9 | 1.5 | 8.5 | 1.8 | | | 10 | 4.5 | 4.1 | 6.5 | | | 9 | 6.2 | 12.4 | | 14.4 |
| 74 | 6.5 | | 4.8 | 7.5 | 2.6 | 4.9 | 5.7 | 2.6 | | | 12.2 | 13.5 | 5.7 | 1.8 | | | 7.2 | 2.2 | 24.4 | | 13.4 |
| 75 | 3.3 | | 4.6 | 7.3 | 14 | 6.5 | 6 | 1.9 | | | 12.9 | 7.8 | 13.1 | 3.3 | | | 6.2 | 3.1 | 18.2 | | 12.1 |
| 76 | 3.6 | | 6.3 | 4.6 | 4 | 3.7 | 11.2 | 2 | | | 10.2 | 5.1 | 5.2 | 3.7 | | | 6.1 | 4.8 | 17.9 | | 12.8 |
| 77 | 14.2 | | 6.6 | 5.1 | 17.5 | 5.2 | 8.9 | 2.8 | | | 12.5 | 9.1 | 7.8 | 6.4 | | | 8 | 4.2 | 15.1 | | 12.1 |
| 78 | 4.2 | | 7.3 | 7.1 | 2.4 | 3.2 | 9.7 | 2.5 | | | 21 | 16.1 | 7.8 | 3.1 | | | 6.7 | 2.1 | 15.9 | | 13.8 |
| 79 | 6.4 | | 4.7 | 4.8 | 11.1 | 5.7 | 7.9 | 2.2 | | | 10.7 | 8.5 | 7.1 | 4.2 | | | 1.6 | 5.2 | 11.3 | | 12.9 |
| 80 | 6.6 | | 2.9 | 7.1 | 6.4 | 7 | 10.3 | 3.1 | | | 9.6 | 5.7 | 7.6 | 1.6 | | | 2 | 2.7 | 15.3 | | 14.4 |
| 81 | 4 | | 1.5 | 5.2 | 10.5 | 4.6 | 3.2 | 3.2 | | | 10.2 | 7 | 8.7 | 2.2 | | | 3 | 3.4 | 15.1 | | 10.9 |
| 82 | 3.2 | | 2.7 | 4.4 | 8.6 | 4.4 | 9.8 | 2.1 | | | 14.2 | 7.3 | 9.6 | 8.4 | | | 1.6 | 2.4 | 11.9 | | 12.3 |
| 83 | 1.6 | | 2.3 | 4.6 | 8.8 | 4.3 | 8.8 | 3.2 | | | 6.9 | 8.4 | 5.8 | 8.5 | | | 1.7 | 2.6 | 14.2 | | 11 |
| 84 | 2.6 | | 6 | 8.3 | 12.5 | 2.2 | 4.4 | 4.5 | | | 5.8 | 5.5 | 6.4 | 6 | | | 1.5 | 5.5 | 15.5 | | 13.4 |
| 85 | 13.7 | | 5.3 | 9.3 | 5.1 | 2.5 | 1.8 | 2.7 | | | 9.4 | 10.6 | 8.3 | 10.1 | | | 3.7 | 3.3 | 13.6 | | 11.2 |
| 86 | 10.7 | | 7.5 | 5.8 | 5.9 | 2.5 | 10 | 4.3 | | | 9.2 | 8.9 | 4.7 | 1.6 | | | 5.1 | 3.4 | 13.7 | | 11 |

**Table A6.6a. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data.**

| Zone | Zone A | | | Zone A | | | Zone B | | | Zone C | | | Zone C | | | Zone D | | | Zone D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| 87 | 3.8 | | 3.8 | 4.3 | 5 | 13 | 5.4 | 2.7 | | | 11.2 | 8.4 | 10.9 | 9.2 | | | 5.5 | 3 | 12.9 | | 13.6 |
| 88 | 3.7 | | 2.3 | 5 | 15.1 | 2.4 | 10.7 | 3.5 | | | 10.3 | 6.7 | 9.6 | 5.2 | | | 6.4 | 2 | 14.4 | | 15 |
| 89 | 5.2 | | 4.6 | 4.7 | 15.1 | 3.3 | 5.7 | 3.1 | | | 9.1 | 7.6 | 5.1 | 2.4 | | | 6.1 | 1.5 | 12.7 | | 12.9 |
| 90 | 12.2 | | 4.8 | 9.3 | 8.5 | 2.6 | 7.8 | 4.2 | | | 13.4 | 4.4 | 11.4 | 4.2 | | | 7.6 | 3.8 | 13.2 | | 13.6 |
| 91 | 2.5 | | 5.6 | 4.9 | 10 | 2.6 | 9.3 | 2 | | | 12.2 | 5.3 | 7.6 | 7.2 | | | 3.3 | 5.5 | 11.1 | | 13.4 |
| 92 | 4.6 | | 4.2 | 8.8 | 9.2 | 2.8 | 5.7 | 3 | | | 7.4 | 5.8 | 2.7 | 1.7 | | | 5.2 | 1.4 | 14.2 | | 11.1 |
| 93 | 1.8 | | 6.5 | 7.3 | 8.3 | 5.3 | 2.1 | 2.2 | | | 3.7 | 4.3 | 5.7 | 1.6 | | | 6.6 | 1.1 | 11 | | 11.5 |
| 94 | 4.4 | | 3.2 | 5.1 | 19.5 | 4.8 | 7.3 | 2.7 | | | 6.4 | 9.2 | 8.4 | 1.2 | | | 4.5 | 1.4 | 11.9 | | 10.1 |
| 95 | 15.6 | | 5.4 | 4.9 | 18.3 | 2.3 | 4.1 | 2.1 | | | 7.8 | 6.5 | 9.8 | 5.5 | | | 4.4 | 6.3 | 10.8 | | 12.9 |
| 96 | 10.2 | | 6.6 | 6.8 | 9.5 | 3.6 | 2.6 | 2.2 | | | 4.8 | 6.4 | 2.4 | 7.7 | | | 6.8 | 2.5 | 11.1 | | 8.7 |
| 97 | 15.6 | | 3.8 | 5.7 | 10.3 | 2 | 8.1 | 5.5 | | | 4 | 9.1 | 12.6 | 9.7 | | | 5.8 | 1.4 | 11.2 | | 7.8 |
| 98 | 3.5 | | 3 | 4.5 | 9.1 | 2.5 | 7.2 | 4.2 | | | 13.6 | 7.9 | 9.3 | 5.3 | | | 2.6 | 2.7 | 13.9 | | 11.4 |
| 99 | 2.6 | | 3.1 | 5.5 | 16.4 | 5.4 | 9.7 | 4 | | | 12.5 | 7.2 | 3.2 | 10.9 | | | 3.8 | 1.6 | 12.2 | | 9 |
| 100 | 11.8 | | 3.5 | 5.4 | 21.2 | 3.9 | 5.6 | 2.4 | | | 11.4 | 9.5 | 2.6 | 4.9 | | | 2.4 | 2 | 11.7 | | 11.8 |

**Table A6.6a. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data.**

| Zone | Zone E | | | Zone F | | | Zone G | | | Zone H | | | Zone H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| Median Length | 5 | 4 | 5 | 9 | 8 | 7 | 4 | 4 | 0 | 6 | 10 | 10 | 12 | 7 | 7 |
| Mean Length | 6.1 | 3.8 | 5.7 | 9.6 | 9.6 | 6.6 | 4.0 | 3.8 | 0.0 | 7.3 | 10.0 | 10.4 | 10.4 | 6.8 | 8.2 |
| 1 | 12 | 5.1 | 9.9 | 22.3 | 6.3 | 7.8 | 4.6 | 3.7 | 0 | 7.8 | 7.5 | 19.2 | 14.1 | 13.8 | 13.4 |
| 2 | 3.2 | 4.3 | 8.6 | 22.7 | 13.4 | 6.1 | 4.5 | 4 | | 23.1 | 8.4 | 18.2 | 18.7 | 8.8 | 12.9 |
| 3 | 8.8 | 8.7 | 6.1 | 18.1 | 14.7 | 5.9 | 4.2 | 5.2 | | 17.4 | 12.1 | 13.1 | 13.2 | 4.8 | 13.3 |
| 4 | 10.6 | 3.1 | 4.5 | 12.2 | 5.5 | 6.5 | 5.6 | 5.6 | | 21.9 | 9 | 18.5 | 14.1 | 6.6 | 10.4 |
| 5 | 8.8 | 1.1 | 7.5 | 15.7 | 10.9 | 5.5 | 3.1 | 4.2 | | 22.9 | 8.9 | 10.3 | 17.3 | 5 | 13.2 |
| 6 | 3.9 | 6.6 | 4.9 | 15.8 | 5.7 | 2.7 | 3.2 | 4.3 | | 21.9 | 8.3 | 14.2 | 12 | 6.6 | 5.8 |
| 7 | 11 | 5.4 | 9.4 | 17.1 | 18 | 5.5 | 4.4 | 4.5 | | 6.5 | 6.2 | 10.5 | 14.8 | 5.2 | 13.1 |
| 8 | 4.1 | 3.2 | 9.7 | 13.4 | 1.7 | 8.2 | 2.2 | 4.4 | | 11.3 | 10.9 | 21.3 | 12.4 | 5.9 | 12 |
| 9 | 3.3 | 1.6 | 4.6 | 16.4 | 1.5 | 9.5 | | 3.4 | | 5.5 | 8.8 | 12.9 | 12.3 | 7.9 | 10.5 |
| 10 | 8.1 | 2.4 | 7.4 | 10.5 | 12.8 | 10.8 | | 3.3 | | 6.7 | 13.4 | 9.8 | 12.3 | 7.1 | 5.8 |
| 11 | 10.1 | 1 | 7.8 | 13.5 | 7.6 | 5.2 | | 3.1 | | 6.4 | 7.4 | 13.6 | 12.4 | 6.6 | 8.2 |
| 12 | 6 | 4.7 | 7.9 | 9.7 | 10.2 | 3.8 | | 4.1 | | 6.1 | 13.6 | 11.7 | 16.9 | 6 | 7 |
| 13 | 7.3 | 2.5 | 7.7 | 10.4 | 6.8 | 4.2 | | 2.9 | | 6.7 | 13.2 | 17.6 | 13.1 | 4.6 | 6.2 |
| 14 | 3.9 | 4 | 8.1 | 9.8 | 6.6 | 8.2 | | 3.5 | | 3.3 | 3.5 | 8.3 | 16.7 | | 5.9 |
| 15 | 3.2 | | 7.9 | 6.7 | 21.5 | 1.6 | | 3.4 | | 19.7 | 13.5 | 13.9 | 13.2 | | 7.5 |
| 16 | 8.6 | | 5.2 | 13.9 | 15.5 | 10.2 | | 3.6 | | 6.5 | 12.4 | 12.8 | 14.6 | | 11 |
| 17 | 4.2 | | 5.2 | 8.2 | 24.1 | 6.1 | | 3.4 | | 4.4 | 7.8 | 10.7 | 12.7 | | 5.3 |
| 18 | 2.8 | | 6.3 | 8.2 | 19.4 | 8.2 | | 4.3 | | 2.8 | 12.7 | 15.2 | 11.7 | | 5 |
| 19 | 3.3 | | 4.2 | 7.9 | 4 | 6.2 | | 4.8 | | 6.2 | 11.9 | 17.3 | 13 | | 5.6 |
| 20 | 3.9 | | 4.6 | 7.7 | 2.8 | 5.6 | | 4.3 | | 4.3 | 11.1 | 14.7 | 14.1 | | 6.2 |
| 21 | 11 | | 5.4 | 7.8 | 5.9 | 4.3 | | 3.6 | | 6.9 | 11.3 | 8.5 | 12.1 | | 6.4 |
| 22 | 7.2 | | 6 | 12.9 | 6.9 | 7 | | 4.5 | | 4.6 | 6.1 | 10.6 | 12 | | 6 |
| 23 | 5.8 | | 7.5 | 11.6 | 2.8 | 7.8 | | 3.4 | | 5.2 | 12.9 | 9.1 | 8.8 | | 4.2 |
| 24 | 8.3 | | 7.7 | 10.3 | 4.5 | 5.5 | | 3.4 | | 4.8 | 13.4 | 9.4 | 15.4 | | 4.9 |
| 25 | 8.1 | | 6.5 | 9.2 | 6.1 | 5.9 | | 3.5 | | 3.9 | 8.3 | 11.8 | 11.6 | | 7 |
| 26 | 3 | | 6.2 | 11.7 | 5.1 | 5.8 | | 3.8 | | 7.6 | 10.1 | 7.3 | 13.1 | | 5.9 |
| 27 | 5.3 | | 7.3 | 12.7 | 11.1 | 6.3 | | 3.3 | | 6.7 | 17.3 | 10.9 | 14.2 | | |
| 28 | 14.2 | | 7.5 | 9.7 | 17.7 | 6.7 | | 3.1 | | 13.5 | 8.9 | 9.5 | 15.6 | | |
| 29 | 2.1 | | 5.7 | 9.6 | 7.1 | 4.9 | | 3.1 | | 8.9 | 7.4 | 10.2 | 12.6 | | |
| 30 | 5.4 | | 4.4 | 12.7 | 8.6 | 3.8 | | 3.5 | | 6.6 | 10.5 | 10.1 | 12.6 | | |
| 31 | 3.1 | | 4.6 | 5.2 | 6.7 | 12 | | 3.6 | | 6.1 | 12.5 | 8.5 | 13.6 | | |
| 32 | 6.2 | | 5.2 | 10.8 | 7.5 | 6.7 | | 3.5 | | 6.2 | 9.3 | 8.6 | 12.3 | | |
| 33 | 2 | | 6 | 5.6 | 5.5 | 6.5 | | 3.6 | | 6.4 | 9.6 | 12.1 | 9.8 | | |
| 34 | 4.3 | | 5 | 11.7 | 5.2 | 5.3 | | 3.2 | | 8 | 5.4 | 6 | 12.5 | | |
| 35 | 3.7 | | 6.7 | 11.1 | 5.3 | 5.8 | | 3.6 | | 7.9 | 9.2 | 8.2 | 13.5 | | |
| 36 | 2.3 | | 5.2 | 7.8 | 4.7 | 11.4 | | 3.6 | | 3.9 | 10.4 | 10.7 | 11.6 | | |
| 37 | 3.1 | | 3.5 | 4.3 | 6.8 | 6.9 | | 3.8 | | 6.2 | 10.7 | 6.9 | 11.5 | | |
| 38 | 4.1 | | 3.3 | 5.9 | 17.7 | 5.8 | | 3.8 | | 5.8 | 12.3 | 9.4 | 10.6 | | |
| 39 | 9.5 | | 4.6 | 10.2 | 18.9 | 2.9 | | 3.1 | | 4.2 | 9.7 | 6.9 | 15.8 | | |
| 40 | 7.4 | | 6.3 | 11.7 | 17.6 | 8.5 | | 2.4 | | 6.5 | 9.7 | 14.4 | 13.5 | | |
| 41 | 4.5 | | 6 | 3.6 | 2.5 | 4.5 | | 2.5 | | 7.7 | 10.9 | 10.3 | 11.4 | | |
| 42 | 5.2 | | 4.2 | 9 | 6.3 | 6.3 | | 3.3 | | 6.6 | 7.9 | 9 | 15 | | |

**Table A6.6a. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data.**

| Zone | Zone E | | | Zone F | | | Zone G | | | Zone H | | | Zone H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| 43 | 4.5 | | 4.3 | 5.6 | 10.5 | 5.2 | | 5.4 | | 7.6 | 7.9 | 9.6 | 10.7 | | |
| 44 | 6.3 | | 4.5 | 15.5 | 4.1 | 12.7 | | 3.1 | | 6.8 | 8.2 | 11 | 12.1 | | |
| 45 | 3.5 | | 4.1 | 7.1 | 12.7 | 9.2 | | 2.5 | | 5.9 | 7.6 | 10.3 | 13.3 | | |
| 46 | 6.7 | | 3.7 | 16 | 5.9 | 5.8 | | 2.7 | | 7.6 | | 10.3 | 10.1 | | |
| 47 | 5.2 | | 3.1 | 9 | 5.4 | 9.7 | | 3 | | 8.5 | | 8.3 | 12 | | |
| 48 | 6.8 | | 2.5 | 8.3 | 6.7 | 7.4 | | 3 | | 6.9 | | 9.2 | 11.6 | | |
| 49 | 8.9 | | 3.8 | 7.2 | 8.3 | 3.4 | | 3.1 | | 3.8 | | 13.2 | 10.5 | | |
| 50 | 9.4 | | 3.7 | 10.7 | 7.3 | 6.5 | | 2.6 | | 10.2 | | 8.1 | 8.6 | | |
| 51 | 3.7 | | 3.1 | 7.5 | 17.8 | 5.2 | | 3.6 | | 3.9 | | 13.5 | 10.9 | | |
| 52 | 3.6 | | 3 | 15.8 | 9.2 | 3.5 | | 2.5 | | 3.4 | | 13.1 | 8.8 | | |
| 53 | 2.1 | | 3.3 | 12.8 | 20.7 | 3.1 | | 4.5 | | 6.7 | | 10 | 7 | | |
| 54 | 11.7 | | | 9.1 | 9.2 | 9.5 | | 11.6 | | 4.7 | | 7.9 | 8.5 | | |
| 55 | 4.8 | | | 7.1 | 20.2 | 8.7 | | 9.1 | | 7.1 | | 6.9 | 9.1 | | |
| 56 | 2.6 | | | 7.9 | 8.5 | 5.8 | | 5.9 | | 4.5 | | 7.1 | 8.5 | | |
| 57 | 7.3 | | | 6.9 | 10.1 | 9 | | 5.8 | | 4.3 | | 7.4 | 9.1 | | |
| 58 | 6.7 | | | 6.7 | 5.9 | 2 | | 8.4 | | 8.2 | | 6.9 | 7.9 | | |
| 59 | 13.3 | | | 6.6 | 16.5 | 8.7 | | 5.7 | | 10.2 | | 6.7 | 10.2 | | |
| 60 | 2.1 | | | 6.8 | 22.6 | 7.9 | | 4.8 | | 5 | | 12.1 | 8.4 | | |
| 61 | 12.8 | | | 10 | 12.5 | 4.7 | | 4.4 | | 9.3 | | 8.3 | 6.9 | | |
| 62 | 6.2 | | | 10 | 5.3 | 3.8 | | 4.5 | | 2.6 | | 9 | 6.1 | | |
| 63 | 7.8 | | | 4.5 | 5.5 | 7.3 | | 4.5 | | 3.2 | | 9.1 | 6.2 | | |
| 64 | 3.7 | | | 5 | 7.8 | 8.6 | | 4.8 | | 5.6 | | 8.1 | 7.6 | | |
| 65 | 3.4 | | | 7.2 | 18.2 | 7.3 | | 4.7 | | 4.4 | | 7.9 | 7.2 | | |
| 66 | 4.6 | | | 3.6 | 8.4 | 9.4 | | 4.2 | | 6.7 | | 12.1 | 7 | | |
| 67 | 3.7 | | | 14.5 | 10.3 | 3.8 | | 3.9 | | 7.5 | | 10.7 | 5.2 | | |
| 68 | 8.2 | | | 5.7 | 9.3 | 3.7 | | 3.6 | | 5.2 | | 8.6 | 5.6 | | |
| 69 | 7 | | | 4.8 | 12.6 | 11.7 | | 5.2 | | 3.8 | | 9.2 | 3.8 | | |
| 70 | 6.9 | | | 6.9 | 3 | 9.6 | | 2.6 | | 6 | | 10.4 | 5 | | |
| 71 | 7.4 | | | 7.8 | 18.8 | 5.1 | | 2.7 | | 4.8 | | 8.3 | 5 | | |
| 72 | 9.5 | | | 7.4 | 23.1 | 5.1 | | 5.5 | | 5.4 | | 11.6 | 7 | | |
| 73 | 4.4 | | | 6.6 | 14.5 | 8.5 | | 5.6 | | 4.7 | | 8.3 | 5.1 | | |
| 74 | 9.3 | | | 9.8 | 19.8 | 7.7 | | 4 | | 3.9 | | 12.6 | 5.2 | | |
| 75 | 6.8 | | | 8.3 | 14.4 | 6.5 | | 5.3 | | 4.9 | | 11.2 | 5 | | |
| 76 | 6.9 | | | 5.2 | 5.2 | 7.1 | | 4.6 | | | | 12.7 | 3.8 | | |
| 77 | 5.3 | | | 7.6 | 8.5 | 8.6 | | 2.5 | | | | 9.2 | 7.7 | | |
| 78 | 4.2 | | | 8.1 | 8.4 | 3.1 | | 2.4 | | | | 13.8 | 5.4 | | |
| 79 | 7 | | | 4.5 | 12.5 | 7.4 | | 4.4 | | | | 8.5 | 4.9 | | |
| 80 | 6.4 | | | 5.7 | 7.8 | 5.1 | | 4.3 | | | | 15.8 | 4.6 | | |
| 81 | 3.5 | | | 6.5 | 12.6 | 2.9 | | 2.3 | | | | 7.3 | 4.2 | | |
| 82 | 5.3 | | | 8.5 | 5.5 | 7 | | 2.4 | | | | 7.2 | 4.5 | | |
| 83 | 5.2 | | | 11.9 | 8.9 | 6.7 | | 3 | | | | 8.1 | 3.1 | | |
| 84 | 7 | | | 2.7 | 6.8 | 7.6 | | 3.1 | | | | 7.7 | | | |
| 85 | 5.5 | | | 9 | 7.6 | 2.4 | | 4.5 | | | | 7 | | | |
| 86 | 4.1 | | | 8.9 | 12.1 | 5.8 | | 3.1 | | | | 10.3 | | | |

**Table A6.6a. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Zebra Mussel Raw Length (mm) Data.**

| Zone | Zone E | | | Zone F | | | Zone G | | | Zone H | | | Zone H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| 87 | 4 | | | 15.6 | 5.3 | 6.7 | | 2.8 | | | | 8.3 | | | |
| 88 | 11.4 | | | 11.2 | 6 | 8 | | 2.9 | | | | 6.7 | | | |
| 89 | 2.2 | | | 12.9 | 7.3 | 7.1 | | 3 | | | | 9.3 | | | |
| 90 | 6.1 | | | 9.6 | 5.1 | 7.7 | | 2.9 | | | | 6.2 | | | |
| 91 | 4.4 | | | 7.3 | 12 | 7.7 | | 3 | | | | 6.3 | | | |
| 92 | 3 | | | 8.4 | 7.5 | 2.7 | | 2.9 | | | | 6 | | | |
| 93 | 6.1 | | | 8.8 | 6.6 | 3.8 | | 3.6 | | | | 6.1 | | | |
| 94 | 7.6 | | | 9.3 | 3.5 | 5.3 | | 2.2 | | | | | | | |
| 95 | 4.8 | | | 17 | 4.9 | 3.4 | | 3.1 | | | | | | | |
| 96 | 9 | | | 9.2 | 10.9 | 9 | | 2.6 | | | | | | | |
| 97 | 4.5 | | | 8.2 | 5.2 | 12.2 | | 2.7 | | | | | | | |
| 98 | 5 | | | 7.4 | 4.2 | 9.8 | | 2.6 | | | | | | | |
| 99 | 8.8 | | | 7.7 | 7.3 | 8.7 | | 2.7 | | | | | | | |
| 100 | 3.9 | | | 6.1 | 2.3 | 6.8 | | 3 | | | | | | | |

**Table A6.6b. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Quagga Mussel Raw Length (mm) Data.**

| Zone | Zone A | | | Zone A | | | Zone B | | | Zone C | | | Zone C | | | Zone D | | | Zone D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| **Median Length** | **0** | **0** | **0** | **13** | **14** | **4** | **0** | **0** | **0** | **0** | **16** | **16** | **0** | **5** | **7** | **0** | **6** | **0** | **16** | **0** | **6** |
| **Mean Length** | **0.0** | **0.0** | **0.0** | **13.3** | **13.7** | **4.0** | **0.0** | **0.0** | **0.0** | **0.0** | **16.3** | **15.5** | **0.0** | **5.2** | **6.7** | **0.0** | **9.1** | **0.0** | **15.2** | **0.0** | **6.2** |
| 1 | 0 | 0 | 0 | 12.1 | 15.2 | 6.8 | 0 | 0 | 0 | 0 | 18.9 | 21 | 0 | 4.7 | 8.2 | 0 | 17.5 | 0 | 18.5 | 0 | 9.2 |
| 2 | | | | 12.1 | 17.9 | 3.6 | | | | | 14.6 | 17.1 | | 8.5 | 6.6 | | 17.6 | | 13 | | 10 |
| 3 | | | | 13.4 | 8 | 1.9 | | | | | 13.2 | 14 | | 7 | 5.2 | | 5.3 | | 10.5 | | 6.8 |
| 4 | | | | 12.5 | 15.6 | 3.7 | | | | | 17.2 | 13.9 | | 4.5 | | | 5.7 | | 16.9 | | 6.1 |
| 5 | | | | 15.9 | 17.7 | | | | | | 17 | 16.7 | | 4.9 | | | 4 | | 15.7 | | 7.7 |
| 6 | | | | 17.3 | 11 | | | | | | 16.3 | 19.3 | | 5.5 | | | 4.7 | | 16.5 | | 7.3 |
| 7 | | | | 11.5 | 13.3 | | | | | | 16.1 | 19.9 | | 3.8 | | | | | | | 5.7 |
| 8 | | | | 11.8 | 13.7 | | | | | | 14.7 | 16.4 | | 3.6 | | | | | | | 6.8 |
| 9 | | | | 13.1 | 14.5 | | | | | | 17.3 | 19.2 | | 3.5 | | | | | | | 5.5 |
| 10 | | | | | 13.5 | | | | | | 16.1 | 14.3 | | 6.9 | | | | | | | 5.7 |
| 11 | | | | | 14.3 | | | | | | 16.3 | 16.8 | | 4.2 | | | | | | | 7.2 |
| 12 | | | | | 13.4 | | | | | | 13.3 | 17.4 | | | | | | | | | 5.1 |
| 13 | | | | | 15.7 | | | | | | 15.6 | 19 | | | | | | | | | 6.2 |
| 14 | | | | | 12.1 | | | | | | 17.2 | 15.1 | | | | | | | | | 5.7 |
| 15 | | | | | 13.8 | | | | | | 17.6 | 15.6 | | | | | | | | | 6.8 |
| 16 | | | | | 12.5 | | | | | | 16.2 | 16.1 | | | | | | | | | 5.7 |
| 17 | | | | | 12.8 | | | | | | 16.6 | 19.3 | | | | | | | | | 5.3 |
| 18 | | | | | 11.3 | | | | | | 17.7 | 17.3 | | | | | | | | | 4.7 |
| 19 | | | | | | | | | | | 17.2 | 14.3 | | | | | | | | | 5.7 |
| 20 | | | | | | | | | | | 17 | 15.9 | | | | | | | | | 5 |
| 21 | | | | | | | | | | | 19.4 | 16.5 | | | | | | | | | 6.2 |
| 22 | | | | | | | | | | | 17.7 | 19 | | | | | | | | | 4.3 |
| 23 | | | | | | | | | | | 14.3 | 15.2 | | | | | | | | | 5.1 |
| 24 | | | | | | | | | | | 16.5 | 14.7 | | | | | | | | | 6.5 |
| 25 | | | | | | | | | | | 21 | 18 | | | | | | | | | 6.2 |
| 26 | | | | | | | | | | | 19.5 | 15.2 | | | | | | | | | 4.5 |
| 27 | | | | | | | | | | | 16.8 | 14.4 | | | | | | | | | |
| 28 | | | | | | | | | | | 19.6 | 16.2 | | | | | | | | | |
| 29 | | | | | | | | | | | 17.8 | 15.9 | | | | | | | | | |
| 30 | | | | | | | | | | | 17.8 | 16.1 | | | | | | | | | |
| 31 | | | | | | | | | | | 17 | 15.8 | | | | | | | | | |
| 32 | | | | | | | | | | | 16.2 | 16.5 | | | | | | | | | |
| 33 | | | | | | | | | | | 17 | 16.2 | | | | | | | | | |
| 34 | | | | | | | | | | | 15.7 | 12.8 | | | | | | | | | |
| 35 | | | | | | | | | | | 16.2 | 19.6 | | | | | | | | | |
| 36 | | | | | | | | | | | 16.9 | 15.9 | | | | | | | | | |
| 37 | | | | | | | | | | | 14.7 | 15.2 | | | | | | | | | |
| 38 | | | | | | | | | | | 15.4 | 13.9 | | | | | | | | | |
| 39 | | | | | | | | | | | 16.6 | 16.3 | | | | | | | | | |
| 40 | | | | | | | | | | | 12.9 | 17.4 | | | | | | | | | |

**Table A6.6b. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Quagga Mussel Raw Length (mm) Data.**

| Zone | Zone A | | | Zone A | | | Zone B | | | Zone C | | | Zone C | | | Zone D | | | Zone D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| 41 | | | | | | | | | | | 14.1 | 17 | | | | | | | | | | | | |
| 42 | | | | | | | | | | | 13.6 | 14.6 | | | | | | | | | | | | |
| 43 | | | | | | | | | | | 18.5 | 13.9 | | | | | | | | | | | | |
| 44 | | | | | | | | | | | 15.5 | 16 | | | | | | | | | | | | |
| 45 | | | | | | | | | | | 11 | 15.2 | | | | | | | | | | | | |
| 46 | | | | | | | | | | | 15.7 | 15.1 | | | | | | | | | | | | |
| 47 | | | | | | | | | | | 14.2 | 12.3 | | | | | | | | | | | | |
| 48 | | | | | | | | | | | 15.7 | 13.9 | | | | | | | | | | | | |
| 49 | | | | | | | | | | | | 15.7 | | | | | | | | | | | | |
| 50 | | | | | | | | | | | | 17 | | | | | | | | | | | | |
| 51 | | | | | | | | | | | | 15.9 | | | | | | | | | | | | |
| 52 | | | | | | | | | | | | 13.3 | | | | | | | | | | | | |
| 53 | | | | | | | | | | | | 16.6 | | | | | | | | | | | | |
| 54 | | | | | | | | | | | | 17.2 | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | 13.8 | | | | | | | | | | | | |
| 56 | | | | | | | | | | | | 16 | | | | | | | | | | | | |
| 57 | | | | | | | | | | | | 15.2 | | | | | | | | | | | | |
| 58 | | | | | | | | | | | | 17.8 | | | | | | | | | | | | |
| 59 | | | | | | | | | | | | 12.5 | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | 13.4 | | | | | | | | | | | | |
| 61 | | | | | | | | | | | | 15.2 | | | | | | | | | | | | |
| 62 | | | | | | | | | | | | 11.8 | | | | | | | | | | | | |
| 63 | | | | | | | | | | | | 13.1 | | | | | | | | | | | | |
| 64 | | | | | | | | | | | | 11.1 | | | | | | | | | | | | |
| 65 | | | | | | | | | | | | 17 | | | | | | | | | | | | |
| 66 | | | | | | | | | | | | 20.8 | | | | | | | | | | | | |
| 67 | | | | | | | | | | | | 17.1 | | | | | | | | | | | | |
| 68 | | | | | | | | | | | | 16.7 | | | | | | | | | | | | |
| 69 | | | | | | | | | | | | 15 | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | 14.6 | | | | | | | | | | | | |
| 71 | | | | | | | | | | | | 14.2 | | | | | | | | | | | | |
| 72 | | | | | | | | | | | | 12 | | | | | | | | | | | | |
| 73 | | | | | | | | | | | | 12.3 | | | | | | | | | | | | |
| 74 | | | | | | | | | | | | 15.3 | | | | | | | | | | | | |
| 75 | | | | | | | | | | | | 12.6 | | | | | | | | | | | | |
| 76 | | | | | | | | | | | | 15.4 | | | | | | | | | | | | |
| 77 | | | | | | | | | | | | 15.7 | | | | | | | | | | | | |
| 78 | | | | | | | | | | | | 16.2 | | | | | | | | | | | | |
| 79 | | | | | | | | | | | | 16.7 | | | | | | | | | | | | |
| 80 | | | | | | | | | | | | 15.6 | | | | | | | | | | | | |
| 81 | | | | | | | | | | | | 18.1 | | | | | | | | | | | | |
| 82 | | | | | | | | | | | | 12.4 | | | | | | | | | | | | |

**Table A6.6b. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Quagga Mussel Raw Length (mm) Data.**

| Zone | Zone A | | | Zone A | | | Zone B | | | Zone C | | | Zone C | | | Zone D | | | Zone D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| 83 | | | | | | | | | | | | 11.7 | | | | | | | | | |
| 84 | | | | | | | | | | | | 15.1 | | | | | | | | | |
| 85 | | | | | | | | | | | | 16.2 | | | | | | | | | |
| 86 | | | | | | | | | | | | 13.9 | | | | | | | | | |
| 87 | | | | | | | | | | | | 13.2 | | | | | | | | | |
| 88 | | | | | | | | | | | | 16.7 | | | | | | | | | |
| 89 | | | | | | | | | | | | 14.3 | | | | | | | | | |
| 90 | | | | | | | | | | | | 17.5 | | | | | | | | | |
| 91 | | | | | | | | | | | | 15.9 | | | | | | | | | |
| 92 | | | | | | | | | | | | 15.2 | | | | | | | | | |
| 93 | | | | | | | | | | | | 14.5 | | | | | | | | | |
| 94 | | | | | | | | | | | | 11.7 | | | | | | | | | |
| 95 | | | | | | | | | | | | 13.7 | | | | | | | | | |
| 96 | | | | | | | | | | | | 15.6 | | | | | | | | | |
| 97 | | | | | | | | | | | | 14.8 | | | | | | | | | |
| 98 | | | | | | | | | | | | 12.7 | | | | | | | | | |
| 99 | | | | | | | | | | | | 13.3 | | | | | | | | | |
| 100 | | | | | | | | | | | | 14.1 | | | | | | | | | |

**Table A6.6b. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Quagga Mussel Raw Length (mm) Data.**

| Zone | Zone E | | | Zone F | | | Zone G | | | Zone H | | | Zone H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
| Median Length | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean Length | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | |
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**Table A6.6b. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Quagga Mussel Raw Length (mm) Data.**

| Zone | Zone E | | | Zone F | | | Zone G | | | Zone H | | | Zone H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
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**Table A6.6b. Onondaga Lake Dreissenid Mussel Survey Fall 2007 - Quagga Mussel Raw Length (mm) Data.**

| Zone | Zone E | | | Zone F | | | Zone G | | | Zone H | | | Zone H | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transect | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 1 | | | Transect 2 | | |
| Water Depth | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 | 0 - 1.5 | 1.5 - 3 | 3 - 4.5 |
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FIGURES

**Figure A6.1 - Seneca River Dreissenid Mussel Survey – Length Frequency Distribution by Transect (04’-07’)**

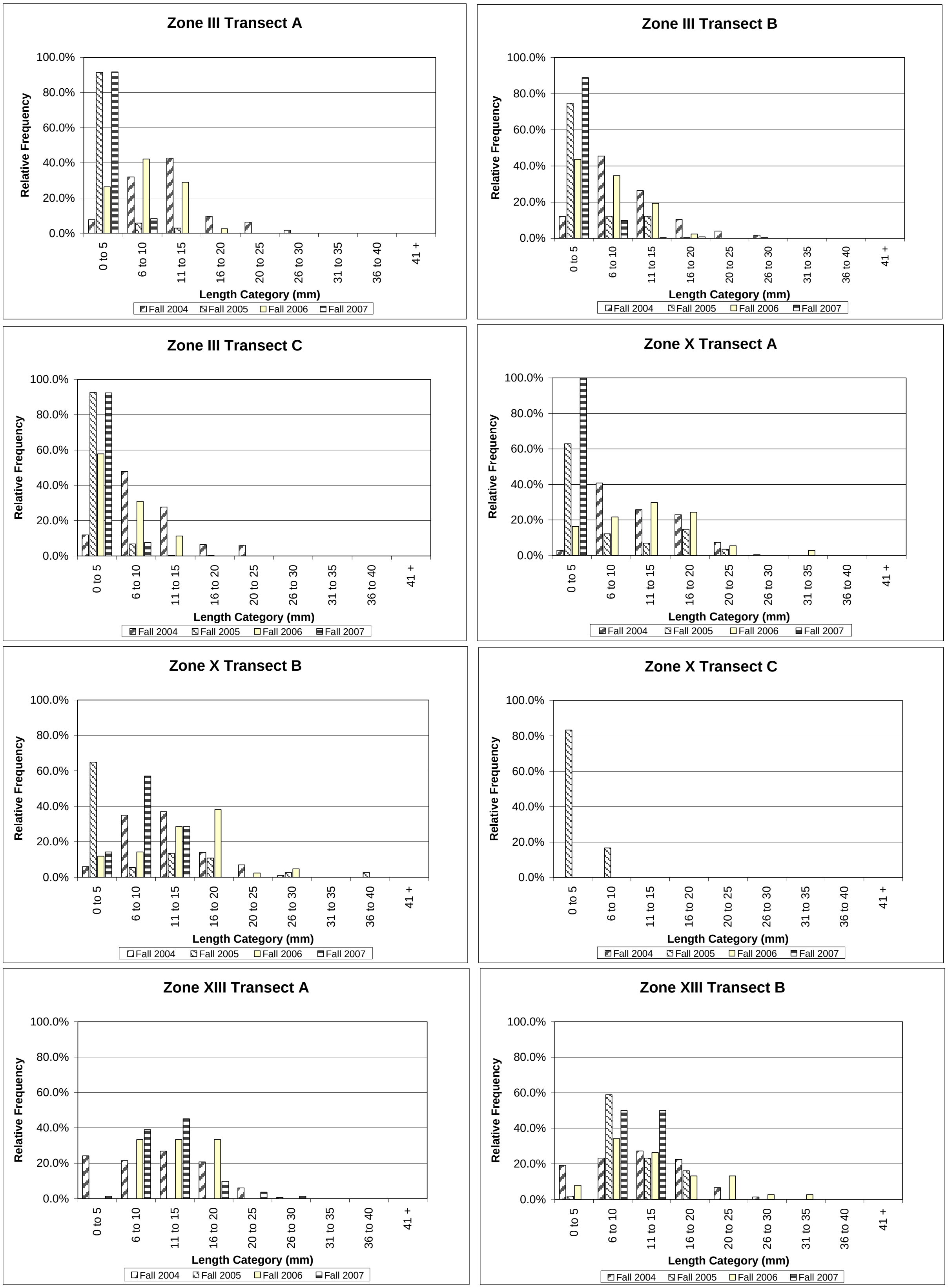
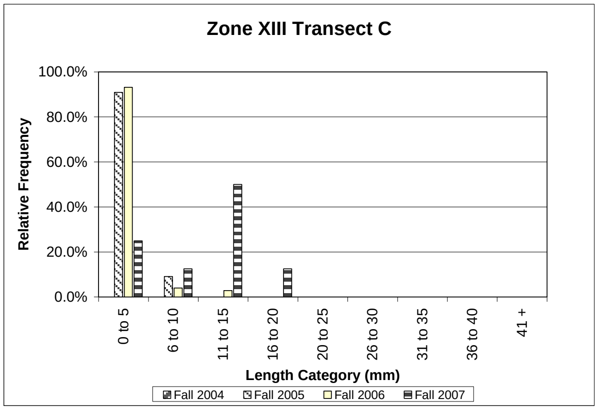
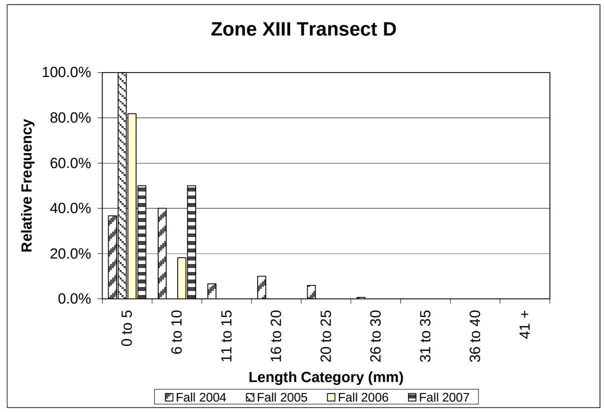
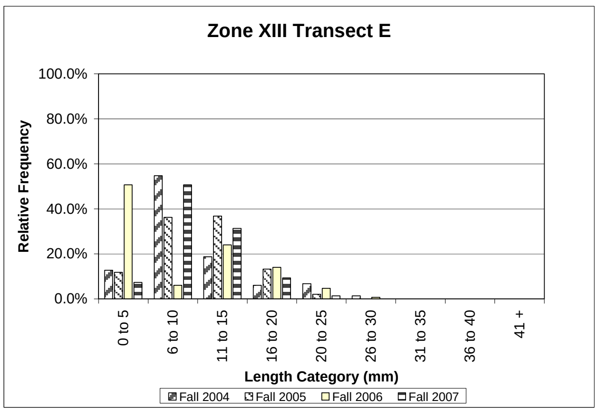
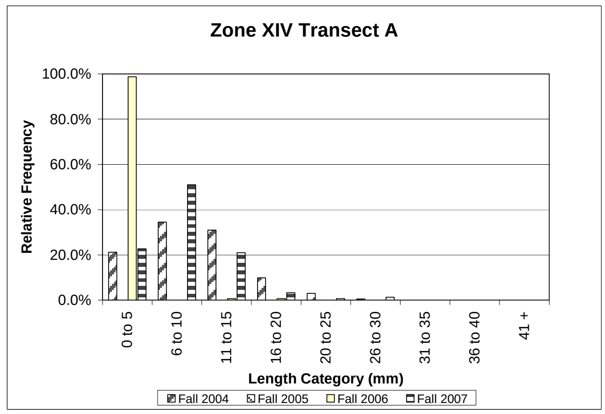


**Figure A6.1 - Seneca River Dreissenid Mussel Survey – Length Frequency Distribution by Transect (04'-07') (continued)**



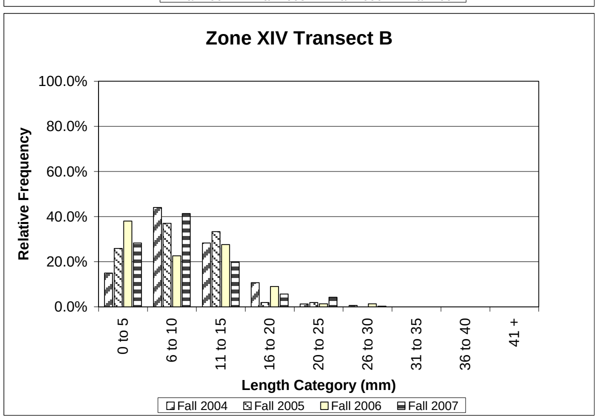



**Figure A6.2 – Seneca River Dreissenid Mussel Survey Fall 2007 – Length Frequency Distribution by Transect for Zebra and Quagga Mussels**

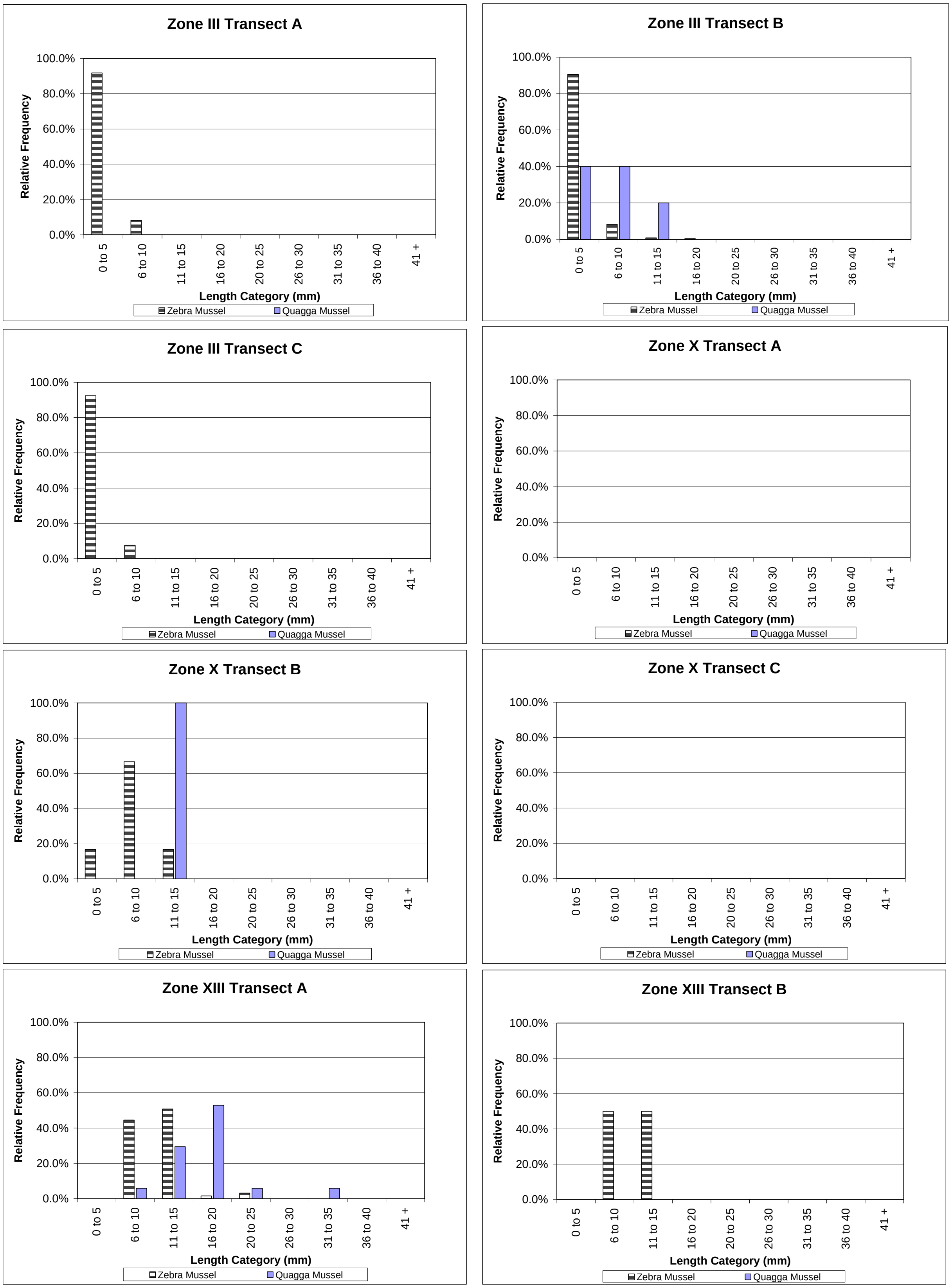
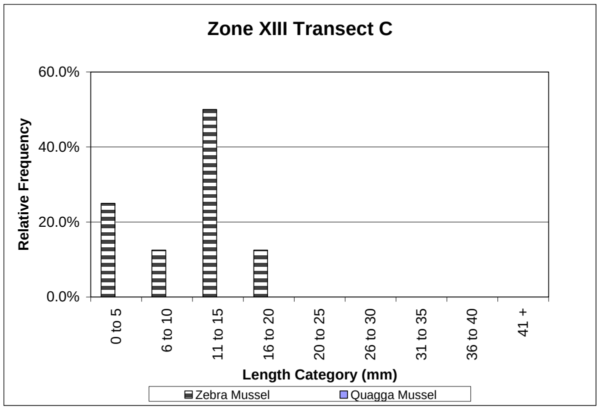
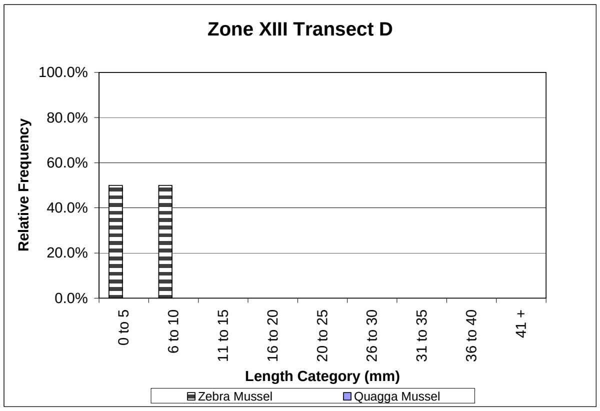
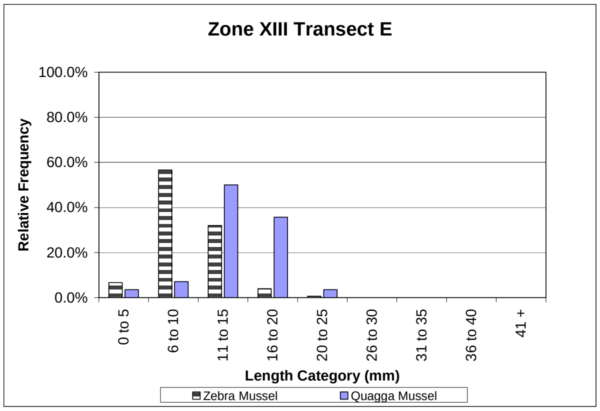
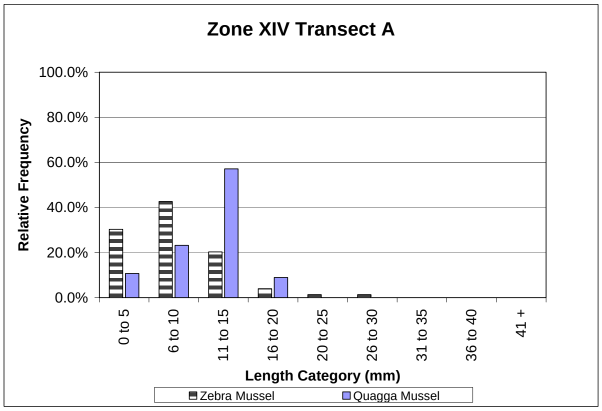


**Figure A6.2 – Seneca River Dreissenid Mussel Survey Fall 2007 – Length Frequency Distribution by Transect for Zebra and Quagga Mussels (continued)**



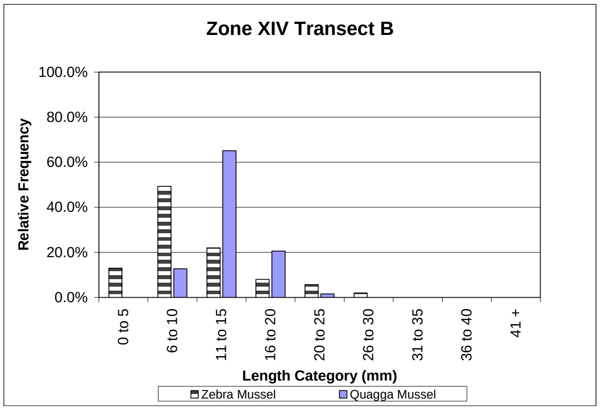



**Figure A6.3 – Onondaga Lake Dreissenid Mussel Survey Fall 2007 – Length Frequency Distribution by Zone (All Transects) and Depth Range/Category (All Depths) for Zebra and Quagga Mussel**

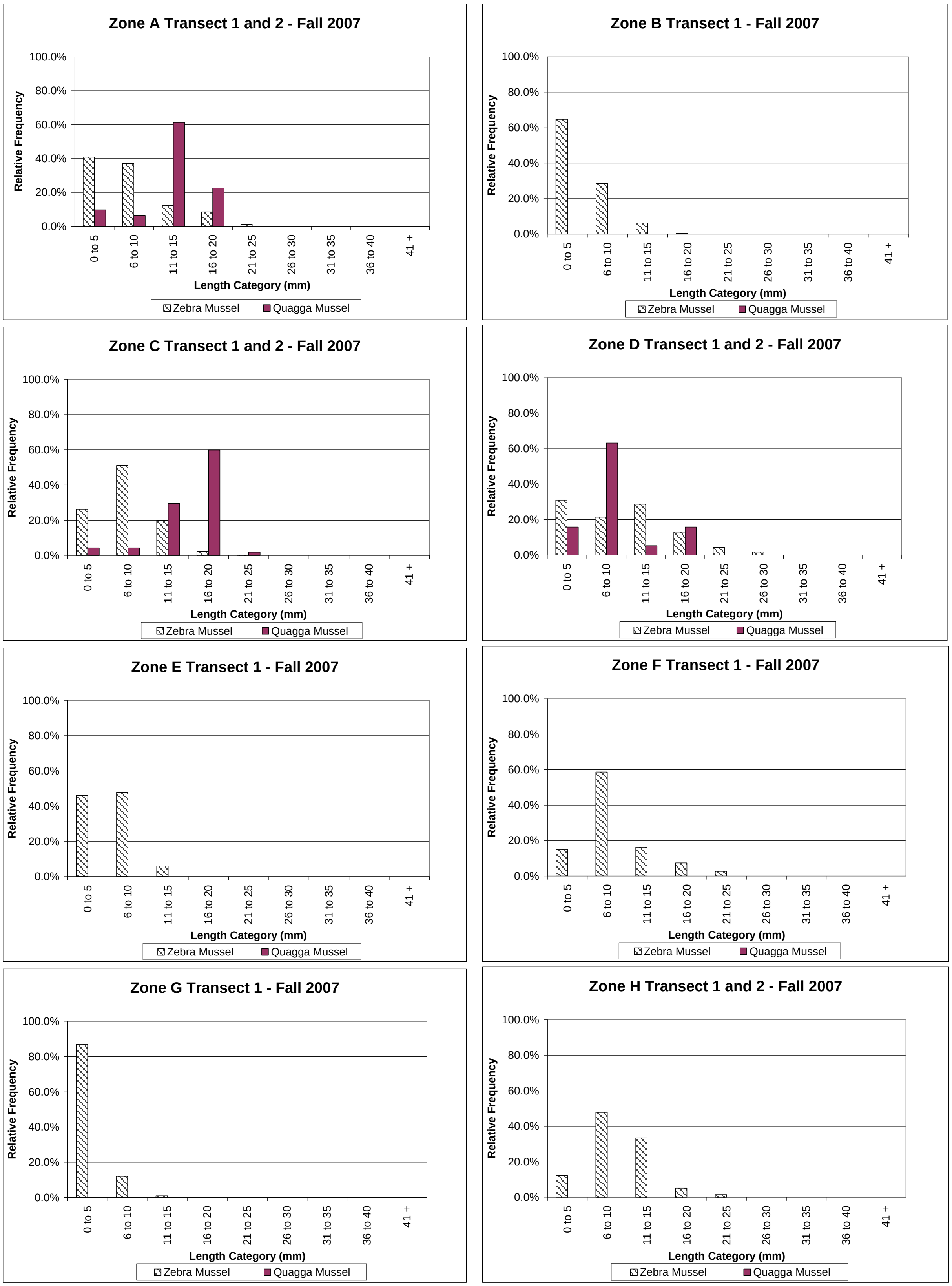


**Figure A6.4 – Onondaga Lake Dreissenid Mussel Survey – Fall 2002, 2005, 2006 and 2007 Comparison of Length Frequency Distribution by Zone (All Transects) and Depth Range/Category (All Depths)**

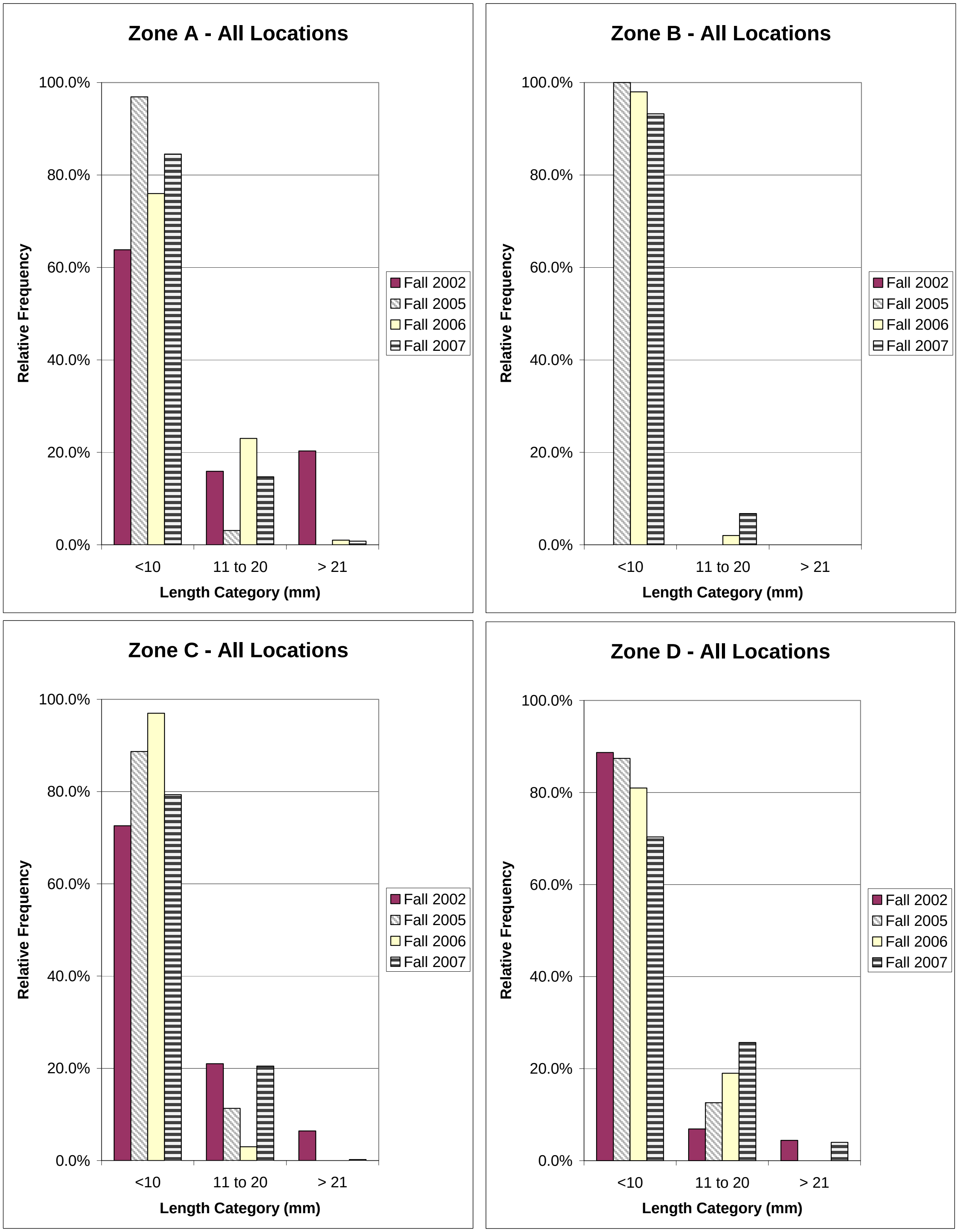
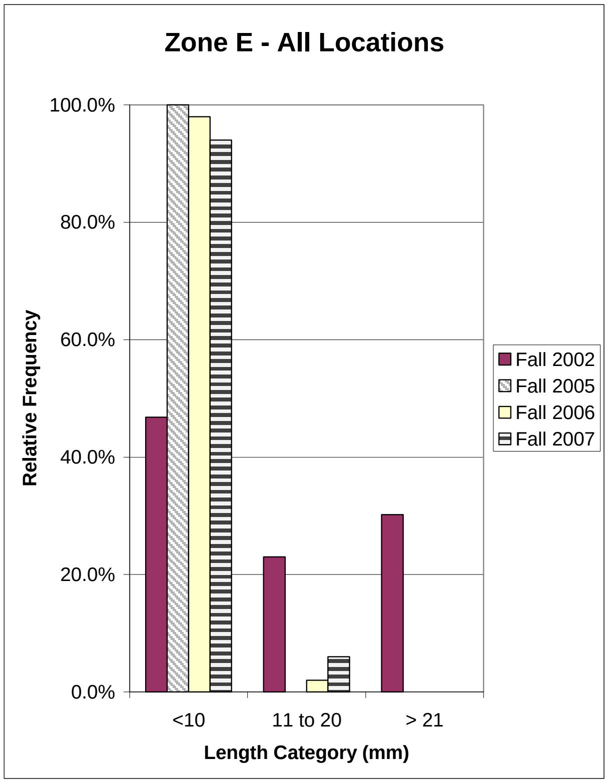
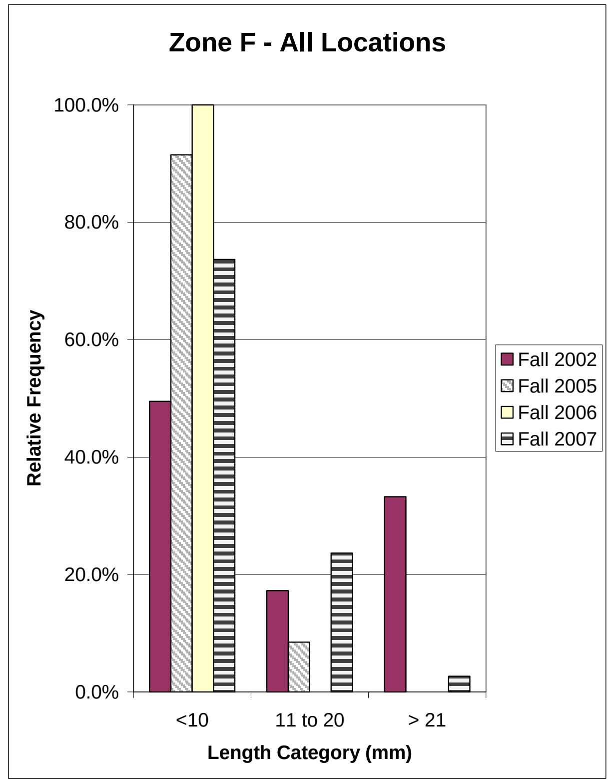
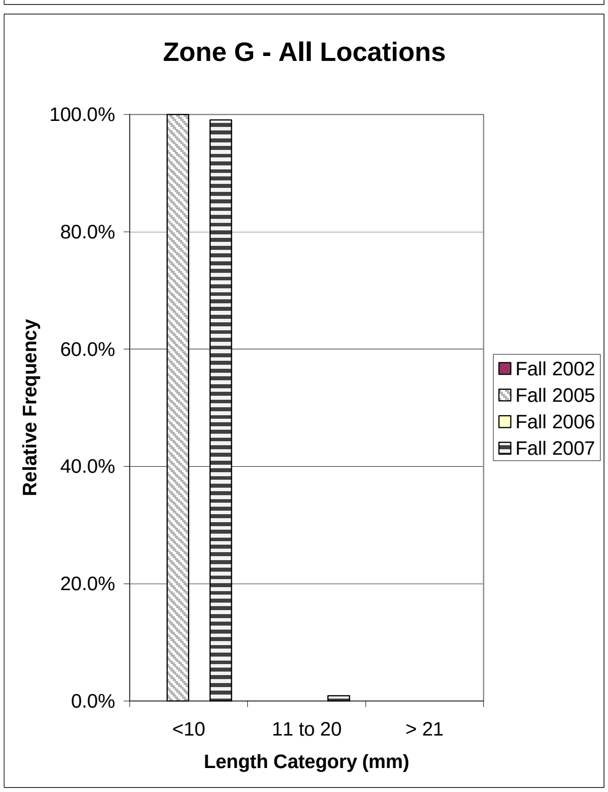


**Figure A6.4 – Onondaga Lake Dreissenid Mussel Survey – Fall 2002, 2005, 2006 and 2007 Comparison of Length Frequency Distribution by Zone (All Transects) and Depth Range/Category (All Depths) (continued)**



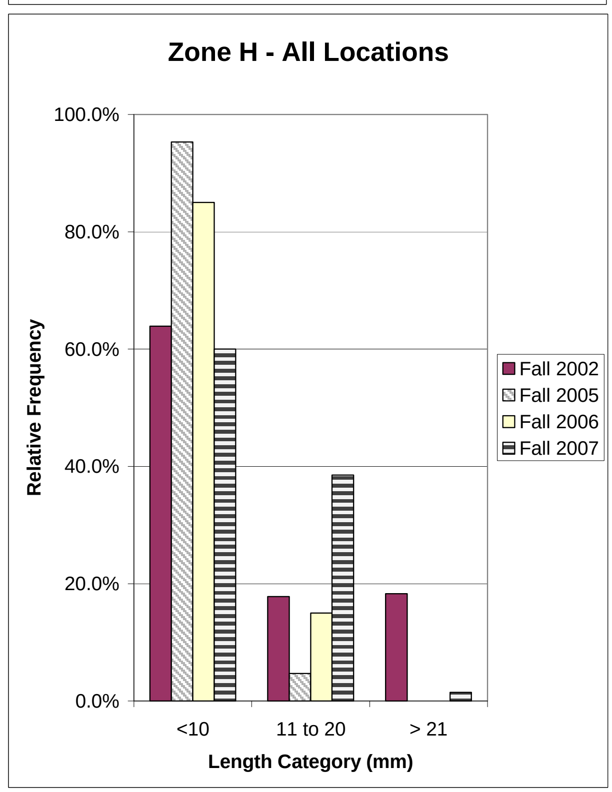



**Figure A6.5 – Onondaga Lake Dreissenid Mussel Survey – Fall 2002, 2005, 2006 and 2007 Comparison of Length Frequency Distribution by Zone (All Transects) and Depth Range/Category**

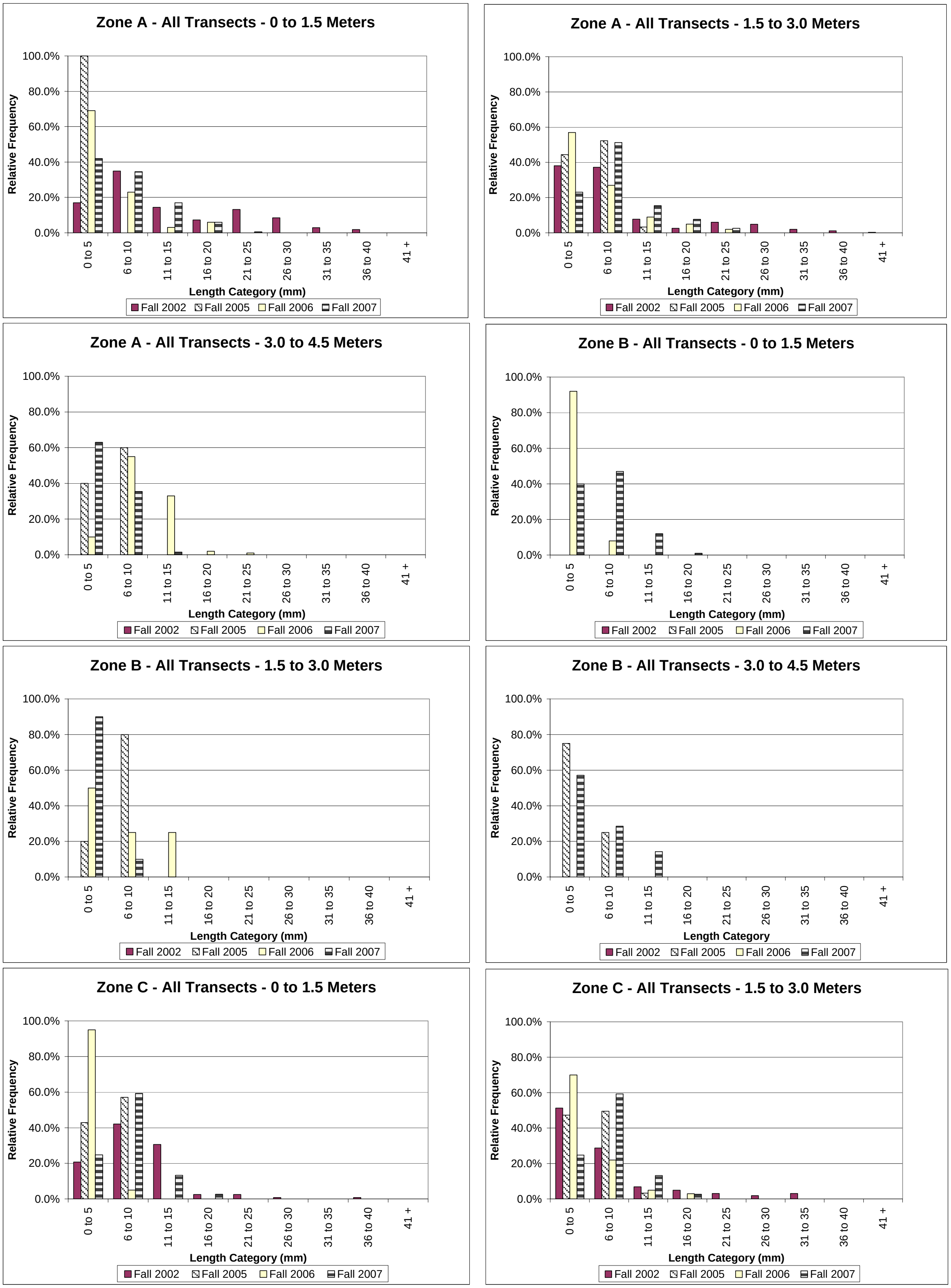
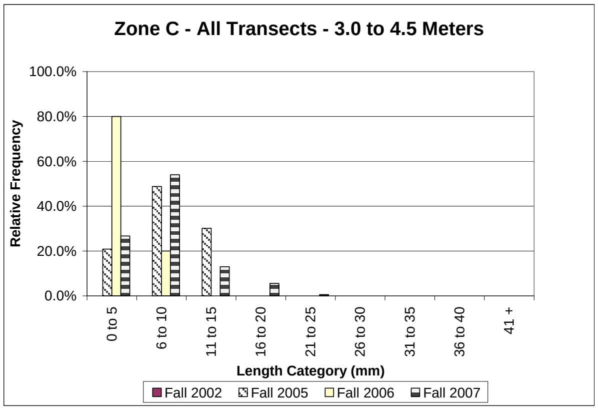
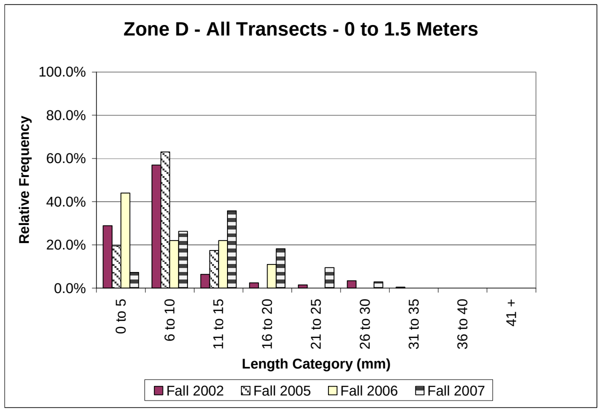
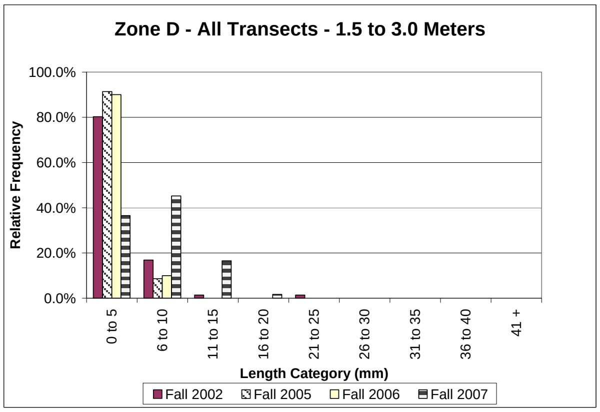
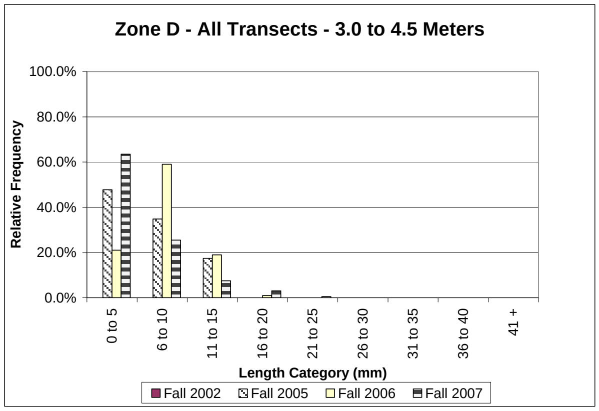


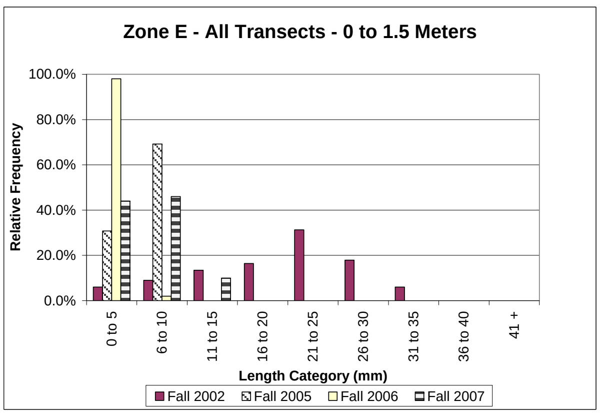
**Figure A6.5 – Onondaga Lake Dreissenid Mussel Survey – Fall 2002, 2005, 2006 and 2007 Comparison of Length Frequency Distribution by Zone (All Transects) and Depth Range/Category (continued)**

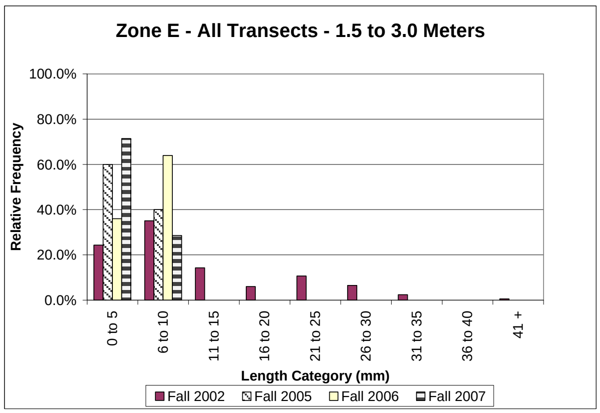


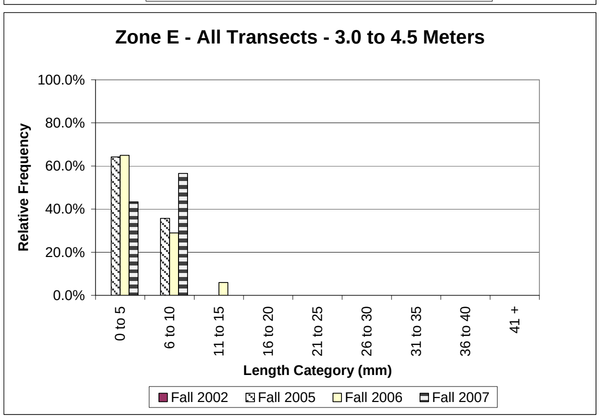



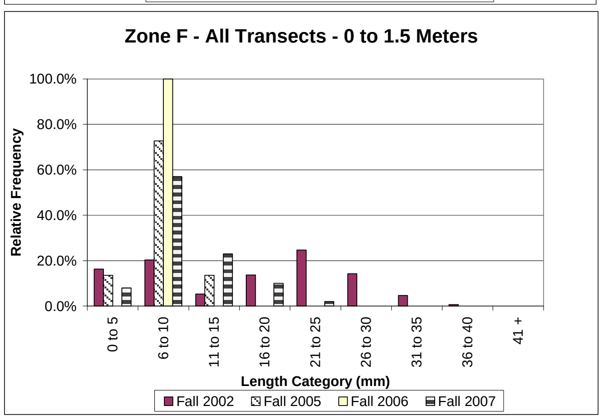
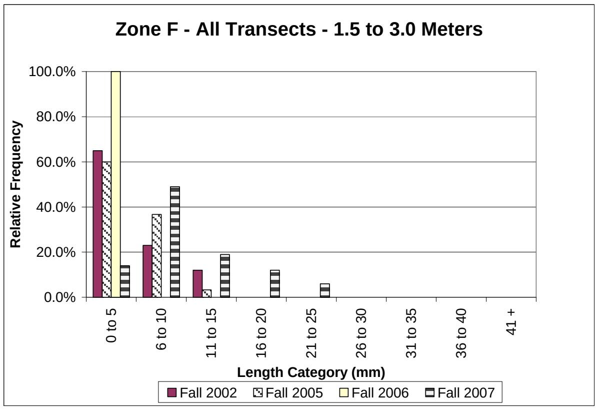
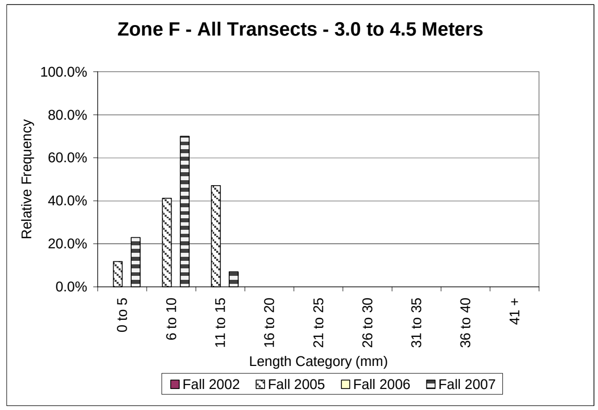
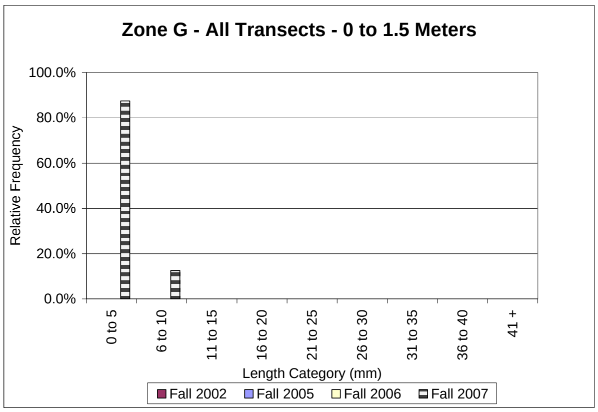
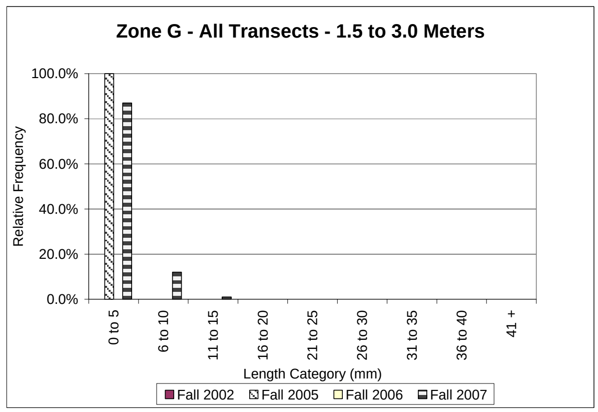



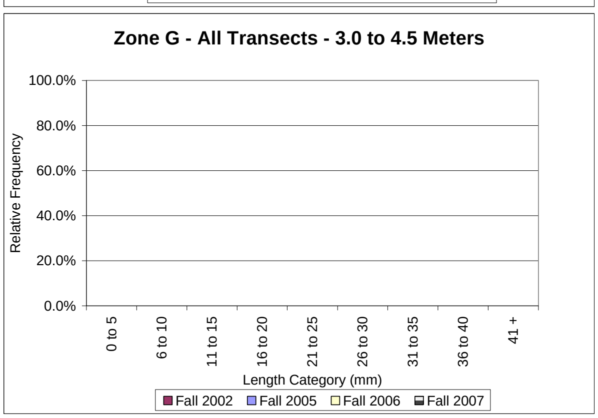
**Figure A6.5 – Onondaga Lake Dreissenid Mussel Survey – Fall 2002, 2005, 2006 and 2007 Comparison of Length Frequency Distribution by Zone (All Transects) and Depth Range/Category (continued)**

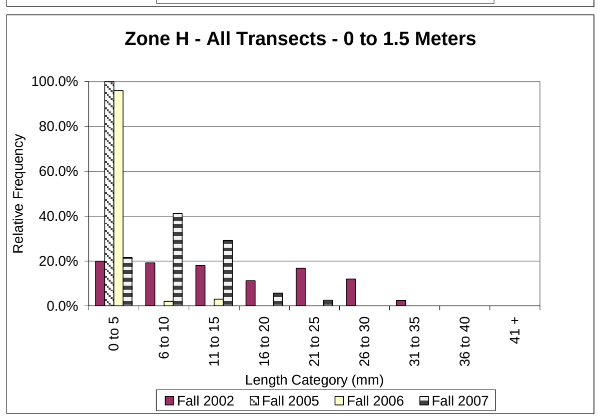


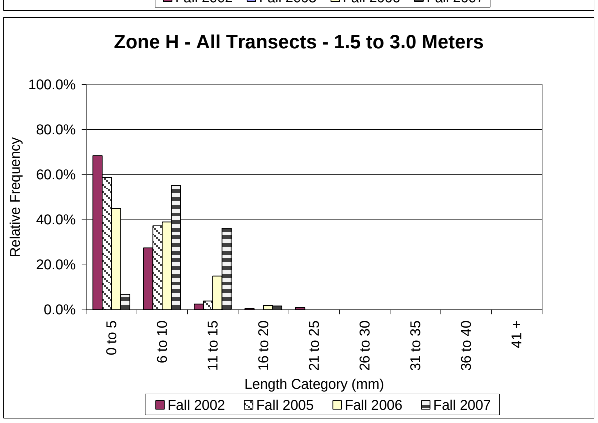



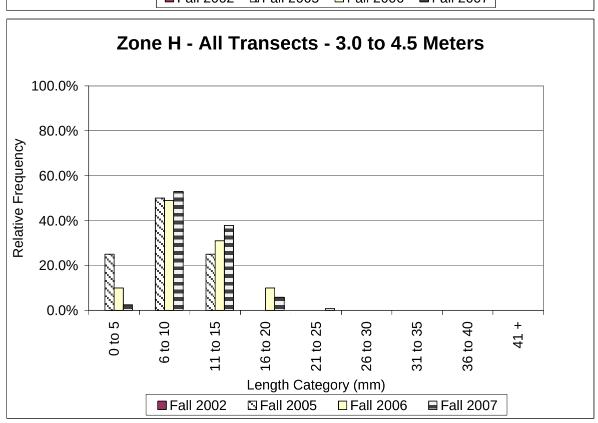



# APPENDIX 7: BIBLIOGRAPHY OF MATERIAL PERTAINING TO ONONDAGA LAKE, NEW YORK

# APPENDIX 7: BIBLIOGRAPHY OF MATERIAL PERTAINING TO ONONDAGA LAKE, NEW YORK

*(Revised July 2008)*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# APPENDIX 8: FISH MONITORING

# DATA TABLES AND FIGURES

## A8-1 DATA TABLES AND FIGURES

This Appendix includes the fish data tables and figures as part of the 2007 Ambient Monitoring Program. For a discussion of the methods, refer to Appendix I of the 2007 Ambient Monitoring Program report.

## A8-2 DATA INTEPRETATION: METRICS

As described in the Data Analysis and Interpretation Plan (Appendix 5) the fish data were evaluated to test specific hypotheses related to the lake improvement efforts. A series of metrics were used to evaluate the AMP fisheries data. Selected metrics examine species composition and community structure, system function and health, and trophic structure. The following metrics were used to track changes in the Onondaga Lake fish community:

***Species structure and composition***

- Species Richness
- Diversity / Community Structure (relative abundance)
- Pollution Tolerance
- Thermal Guilds

***Trophic structure***

- Relative Proportion of Trophic Guild

***System function***

- Number of Reproducing Species
- Recruitment

***Health***

- Size
- Growth
- Relative Weight
- Deformities, erosion, lesions, tumors and fungal infections

Refer to Chapter 5 of this Annual AMP Report for discussion of the 2007 results and metrics

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# APPENDIX 8: TABLES

**Table 8-1.** 2007 Onondaga Lake Fish Community Sampling Plan

| Component | Methodology/Gear | Sampling Objectives | Location and Number of Samples | Timing | Changes |
|---|---|---|---|---|---|
| Pelagic Larvae | Modified double oblique Miller high-speed trawl, with flow meter attached, collected during the day in the pelagic zone. | Determine species richness | - 4 double oblique tows in each basin (North and South) per event.<br><br>- Tows will sample water depths from the surface to 5.5 meters.<br><br>-Total No. of events = 8<br>-Total No. of samples = 64 | - Daytime<br><br>- Bi-weekly<br><br>- April (when water temps are 7-8°C) through end of July | - No change from previous year |
| Juvenile Fish | 50' x 4' x 1/4" bag seine swept into shore in littoral zone. | Determine community structure and species richness | - 5 strata with 3 sites in each strata and 1 sweep at each site.<br><br>- No. of Sites = 15<br>- Total No. of events = 6<br>- Total No. of samples = 90 | - Daytime<br><br>- Every 3 weeks<br><br>- July - October | - No change from previous year |
| Nesting Fish | Lake wide nest survey | Document spatial distribution and species composition | - Entire perimeter of lake divided into 24 equal length sections.<br><br>- Total No. of events = 1<br>- Total No. of samples = 24 | - Once in June when water temperature is between 15 and 20 °C | - No change from previous year |
| Adult Fish Littoral Zone | Boat mounted electrofisher in the littoral zone at night. | Determine community structure, species richness, CPUE, and relative abundance | - Entire perimeter of lake shocked in 24 contiguous transects<br><br>- Alternating all fish/gamefish transects<br><br>- Total No. of events = 2<br>- Total No. of samples = 48 | - Night-time.<br><br>- Twice per year; Spring and Fall.<br><br>- Water temp between 15 and 21 °C | - No change from previous year |
| Adult Fish Profundal Zone | Experimental gill nets of standard NYSDEC dimensions. | Determine community structure and species richness | - One net per strata<br><br>- Nets set on bottom parallel to shore at a water depth of 4-5m for two hours.<br><br>- Total No. of events = 2<br>- Total No. of samples = 10 | - During the day<br>- Twice per year, within one week of littoral electrofishing | - No change from previous year |
| Angler Census | Angler diary program and bass tournament surveys. | Determine catch rates, species composition. Attitudes and opinions over the AMP. | - Recruit diary participants at fish & game clubs and fishing organizations<br><br>- Tournaments will be surveyed at time of weigh-in | - Issued annually and collected at end of fishing season (fall)<br><br>- Tournament schedule TBA | - No change from previous year |

**Table A8-2. Guild and Tolerance Designations for Species Collected from Surveys in Onondaga Lake, 2000-2007.**

| Common name | Trophic Guild | Pollution Tolerance | Thermal Guild | Reproductive Guild |
|---|---|---|---|---|
| **Alewife** | Planktivore | Moderate | Cool | Nonguarder, open substrate spawner, phyto-lithophil |
| **Banded killifish** | Planktivore/invertivore | Moderate | Warm | Nonguarder, open substrate spawner, phytophil |
| **Black crappie** | Invertivore/Piscivore | Tolerant | Warm | Guarder, nest spawner, phytophil |
| **Black Bullhead** | Invertivore/Piscivore | Moderately Tolerant | Warm | Guarder, nest spawner, phytophil |
| **Bluegill** | Invertivore | Tolerant | Warm | Guarder, nest spawner, lithophil |
| **Bluntnose minnow** | Detritivore | Moderate | - | Guarder, nest spawner, speleophil |
| **Bowfin** | Piscivore | Tolerant[1] | Warm | Guarder, nest spawner, phytophil |
| **Brook silverside** | Planktivore/invertivore | - | Warm | Nonguarder, open substrate spawner, phyto-lithophil |
| **Brook stickleback** | Planktivore/invertivore | - | Cool | Guarder, nest spawner, ariadnophil |
| **Brown bullhead** | Invertivore/Piscivore | Tolerant | Warm | Guarder, nest spawner, speleophil |
| **Brown trout** | Invertivore/Piscivore | Moderately Intolerant | Cold | Nonguarder, brood hider, lithophil |
| **Carp** | Benthic Invertivore | Tolerant | Warm | Nonguarder, open substrate spawner, phytophil |
| **Channel catfish** | Invertivore/Piscivore | Moderately Tolerant | Warm | Guarder, nest spawner, speleophil |
| **Emerald shiner** | Planktivore | - | Warm | Nonguarder, open substrate spawner, pelagophil |
| **Fathead minnow** | Invertivore | Intolerant | Warm | Guarder, nest spawner, speleophil |
| **Freshwater drum** | Invertivore/Piscivore | Moderate[1] | Warm | Nonguarder, open substrate spawner, pelagophil |
| **Gizzard shad** | Detritivore | Moderately Tolerant[3] | Warm | Nonguarder, open substrate spawner, litho-pelagophil |
| **Golden shiner** | Planktivore/invertivore | Tolerant | Cool | Nonguarder, open substrate spawner, phytophil |
| **Greater Redhorse** | Benthic Invertivore | Intolerant | Cool | Nonguarder, open substrate spawner, lithophil |
| **Johnny darter** | Invertivore | Moderate[1] | Cool | Guarder, nest spawner, speleophil |
| **Lake Sturgeon** | Benthic Invertivore | Moderate[1] | Cold/Cool | Nonguarder, open substrate spawner, lithophil |
| **Largemouth bass** | Piscivore | Tolerant | Warm | Guarder, nest spawner, phytophil |
| **Logperch** | Invertivore | Moderate[1] | Cool/Warm | Nonguarder, open substrate spawner, psammophil |
| **Longnose dace** | Planktivore/invertivore | Moderately Intolerant | Cool | Nonguarder, brood hider, lithophil |
| **Longnose gar** | Invertivore/Piscivore | Tolerant[1] | Warm | Nonguarder, open substrate spawner, phytophil |
| **Northern hog sucker** | Benthic Invertivore | Moderately Intolerant | Cool | Nonguarder, open substrate spawner, lithophil |
| **Northern pike** | Piscivore | Moderate | Cool | Nonguarder, open substrate spawner, phytophil |

**Table A8-2. Guild and Tolerance Designations for Species Collected from Surveys in Onondaga Lake, 2000-2007. (continued)**

| Common name | Trophic Guild | Pollution Tolerance | Thermal Guild | Reproductive Guild |
|---|---|---|---|---|
| **Pumpkinseed** | Invertivore | Tolerant | Warm | Guarder, nest spawner, lithophil |
| **Quillback** | Benthic Invertivore | Moderate | Warm | Nonguarder, open substrate spawner, litho-pelagophil |
| **Rainbow trout** | Invertivore/Piscivore | Moderately Intolerant[3] | Cold | Nonguarder, brood hider, lithophil |
| **Rock bass** | Invertivore/Piscivore | Moderate | Warm | Guarder, nest spawner, lithophil |
| **Rudd** | Invertivore | Tolerant | Warm | Nonguarder, open substrate spawner, phytophil |
| **Shorthead redhorse** | Benthic Invertivore | Moderately Tolerant[3] | Cool | Nonguarder, open substrate spawner, lithophil |
| **Smallmouth bass** | Piscivore | Moderate | Cool | Guarder, nest spawner, lithophil |
| **Tessellated darter** | Invertivore | Moderate | Cool | Guarder, nest spawner, speleophil |
| **Tiger muskellunge** | Piscivore | Moderate[1] | Cool | Sterile hybrid |
| **Trout perch** | Invertivore/Piscivore | - | Cold | Nonguarder, open substrate spawner, lithophil |
| **Walleye** | Piscivore | Moderately Tolerant[3] | Cool | Nonguarder, open substrate spawner, lithophil |
| **White perch** | Invertivore/Piscivore | Tolerant | Warm | Nonguarder, open substrate spawner, phyto-lithophil |
| **White sucker** | Benthic Invertivore | Moderately Tolerant | Cool | Nonguarder, open substrate spawner, lithophil |
| **Yellow Bullhead** | Invertivore/Piscivore | Tolerant | Warm | Guarder, nest spawner, speleophil |
| **Yellow perch** | Invertivore/Piscivore | Moderately Tolerant | Cool | Nonguarder, open substrate spawner, phyto-lithophil |

* Notes: brown and rainbow trout trophic guilds are for lakes. Not all species were able to be grouped into tolerance categories or thermal guilds.

Reproductive guild substrate types: lithophils (sediment), phytophils (plant material, live or dead), speleophils (holes, crevices), pelagophils (openwater), psammophils (sand) and ariadnophils (specialised nest building that include some level of parent

1 EPA 1993

2 Smith 1986

3 Inferred from combination of EPA designation for these species and the designation of similar species in Whittier and Hughes.

**Table A8-3(a-c). Whole Lake Electrofishing CPUE and relative abundance in 2007 for each sampling event (spring and fall).**

*Note: CPUE for gamefish (bolded) is calculated from all 24 transects. CPUE for non-gamefish are calculated from only the one-half of the transects where all fish are collected (every other transect). Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from the combination of the number of fish netted and estimates of the number missed. Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water.*

a.) 2007 Entire year

| Species | Mean CPUE | SE | Total fish | Relative abundance with clupeids | Relative abundance without clupeids |
|---|---|---|---|---|---|
| Gizzard shad | 194.6 | 72.1 | 1026 | 42.7% | - |
| Alewife | 74.4 | 48.3 | 345 | 16.3% | - |
| **Pumpkinseed** | 38.7 | 4.3 | 379 | 8.5% | 20.7% |
| White sucker | 21.7 | 5.4 | 109 | 4.8% | 11.6% |
| Carp | 20.6 | 4.8 | 96 | 4.5% | 11.0% |
| White perch | 19.4 | 5.4 | 94 | 4.3% | 10.4% |
| **Smallmouth bass** | 18.1 | 2.3 | 176 | 4.0% | 9.7% |
| **Yellow perch** | 17.9 | 2.4 | 174 | 3.9% | 9.6% |
| **Largemouth bass** | 14.2 | 1.7 | 137 | 3.1% | 7.6% |
| **Bluegill** | 13.5 | 2.9 | 133 | 3.0% | 7.2% |
| **Brown bullhead** | 10.5 | 1.7 | 101 | 2.3% | 5.6% |
| Longnose gar | 2.3 | 1.4 | 11 | 0.5% | 1.2% |
| Bowfin | 2.1 | 0.7 | 10 | 0.5% | 1.1% |
| **Channel catfish** | 1.7 | 0.6 | 16 | 0.4% | 0.9% |
| Freshwater drum | 1.2 | 0.5 | 6 | 0.3% | 0.7% |
| Shorthead redhorse | 1.2 | 0.6 | 6 | 0.3% | 0.7% |
| **Rock bass** | 1.2 | 0.4 | 12 | 0.3% | 0.7% |
| **Walleye** | 1.1 | 0.5 | 11 | 0.2% | 0.6% |
| Golden shiner | 0.6 | 0.3 | 3 | 0.1% | 0.3% |
| Northern hog sucker | 0.4 | 0.3 | 2 | 0.1% | 0.2% |
| Rudd | 0.2 | 0.2 | 1 | 0.1% | 0.1% |
| **Northern pike** | 0.2 | 0.2 | 2 | 0.0% | 0.1% |

**Table A8-3(a-c). Whole Lake Electrofishing CPUE and relative abundance in 2007 for each sampling event (spring and fall). (continued)**

*Note: CPUE for gamefish (bolded) is calculated from all 24 transects. CPUE for non-gamefish are calculated from only the one-half of the transects where all fish are collected (every other transect). Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from the combination of the number of fish netted and estimates of the number missed. Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water.*

b.) 2007 Spring

| Species | Mean CPUE | SE | Total fish | Relative abundance with clupeids | Relative abundance without clupeids |
|---|---|---|---|---|---|
| Gizzard shad | 282.3 | 115.1 | 705 | 51.2% | - |
| Alewife | 55.4 | 16.2 | 142 | 10.1% | - |
| **Pumpkinseed** | 53.8 | 7.1 | 275 | 9.8% | 25.2% |
| Carp | 41.0 | 9.5 | 96 | 7.4% | 19.2% |
| White sucker | 21.6 | 7.7 | 54 | 3.9% | 10.1% |
| White perch | 20.5 | 5.5 | 50 | 3.7% | 9.6% |
| **Yellow perch** | 17.1 | 3.1 | 87 | 3.1% | 8.0% |
| **Largemouth bass** | 14.9 | 2.4 | 76 | 2.7% | 7.0% |
| **Bluegill** | 14.5 | 2.8 | 72 | 2.6% | 6.8% |
| **Smallmouth bass** | 12.2 | 2.0 | 61 | 2.2% | 5.7% |
| **Brown bullhead** | 10.9 | 2.7 | 54 | 2.0% | 5.1% |
| **Walleye** | 1.9 | 0.9 | 10 | 0.3% | 0.9% |
| Golden shiner | 1.2 | 0.6 | 3 | 0.2% | 0.6% |
| Freshwater drum | 0.9 | 0.6 | 2 | 0.2% | 0.4% |
| Shorthead redhorse | 0.8 | 0.5 | 2 | 0.2% | 0.4% |
| Bowfin | 0.8 | 0.5 | 2 | 0.2% | 0.4% |
| Longnose gar | 0.4 | 0.4 | 1 | 0.1% | 0.2% |
| **Channel catfish** | 0.4 | 0.3 | 2 | 0.1% | 0.2% |
| **Northern pike** | 0.2 | 0.2 | 1 | 0.0% | 0.1% |
| **Rock bass** | 0.2 | 0.2 | 1 | 0.0% | 0.1% |

**Table A8-3(a-c). Whole Lake Electrofishing CPUE and relative abundance in 2007 for each sampling event (spring and fall). (continued)**

*Note: CPUE for gamefish (bolded) is calculated from all 24 transects. CPUE for non-gamefish are calculated from only the one-half of the transects where all fish are collected (every other transect). Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from the combination of the number of fish netted and estimates of the number missed. Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water.*

c.) 2007 Fall

| Species | Mean CPUE | SE | Total fish | Relative abundance with clupeids | Relative abundance without clupeids |
|---|---|---|---|---|---|
| Gizzard shad | 114.3 | 49.5 | 321 | 31.6% | - |
| Alewife | 88.6 | 87.5 | 203 | 24.5% | - |
| **Smallmouth bass** | 24.7 | 3.7 | 115 | 6.8% | 15.6% |
| **Pumpkinseed** | 22.6 | 4.7 | 104 | 6.3% | 14.3% |
| White sucker | 21.5 | 5.5 | 55 | 6.0% | 13.6% |
| **Yellow perch** | 18.7 | 4.5 | 87 | 5.2% | 11.8% |
| White perch | 18.1 | 6.1 | 44 | 5.0% | 11.4% |
| **Largemouth bass** | 13.1 | 2.4 | 61 | 3.6% | 8.2% |
| **Bluegill** | 12.1 | 4.6 | 61 | 3.4% | 7.7% |
| **Brown bullhead** | 9.9 | 1.8 | 47 | 2.7% | 6.2% |
| Longnose gar | 4.2 | 2.9 | 10 | 1.2% | 2.7% |
| Bowfin | 3.5 | 1.4 | 8 | 1.0% | 2.2% |
| **Channel catfish** | 3.1 | 1.0 | 14 | 0.9% | 1.9% |
| **Rock bass** | 2.4 | 0.8 | 11 | 0.7% | 1.5% |
| Shorthead redhorse | 1.6 | 0.9 | 4 | 0.4% | 1.0% |
| Freshwater drum | 1.5 | 0.8 | 4 | 0.4% | 0.9% |
| Northern hog sucker | 0.8 | 0.5 | 2 | 0.2% | 0.5% |
| Rudd | 0.4 | 0.4 | 1 | 0.1% | 0.3% |
| **Walleye** | 0.2 | 0.2 | 1 | 0.1% | 0.1% |
| **Northern pike** | 0.2 | 0.2 | 1 | 0.1% | 0.1% |

## Table A8-3(d-f). Whole Lake Electrofishing number netted and number missed in 2007 for each sampling event (spring and fall).

*Note: Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water therefore no carp within netting distance are ever "missed". Lepomis sp. include bluegill and pumpkinseed because these species cannot be distinguished while still in the water, at night when missed. Although most fish in the genus Micropterus sp. (black bass) are large enough to be readily distinguishable when missed, some are not, these are counted under the designation "Micropterus sp.". Bullhead that are missed are assumed to be brown bullhead. The "number netted" for shad and alewives (clupeids) differs from the "total number" depicted in Tables A8-3(a-c) because the totals in those tables include both the netted and missed fish (see note under Table A8-3(a-c) title). For the clupeids in Tables A8-3(d-f) the sum of the "Number Missed" and "Number Netted" will equal the total number for those species in Table A8-3(a-c).*

d.) 2007 Entire year

| Species | Number Netted | Number Missed |
|---|---|---|
| **Pumpkinseed** | 379 | 509 |
| Gizzard shad | 211 | 815 |
| **Smallmouth bass** | 176 | 44 |
| **Yellow perch** | 174 | 172 |
| **Largemouth bass** | 137 | 43 |
| **Bluegill** | 133 | 20 |
| Carp | 128 | 0 |
| White sucker | 109 | 82 |
| **Brown bullhead** | 101 | 69 |
| White perch | 94 | 58 |
| Alewife | 37 | 308 |
| Bowfin | 19 | 6 |
| **Channel catfish** | 16 | 31 |
| Longnose gar | 12 | 104 |
| **Rock bass** | 12 | 0 |
| **Walleye** | 11 | 4 |
| Freshwater drum | 6 | 7 |
| Shorthead redhorse | 6 | 0 |
| Golden shiner | 3 | 0 |
| **Northern pike** | 2 | 1 |
| Northern hog sucker | 2 | 0 |
| Rudd | 1 | 0 |
| Lepomis sp. | 0 | 525 |
| Micropterus sp. | 0 | 5 |
| Tiger muskellunge | 0 | 3 |

**Table A8-3(d-f). Whole Lake Electrofishing number netted and number missed in 2007 for each sampling event (spring and fall) (continued).**

*Note: Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water therefore no carp within netting distance are ever "missed". Lepomis sp. include bluegill and pumpkinseed because these species cannot be distinguished while still in the water, at night when missed. Although most fish in the genus Micropterus sp. (black bass) are large enough to be readily distinguishable when missed, some are not, these are counted under the designation "Micropterus sp.". Bullhead that are missed are assumed to be brown bullhead. The "number netted" for shad and alewives (clupeids) differs from the "total number" depicted in Tables A8-3(a-c) because the totals in those tables include both the netted and missed fish (see note under Table A8-3(a-c) title). For the clupeids in Tables A8-3(d-f) the sum of the "Number Missed" and "Number Netted" will equal the total number for those species in Table A8-3(a-c).*

e.) 2007 Spring

| **Species** | **Number Netted** | **Number Missed** |
|---|---|---|
| **Pumpkinseed** | 275 | 95 |
| Gizzard shad | 105 | 600 |
| Carp | 96 | 0 |
| **Yellow perch** | 87 | 29 |
| **Largemouth bass** | 76 | 14 |
| **Bluegill** | 72 | 0 |
| **Smallmouth bass** | 61 | 0 |
| White sucker | 54 | 50 |
| **Brown bullhead** | 54 | 13 |
| White perch | 50 | 17 |
| Alewife | 37 | 105 |
| **Walleye** | 10 | 3 |
| Bowfin | 9 | 5 |
| Golden shiner | 3 | 0 |
| Freshwater drum | 2 | 0 |
| **Channel catfish** | 2 | 0 |
| Shorthead redhorse | 2 | 0 |
| Longnose gar | 1 | 0 |
| **Rock bass** | 1 | 0 |
| **Northern pike** | 1 | 0 |
| Lepomis sp. | 0 | 525 |
| Micropterus sp. | 0 | 5 |
| Tiger muskellunge | 0 | 2 |

**Table A8-3(d-f). Whole Lake Electrofishing number netted and number missed in 2007 for each sampling event (spring and fall) (continued).**

*Note: Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water therefore no carp within netting distance are ever "missed". Lepomis sp. include bluegill and pumpkinseed because these species cannot be distinguished while still in the water, at night when missed. Although most fish in the genus Micropterus sp. (black bass) are large enough to be readily distinguishable when missed, some are not, these are counted under the designation "Micropterus sp.". Bullhead that are missed are assumed to be brown bullhead. The "number netted" for shad and alewives (clupeids) differs from the "total number" depicted in Tables A8-3(a-c) because the totals in those tables include both the netted and missed fish (see note under Table A8-3(a-c) title). For the clupeids in Tables A8-3(d-f) the sum of the "Number Missed" and "Number Netted" will equal the total number for those species in Table A8-3(a-c).*

f.) 2007 Fall

| Species | Number Netted | Number Missed |
|---|---|---|
| **Smallmouth bass** | 115 | 44 |
| Gizzard shad | 106 | 215 |
| **Pumpkinseed** | 104 | 414 |
| **Yellow perch** | 87 | 143 |
| **Largemouth bass** | 61 | 29 |
| **Bluegill** | 61 | 20 |
| White sucker | 55 | 32 |
| **Brown bullhead** | 47 | 56 |
| White perch | 44 | 41 |
| Carp | 32 | 0 |
| **Channel catfish** | 14 | 31 |
| Longnose gar | 11 | 104 |
| **Rock bass** | 11 | 0 |
| Bowfin | 10 | 1 |
| Freshwater drum | 4 | 7 |
| Shorthead redhorse | 4 | 0 |
| Northern hog sucker | 2 | 0 |
| **Walleye** | 1 | 1 |
| **Northern pike** | 1 | 1 |
| Rudd | 1 | 0 |
| Alewife | 0 | 203 |
| Tiger muskellunge | 0 | 1 |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE.

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **a.) Entire year 2007** | **Stratum 1** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | Alewife | 7.58 | 7.58 | 2.3% | 0.0% |
| | **Bluegill** | 15.42 | 7.56 | 4.6% | 8.7% |
| | Bowfin | 3.59 | 1.80 | 1.1% | 2.0% |
| | **Brown bullhead** | 9.72 | 2.50 | 2.9% | 5.5% |
| | Carp | 18.09 | 12.08 | 5.4% | 10.2% |
| | Freshwater drum | 0.69 | 0.69 | 0.2% | 0.4% |
| | Gizzard shad | 148.27 | 129.42 | 44.5% | 0.0% |
| | **Largemouth bass** | 23.61 | 4.41 | 7.1% | 13.3% |
| | Longnose gar | 5.47 | 5.47 | 1.6% | 3.1% |
| | Northern hog sucker | 0.69 | 0.69 | 0.2% | 0.4% |
| | **Pumpkinseed** | 41.23 | 6.63 | 12.4% | 23.2% |
| | **Rock bass** | 2.09 | 1.51 | 0.6% | 1.2% |
| | Shorthead redhorse | 0.69 | 0.69 | 0.2% | 0.4% |
| | **Smallmouth bass** | 17.22 | 2.65 | 5.2% | 9.7% |
| | White perch | 10.62 | 0.17 | 3.2% | 6.0% |
| | White sucker | 13.46 | 6.76 | 4.0% | 7.6% |
| | **Yellow perch** | 15.10 | 4.06 | 4.5% | 8.5% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **b.) Spring 2007** | **Stratum 1** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | Alewife | 11.84 | 11.84 | 3.8% | 0.0% |
| | **Bluegill** | 13.39 | 3.06 | 4.3% | 7.3% |
| | Bowfin | 1.71 | 1.71 | 0.5% | 0.9% |
| | **Brown bullhead** | 9.26 | 5.79 | 2.9% | 5.0% |
| | Carp | 35.36 | 23.69 | 11.2% | 19.2% |
| | Gizzard shad | 118.37 | 118.37 | 37.6% | 0.0% |
| | **Largemouth bass** | 19.07 | 5.25 | 6.1% | 10.3% |
| | **Pumpkinseed** | 50.70 | 16.32 | 16.1% | 27.5% |
| | **Rock bass** | 0.85 | 0.85 | 0.3% | 0.5% |
| | **Smallmouth bass** | 14.98 | 5.23 | 4.8% | 8.1% |
| | White perch | 11.91 | 4.70 | 3.8% | 6.5% |
| | White sucker | 9.65 | 2.32 | 3.1% | 5.2% |
| | **Yellow perch** | 17.76 | 7.08 | 5.6% | 9.6% |

**Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)**

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **c.) Fall 2007** | **Stratum 1** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | Alewife | 3.87 | 3.87 | 1.1% | 0.0% |
| | **Bluegill** | 16.41 | 12.49 | 4.7% | 9.7% |
| | Bowfin | 5.54 | 3.22 | 1.6% | 3.3% |
| | **Brown bullhead** | 10.47 | 2.15 | 3.0% | 6.2% |
| | Freshwater drum | 1.29 | 1.29 | 0.4% | 0.8% |
| | Gizzard shad | 176.60 | 137.91 | 50.5% | 0.0% |
| | **Largemouth bass** | 27.14 | 7.06 | 7.8% | 16.0% |
| | Longnose gar | 11.16 | 11.16 | 3.2% | 6.6% |
| | Northern hog sucker | 1.29 | 1.29 | 0.4% | 0.8% |
| | **Pumpkinseed** | 33.62 | 7.40 | 9.6% | 19.9% |
| | **Rock bass** | 3.78 | 2.63 | 1.1% | 2.2% |
| | Shorthead redhorse | 1.29 | 1.29 | 0.4% | 0.8% |
| | **Smallmouth bass** | 18.81 | 3.83 | 5.4% | 11.1% |
| | White perch | 8.88 | 4.61 | 2.5% | 5.2% |
| | White sucker | 16.61 | 11.49 | 4.8% | 9.8% |
| | **Yellow perch** | 13.02 | 1.69 | 3.7% | 7.7% |

**Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)**

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **d.) Entire year 2007** | **Stratum 2** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | Alewife | 56.38 | 14.48 | 8.8% | 0.0% |
| | **Bluegill** | 3.70 | 1.17 | 0.6% | 2.4% |
| | Bowfin | 0.70 | 0.70 | 0.1% | 0.5% |
| | **Brown bullhead** | 10.03 | 2.35 | 1.6% | 6.6% |
| | Carp | 11.36 | 3.87 | 1.8% | 7.5% |
| | **Channel catfish** | 0.38 | 0.38 | 0.1% | 0.3% |
| | Freshwater drum | 1.53 | 1.53 | 0.2% | 1.0% |
| | Gizzard shad | 429.62 | 199.87 | 67.3% | 0.0% |
| | Golden shiner | 0.76 | 0.76 | 0.1% | 0.5% |
| | **Largemouth bass** | 13.50 | 1.54 | 2.1% | 8.9% |
| | Longnose gar | 2.10 | 2.10 | 0.3% | 1.4% |
| | **Pumpkinseed** | 30.66 | 4.75 | 4.8% | 20.1% |
| | **Rock bass** | 0.70 | 0.70 | 0.1% | 0.5% |
| | Shorthead redhorse | 1.53 | 1.53 | 0.2% | 1.0% |
| | **Smallmouth bass** | 12.10 | 2.89 | 1.9% | 7.9% |
| | **Walleye** | 1.82 | 1.17 | 0.3% | 1.2% |
| | White perch | 19.72 | 8.27 | 3.1% | 13.0% |
| | White sucker | 24.51 | 6.27 | 3.8% | 16.1% |
| | **Yellow perch** | 17.25 | 2.57 | 2.7% | 11.3% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **e.) Spring 2007** | **Stratum 2** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | Alewife | 117.87 | 29.87 | 12.2% | 0.0% |
| | **Bluegill** | 5.23 | 1.84 | 0.5% | 2.8% |
| | Bowfin | 1.48 | 1.48 | 0.2% | 0.8% |
| | **Brown bullhead** | 8.33 | 2.18 | 0.9% | 4.4% |
| | Carp | 23.93 | 8.29 | 2.5% | 12.6% |
| | Gizzard shad | 658.80 | 319.97 | 68.1% | 0.0% |
| | Golden shiner | 1.62 | 1.62 | 0.2% | 0.9% |
| | **Largemouth bass** | 14.49 | 4.25 | 1.5% | 7.6% |
| | **Pumpkinseed** | 50.70 | 9.18 | 5.2% | 26.6% |
| | Shorthead redhorse | 1.62 | 1.62 | 0.2% | 0.9% |
| | **Smallmouth bass** | 5.37 | 2.24 | 0.6% | 2.8% |
| | **Walleye** | 3.67 | 2.40 | 0.4% | 1.9% |
| | White perch | 20.09 | 8.66 | 2.1% | 10.6% |
| | White sucker | 29.07 | 9.83 | 3.0% | 15.3% |
| | **Yellow perch** | 24.80 | 5.21 | 2.6% | 13.0% |

**Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)**

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **f.) Fall 2007** | **Stratum 2** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | **Bluegill** | 2.23 | 1.45 | 0.7% | 1.9% |
| | **Brown bullhead** | 11.75 | 4.53 | 3.5% | 10.0% |
| | **Channel catfish** | 0.72 | 0.72 | 0.2% | 0.6% |
| | Freshwater drum | 2.90 | 2.90 | 0.9% | 2.5% |
| | Gizzard shad | 216.67 | 143.24 | 64.7% | 0.0% |
| | **Largemouth bass** | 13.14 | 3.48 | 3.9% | 11.1% |
| | Longnose gar | 3.98 | 3.98 | 1.2% | 3.4% |
| | **Pumpkinseed** | 11.27 | 2.45 | 3.4% | 9.6% |
| | **Rock bass** | 1.33 | 1.33 | 0.4% | 1.1% |
| | Shorthead redhorse | 1.45 | 1.45 | 0.4% | 1.2% |
| | **Smallmouth bass** | 19.09 | 5.58 | 5.7% | 16.2% |
| | White perch | 19.39 | 7.96 | 5.8% | 16.4% |
| | White sucker | 20.34 | 8.21 | 6.1% | 17.2% |
| | **Yellow perch** | 10.47 | 4.41 | 3.1% | 8.9% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **g.) Entire year 2007** | **Stratum 3** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | Alewife | 316.74 | 282.31 | 44.3% | 0.0% |
| | **Bluegill** | 3.68 | 2.93 | 0.5% | 2.1% |
| | Bowfin | 1.41 | 1.41 | 0.2% | 0.8% |
| | **Brown bullhead** | 21.78 | 5.72 | 3.1% | 12.6% |
| | Carp | 40.77 | 1.42 | 5.7% | 23.5% |
| | **Channel catfish** | 5.77 | 2.29 | 0.8% | 3.3% |
| | Freshwater drum | 2.64 | 0.18 | 0.4% | 1.5% |
| | Gizzard shad | 224.63 | 180.37 | 31.4% | 0.0% |
| | Golden shiner | 1.23 | 1.23 | 0.2% | 0.7% |
| | **Largemouth bass** | 8.21 | 2.60 | 1.2% | 4.7% |
| | Longnose gar | 2.46 | 2.46 | 0.3% | 1.4% |
| | **Pumpkinseed** | 25.01 | 7.28 | 3.5% | 14.4% |
| | **Rock bass** | 1.23 | 1.23 | 0.2% | 0.7% |
| | Rudd | 1.41 | 1.41 | 0.2% | 0.8% |
| | Shorthead redhorse | 2.81 | 2.81 | 0.4% | 1.6% |
| | **Smallmouth bass** | 11.61 | 1.97 | 1.6% | 6.7% |
| | **Walleye** | 2.54 | 1.73 | 0.4% | 1.5% |
| | White perch | 12.29 | 12.29 | 1.7% | 7.1% |
| | White sucker | 20.92 | 18.46 | 2.9% | 12.1% |
| | **Yellow perch** | 7.46 | 3.10 | 1.0% | 4.3% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **h.) Spring 2007** | **Stratum 3** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | Alewife | 72.49 | 6.17 | 10.4% | 0.0% |
| | **Bluegill** | 6.96 | 5.66 | 1.0% | 3.4% |
| | **Brown bullhead** | 30.83 | 9.57 | 4.4% | 15.2% |
| | Carp | 83.27 | 7.48 | 11.9% | 41.0% |
| | **Channel catfish** | 2.34 | 1.35 | 0.3% | 1.2% |
| | Freshwater drum | 3.03 | 3.03 | 0.4% | 1.5% |
| | Gizzard shad | 421.69 | 364.85 | 60.5% | 0.0% |
| | Golden shiner | 2.37 | 2.37 | 0.3% | 1.2% |
| | **Largemouth bass** | 10.39 | 2.97 | 1.5% | 5.1% |
| | Longnose gar | 2.37 | 2.37 | 0.3% | 1.2% |
| | **Pumpkinseed** | 24.98 | 10.72 | 3.6% | 12.3% |
| | **Smallmouth bass** | 6.08 | 1.20 | 0.9% | 3.0% |
| | **Walleye** | 3.13 | 3.13 | 0.5% | 1.5% |
| | White perch | 16.58 | 16.58 | 2.4% | 8.2% |
| | White sucker | 6.05 | 6.05 | 0.9% | 3.0% |
| | **Yellow perch** | 4.62 | 4.62 | 0.7% | 2.3% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **i.) Fall 2007** | **Stratum 3** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | Alewife | 525.54 | 525.54 | 73.5% | 0.0% |
| | Bowfin | 2.63 | 2.63 | 0.4% | 1.9% |
| | **Brown bullhead** | 10.60 | 5.63 | 1.5% | 7.7% |
| | **Channel catfish** | 9.22 | 4.32 | 1.3% | 6.7% |
| | Freshwater drum | 2.56 | 2.56 | 0.4% | 1.9% |
| | Gizzard shad | 52.13 | 21.45 | 7.3% | 0.0% |
| | **Largemouth bass** | 5.55 | 2.42 | 0.8% | 4.0% |
| | Longnose gar | 2.56 | 2.56 | 0.4% | 1.9% |
| | **Pumpkinseed** | 22.99 | 15.18 | 3.2% | 16.8% |
| | **Rock bass** | 2.56 | 2.56 | 0.4% | 1.9% |
| | Rudd | 2.63 | 2.63 | 0.4% | 1.9% |
| | Shorthead redhorse | 5.26 | 5.26 | 0.7% | 3.8% |
| | **Smallmouth bass** | 18.12 | 2.64 | 2.5% | 13.2% |
| | **Walleye** | 1.31 | 1.31 | 0.2% | 1.0% |
| | White perch | 7.67 | 7.67 | 1.1% | 5.6% |
| | White sucker | 34.09 | 28.98 | 4.8% | 24.8% |
| | **Yellow perch** | 9.49 | 4.39 | 1.3% | 6.9% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| j.) Entire year 2007 | Stratum 4 | | | | |
|---|---|---|---|---|---|
| | Species | Mean CPUE | SE | Relative abundance with clupeids | Relative abundance without clupeids |
| | Alewife | 33.98 | 22.71 | 10.9% | 0.0% |
| | **Bluegill** | 22.00 | 3.42 | 7.0% | 10.1% |
| | **Brown bullhead** | 6.01 | 3.18 | 1.9% | 2.8% |
| | Carp | 32.72 | 9.53 | 10.5% | 15.0% |
| | **Channel catfish** | 1.11 | 0.68 | 0.4% | 0.5% |
| | Freshwater drum | 1.41 | 1.41 | 0.5% | 0.6% |
| | Gizzard shad | 60.68 | 57.86 | 19.4% | 0.0% |
| | Golden shiner | 1.29 | 1.29 | 0.4% | 0.6% |
| | **Largemouth bass** | 12.97 | 4.10 | 4.1% | 5.9% |
| | **Pumpkinseed** | 47.21 | 7.41 | 15.1% | 21.6% |
| | **Rock bass** | 0.48 | 0.48 | 0.2% | 0.2% |
| | **Smallmouth bass** | 18.90 | 5.93 | 6.0% | 8.7% |
| | **Walleye** | 1.09 | 1.09 | 0.4% | 0.5% |
| | White perch | 42.94 | 27.48 | 13.7% | 19.7% |
| | White sucker | 12.56 | 9.98 | 4.0% | 5.8% |
| | **Yellow perch** | 17.76 | 5.66 | 5.7% | 8.1% |

**Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)**

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **k.) Spring 2007** | **Stratum 4**<br>**Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
|---|---|---|---|---|---|
| | Alewife | 65.12 | 44.13 | 14.1% | 0.0% |
| | **Bluegill** | 32.68 | 7.71 | 7.1% | 11.1% |
| | **Brown bullhead** | 5.60 | 2.65 | 1.2% | 1.9% |
| | Carp | 61.70 | 17.01 | 13.4% | 21.0% |
| | Freshwater drum | 2.62 | 2.62 | 0.6% | 0.9% |
| | Gizzard shad | 101.79 | 101.79 | 22.1% | 0.0% |
| | Golden shiner | 2.48 | 2.48 | 0.5% | 0.8% |
| | **Largemouth bass** | 18.50 | 7.69 | 4.0% | 6.3% |
| | **Pumpkinseed** | 79.88 | 16.00 | 17.3% | 27.1% |
| | **Smallmouth bass** | 12.01 | 4.18 | 2.6% | 4.1% |
| | **Walleye** | 2.05 | 2.05 | 0.4% | 0.7% |
| | White perch | 49.01 | 19.21 | 10.6% | 16.7% |
| | White sucker | 12.98 | 8.01 | 2.8% | 4.4% |
| | **Yellow perch** | 14.91 | 4.26 | 3.2% | 5.1% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **l.) Fall 2007** | **Stratum 4** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | **Bluegill** | 10.03 | 4.02 | 6.7% | 7.6% |
| | **Brown bullhead** | 6.51 | 3.99 | 4.4% | 4.9% |
| | **Channel catfish** | 2.39 | 1.46 | 1.6% | 1.8% |
| | Gizzard shad | 16.43 | 10.35 | 11.0% | 0.0% |
| | **Largemouth bass** | 6.45 | 3.10 | 4.3% | 4.9% |
| | **Pumpkinseed** | 9.54 | 8.11 | 6.4% | 7.2% |
| | **Rock bass** | 1.04 | 1.04 | 0.7% | 0.8% |
| | **Smallmouth bass** | 26.97 | 9.00 | 18.1% | 20.3% |
| | White perch | 36.49 | 36.49 | 24.5% | 27.5% |
| | White sucker | 12.16 | 12.16 | 8.2% | 9.2% |
| | **Yellow perch** | 21.18 | 14.36 | 14.2% | 16.0% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **m.) Entire year 2007** | **Stratum 5** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | **Bluegill** | 24.97 | 10.25 | 10.0% | 10.7% |
| | Bowfin | 4.81 | 2.35 | 1.9% | 2.1% |
| | **Brown bullhead** | 6.69 | 1.70 | 2.7% | 2.9% |
| | Carp | 5.96 | 5.96 | 2.4% | 2.6% |
| | **Channel catfish** | 2.50 | 0.98 | 1.0% | 1.1% |
| | Gizzard shad | 15.61 | 8.23 | 6.3% | 0.0% |
| | **Largemouth bass** | 11.22 | 1.24 | 4.5% | 4.8% |
| | Northern hog sucker | 1.23 | 1.23 | 0.5% | 0.5% |
| | **Northern pike** | 1.19 | 1.19 | 0.5% | 0.5% |
| | **Pumpkinseed** | 50.69 | 19.68 | 20.3% | 21.7% |
| | **Rock bass** | 1.79 | 1.14 | 0.7% | 0.8% |
| | Shorthead redhorse | 1.19 | 1.19 | 0.5% | 0.5% |
| | **Smallmouth bass** | 33.92 | 5.82 | 13.6% | 14.5% |
| | White perch | 15.58 | 10.65 | 6.2% | 6.7% |
| | White sucker | 39.53 | 27.22 | 15.8% | 16.9% |
| | **Yellow perch** | 32.88 | 7.32 | 13.2% | 14.0% |

**Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)**

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **n.) Spring 2007** | **Stratum 5** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | **Bluegill** | 14.46 | 3.23 | 6.7% | 6.9% |
| | **Brown bullhead** | 3.33 | 2.09 | 1.6% | 1.6% |
| | Carp | 12.03 | 12.03 | 5.6% | 5.7% |
| | Gizzard shad | 4.81 | 4.81 | 2.2% | 0.0% |
| | **Largemouth bass** | 10.25 | 5.59 | 4.8% | 4.9% |
| | **Northern pike** | 1.16 | 1.16 | 0.5% | 0.6% |
| | **Pumpkinseed** | 58.79 | 23.48 | 27.4% | 28.0% |
| | Shorthead redhorse | 2.41 | 2.41 | 1.1% | 1.2% |
| | **Smallmouth bass** | 25.41 | 2.12 | 11.8% | 12.1% |
| | White perch | 9.39 | 5.05 | 4.4% | 4.5% |
| | White sucker | 52.47 | 43.79 | 24.4% | 25.0% |
| | **Yellow perch** | 20.21 | 12.23 | 9.4% | 9.6% |

## Table A8-4 (a-o). 2007 Individual Stratum Electrofishing CPUE. (continued)

*Note: CPUE for gamefish (bolded) is calculated from all transects within the Stratum. CPUE for non-gamefish are calculated from only the transects where all fish are collected. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from estimates of the number of fish.*

| **o.) Fall 2007** | **Stratum 5** | | | | |
|---|---|---|---|---|---|
| | **Species** | **Mean CPUE** | **SE** | **Relative abundance with clupeids** | **Relative abundance without clupeids** |
| | **Bluegill** | 36.39 | 19.40 | 12.7% | 14.0% |
| | Bowfin | 9.93 | 4.24 | 3.5% | 3.8% |
| | **Brown bullhead** | 9.73 | 4.30 | 3.4% | 3.7% |
| | **Channel catfish** | 5.21 | 2.00 | 1.8% | 2.0% |
| | Gizzard shad | 27.44 | 10.35 | 9.5% | 0.0% |
| | **Largemouth bass** | 11.18 | 4.19 | 3.9% | 4.3% |
| | Northern hog sucker | 2.85 | 2.85 | 1.0% | 1.1% |
| | **Northern pike** | 1.22 | 1.22 | 0.4% | 0.5% |
| | **Pumpkinseed** | 41.99 | 16.36 | 14.6% | 16.2% |
| | **Rock bass** | 3.62 | 2.33 | 1.3% | 1.4% |
| | **Smallmouth bass** | 44.27 | 13.95 | 15.4% | 17.0% |
| | White perch | 21.75 | 16.05 | 7.6% | 8.4% |
| | White sucker | 27.44 | 10.35 | 9.5% | 10.6% |
| | **Yellow perch** | 44.49 | 14.74 | 15.5% | 17.1% |

## Table A8-5(a-d). Individual Transect Electrofishing CPUE in 2007.

*Note: CPUE for non-gamefish are calculated from only the one-half of the transects where all fish are collected (every other transect, shaded). Cells with no data indicate a non-gamefish species in a gamefish only transect. Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from a combination of the number of fish netted and estimates of the number missed.*

**a.) 2007 entire year mean CPUE**

| Transect | Alewife | Bluegill | Bowfin | Brown bullhead | Carp | Channel catfish | Freshwater drum | Gizzard shad | Golden shiner | Largemouth bass | Longnose gar | Northern hog sucker | Northern pike | Pumpkinseed | Rock bass | Rudd | Shorthead redhorse | Smallmouth bass | Walleye | White perch | White sucker | Yellow perch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EF 1 | 0.00 | 11.86 | 7.09 | 9.45 | 12.03 | 0.00 | 0.00 | 23.71 | 0.00 | 9.45 | 0.00 | 0.00 | 0.00 | 16.67 | 2.36 | 0.00 | 2.41 | 35.61 | 0.00 | 26.12 | 67.03 | 40.20 |
| EF 2 | 0.00 | 11.22 | 0.00 | 2.68 | 0.00 | 2.68 | 0.00 | 0.00 | 0.00 | 10.88 | 0.00 | 0.00 | 0.00 | 16.75 | 0.00 | 0.00 | 0.00 | 22.28 | 0.00 | 0.00 | 0.00 | 10.88 |
| EF 3 | 0.00 | 22.92 | 2.85 | 4.34 | 0.00 | 2.85 | 0.00 | 8.54 | 0.00 | 13.01 | 0.00 | 2.85 | 0.00 | 85.41 | 0.00 | 0.00 | 0.00 | 52.88 | 0.00 | 5.02 | 12.88 | 39.58 |
| EF 4 | 0.00 | 55.70 | 0.00 | 9.65 | 0.00 | 4.89 | 0.00 | 0.00 | 0.00 | 9.53 | 0.00 | 0.00 | 4.77 | 82.73 | 4.89 | 0.00 | 0.00 | 28.59 | 0.00 | 0.00 | 0.00 | 38.72 |
| EF 5 | 23.56 | 43.97 | 0.00 | 5.80 | 0.00 | 0.00 | 1.93 | 403.77 | 0.00 | 9.67 | 0.00 | 1.93 | 0.00 | 66.80 | 0.00 | 0.00 | 1.93 | 20.19 | 0.00 | 9.95 | 25.99 | 14.96 |
| EF 6 | 0.00 | 4.23 | 0.00 | 8.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 18.16 | 0.00 | 0.00 | 0.00 | 47.97 | 8.82 | 0.00 | 0.00 | 13.93 | 0.00 | 0.00 | 0.00 | 8.82 |
| EF 7 | 0.00 | 10.45 | 5.31 | 5.31 | 12.86 | 0.00 | 0.00 | 19.15 | 0.00 | 37.48 | 0.00 | 0.00 | 0.00 | 34.09 | 2.74 | 0.00 | 0.00 | 23.64 | 0.00 | 10.29 | 5.14 | 8.04 |
| EF 8 | 0.00 | 7.82 | 0.00 | 10.53 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 28.23 | 0.00 | 0.00 | 0.00 | 26.79 | 0.00 | 0.00 | 0.00 | 18.34 | 0.00 | 0.00 | 0.00 | 15.31 |
| EF 9 | 0.00 | 8.04 | 5.58 | 18.86 | 40.18 | 0.00 | 0.00 | 19.54 | 0.00 | 21.99 | 16.74 | 0.00 | 0.00 | 35.16 | 0.00 | 0.00 | 0.00 | 8.37 | 0.00 | 10.94 | 8.26 | 29.80 |
| EF 10 | 0.00 | 0.00 | 0.00 | 14.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.04 | 0.00 | 0.00 | 0.00 | 21.02 | 0.00 | 0.00 | 0.00 | 3.01 | 0.00 | 0.00 | 0.00 | 22.55 |
| EF 11 | 74.40 | 2.07 | 0.00 | 8.16 | 6.20 | 0.00 | 0.00 | 461.95 | 0.00 | 9.90 | 0.00 | 0.00 | 0.00 | 40.79 | 0.00 | 0.00 | 0.00 | 13.93 | 0.00 | 4.03 | 12.18 | 10.33 |
| EF 12 | 0.00 | 2.72 | 0.00 | 10.22 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.95 | 0.00 | 0.00 | 0.00 | 20.45 | 0.00 | 0.00 | 0.00 | 21.56 | 0.00 | 0.00 | 0.00 | 15.22 |
| EF 13 | 29.07 | 4.85 | 0.00 | 2.17 | 9.69 | 2.17 | 4.34 | 780.25 | 2.42 | 14.03 | 0.00 | 0.00 | 0.00 | 33.67 | 0.00 | 0.00 | 4.59 | 9.44 | 0.00 | 32.16 | 32.91 | 28.57 |
| EF 14 | 0.00 | 4.35 | 0.00 | 6.78 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 20.61 | 0.00 | 0.00 | 0.00 | 19.83 | 0.00 | 0.00 | 0.00 | 7.31 | 4.35 | 0.00 | 0.00 | 13.83 |
| EF 15 | 73.33 | 8.42 | 2.22 | 18.37 | 20.00 | 0.00 | 0.00 | 71.01 | 0.00 | 13.33 | 5.97 | 0.00 | 0.00 | 50.18 | 3.98 | 0.00 | 0.00 | 18.13 | 6.67 | 23.05 | 29.01 | 15.32 |
| EF 16 | 0.00 | 2.08 | 0.00 | 5.04 | 0.00 | 2.96 | 0.00 | 0.00 | 0.00 | 14.25 | 0.00 | 0.00 | 0.00 | 12.16 | 0.00 | 0.00 | 0.00 | 10.95 | 6.25 | 0.00 | 0.00 | 0.00 |
| EF 17 | 564.87 | 0.00 | 2.63 | 28.26 | 45.38 | 5.26 | 3.03 | 430.06 | 0.00 | 5.65 | 0.00 | 0.00 | 0.00 | 40.21 | 0.00 | 2.63 | 5.26 | 10.91 | 2.63 | 0.00 | 37.58 | 10.51 |
| EF 18 | 0.00 | 0.00 | 0.00 | 20.77 | 0.00 | 2.31 | 0.00 | 0.00 | 0.00 | 2.31 | 0.00 | 0.00 | 0.00 | 12.58 | 0.00 | 0.00 | 0.00 | 9.01 | 0.00 | 0.00 | 0.00 | 12.58 |
| EF 19 | 33.16 | 11.84 | 0.00 | 28.80 | 37.90 | 12.60 | 2.56 | 43.76 | 2.37 | 9.66 | 4.93 | 0.00 | 0.00 | 30.98 | 5.11 | 0.00 | 0.00 | 17.52 | 0.00 | 24.25 | 2.56 | 5.11 |
| EF 20 | 0.00 | 20.42 | 0.00 | 15.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21.60 | 0.00 | 0.00 | 0.00 | 47.85 | 0.00 | 0.00 | 0.00 | 8.48 | 0.00 | 0.00 | 0.00 | 10.21 |
| EF 21 | 10.50 | 16.16 | 0.00 | 2.62 | 39.36 | 3.04 | 2.62 | 3.04 | 0.00 | 5.25 | 0.00 | 0.00 | 0.00 | 21.41 | 0.00 | 0.00 | 0.00 | 22.66 | 0.00 | 70.60 | 22.66 | 7.87 |
| EF 22 | 0.00 | 33.69 | 0.00 | 0.00 | 0.00 | 2.92 | 0.00 | 0.00 | 0.00 | 20.51 | 0.00 | 0.00 | 0.00 | 64.10 | 0.00 | 0.00 | 0.00 | 33.63 | 5.13 | 0.00 | 0.00 | 10.61 |
| EF 23 | 54.62 | 17.38 | 0.00 | 0.00 | 22.35 | 0.00 | 0.00 | 115.19 | 2.48 | 2.68 | 0.00 | 0.00 | 0.00 | 42.21 | 0.00 | 0.00 | 0.00 | 2.48 | 0.00 | 14.90 | 2.48 | 20.25 |
| EF 24 | 0.00 | 19.12 | 0.00 | 12.33 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.33 | 0.00 | 0.00 | 0.00 | 47.98 | 2.60 | 0.00 | 0.00 | 30.20 | 0.00 | 0.00 | 0.00 | 41.28 |

**Table A8-5(a-d). Individual Transect Electrofishing CPUE in 2007. (continued)**

**b.) Entire year SE of the mean for table a.**

| Transect | Alewife | Bluegill | Bowfin | Brown bullhead | Carp | Channel catfish | Freshwater drum | Gizzard shad | Golden shiner | Largemouth bass | Longnose gar | Northern hog sucker | Northern pike | Pumpkinseed | Rock bass | Rudd | Shorthead redhorse | Smallmouth bass | Walleye | White perch | White sucker | Yellow perch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EF 1 | 0.00 | 7.04 | 7.09 | 9.45 | 12.03 | 0.00 | 0.00 | 14.08 | 0.00 | 9.45 | 0.00 | 0.00 | 0.00 | 2.23 | 2.36 | 0.00 | 2.41 | 16.36 | 0.00 | 11.68 | 29.23 | 35.39 |
| EF 2 | 0.00 | 5.87 | 0.00 | 2.68 | 0.00 | 2.68 | 0.00 | 0.00 | 0.00 | 5.19 | 0.00 | 0.00 | 0.00 | 6.04 | 0.00 | 0.00 | 0.00 | 6.21 | 0.00 | 0.00 | 0.00 | 5.19 |
| EF 3 | 0.00 | 5.57 | 2.85 | 4.34 | 0.00 | 2.85 | 0.00 | 8.54 | 0.00 | 13.01 | 0.00 | 2.85 | 0.00 | 5.67 | 0.00 | 0.00 | 0.00 | 26.86 | 0.00 | 0.68 | 4.21 | 16.80 |
| EF 4 | 0.00 | 37.12 | 0.00 | 5.01 | 0.00 | 4.89 | 0.00 | 0.00 | 0.00 | 0.24 | 0.00 | 0.00 | 0.12 | 24.11 | 4.89 | 0.00 | 0.00 | 0.72 | 0.00 | 0.00 | 0.00 | 24.78 |
| EF 5 | 11.96 | 21.77 | 0.00 | 5.80 | 0.00 | 0.00 | 1.93 | 48.65 | 0.00 | 9.67 | 0.00 | 1.93 | 0.00 | 39.73 | 0.00 | 0.00 | 1.93 | 6.88 | 0.00 | 5.51 | 12.68 | 7.23 |
| EF 6 | 0.00 | 4.23 | 0.00 | 4.59 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.45 | 0.00 | 0.00 | 0.00 | 5.66 | 4.59 | 0.00 | 0.00 | 7.22 | 0.00 | 0.00 | 0.00 | 4.59 |
| EF 7 | 0.00 | 4.98 | 0.16 | 0.16 | 12.86 | 0.00 | 0.00 | 19.15 | 0.00 | 11.76 | 0.00 | 0.00 | 0.00 | 12.20 | 2.74 | 0.00 | 0.00 | 7.22 | 0.00 | 10.29 | 5.14 | 2.90 |
| EF 8 | 0.00 | 3.03 | 0.00 | 5.74 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.30 | 0.00 | 0.00 | 0.00 | 22.01 | 0.00 | 0.00 | 0.00 | 8.77 | 0.00 | 0.00 | 0.00 | 0.95 |
| EF 9 | 0.00 | 8.04 | 5.58 | 13.28 | 40.18 | 0.00 | 0.00 | 19.54 | 0.00 | 5.92 | 16.74 | 0.00 | 0.00 | 18.41 | 0.00 | 0.00 | 0.00 | 8.37 | 0.00 | 0.22 | 2.90 | 13.06 |
| EF 10 | 0.00 | 0.00 | 0.00 | 9.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.04 | 0.00 | 0.00 | 0.00 | 8.98 | 0.00 | 0.00 | 0.00 | 3.01 | 0.00 | 0.00 | 0.00 | 7.55 |
| EF 11 | 74.40 | 2.07 | 0.00 | 4.24 | 6.20 | 0.00 | 0.00 | 426.70 | 0.00 | 5.77 | 0.00 | 0.00 | 0.00 | 21.21 | 0.00 | 0.00 | 0.00 | 5.66 | 0.00 | 0.11 | 4.35 | 10.33 |
| EF 12 | 0.00 | 2.72 | 0.00 | 4.78 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.05 | 0.00 | 0.00 | 0.00 | 9.55 | 0.00 | 0.00 | 0.00 | 16.56 | 0.00 | 0.00 | 0.00 | 9.78 |
| EF 13 | 29.07 | 4.85 | 0.00 | 2.17 | 9.69 | 2.17 | 4.34 | 280.85 | 2.42 | 5.35 | 0.00 | 0.00 | 0.00 | 29.32 | 0.00 | 0.00 | 0.25 | 5.10 | 0.00 | 1.76 | 15.54 | 19.88 |
| EF 14 | 0.00 | 4.35 | 0.00 | 1.91 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.13 | 0.00 | 0.00 | 0.00 | 14.96 | 0.00 | 0.00 | 0.00 | 7.31 | 4.35 | 0.00 | 0.00 | 0.79 |
| EF 15 | 73.33 | 0.47 | 2.22 | 9.48 | 20.00 | 0.00 | 0.00 | 44.35 | 0.00 | 13.33 | 5.97 | 0.00 | 0.00 | 34.27 | 3.98 | 0.00 | 0.00 | 13.69 | 6.67 | 0.82 | 6.79 | 11.34 |
| EF 16 | 0.00 | 2.08 | 0.00 | 0.87 | 0.00 | 2.96 | 0.00 | 0.00 | 0.00 | 2.42 | 0.00 | 0.00 | 0.00 | 0.34 | 0.00 | 0.00 | 0.00 | 6.78 | 6.25 | 0.00 | 0.00 | 0.00 |
| EF 17 | 486.21 | 0.00 | 2.63 | 1.99 | 45.38 | 5.26 | 3.03 | 356.48 | 0.00 | 0.40 | 0.00 | 0.00 | 0.00 | 28.11 | 0.00 | 2.63 | 5.26 | 4.86 | 2.63 | 0.00 | 25.48 | 10.51 |
| EF 18 | 0.00 | 0.00 | 0.00 | 20.77 | 0.00 | 2.31 | 0.00 | 0.00 | 0.00 | 2.31 | 0.00 | 0.00 | 0.00 | 5.88 | 0.00 | 0.00 | 0.00 | 4.40 | 0.00 | 0.00 | 0.00 | 5.88 |
| EF 19 | 33.16 | 11.84 | 0.00 | 18.57 | 37.90 | 7.86 | 2.56 | 13.08 | 2.37 | 4.55 | 0.19 | 0.00 | 0.00 | 25.86 | 5.11 | 0.00 | 0.00 | 8.05 | 0.00 | 8.91 | 2.56 | 5.11 |
| EF 20 | 0.00 | 2.19 | 0.00 | 1.64 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.30 | 0.00 | 0.00 | 0.00 | 47.85 | 0.00 | 0.00 | 0.00 | 8.48 | 0.00 | 0.00 | 0.00 | 1.10 |
| EF 21 | 10.50 | 10.08 | 0.00 | 2.62 | 39.36 | 3.04 | 2.62 | 3.04 | 0.00 | 5.25 | 0.00 | 0.00 | 0.00 | 15.33 | 0.00 | 0.00 | 0.00 | 1.67 | 0.00 | 2.38 | 1.67 | 7.87 |
| EF 22 | 0.00 | 27.85 | 0.00 | 0.00 | 0.00 | 2.92 | 0.00 | 0.00 | 0.00 | 20.51 | 0.00 | 0.00 | 0.00 | 64.10 | 0.00 | 0.00 | 0.00 | 13.12 | 5.13 | 0.00 | 0.00 | 4.77 |
| EF 23 | 54.62 | 17.38 | 0.00 | 0.00 | 22.35 | 0.00 | 0.00 | 88.40 | 2.48 | 2.68 | 0.00 | 0.00 | 0.00 | 42.21 | 0.00 | 0.00 | 0.00 | 2.48 | 0.00 | 14.90 | 2.48 | 9.54 |
| EF 24 | 0.00 | 3.52 | 0.00 | 3.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.28 | 0.00 | 0.00 | 0.00 | 6.36 | 2.60 | 0.00 | 0.00 | 16.62 | 0.00 | 0.00 | 0.00 | 36.75 |

**Table A8-5(a-d). Individual Transect Electrofishing CPUE in 2007. (continued)**

**c.) 2007 spring CPUE**

| Transect | Alewife | Bluegill | Bowfin | Brown bullhead | Carp | Channel catfish | Freshwater drum | Gizzard shad | Golden shiner | Largemouth bass | Longnose gar | Northern hog sucker | Northern pike | Pumpkinseed | Rock bass | Rudd | Shorthead redhorse | Smallmouth bass | Walleye | White perch | White sucker | Yellow perch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EF 1 | 0.00 | 4.81 | 0.00 | 0.00 | 24.06 | 0.00 | 0.00 | 9.63 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14.44 | 0.00 | 0.00 | 4.81 | 19.25 | 0.00 | 14.44 | 96.26 | 4.81 |
| EF 2 | 0.00 | 17.09 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.70 | 0.00 | 0.00 | 0.00 | 22.78 | 0.00 | 0.00 | 0.00 | 28.48 | 0.00 | 0.00 | 0.00 | 5.70 |
| EF 3 | 0.00 | 17.35 | 0.00 | 8.68 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 26.02 | 0.00 | 0.00 | 0.00 | 91.08 | 0.00 | 0.00 | 0.00 | 26.02 | 0.00 | 4.34 | 8.68 | 56.38 |
| EF 4 | 0.00 | 18.58 | 0.00 | 4.65 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.29 | 0.00 | 0.00 | 4.65 | 106.84 | 0.00 | 0.00 | 0.00 | 27.87 | 0.00 | 0.00 | 0.00 | 13.94 |
| EF 5 | 35.51 | 22.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 355.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 106.53 | 0.00 | 0.00 | 0.00 | 13.32 | 0.00 | 4.44 | 13.32 | 22.20 |
| EF 6 | 0.00 | 8.46 | 0.00 | 4.23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 29.61 | 0.00 | 0.00 | 0.00 | 42.30 | 4.23 | 0.00 | 0.00 | 21.15 | 0.00 | 0.00 | 0.00 | 4.23 |
| EF 7 | 0.00 | 15.43 | 5.14 | 5.14 | 25.72 | 0.00 | 0.00 | 0.00 | 0.00 | 25.72 | 0.00 | 0.00 | 0.00 | 46.29 | 0.00 | 0.00 | 0.00 | 30.86 | 0.00 | 20.57 | 10.29 | 5.14 |
| EF 8 | 0.00 | 4.79 | 0.00 | 4.79 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 23.94 | 0.00 | 0.00 | 0.00 | 4.79 | 0.00 | 0.00 | 0.00 | 9.57 | 0.00 | 0.00 | 0.00 | 14.36 |
| EF 9 | 0.00 | 16.07 | 0.00 | 32.14 | 80.36 | 0.00 | 0.00 | 0.00 | 0.00 | 16.07 | 0.00 | 0.00 | 0.00 | 53.57 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.71 | 5.36 | 42.86 |
| EF 10 | 0.00 | 0.00 | 0.00 | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 30.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15.00 |
| EF 11 | 148.80 | 4.13 | 0.00 | 12.40 | 12.40 | 0.00 | 0.00 | 888.65 | 0.00 | 4.13 | 0.00 | 0.00 | 0.00 | 62.00 | 0.00 | 0.00 | 0.00 | 8.27 | 0.00 | 4.13 | 16.53 | 20.67 |
| EF 12 | 0.00 | 0.00 | 0.00 | 15.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15.00 | 0.00 | 0.00 | 0.00 | 30.00 | 0.00 | 0.00 | 0.00 | 5.00 | 0.00 | 0.00 | 0.00 | 25.00 |
| EF 13 | 58.14 | 9.69 | 0.00 | 0.00 | 19.38 | 0.00 | 0.00 | 1061.10 | 4.85 | 19.38 | 0.00 | 0.00 | 0.00 | 62.99 | 0.00 | 0.00 | 4.85 | 14.54 | 0.00 | 33.92 | 48.45 | 48.45 |
| EF 14 | 0.00 | 8.70 | 0.00 | 8.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21.74 | 0.00 | 0.00 | 0.00 | 34.78 | 0.00 | 0.00 | 0.00 | 0.00 | 8.70 | 0.00 | 0.00 | 13.04 |
| EF 15 | 146.67 | 8.89 | 4.44 | 8.89 | 40.00 | 0.00 | 0.00 | 26.67 | 0.00 | 26.67 | 0.00 | 0.00 | 0.00 | 84.44 | 0.00 | 0.00 | 0.00 | 4.44 | 13.33 | 22.22 | 22.22 | 26.67 |
| EF 16 | 0.00 | 4.17 | 0.00 | 4.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 16.67 | 0.00 | 0.00 | 0.00 | 12.50 | 0.00 | 0.00 | 0.00 | 4.17 | 12.50 | 0.00 | 0.00 | 0.00 |
| EF 17 | 78.65 | 0.00 | 0.00 | 30.25 | 90.76 | 0.00 | 6.05 | 786.54 | 0.00 | 6.05 | 0.00 | 0.00 | 0.00 | 12.10 | 0.00 | 0.00 | 0.00 | 6.05 | 0.00 | 0.00 | 12.10 | 0.00 |
| EF 18 | 0.00 | 0.00 | 0.00 | 41.54 | 0.00 | 4.62 | 0.00 | 0.00 | 0.00 | 4.62 | 0.00 | 0.00 | 0.00 | 18.46 | 0.00 | 0.00 | 0.00 | 4.62 | 0.00 | 0.00 | 0.00 | 18.46 |
| EF 19 | 66.32 | 23.68 | 0.00 | 47.37 | 75.79 | 4.74 | 0.00 | 56.84 | 4.74 | 14.21 | 4.74 | 0.00 | 0.00 | 56.84 | 0.00 | 0.00 | 0.00 | 9.47 | 0.00 | 33.16 | 0.00 | 0.00 |
| EF 20 | 0.00 | 18.23 | 0.00 | 13.67 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 31.90 | 0.00 | 0.00 | 0.00 | 95.70 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.11 |
| EF 21 | 20.99 | 26.24 | 0.00 | 5.25 | 78.72 | 0.00 | 5.25 | 0.00 | 0.00 | 10.50 | 0.00 | 0.00 | 0.00 | 36.73 | 0.00 | 0.00 | 0.00 | 20.99 | 0.00 | 68.22 | 20.99 | 15.74 |
| EF 22 | 0.00 | 61.54 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 41.03 | 0.00 | 0.00 | 0.00 | 128.21 | 0.00 | 0.00 | 0.00 | 20.51 | 10.26 | 0.00 | 0.00 | 15.39 |
| EF 23 | 109.24 | 34.76 | 0.00 | 0.00 | 44.69 | 0.00 | 0.00 | 203.59 | 4.97 | 0.00 | 0.00 | 0.00 | 0.00 | 84.41 | 0.00 | 0.00 | 0.00 | 4.97 | 0.00 | 29.79 | 4.97 | 29.79 |
| EF 24 | 0.00 | 22.64 | 0.00 | 9.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.06 | 0.00 | 0.00 | 0.00 | 54.34 | 0.00 | 0.00 | 0.00 | 13.59 | 0.00 | 0.00 | 0.00 | 4.53 |

## Table A8-5(a-d). Individual Transect Electrofishing CPUE in 2007. (continued)

**d.) 2007 fall CPUE**

| Transect | Alewife | Bluegill | Bowfin | Brown bullhead | Carp | Channel catfish | Freshwater drum | Gizzard shad | Golden shiner | Largemouth bass | Longnose gar | Northern hog sucker | Northern pike | Pumpkinseed | Rock bass | Rudd | Shorthead redhorse | Smallmouth bass | Walleye | White perch | White sucker | Yellow perch |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EF 1 | 0.00 | 18.90 | 14.17 | 18.90 | 0.00 | 0.00 | 0.00 | 37.80 | 0.00 | 18.90 | 0.00 | 0.00 | 0.00 | 18.90 | 4.72 | 0.00 | 0.00 | 51.97 | 0.00 | 37.80 | 37.80 | 75.59 |
| EF 2 | 0.00 | 5.36 | 0.00 | 5.36 | 0.00 | 5.36 | 0.00 | 0.00 | 0.00 | 16.07 | 0.00 | 0.00 | 0.00 | 10.71 | 0.00 | 0.00 | 0.00 | 16.07 | 0.00 | 0.00 | 0.00 | 16.07 |
| EF 3 | 0.00 | 28.48 | 5.70 | 0.00 | 0.00 | 5.70 | 0.00 | 17.09 | 0.00 | 0.00 | 0.00 | 5.70 | 0.00 | 79.75 | 0.00 | 0.00 | 0.00 | 79.75 | 0.00 | 5.70 | 17.09 | 22.78 |
| EF 4 | 0.00 | 92.81 | 0.00 | 14.65 | 0.00 | 9.77 | 0.00 | 0.00 | 0.00 | 9.77 | 0.00 | 0.00 | 4.89 | 58.62 | 9.77 | 0.00 | 0.00 | 29.31 | 0.00 | 0.00 | 0.00 | 63.50 |
| EF 5 | 11.60 | 65.74 | 0.00 | 11.60 | 0.00 | 0.00 | 3.87 | 452.42 | 0.00 | 19.33 | 0.00 | 3.87 | 0.00 | 27.07 | 0.00 | 0.00 | 3.87 | 27.07 | 0.00 | 15.47 | 38.67 | 7.73 |
| EF 6 | 0.00 | 0.00 | 0.00 | 13.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.70 | 0.00 | 0.00 | 0.00 | 53.63 | 13.41 | 0.00 | 0.00 | 6.70 | 0.00 | 0.00 | 0.00 | 13.41 |
| EF 7 | 0.00 | 5.47 | 5.47 | 5.47 | 0.00 | 0.00 | 0.00 | 38.30 | 0.00 | 49.24 | 0.00 | 0.00 | 0.00 | 21.88 | 5.47 | 0.00 | 0.00 | 16.41 | 0.00 | 0.00 | 0.00 | 10.94 |
| EF 8 | 0.00 | 10.84 | 0.00 | 16.27 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 32.53 | 0.00 | 0.00 | 0.00 | 48.80 | 0.00 | 0.00 | 0.00 | 27.11 | 0.00 | 0.00 | 0.00 | 16.27 |
| EF 9 | 0.00 | 0.00 | 11.16 | 5.58 | 0.00 | 0.00 | 0.00 | 39.07 | 0.00 | 27.91 | 33.49 | 0.00 | 0.00 | 16.74 | 0.00 | 0.00 | 0.00 | 16.74 | 0.00 | 11.16 | 11.16 | 16.74 |
| EF 10 | 0.00 | 0.00 | 0.00 | 24.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24.08 | 0.00 | 0.00 | 0.00 | 12.04 | 0.00 | 0.00 | 0.00 | 6.02 | 0.00 | 0.00 | 0.00 | 30.10 |
| EF 11 | 0.00 | 0.00 | 0.00 | 3.92 | 0.00 | 0.00 | 0.00 | 35.26 | 0.00 | 15.67 | 0.00 | 0.00 | 0.00 | 19.59 | 0.00 | 0.00 | 0.00 | 19.59 | 0.00 | 3.92 | 7.84 | 0.00 |
| EF 12 | 0.00 | 5.45 | 0.00 | 5.45 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.89 | 0.00 | 0.00 | 0.00 | 10.89 | 0.00 | 0.00 | 0.00 | 38.12 | 0.00 | 0.00 | 0.00 | 5.45 |
| EF 13 | 0.00 | 0.00 | 0.00 | 4.34 | 0.00 | 4.34 | 8.69 | 499.39 | 0.00 | 8.69 | 0.00 | 0.00 | 0.00 | 4.34 | 0.00 | 0.00 | 4.34 | 4.34 | 0.00 | 30.40 | 17.37 | 8.69 |
| EF 14 | 0.00 | 0.00 | 0.00 | 4.87 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 19.49 | 0.00 | 0.00 | 0.00 | 4.87 | 0.00 | 0.00 | 0.00 | 14.61 | 0.00 | 0.00 | 0.00 | 14.61 |
| EF 15 | 0.00 | 7.96 | 0.00 | 27.85 | 0.00 | 0.00 | 0.00 | 115.36 | 0.00 | 0.00 | 11.93 | 0.00 | 0.00 | 15.91 | 7.96 | 0.00 | 0.00 | 31.82 | 0.00 | 23.87 | 35.80 | 3.98 |
| EF 16 | 0.00 | 0.00 | 0.00 | 5.91 | 0.00 | 5.91 | 0.00 | 0.00 | 0.00 | 11.82 | 0.00 | 0.00 | 0.00 | 11.82 | 0.00 | 0.00 | 0.00 | 17.73 | 0.00 | 0.00 | 0.00 | 0.00 |
| EF 17 | 1051.08 | 0.00 | 5.26 | 26.28 | 0.00 | 10.51 | 0.00 | 73.58 | 0.00 | 5.26 | 0.00 | 0.00 | 0.00 | 68.32 | 0.00 | 5.26 | 10.51 | 15.77 | 5.26 | 0.00 | 63.07 | 21.02 |
| EF 18 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.70 | 0.00 | 0.00 | 0.00 | 13.41 | 0.00 | 0.00 | 0.00 | 6.70 |
| EF 19 | 0.00 | 0.00 | 0.00 | 10.23 | 0.00 | 20.45 | 5.11 | 30.68 | 0.00 | 5.11 | 5.11 | 0.00 | 0.00 | 5.11 | 10.23 | 0.00 | 0.00 | 25.57 | 0.00 | 15.34 | 5.11 | 10.23 |
| EF 20 | 0.00 | 22.61 | 0.00 | 16.96 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 16.96 | 0.00 | 0.00 | 0.00 | 11.30 |
| EF 21 | 0.00 | 6.08 | 0.00 | 0.00 | 0.00 | 6.08 | 0.00 | 6.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.08 | 0.00 | 0.00 | 0.00 | 24.33 | 0.00 | 72.98 | 24.33 | 0.00 |
| EF 22 | 0.00 | 5.84 | 0.00 | 0.00 | 0.00 | 5.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 46.75 | 0.00 | 0.00 | 0.00 | 5.84 |
| EF 23 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 26.79 | 0.00 | 5.36 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.71 |
| EF 24 | 0.00 | 15.61 | 0.00 | 15.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15.61 | 0.00 | 0.00 | 0.00 | 41.62 | 5.20 | 0.00 | 0.00 | 46.82 | 0.00 | 0.00 | 0.00 | 78.04 |

**Table A8-6. Electrofishing species richness in ''all fish'' transects in 2007.**

| Season | Whole Lake | Stratum 1 | Stratum 2 | Stratum 3 | Stratum 4 | Stratum 5 |
|---|---|---|---|---|---|---|
| Year | 22 | 17 | 19 | 20 | 16 | 16 |
| Spring | 20 | 13 | 15 | 17 | 14 | 12 |
| Fall | 20 | 16 | 15 | 17 | 11 | 14 |

* Note: Richness does not include the fish identified in the field as "Lepomis sp" as these are likely either bluegill or pumpkinseed which are included in the richness calculation.

**Table A8-7. Electrofishing Shannon Diversity Index with and without Clupeids from all electrofishing transects in 2007.**

| Season | Stratum | With Clupeids | Without Clupeids |
|---|---|---|---|
| Whole Year | Whole Lake | 0.940 | 1.003 |
| | Stratum 1 | 0.897 | 0.965 |
| | Stratum 2 | 0.704 | 0.988 |
| | Stratum 3 | 0.839 | 1.060 |
| | Stratum 4 | 1.004 | 0.912 |
| | Stratum 5 | 0.955 | 0.919 |
| Spring | Whole Lake | 0.869 | 0.936 |
| | Stratum 1 | 0.900 | 0.879 |
| | Stratum 2 | 0.644 | 0.905 |
| | Stratum 3 | 0.806 | 0.950 |
| | Stratum 4 | 0.949 | 0.842 |
| | Stratum 5 | 0.855 | 0.835 |
| Fall | Whole Lake | 0.983 | 1.009 |
| | Stratum 1 | 0.843 | 0.980 |
| | Stratum 2 | 0.737 | 0.975 |
| | Stratum 3 | 0.623 | 1.004 |
| | Stratum 4 | 0.922 | 0.876 |
| | Stratum 5 | 0.970 | 0.927 |

## Table A8-8. Whole Lake Pollution Tolerance in 2007.

| Area | Time | Tolerant | Moderately Tolerant | Moderate | Moderately Intolerant | Intolerant |
|---|---|---|---|---|---|---|
| Whole Lake | Spring | 45% | 30% | 25% | 0% | 0% |
| | Fall | 40% | 30% | 25% | 5% | 0% |
| | Whole Year | 45% | 27% | 23% | 5% | 0% |
| Stratum 1 | Spring | 54% | 23% | 23% | 0% | 0% |
| | Fall | 44% | 25% | 25% | 6% | 0% |
| | Whole Year | 47% | 24% | 24% | 6% | 0% |
| Stratum 2 | Spring | 53% | 33% | 13% | 0% | 0% |
| | Fall | 43% | 36% | 21% | 0% | 0% |
| | Whole Year | 47% | 32% | 21% | 0% | 0% |
| Stratum 3 | Spring | 50% | 31% | 19% | 0% | 0% |
| | Fall | 41% | 35% | 24% | 0% | 0% |
| | Whole Year | 50% | 30% | 20% | 0% | 0% |
| Stratum 4 | Spring | 50% | 29% | 21% | 0% | 0% |
| | Fall | 45% | 36% | 18% | 0% | 0% |
| | Whole Year | 44% | 31% | 25% | 0% | 0% |
| Stratum 5 | Spring | 50% | 33% | 17% | 0% | 0% |
| | Fall | 43% | 29% | 21% | 7% | 0% |
| | Whole Year | 44% | 31% | 19% | 6% | 0% |

Percent of species in each tolerance category, based on presence of species.

Tolerance designations based on Whittier and Hughes (1998)

**Table A8-9(a-b). Trophic Guild CPUE and Relative Abundance from electrofishing data in 2007 with and without Clupeids**

**a) Clupeids Included**

| Area | Time | Planktivore | | Benthic Invertivore | | Invertivore/ Piscivore | | Piscivore | | Invertivore | | Planktivore/ Invertivore | | Detritivore | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance |
| Whole Lake | Spring | 55 | 10% | 63 | 12% | 50 | 9% | 30 | 5% | 68 | 12% | 1 | 0% | 282 | 51% |
| | Fall | 89 | 25% | 24 | 7% | 58 | 16% | 42 | 12% | 35 | 10% | 0 | 0% | 114 | 32% |
| | Whole Year | 74 | 16% | 44 | 10% | 54 | 12% | 36 | 8% | 52 | 11% | 1 | 0% | 195 | 43% |
| Stratum 1 | Spring | 12 | 4% | 45 | 14% | 40 | 13% | 36 | 11% | 64 | 20% | 0 | 0% | 118 | 38% |
| | Fall | 4 | 1% | 19 | 5% | 49 | 14% | 51 | 15% | 50 | 14% | 0 | 0% | 177 | 50% |
| | Whole Year | 8 | 2% | 33 | 10% | 44 | 13% | 44 | 13% | 57 | 17% | 0 | 0% | 148 | 44% |
| Stratum 2 | Spring | 118 | 12% | 55 | 6% | 53 | 6% | 25 | 3% | 56 | 6% | 2 | 0% | 659 | 68% |
| | Fall | 0 | 0% | 22 | 7% | 51 | 15% | 32 | 10% | 14 | 4% | 0 | 0% | 217 | 65% |
| | Whole Year | 56 | 9% | 37 | 6% | 52 | 8% | 28 | 4% | 34 | 5% | 1 | 0% | 430 | 67% |
| Stratum 3 | Spring | 72 | 10% | 89 | 13% | 60 | 9% | 20 | 3% | 32 | 5% | 2 | 0% | 422 | 60% |
| | Fall | 526 | 74% | 39 | 6% | 45 | 6% | 28 | 4% | 26 | 4% | 0 | 0% | 52 | 7% |
| | Whole Year | 317 | 44% | 64 | 9% | 54 | 8% | 24 | 3% | 30 | 4% | 1 | 0% | 225 | 31% |
| Stratum 4 | Spring | 65 | 14% | 75 | 16% | 72 | 16% | 33 | 7% | 113 | 24% | 2 | 1% | 102 | 22% |
| | Fall | 0 | 0% | 12 | 8% | 68 | 45% | 33 | 22% | 20 | 13% | 0 | 0% | 16 | 11% |
| | Whole Year | 34 | 11% | 45 | 14% | 70 | 22% | 33 | 11% | 69 | 22% | 1 | 0% | 61 | 19% |
| Stratum 5 | Spring | 0 | 0% | 67 | 31% | 33 | 15% | 37 | 17% | 73 | 34% | 0 | 0% | 5 | 2% |
| | Fall | 0 | 0% | 30 | 11% | 85 | 29% | 67 | 23% | 78 | 27% | 0 | 0% | 27 | 10% |
| | Whole Year | 0 | 0% | 48 | 19% | 59 | 24% | 51 | 20% | 76 | 30% | 0 | 0% | 16 | 6% |

## Table A8-9(a-b). Trophic Guild CPUE and Relative Abundance from electrofishing data in 2007 with and without Clupeids. (continued)

**b) Clupeids Excluded**

| Area | Time | Planktivore | | Benthic Invertivore | | Invertivore/ Piscivore | | Piscivore | | Invertivore | | Planktivore/ Invertivore | | Detritivore | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance |
| Whole Lake | Spring | 0 | 0% | 63 | 30% | 50 | 24% | 30 | 14% | 68 | 32% | 1 | 1% | 0 | 0% |
| | Fall | 0 | 0% | 24 | 15% | 58 | 36% | 42 | 26% | 35 | 22% | 0 | 0% | 0 | 0% |
| | Whole Year | 0 | 0% | 44 | 23% | 54 | 29% | 36 | 19% | 52 | 28% | 1 | 0% | 0 | 0% |
| Stratum 1 | Spring | 0 | 0% | 45 | 24% | 40 | 22% | 36 | 19% | 64 | 35% | 0 | 0% | 0 | 0% |
| | Fall | 0 | 0% | 19 | 11% | 49 | 29% | 51 | 30% | 50 | 30% | 0 | 0% | 0 | 0% |
| | Whole Year | 0 | 0% | 33 | 19% | 44 | 25% | 44 | 25% | 57 | 32% | 0 | 0% | 0 | 0% |
| Stratum 2 | Spring | 0 | 0% | 55 | 29% | 53 | 28% | 25 | 13% | 56 | 29% | 2 | 1% | 0 | 0% |
| | Fall | 0 | 0% | 22 | 18% | 51 | 43% | 32 | 27% | 14 | 11% | 0 | 0% | 0 | 0% |
| | Whole Year | 0 | 0% | 37 | 25% | 52 | 34% | 28 | 18% | 34 | 23% | 1 | 1% | 0 | 0% |
| Stratum 3 | Spring | 0 | 0% | 89 | 44% | 60 | 29% | 20 | 10% | 32 | 16% | 2 | 1% | 0 | 0% |
| | Fall | 0 | 0% | 39 | 29% | 45 | 33% | 28 | 20% | 26 | 19% | 0 | 0% | 0 | 0% |
| | Whole Year | 0 | 0% | 64 | 37% | 54 | 31% | 24 | 14% | 30 | 17% | 1 | 1% | 0 | 0% |
| Stratum 4 | Spring | 0 | 0% | 75 | 25% | 72 | 25% | 33 | 11% | 113 | 38% | 2 | 1% | 0 | 0% |
| | Fall | 0 | 0% | 12 | 9% | 68 | 51% | 33 | 25% | 20 | 15% | 0 | 0% | 0 | 0% |
| | Whole Year | 0 | 0% | 45 | 21% | 70 | 32% | 33 | 15% | 69 | 32% | 1 | 1% | 0 | 0% |
| Stratum 5 | Spring | 0 | 0% | 67 | 32% | 33 | 16% | 37 | 18% | 73 | 35% | 0 | 0% | 0 | 0% |
| | Fall | 0 | 0% | 30 | 12% | 85 | 33% | 67 | 26% | 78 | 30% | 0 | 0% | 0 | 0% |
| | Whole Year | 0 | 0% | 48 | 20% | 59 | 25% | 51 | 22% | 76 | 32% | 0 | 0% | 0 | 0% |

**Table A8-10(a-b). Thermal Guild CPUE and Relative Abundance from electrofishing data in 2007 with and without Clupeids.**

**a) Clupeids Included**

| Area | Time | Warm | | Cool | | Cold | |
|---|---|---|---|---|---|---|---|
| | | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance |
| Whole Lake | Spring | 441 | 80% | 110 | 20% | 0 | 0% |
| | Fall | 205 | 57% | 156 | 43% | 0 | 0% |
| | Whole Year | 320 | 70% | 136 | 30% | 0 | 0% |
| Stratum 1 | Spring | 261 | 83% | 54 | 17% | 0 | 0% |
| | Fall | 295 | 84% | 55 | 16% | 0 | 0% |
| | Whole Year | 279 | 84% | 55 | 16% | 0 | 0% |
| Stratum 2 | Spring | 783 | 81% | 184 | 19% | 0 | 0% |
| | Fall | 283 | 85% | 51 | 15% | 0 | 0% |
| | Whole Year | 524 | 82% | 114 | 18% | 0 | 0% |
| Stratum 3 | Spring | 602 | 86% | 95 | 14% | 0 | 0% |
| | Fall | 121 | 17% | 594 | 83% | 0 | 0% |
| | Whole Year | 351 | 49% | 363 | 51% | 0 | 0% |
| Stratum 4 | Spring | 352 | 76% | 110 | 24% | 0 | 0% |
| | Fall | 89 | 60% | 60 | 40% | 0 | 0% |
| | Whole Year | 228 | 73% | 86 | 27% | 0 | 0% |
| Stratum 5 | Spring | 113 | 53% | 102 | 47% | 0 | 0% |
| | Fall | 167 | 58% | 120 | 42% | 0 | 0% |
| | Whole Year | 140 | 56% | 110 | 44% | 0 | 0% |

**Table A8-10(a-b). Thermal Guild CPUE and Relative Abundance from electrofishing data in 2007 with and without Clupeids. (continued)**

**b) Clupeids Excluded**

| Area | Time | Warm | | Cool | | Cold | |
|---|---|---|---|---|---|---|---|
| | | CPUE | Relative Abundance | CPUE | Relative Abundance | CPUE | Relative Abundance |
| Whole Lake | Spring | 158 | 74% | 55 | 26% | 0 | 0% |
| | Fall | 91 | 57% | 68 | 43% | 0 | 0% |
| | Whole Year | 126 | 67% | 61 | 33% | 0 | 0% |
| Stratum 1 | Spring | 142 | 77% | 42 | 23% | 0 | 0% |
| | Fall | 118 | 70% | 51 | 30% | 0 | 0% |
| | Whole Year | 131 | 73% | 47 | 27% | 0 | 0% |
| Stratum 2 | Spring | 124 | 65% | 66 | 35% | 0 | 0% |
| | Fall | 67 | 57% | 51 | 43% | 0 | 0% |
| | Whole Year | 94 | 62% | 58 | 38% | 0 | 0% |
| Stratum 3 | Spring | 181 | 89% | 22 | 11% | 0 | 0% |
| | Fall | 69 | 50% | 68 | 50% | 0 | 0% |
| | Whole Year | 127 | 73% | 47 | 27% | 0 | 0% |
| Stratum 4 | Spring | 250 | 85% | 44 | 15% | 0 | 0% |
| | Fall | 72 | 55% | 60 | 45% | 0 | 0% |
| | Whole Year | 167 | 76% | 52 | 24% | 0 | 0% |
| Stratum 5 | Spring | 108 | 52% | 102 | 48% | 0 | 0% |
| | Fall | 140 | 54% | 120 | 46% | 0 | 0% |
| | Whole Year | 124 | 53% | 110 | 47% | 0 | 0% |

**Table A8-11. Length frequency in Fall 2007 electrofishing and Gill netting combined for species where n > 20.**

| Total Length (mm) | Bluegill | Brown bullhead | Channel catfish | Gizzard shad | Largemouth bass | Pumpkin-seed | Smallmouth bass | White perch | White sucker | Yellow perch |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 - 59 | | | | | | | | | | |
| 60 - 79 | | | | | | | | | | |
| 80 - 99 | | | | | 1 | | 1 | | | |
| 100 - 119 | 2 | | | | | 4 | | | | |
| 120 - 139 | 1 | | | 9 | 1 | 9 | | | | |
| 140 - 159 | 21 | | | 1 | 1 | 34 | | | | |
| 160 - 179 | 20 | 1 | | 3 | 2 | 53 | 13 | 10 | | 6 |
| 180 - 199 | 16 | | | 1 | 2 | 10 | 23 | 17 | | 28 |
| 200 - 219 | 2 | | | | 1 | 2 | 41 | 19 | | 41 |
| 220 - 239 | | | | 1 | 2 | | 12 | 12 | | 11 |
| 240 - 259 | | 6 | | 2 | 6 | | 20 | 1 | | 3 |
| 260 - 279 | | 6 | | 35 | 15 | | 4 | 1 | | 1 |
| 280 - 299 | | 16 | | 35 | 5 | | 2 | | 2 | 2 |
| 300 - 319 | | 6 | | 17 | 1 | | 1 | | | |
| 320 - 339 | | 9 | | 7 | 2 | | 2 | | | |
| 340 - 359 | | 1 | | 2 | 6 | | | | 2 | |
| 360 - 379 | | 1 | | | 4 | | | | 3 | |
| 380 - 399 | | | | | 1 | | 1 | | 2 | |
| 400 - 419 | | 2 | | 2 | 1 | | | | 2 | |
| 420 - 439 | | | 2 | 2 | 4 | | 1 | | 7 | |
| 440 - 459 | | | 2 | 2 | 3 | | 1 | | 9 | |
| 460 - 479 | | | 3 | 1 | 2 | | | | 13 | |
| 480 - 499 | | | 5 | | 1 | | | | 4 | |
| 500 - 519 | | | 5 | | | | | | 10 | |
| > 519 | | | 5 | | | | | | 4 | |
| **Total** | **62** | **48** | **22** | **120** | **61** | **112** | **122** | **60** | **58** | **92** |

**Table A8-12(a-c). Mean total lengths of largemouth and smallmouth bass in each stratum and the whole lake for each sampling event and the whole year from electrofishing, and mean lengths of all species in each event and the whole year.**

*a) Smallmouth bass.*

| Season | Stratum | Mean Total Length (mm) | Standard Error | N |
|---|---|---|---|---|
| Whole Year | Stratum 1 | 257.51 | 15.35 | 35 |
| | Stratum 2 | 215.59 | 9.59 | 32 |
| | Stratum 3 | 231.28 | 13.39 | 18 |
| | Stratum 4 | 219.19 | 11.09 | 36 |
| | Stratum 5 | 237.55 | 8.40 | 55 |
| | Whole Lake | 233.13 | 5.19 | 176 |
| Spring | Stratum 1 | 323.31 | 24.23 | 16 |
| | Stratum 2 | 235.00 | 39.95 | 7 |
| | Stratum 3 | 255.20 | 40.83 | 5 |
| | Stratum 4 | 241.08 | 29.03 | 12 |
| | Stratum 5 | 269.57 | 19.08 | 21 |
| | Whole Lake | 272.92 | 12.48 | 61 |
| Fall | Stratum 1 | 202.11 | 5.94 | 19 |
| | Stratum 2 | 210.16 | 5.89 | 25 |
| | Stratum 3 | 222.08 | 10.61 | 13 |
| | Stratum 4 | 208.25 | 7.97 | 24 |
| | Stratum 5 | 217.76 | 4.43 | 34 |
| | Whole Lake | 212.03 | 2.93 | 115 |

*b) Largemouth bass.*

| Season | Stratum | Mean Total Length (mm) | Standard Error | N |
|---|---|---|---|---|
| Whole Year | Stratum 1 | 304.67 | 13.21 | 46 |
| | Stratum 2 | 353.51 | 12.93 | 35 |
| | Stratum 3 | 281.85 | 15.84 | 13 |
| | Stratum 4 | 318.48 | 17.75 | 25 |
| | Stratum 5 | 284.83 | 25.64 | 18 |
| | Whole Lake | 314.90 | 7.60 | 137 |
| Spring | Stratum 1 | 314.85 | 21.21 | 20 |
| | Stratum 2 | 363.84 | 17.31 | 19 |
| | Stratum 3 | 284.22 | 21.99 | 9 |
| | Stratum 4 | 332.58 | 19.11 | 19 |
| | Stratum 5 | 278.00 | 36.41 | 9 |
| | Whole Lake | 323.54 | 10.22 | 76 |
| Fall | Stratum 1 | 296.85 | 16.93 | 26 |
| | Stratum 2 | 341.25 | 19.57 | 16 |
| | Stratum 3 | 276.50 | 18.62 | 4 |
| | Stratum 4 | 273.83 | 40.20 | 6 |
| | Stratum 5 | 291.67 | 38.15 | 9 |
| | Whole Lake | 304.13 | 11.32 | 61 |

**Table A8-12(a-c). Mean total lengths of largemouth and smallmouth bass in each stratum and the whole lake for each sampling event and the whole year from electrofishing, and mean lengths of all other species in each event and the whole year. (continued)**

*c) 2007 all other species.*

| | 2007 | | | Spring | | | Fall | | |
|---|---|---|---|---|---|---|---|---|---|
| **Species** | **Mean Total Length (mm)** | **Standard Error** | **N** | **Mean Total Length (mm)** | **Standard Error** | **N** | **Mean Total Length (mm)** | **Standard Error** | **N** |
| Alewife | 152.32 | 1.98 | 37 | 152.32 | 1.98 | 37 | | | |
| Bluegill | 162.87 | 1.78 | 133 | 160.58 | 2.45 | 72 | 165.57 | 2.562173 | 61 |
| Bowfin | 594.00 | 21.65 | 19 | 626.89 | 21.80 | 9 | 564.40 | 34.57 | 10 |
| Brown bullhead | 293.75 | 3.86 | 101 | 290.61 | 5.29 | 54 | 297.36 | 5.67 | 47 |
| Channel catfish | 512.75 | 16.16 | 16 | 593.50 | 66.50 | 2 | 501.21 | 14.63 | 14 |
| Freshwater drum | 458.67 | 78.63 | 6 | 401.00 | 201.00 | 2 | 487.50 | 88.83 | 4 |
| Gizzard shad | 273.18 | 3.53 | 211 | 270.28 | 3.18 | 105 | 276.07 | 6.30 | 106 |
| Golden shiner | 149.33 | 1.67 | 3 | 149.33 | 1.67 | 3 | | | |
| Largemouth bass | 314.90 | 7.60 | 137 | 323.54 | 10.22 | 76 | 304.13 | 11.32 | 61 |
| Longnose gar | 744.92 | 25.90 | 12 | 565.00 | | 1 | 761.27 | 22.00 | 11 |
| Northern hog sucker | 262.50 | 12.50 | 2 | | | | 262.50 | 12.50 | 2 |
| Northern pike | 678.50 | 79.50 | 2 | 599.00 | | 1 | 758.00 | | 1 |
| Pumpkinseed | 153.61 | 0.99 | 379 | 151.55 | 1.15 | 275 | 159.07 | 1.82 | 104 |
| Rock bass | 172.92 | 7.59 | 12 | 211.00 | | 1 | 169.45 | 7.40 | 11 |
| Rudd | 357.00 | | 1 | | | | 357.00 | | 1 |
| Shorthead redhorse | 464.67 | 14.13 | 6 | 475.50 | 7.50 | 2 | 459.25 | 21.46 | 4 |
| Smallmouth bass | 233.13 | 5.19 | 176 | 272.92 | 12.48 | 61 | 212.03 | 2.93 | 115 |
| Walleye | 532.18 | 31.27 | 11 | 537.80 | 34.01 | 10 | 476.00 | | 1 |
| White perch | 195.76 | 2.00 | 94 | 197.78 | 3.02 | 50 | 193.45 | 2.53 | 44 |
| White sucker | 444.94 | 5.68 | 109 | 432.74 | 8.87 | 54 | 456.91 | 6.83 | 55 |
| Yellow perch | 192.75 | 2.66 | 174 | 180.14 | 4.47 | 87 | 205.37 | 2.20 | 87 |

**Table A8-13. PSD & RSD of select species captured during Fall 2007 electrofishing.**

| Species | PSD or RSD | Value |
|---|---|---|
| Bluegill | PSD | 78.69 |
| | RSD8 | 0.00 |
| Gizzard shad | PSD | 61.29 |
| Largemouth bass | PSD | 44.44 |
| | RSD15 | 22.22 |
| | RSD18 | 5.56 |
| Lepomis sp. | PSD | 75.15 |
| | RSD8 | 0.00 |
| Pumpkinseed | PSD | 73.08 |
| | RSD8 | 0.00 |
| Smallmouth bass | PSD | 1.98 |
| | RSD12 | 0.99 |
| | RSD14 | 0.00 |
| | RSD18 | 0.00 |

* Number after "PSD" or "RSD" designates fish size in inches. So RSD8 is the RSD of fish 8 inches and larger.

**Table A8-14(a-b). Relative weights and condition factor of select species captured during electrofishing in the Fall of 2007.**

*a) 2007 Relative Weights*

| Species | Mean Relative Weight | SE | N |
|---|---|---|---|
| Bluegill | 97.95 | 3.11 | 61 |
| Gizzard shad | 110.61 | 5.85 | 105 |
| Largemouth bass | 108.19 | 3.61 | 61 |
| Pumpkinseed | 108.19 | 1.47 | 104 |
| Smallmouth bass | 90.18 | 1.03 | 115 |
| White perch | 91.94 | 2.05 | 43 |
| Yellow perch | 85.34 | 0.89 | 87 |

*b) 2007 Condition Factors*

| Species | Condition Factor |
|---|---|
| Bluegill | 2.06 |
| Gizzard shad | 1.09 |
| Largemouth bass | 1.60 |
| Pumpkinseed | 2.39 |
| Smallmouth bass | 1.21 |
| White perch | 1.41 |
| Yellow perch | 1.18 |

**Table A8-15(a-b). Largemouth and smallmouth bass catch rates from electrofishing in 2007.**

*a) Largemouth bass*

| Season | Category* | CPUE |
|---|---|---|
| Spring | yearling | 0.99 |
| | yearling to 10 inch | 3.17 |
| | > 10 inch | 10.90 |
| | > 12 inch | 8.52 |
| Fall | fingerling | 0.65 |
| | fingerling to 10 inch | 2.38 |
| | > 10 inch | 10.17 |
| | > 12 inch | 5.19 |

*b) Smallmouth bass*

| Season | Category* | CPUE |
|---|---|---|
| Spring | yearling | 1.98 |
| | yearling to 10 inch | 5.75 |
| | > 10 inch | 4.36 |
| | > 12 inch | 3.37 |
| Fall | fingerling | 0.22 |
| | fingerling to 10 inch | 22.29 |
| | > 10 inch | 2.38 |
| | > 12 inch | 0.22 |

* Note: Yearlings are less than or equal to 200 mm total length. Fingerlings are less than or equal to 150 mm total length. These sizes are based on length frequency data from the OCDWEP database.

## Table A8-16(a-c). Summary of DELTFM results in 2007.

*a) Adult Fish DELTFM Summary*

| Stratum | Number |
|---|---|
| Stratum 1 | 8 |
| Stratum 2 | 13 |
| Stratum 3 | 14 |
| Stratum 4 | 5 |
| Stratum 5 | 9 |
| Whole Lake | 49 |

* Note: Juvenile DELTFM are not included in the count by stratum above.

*b) Whole lake DELTFM abnormalities by type and species for juveniles.*

| Species | DELTFM | Number |
|---|---|---|
| Pumpkinseed | Deformities - Very small deformed tail | 1 |

## Table A8-16(a-c). Summary of DELTFM results in 2007. (continued)

*c) Whole lake DELTFM abnormalities by type and species for adults.*

| Species | DELTFM | Number |
|---|---|---|
| Bluegill | Lesions - Left side | 1 |
| Bowfin | Deformities - Split jaw | 1 |
| Brown bullhead | Deformities - Burnt barbs | 2 |
| | Deformities - Deformities, Erosions, and Lesions | 1 |
| | Deformities - Missing barbules | 1 |
| | Deformities - Missing left pectoral fin (spine) □ dorsal fin erosion | 1 |
| | Erosions - | 1 |
| | Erosions - Burnt barb | 1 |
| | Erosions - Burnt barbs | 2 |
| | Erosions - Burnt chin barbels | 1 |
| | Lesions - | 9 |
| | Lesions - Left | 1 |
| | Malignancies - | 2 |
| | Malignancies - Melanoma | 1 |
| | Malignancies - Melanoma on head | 1 |
| Channel catfish | Deformities - Blind in both eyes | 1 |
| | Erosions - Burnt barbs | 2 |
| | Erosions - Burnt barbules | 1 |
| | Erosions - E - Burnt barbules | 1 |
| | Erosions - E - Burned barbules | 1 |
| | Lesions - Right | 1 |
| | Tumors - T - Throughout body | 1 |
| Largemouth bass | Deformities - Blind right eye | 1 |
| | Deformities - Deformity on left eye | 1 |
| | Deformities - Deformities and Lesions (melanoma) | 1 |
| | Deformities - Isthmus disconnected | 1 |
| | Deformities - Missing D-1 | 1 |
| | Deformities - Right eye missing | 1 |
| Northern pike | Lesions - Lesions - left side | 1 |
| | Lesions - Lesions on left side | 1 |
| Pumpkinseed | Erosions - Both pects torn | 1 |
| Smallmouth bass | Lesions - Above left operculum | 1 |
| Walleye | Deformities - Mouth wound (old) | 1 |
| | Deformities - Popeye | 1 |
| | Tumors - | 1 |
| White sucker | Deformities - Tail | 1 |
| | Tumors - Tumors on anal fin | 1 |

## Table A8-17(a-d). Gill net CPUE by location, time period, and species.

**a) Gill net CPUE by location, time period, and species.**

| Year | Location | Season | Species | Mean CPUE |
|---|---|---|---|---|
| 2007 | Stratum 1 | Spring | Brown trout | 0.400 |
| 2007 | Stratum 1 | Spring | Gizzard shad | 2.000 |
| 2007 | Stratum 1 | Spring | Smallmouth bass | 0.400 |
| 2007 | Stratum 1 | Spring | White perch | 0.800 |
| 2007 | Stratum 1 | Spring | Yellow perch | 1.200 |
| 2007 | Stratum 2 | Spring | Gizzard shad | 0.500 |
| 2007 | Stratum 2 | Spring | White perch | 1.000 |
| 2007 | Stratum 2 | Spring | Yellow perch | 1.000 |
| 2007 | Stratum 3 | Spring | White perch | 9.000 |
| 2007 | Stratum 3 | Spring | Yellow perch | 0.500 |
| 2007 | Stratum 4 | Spring | No Catch | 0.500 |
| 2007 | Stratum 5 | Spring | Brown trout | 0.500 |
| 2007 | Stratum 5 | Spring | Carp | 0.500 |
| 2007 | Stratum 5 | Spring | Gizzard shad | 0.500 |
| 2007 | Stratum 5 | Spring | Northern pike | 0.500 |
| 2007 | Stratum 5 | Spring | Shorthead redhorse | 0.500 |
| 2007 | Stratum 5 | Spring | White perch | 3.000 |
| 2007 | Stratum 5 | Spring | White sucker | 3.000 |
| 2007 | Stratum 5 | Spring | Yellow perch | 3.500 |
| 2007 | Stratum 1 | Fall | No Catch | 0.496 |
| 2007 | Stratum 2 | Fall | Channel catfish | 1.500 |
| 2007 | Stratum 2 | Fall | Gizzard shad | 3.000 |
| 2007 | Stratum 2 | Fall | Longnose gar | 2.000 |
| 2007 | Stratum 2 | Fall | Smallmouth bass | 1.500 |
| 2007 | Stratum 2 | Fall | Walleye | 0.500 |
| 2007 | Stratum 2 | Fall | Yellow perch | 1.000 |
| 2007 | Stratum 3 | Fall | Channel catfish | 1.875 |
| 2007 | Stratum 3 | Fall | Gizzard shad | 2.250 |
| 2007 | Stratum 3 | Fall | Smallmouth bass | 1.125 |
| 2007 | Stratum 3 | Fall | White perch | 1.500 |
| 2007 | Stratum 3 | Fall | White sucker | 1.125 |
| 2007 | Stratum 3 | Fall | Yellow perch | 0.750 |
| 2007 | Stratum 4 | Fall | Freshwater drum | 0.500 |
| 2007 | Stratum 4 | Fall | Gizzard shad | 1.000 |
| 2007 | Stratum 4 | Fall | Pumpkinseed | 0.500 |
| 2007 | Stratum 4 | Fall | White perch | 3.000 |
| 2007 | Stratum 5 | Fall | Bluegill | 0.500 |
| 2007 | Stratum 5 | Fall | Brown bullhead | 0.500 |
| 2007 | Stratum 5 | Fall | Pumpkinseed | 3.500 |
| 2007 | Stratum 5 | Fall | Smallmouth bass | 0.500 |
| 2007 | Stratum 5 | Fall | White perch | 3.000 |
| 2007 | Stratum 5 | Fall | Yellow perch | 0.500 |

**Table A8-17(a-d). Gill net CPUE by location, time period, and species. (continued)**

**b) Whole year Gill net CPUE by location and species.**

| Year | Location | Species | Mean CPUE |
|---|---|---|---|
| 2007 | Stratum 1 | Brown trout | 0.221 |
| 2007 | Stratum 1 | Gizzard shad | 1.107 |
| 2007 | Stratum 1 | No Catch | 0.221 |
| 2007 | Stratum 1 | Smallmouth bass | 0.221 |
| 2007 | Stratum 1 | White perch | 0.443 |
| 2007 | Stratum 1 | Yellow perch | 0.664 |
| 2007 | Stratum 2 | Channel catfish | 0.750 |
| 2007 | Stratum 2 | Gizzard shad | 1.750 |
| 2007 | Stratum 2 | Longnose gar | 1.000 |
| 2007 | Stratum 2 | Smallmouth bass | 0.750 |
| 2007 | Stratum 2 | Walleye | 0.250 |
| 2007 | Stratum 2 | White perch | 0.500 |
| 2007 | Stratum 2 | Yellow perch | 1.000 |
| 2007 | Stratum 3 | Channel catfish | 1.071 |
| 2007 | Stratum 3 | Gizzard shad | 1.286 |
| 2007 | Stratum 3 | Smallmouth bass | 0.643 |
| 2007 | Stratum 3 | White perch | 4.714 |
| 2007 | Stratum 3 | White sucker | 0.643 |
| 2007 | Stratum 3 | Yellow perch | 0.643 |
| 2007 | Stratum 4 | Freshwater drum | 0.250 |
| 2007 | Stratum 4 | Gizzard shad | 0.500 |
| 2007 | Stratum 4 | No Catch | 0.250 |
| 2007 | Stratum 4 | Pumpkinseed | 0.250 |
| 2007 | Stratum 4 | White perch | 1.500 |
| 2007 | Stratum 5 | Bluegill | 0.250 |
| 2007 | Stratum 5 | Brown bullhead | 0.250 |
| 2007 | Stratum 5 | Brown trout | 0.250 |
| 2007 | Stratum 5 | Carp | 0.250 |
| 2007 | Stratum 5 | Gizzard shad | 0.250 |
| 2007 | Stratum 5 | Northern pike | 0.250 |
| 2007 | Stratum 5 | Pumpkinseed | 1.750 |
| 2007 | Stratum 5 | Shorthead redhorse | 0.250 |
| 2007 | Stratum 5 | Smallmouth bass | 0.250 |
| 2007 | Stratum 5 | White perch | 3.000 |
| 2007 | Stratum 5 | White sucker | 1.500 |
| 2007 | Stratum 5 | Yellow perch | 2.000 |

## Table A8-17(a-d). Gill net CPUE by location, time period, and species. (continued)

**c) Gill net CPUE by time period and species.**

| Year | Season | Species | Mean CPUE | Relative Abundance |
|---|---|---|---|---|
| 2007 | Spring | Brown trout | 0.180 | 3.3% |
| 2007 | Spring | Carp | 0.100 | 1.6% |
| 2007 | Spring | Gizzard shad | 0.600 | 11.5% |
| 2007 | Spring | No Catch | 0.100 | 1.6% |
| 2007 | Spring | Northern pike | 0.100 | 1.6% |
| 2007 | Spring | Shorthead redhorse | 0.100 | 1.6% |
| 2007 | Spring | Smallmouth bass | 0.080 | 1.6% |
| 2007 | Spring | White perch | 2.760 | 45.9% |
| 2007 | Spring | White sucker | 0.600 | 9.8% |
| 2007 | Spring | Yellow perch | 1.240 | 21.3% |
| 2007 | Fall | Bluegill | 0.100 | 1.4% |
| 2007 | Fall | Brown bullhead | 0.100 | 1.4% |
| 2007 | Fall | Channel catfish | 0.675 | 11.4% |
| 2007 | Fall | Freshwater drum | 0.100 | 1.4% |
| 2007 | Fall | Gizzard shad | 1.250 | 20.0% |
| 2007 | Fall | Longnose gar | 0.400 | 5.7% |
| 2007 | Fall | No Catch | 0.099 | 1.4% |
| 2007 | Fall | Pumpkinseed | 0.800 | 11.4% |
| 2007 | Fall | Smallmouth bass | 0.625 | 10.0% |
| 2007 | Fall | Walleye | 0.100 | 1.4% |
| 2007 | Fall | White perch | 1.500 | 22.9% |
| 2007 | Fall | White sucker | 0.225 | 4.3% |
| 2007 | Fall | Yellow perch | 0.450 | 7.1% |

**Table A8-17(a-d). Gill net CPUE by location, time period, and species. (continued)**

**d) Gill net CPUE for 2007 for entire year**

| Year | Species | Mean CPUE | Relative Abundance |
|---|---|---|---|
| 2007 | Bluegill | 0.050 | 0.8% |
| 2007 | Brown bullhead | 0.050 | 0.8% |
| 2007 | Brown trout | 0.094 | 1.5% |
| 2007 | Carp | 0.050 | 0.8% |
| 2007 | Channel catfish | 0.364 | 6.1% |
| 2007 | Freshwater drum | 0.050 | 0.8% |
| 2007 | Gizzard shad | 0.979 | 16.0% |
| 2007 | Longnose gar | 0.200 | 3.1% |
| 2007 | No Catch | 0.094 | 1.5% |
| 2007 | Northern pike | 0.050 | 0.8% |
| 2007 | Pumpkinseed | 0.400 | 6.1% |
| 2007 | Shorthead redhorse | 0.050 | 0.8% |
| 2007 | Smallmouth bass | 0.373 | 6.1% |
| 2007 | Walleye | 0.050 | 0.8% |
| 2007 | White perch | 2.031 | 33.6% |
| 2007 | White sucker | 0.429 | 6.9% |
| 2007 | Yellow perch | 0.861 | 13.7% |

**Table A8-18. Species richness from Gill nets in 2007.**

| Season | Whole Lake | Stratum 1 | Stratum 2 | Stratum 3 | Stratum 4 | Stratum 5 |
|---|---|---|---|---|---|---|
| Year | 17 | 6 | 7 | 6 | 5 | 12 |
| Spring | 10 | 5 | 3 | 2 | 1 | 8 |
| Fall | 13 | 1 | 6 | 6 | 4 | 6 |

## Table A8-19. Shannon Diversity Index from Gill nets in 2007.

| Season | Stratum | With Clupeids |
|---|---|---|
| Whole Year | Whole Lake | 0.922 |
| | Stratum 1 | 0.689 |
| | Stratum 2 | 0.789 |
| | Stratum 3 | 0.623 |
| | Stratum 4 | 0.562 |
| | Stratum 5 | 0.863 |
| Spring | Whole Lake | 0.700 |
| | Stratum 1 | 0.618 |
| | Stratum 2 | 0.458 |
| | Stratum 3 | 0.090 |
| | Stratum 4 | 0.000 |
| | Stratum 5 | 0.745 |
| Fall | Whole Lake | 0.945 |
| | Stratum 1 | 0.000 |
| | Stratum 2 | 0.724 |
| | Stratum 3 | 0.751 |
| | Stratum 4 | 0.473 |
| | Stratum 5 | 0.608 |

**Table A8-20(a-d). 2007 Nesting survey results by species and transect, with comparison of north vs. south.**

a) 2007 Nesting survey results by species and transect (1-24).

| Transect | Species | Number of Nests |
|---|---|---|
| Transect 1 | Other | 128 |
| | Pumpkinseed | 53 |
| | Black Bass (SM or LM) | 7 |
| Transect 2 | Pumpkinseed | 34 |
| | Black Bass (SM or LM) | 4 |
| | Other | 227 |
| Transect 3 | Other | 152 |
| | Bluegill | 64 |
| Transect 4 | Other | 187 |
| | Pumpkinseed | 83 |
| Transect 5 | Lepomis sp. | 2 |
| | Other | 95 |
| Transect 6 | Other | 201 |
| Transect 7 | Other | 310 |
| Transect 8 | Other | 140 |
| Transect 9 | Other | 30 |
| Transect 10 | Other | 3 |
| Transect 11 | No Catch | 0 |
| Transect 12 | No Catch | 0 |
| Transect 13 | No Catch | 0 |
| Transect 14 | Other | 1 |
| | Pumpkinseed | 1 |
| Transect 15 | Other | 62 |
| Transect 16 | Other | 2 |
| Transect 17 | No Catch | 0 |
| Transect 18 | No Catch | 0 |
| Transect 19 | Other | 7 |
| Transect 20 | Pumpkinseed | 1 |
| | Other | 69 |
| Transect 21 | Other | 3 |
| | Pumpkinseed | 1 |
| | Lepomis sp. | 1 |
| Transect 22 | Other | 12 |
| | Pumpkinseed | 1 |
| Transect 23 | Bluegill | 1 |
| | Lepomis sp. | 2 |
| | Other | 23 |
| | Pumpkinseed | 2 |
| Transect 24 | Pumpkinseed | 42 |
| | Largemouth bass | 5 |
| | Other | 85 |

**Table A8-20(a-d). 2007 Nesting survey results by species and transect, with comparison of north vs. south. (continued)**

b) 2007 total number of nests in each transect and relative abundance.

| Transect | Total Number of Nests | Percent of Total |
|---|---|---|
| Transect 1 | 188 | 9.2% |
| Transect 2 | 265 | 13.0% |
| Transect 3 | 216 | 10.6% |
| Transect 4 | 270 | 13.2% |
| Transect 5 | 97 | 4.8% |
| Transect 6 | 201 | 9.8% |
| Transect 7 | 310 | 15.2% |
| Transect 8 | 140 | 6.9% |
| Transect 9 | 30 | 1.5% |
| Transect 10 | 3 | 0.1% |
| Transect 11 | 0 | 0.0% |
| Transect 12 | 0 | 0.0% |
| Transect 13 | 0 | 0.0% |
| Transect 14 | 2 | 0.1% |
| Transect 15 | 62 | 3.0% |
| Transect 16 | 2 | 0.1% |
| Transect 17 | 0 | 0.0% |
| Transect 18 | 0 | 0.0% |
| Transect 19 | 7 | 0.3% |
| Transect 20 | 70 | 3.4% |
| Transect 21 | 5 | 0.2% |
| Transect 22 | 13 | 0.6% |
| Transect 23 | 28 | 1.4% |
| Transect 24 | 132 | 6.5% |

c) 2007 nest distribution.

| Basin | Total Number of Nests | Percent of Total |
|---|---|---|
| North Basin | 1717 | 84.1% |
| South Basin | 324 | 15.9% |

d) 2007 species contribution.

| Species | Total Number of Nests | Percent of Total |
|---|---|---|
| Black Bass (SM or LM) | 11 | 0.5% |
| Bluegill | 65 | 3.2% |
| Largemouth bass | 5 | 0.2% |
| Lepomis sp. | 5 | 0.2% |
| Other | 1737 | 85.1% |
| Pumpkinseed | 218 | 10.7% |

## Table A8-21(a-c). Pelagic larvae catch summary for 2007.

a) Whole year CPUE by species

| Species | Basin | Mean (#/m3) | SE |
|---|---|---|---|
| Alewife | North Basin | 0.0106 | 0.0123 |
| | South Basin | 0.0303 | 0.0110 |
| | Whole Lake | 0.0205 | 0.0107 |
| Bluegill | North Basin | 0.0111 | 0.0128 |
| | South Basin | 0.0050 | 0.0099 |
| | Whole Lake | 0.0080 | 0.0079 |
| Pumpkinseed | North Basin | 0 | 0 |
| | South Basin | 0.0050 | 0.0099 |
| | Whole Lake | 0.0025 | 0.0050 |

## Table A8-21(a-c). Pelagic larvae catch summary for 2007. (continued)

b) Sampling Event CPUE by species and location

* Note: two other sample periods had no fish captured.

| Sample Period | Species | Basin | Mean (#/m3) | SE |
|---|---|---|---|---|
| mid June | Alewife | North Basin | 0 | 0 |
| | | South Basin | 0.0375 | 0.0750 |
| | | Whole Lake | 0.0188 | 0.0375 |
| | Pumpkinseed | North Basin | 0 | 0 |
| | | South Basin | 0.0375 | 0.0750 |
| | | Whole Lake | 0.0188 | 0.0375 |
| late June | Alewife | North Basin | 0.0335 | 0.0670 |
| | | South Basin | 0.1542 | 0.1320 |
| | | Whole Lake | 0.0938 | 0.0823 |
| | Bluegill | North Basin | 0.0407 | 0.0814 |
| | | South Basin | 0.0344 | 0.0688 |
| | | Whole Lake | 0.0375 | 0.0494 |
| mid July | Alewife | North Basin | 0.0647 | 0.1295 |
| | | South Basin | 0.0464 | 0.0928 |
| | | Whole Lake | 0.0556 | 0.0741 |
| | Bluegill | North Basin | 0.0647 | 0.1295 |
| | | South Basin | 0 | 0 |
| | | Whole Lake | 0.0324 | 0.0647 |

## Table A8-21(a-c). Pelagic larvae catch summary for 2007. (continued)

c) Species richness in 2007.

| Location | Number of Species |
|---|---|
| North Basin | 2 |
| South Basin | 3 |
| Whole Lake | 3 |

**Table A8-22. 2007 YOY mean CPUE (#/haul) for each species for the whole year from each stratum and the entire lake.**

| Species | Entire Lake | | Stratum 1 | | Stratum 2 | | Stratum 3 | | Stratum 4 | | Stratum 5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Mean CPUE* | *SE* | *Mean CPUE* | *SE* | *Mean CPUE* | *SE* | *Mean CPUE* | *SE* | *Mean CPUE* | *SE* | *Mean CPUE* | *SE* |
| Banded killifish | 0.26 | 0.23 | 0.00 | 0.00 | 1.28 | 1.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Brown bullhead | 0.01 | 0.01 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Carp | 0.03 | 0.03 | 0.00 | 0.00 | 0.17 | 0.17 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Golden shiner | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 |
| Largemouth bass | 7.81 | 1.98 | 16.56 | 5.72 | 0.89 | 0.48 | 0.33 | 0.18 | 13.00 | 5.96 | 8.28 | 4.64 |
| Lepomis sp. | 7.66 | 3.94 | 2.72 | 2.33 | 0.00 | 0.00 | 0.72 | 0.42 | 32.78 | 18.70 | 2.06 | 1.94 |
| Smallmouth bass | 0.53 | 0.14 | 1.00 | 0.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.20 | 1.17 | 0.44 |
| Tesselated darter | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.06 | 0.00 | 0.00 |
| **Total** | **16.32** | **6.20** | **19.28** | **8.05** | **2.39** | **1.87** | **1.06** | **0.60** | **45.83** | **24.72** | **10.33** | **6.58** |

**Table A8-23(a-b). YOY Relative abundance for each species for 2007 from each stratum and the entire lake with and without clupeids.**

**a) With Clupeids**

| Species | Entire Lake | Stratum 1 | Stratum 2 | Stratum 3 | Stratum 4 | Stratum 5 |
|---|---|---|---|---|---|---|
| Banded killifish | 1.56% | 0% | 53.49% | 0% | 0% | 0% |
| Brown bullhead | 0.07% | 0% | 2.33% | 0% | 0% | 0% |
| Carp | 0.20% | 0% | 6.98% | 0% | 0% | 0% |
| Golden shiner | 0.07% | 0% | 0% | 0% | 0.12% | 0% |
| Largemouth bass | 47.69% | 81.64% | 37.21% | 31.58% | 27.92% | 71.29% |
| Lepomis sp. | 46.74% | 13.42% | 0% | 68.42% | 70.41% | 17.70% |
| Rock bass | 0.34% | 0% | 0% | 0% | 0.36% | 0.96% |
| Smallmouth bass | 3.26% | 4.93% | 0% | 0% | 1.07% | 10.05% |
| Tesselated darter | 0.07% | 0% | 0% | 0% | 0.12% | 0% |

**b) Without Clupeids**

| Species | Entire Lake | Stratum 1 | Stratum 2 | Stratum 3 | Stratum 4 | Stratum 5 |
|---|---|---|---|---|---|---|
| Banded killifish | 1.56% | 0% | 53.49% | 0% | 0% | 0% |
| Brown bullhead | 0.07% | 0% | 2.33% | 0% | 0% | 0% |
| Carp | 0.20% | 0% | 6.98% | 0% | 0% | 0% |
| Golden shiner | 0.07% | 0% | 0% | 0% | 0.12% | 0% |
| Largemouth bass | 47.69% | 81.64% | 37.21% | 31.58% | 27.92% | 71.29% |
| Lepomis sp. | 46.74% | 13.42% | 0% | 68.42% | 70.41% | 17.70% |
| Rock bass | 0.34% | 0% | 0% | 0% | 0.36% | 0.96% |
| Smallmouth bass | 3.26% | 4.93% | 0% | 0% | 1.07% | 10.05% |
| Tesselated darter | 0.07% | 0% | 0% | 0% | 0.12% | 0% |

**Table A8-24. YOY mean CPUE (#/haul) for each species from each site for 2007.**

| Stratum | Site | Species | Mean CPUE | SE |
|---|---|---|---|---|
| Stratum 1 | Site 1 | Largemouth bass | 36.00 | 13.54 |
| | | Lepomis sp. | 7.50 | 6.92 |
| | | Smallmouth bass | 2.00 | 1.29 |
| | Site 2 | Largemouth bass | 12.50 | 4.85 |
| | | Lepomis sp. | 0.67 | 0.67 |
| | | Smallmouth bass | 0.67 | 0.33 |
| | Site 3 | Largemouth bass | 1.17 | 0.79 |
| | | Smallmouth bass | 0.33 | 0.33 |
| Stratum 2 | Site 1 | Banded killifish | 0.33 | 0.33 |
| | | Carp | 0.50 | 0.50 |
| | | Largemouth bass | 2.50 | 1.23 |
| | Site 3 | Banded killifish | 3.50 | 3.50 |
| | | Brown bullhead | 0.17 | 0.17 |
| | | Largemouth bass | 0.17 | 0.17 |
| Stratum 3 | Site 1 | Largemouth bass | 0.33 | 0.21 |
| | | Lepomis sp. | 1.00 | 1.00 |
| | Site 2 | Largemouth bass | 0.50 | 0.50 |
| | | Lepomis sp. | 1.00 | 0.82 |
| | Site 3 | Largemouth bass | 0.17 | 0.17 |
| | | Lepomis sp. | 0.17 | 0.17 |
| Stratum 4 | Site 1 | Golden shiner | 0.17 | 0.17 |
| | | Largemouth bass | 3.67 | 2.40 |
| | | Lepomis sp. | 9.67 | 7.24 |
| | | Smallmouth bass | 0.33 | 0.21 |
| | Site 2 | Largemouth bass | 10.00 | 7.51 |
| | | Lepomis sp. | 21.00 | 9.70 |
| | | Rock bass | 0.17 | 0.17 |
| | | Smallmouth bass | 0.33 | 0.33 |
| | | Tesselated darter | 0.17 | 0.17 |
| | Site 3 | Largemouth bass | 25.33 | 15.84 |
| | | Lepomis sp. | 67.67 | 55.15 |
| | | Rock bass | 0.33 | 0.33 |
| | | Smallmouth bass | 0.83 | 0.48 |
| Stratum 5 | Site 1 | Largemouth bass | 5.33 | 3.42 |
| | | Smallmouth bass | 2.67 | 0.88 |
| | Site 2 | Largemouth bass | 2.67 | 1.71 |
| | | Lepomis sp. | 5.83 | 5.83 |
| | | Smallmouth bass | 0.83 | 0.65 |
| | Site 3 | Largemouth bass | 16.83 | 13.51 |
| | | Lepomis sp. | 0.33 | 0.33 |
| | | Rock bass | 0.33 | 0.33 |

**Table A8-25. YOY CPUE (#/haul) in each stratum during each sampling for each species, 2007.**

| Sample period | Stratum | Species | CPUE | SE |
|---|---|---|---|---|
| late June - early July | Stratum 1 | Largemouth bass | 0.67 | 0.33 |
| | Stratum 2 | No Catch | 0.00 | 0.00 |
| | Stratum 3 | No Catch | 0.00 | 0.00 |
| | Stratum 4 | No Catch | 0.00 | 0.00 |
| | Stratum 5 | Largemouth bass | 1.67 | 1.67 |
| | | Smallmouth bass | 0.33 | 0.33 |
| mid July | Stratum 1 | Largemouth bass | 16.00 | 8.14 |
| | | Smallmouth bass | 0.33 | 0.33 |
| | Stratum 2 | Carp | 1.00 | 1.00 |
| | Stratum 3 | No Catch | 0.00 | 0.00 |
| | Stratum 4 | Largemouth bass | 14.33 | 8.35 |
| | | Lepomis sp. | 16.00 | 8.33 |
| | | Rock bass | 0.67 | 0.67 |
| | | Smallmouth bass | 1.67 | 0.88 |
| | Stratum 5 | Largemouth bass | 13.33 | 6.33 |
| | | Smallmouth bass | 0.67 | 0.67 |
| August | Stratum 1 | Largemouth bass | 26.67 | 17.27 |
| | | Lepomis sp. | 2.33 | 1.20 |
| | | Smallmouth bass | 1.67 | 1.67 |
| | Stratum 2 | Largemouth bass | 1.00 | 1.00 |
| | Stratum 3 | Largemouth bass | 1.33 | 0.88 |
| | | Lepomis sp. | 2.33 | 1.86 |
| | Stratum 4 | Largemouth bass | 54.33 | 25.10 |
| | | Lepomis sp. | 146.33 | 97.38 |
| | | Rock bass | 0.33 | 0.33 |
| | | Smallmouth bass | 0.33 | 0.33 |
| | | Tesselated darter | 0.33 | 0.33 |
| | Stratum 5 | Largemouth bass | 32.00 | 25.63 |
| | | Lepomis sp. | 12.33 | 11.35 |
| | | Rock bass | 0.67 | 0.67 |
| | | Smallmouth bass | 2.33 | 1.20 |
| late August | Stratum 1 | Largemouth bass | 24.33 | 18.84 |
| | | Smallmouth bass | 0.67 | 0.67 |
| | Stratum 2 | Largemouth bass | 3.00 | 2.52 |
| | Stratum 3 | Largemouth bass | 0.33 | 0.33 |
| | | Lepomis sp. | 2.00 | 1.53 |
| | Stratum 4 | Largemouth bass | 5.00 | 1.53 |
| | | Lepomis sp. | 14.00 | 14.00 |
| | | Smallmouth bass | 0.33 | 0.33 |
| | Stratum 5 | Largemouth bass | 1.00 | 0.58 |
| | | Smallmouth bass | 2.00 | 2.00 |

**Table A8-25. YOY CPUE (#/haul) in each stratum during each sampling for each species, 2007. (continued)**

| Sample period | Stratum | Species | CPUE | SE |
|---|---|---|---|---|
| mid September | Stratum 1 | Largemouth bass | 31.00 | 22.61 |
| | | Lepomis sp. | 14.00 | 14.00 |
| | | Smallmouth bass | 2.67 | 2.19 |
| | Stratum 2 | Brown bullhead | 0.33 | 0.33 |
| | | Largemouth bass | 0.33 | 0.33 |
| | Stratum 3 | Largemouth bass | 0.33 | 0.33 |
| | Stratum 4 | Golden shiner | 0.33 | 0.33 |
| | | Largemouth bass | 4.33 | 4.33 |
| | | Lepomis sp. | 20.33 | 12.81 |
| | | Smallmouth bass | 0.33 | 0.33 |
| | Stratum 5 | Largemouth bass | 1.67 | 0.88 |
| | | Smallmouth bass | 1.67 | 1.20 |
| October | Stratum 1 | Largemouth bass | 0.67 | 0.67 |
| | | Smallmouth bass | 0.67 | 0.67 |
| | Stratum 2 | Banded killifish | 7.67 | 6.69 |
| | | Largemouth bass | 1.00 | 1.00 |
| | Stratum 3 | No Catch | 0.00 | 0.00 |
| | Stratum 4 | Smallmouth bass | 0.33 | 0.33 |
| | Stratum 5 | No Catch | 0.00 | 0.00 |

**Table A8-26. Mean CPUE (#/haul) of incidental catch of non-YOY species for entire lake in 2007.**

| Species | Mean CPUE | SE |
|---|---|---|
| Alewife | 1.06 | 1.06 |
| Banded killifish | 2.04 | 0.61 |
| Bluegill | 0.11 | 0.05 |
| Brown bullhead | 0.01 | 0.01 |
| Carp | 0.10 | 0.05 |
| Freshwater drum | 0.01 | 0.01 |
| Gizzard shad | 0.02 | 0.02 |
| Golden shiner | 0.51 | 0.26 |
| Largemouth bass | 0.80 | 0.29 |
| Lepomis sp. | 2.58 | 0.76 |
| No Catch | 0.26 | 0.05 |
| Pumpkinseed | 0.98 | 0.31 |
| Rock bass | 0.06 | 0.04 |
| Smallmouth bass | 0.20 | 0.06 |
| Spotfin Shiner | 0.01 | 0.01 |
| Tesselated darter | 0.01 | 0.01 |
| White perch | 0.07 | 0.03 |
| White sucker | 0.02 | 0.02 |
| Yellow perch | 0.06 | 0.04 |

**Table A8-27 (a-d). Mean total length of YOY fish for each stratum and whole lake by sample period in 2007.**

*a) By stratum and sampling period*

| Sample period | Stratum | Species | Mean total length (mm) | SE | N |
|---|---|---|---|---|---|
| late June - early July | Stratum 1 | Largemouth bass | 27.50 | 0.50 | 2 |
| | Stratum 2 | No Catch | | | 0 |
| | Stratum 3 | No Catch | | | 0 |
| | Stratum 4 | No Catch | | | 0 |
| | Stratum 5 | Largemouth bass | 43.60 | 1.94 | 5 |
| | | Smallmouth bass | 31.00 | | 1 |
| mid July | Stratum 1 | Largemouth bass | 46.15 | 0.71 | 48 |
| | | Smallmouth bass | 36.00 | | 1 |
| | Stratum 2 | Carp | 47.67 | 0.88 | 3 |
| | Stratum 3 | No Catch | | | 0 |
| | Stratum 4 | Largemouth bass | 54.79 | 1.35 | 43 |
| | | Lepomis sp. | 30.50 | 0.92 | 48 |
| | | Rock bass | 38.00 | 2.00 | 2 |
| | | Smallmouth bass | 54.60 | 2.36 | 5 |
| | Stratum 5 | Largemouth bass | 52.13 | 1.14 | 40 |
| | | Smallmouth bass | 52.50 | 1.50 | 2 |
| August | Stratum 1 | Largemouth bass | 65.32 | 1.07 | 50 |
| | | Lepomis sp. | 37.57 | 0.37 | 7 |
| | | Smallmouth bass | 62.80 | 3.32 | 5 |
| | Stratum 2 | Largemouth bass | 65.33 | 0.88 | 3 |
| | Stratum 3 | Largemouth bass | 55.75 | 6.81 | 4 |
| | | Lepomis sp. | 36.29 | 1.17 | 7 |
| | Stratum 4 | Largemouth bass | 65.32 | 1.10 | 57 |
| | | Lepomis sp. | 37.00 | 0.55 | 26 |
| | | Rock bass | 30.00 | | 1 |
| | | Smallmouth bass | 62.00 | | 1 |
| | | Tesselated darter | 45.00 | | 1 |
| | Stratum 5 | Largemouth bass | 62.44 | 0.76 | 43 |
| | | Lepomis sp. | 36.33 | 1.94 | 9 |
| | | Rock bass | 33.00 | 2.00 | 2 |
| | | Smallmouth bass | 66.43 | 2.73 | 7 |
| late August | Stratum 1 | Largemouth bass | 65.89 | 1.30 | 35 |
| | | Smallmouth bass | 73.50 | 4.50 | 2 |
| | Stratum 2 | Largemouth bass | 67.89 | 1.46 | 9 |
| | Stratum 3 | Largemouth bass | 61.00 | | 1 |
| | | Lepomis sp. | 35.50 | 0.72 | 6 |
| | Stratum 4 | Largemouth bass | 70.13 | 2.32 | 15 |
| | | Lepomis sp. | 36.33 | 2.19 | 3 |
| | | Smallmouth bass | 77.00 | | 1 |
| | Stratum 5 | Largemouth bass | 63.33 | 6.89 | 3 |
| | | Smallmouth bass | 72.17 | 2.27 | 6 |

**Table A8-27 (a-d). Mean total length of YOY fish for each stratum and whole lake by sample period in 2007. (continued)**

*a) By stratum and sampling period (continued)*

| Sample period | Stratum | Species | Mean total length (mm) | SE | N |
|---|---|---|---|---|---|
| mid September | Stratum 1 | Largemouth bass | 76.48 | 1.42 | 48 |
| | | Lepomis sp. | 48.82 | 1.01 | 28 |
| | | Smallmouth bass | 79.75 | 2.14 | 8 |
| | Stratum 2 | Brown bullhead | 69.00 | | 1 |
| | | Largemouth bass | 72.00 | | 1 |
| | Stratum 3 | Largemouth bass | 103.00 | | 1 |
| | Stratum 4 | Golden shiner | 67.00 | | 1 |
| | | Largemouth bass | 89.08 | 4.37 | 13 |
| | | Lepomis sp. | 53.76 | 0.76 | 42 |
| | | Smallmouth bass | 84.00 | | 1 |
| | Stratum 5 | Largemouth bass | 85.60 | 4.58 | 5 |
| | | Smallmouth bass | 87.60 | 3.23 | 5 |
| October | Stratum 1 | Largemouth bass | 83.50 | 6.50 | 2 |
| | | Smallmouth bass | 87.00 | 2.00 | 2 |
| | Stratum 2 | Banded killifish | 68.00 | 4.00 | 2 |
| | | Largemouth bass | 89.33 | 4.91 | 3 |
| | Stratum 3 | No Catch | | | 0 |
| | Stratum 4 | Smallmouth bass | 90.00 | | 1 |
| | Stratum 5 | No Catch | | | 0 |

**Table A8-27 (a-d). Mean total length of YOY fish for each stratum and whole lake by sample period in 2007. (continued)**

*b) Whole lake by sampling period*

| Sample period | Species | Mean total length (mm) | SE | N |
|---|---|---|---|---|
| late June - early July | Largemouth bass | 39.0 | 3.3 | 7 |
| | Smallmouth bass | 31.0 | | 1 |
| mid July | Carp | 47.7 | 0.9 | 3 |
| | Largemouth bass | 50.8 | 0.7 | 131 |
| | Lepomis sp. | 30.5 | 0.9 | 48 |
| | Rock bass | 38.0 | 2.0 | 2 |
| | Smallmouth bass | 51.8 | 2.7 | 8 |
| August | Largemouth bass | 64.3 | 0.6 | 157 |
| | Lepomis sp. | 36.9 | 0.5 | 49 |
| | Rock bass | 32.0 | 1.5 | 3 |
| | Smallmouth bass | 64.7 | 1.9 | 13 |
| | Tesselated darter | 45.0 | | 1 |
| late August | Largemouth bass | 67.0 | 1.0 | 63 |
| | Lepomis sp. | 35.8 | 0.8 | 9 |
| | Smallmouth bass | 73.0 | 1.7 | 9 |
| mid September | Brown bullhead | 69.0 | | 1 |
| | Golden shiner | 67.0 | | 1 |
| | Largemouth bass | 79.9 | 1.5 | 68 |
| | Lepomis sp. | 51.8 | 0.7 | 70 |
| | Smallmouth bass | 82.9 | 1.9 | 14 |
| October | Banded killifish | 68.0 | 4.0 | 2 |
| | Largemouth bass | 87.0 | 3.7 | 5 |
| | Smallmouth bass | 88.0 | 1.5 | 3 |

**Table A8-27 (a-d). Mean total length of YOY fish for each stratum and whole lake by sample period in 2007. (continued)**

*c) Whole lake, whole year*

| Species | Mean length (mm) | SE | N |
|---|---|---|---|
| Banded killifish | 68.0 | 4.0 | 2 |
| Brown bullhead | 69.0 | | 1 |
| Carp | 47.7 | 0.9 | 3 |
| Golden shiner | 67.0 | | 1 |
| Largemouth bass | 62.9 | 0.7 | 431 |
| Lepomis sp. | 41.0 | 0.8 | 176 |
| Rock bass | 34.4 | 1.8 | 5 |
| Smallmouth bass | 70.1 | 2.1 | 48 |
| Tesselated darter | 45.0 | | 1 |

**Table A8-27 (a-d). Mean total length of YOY fish for each stratum and whole lake by sample period in 2007. (continued)**

*d) Whole year by stratum*

| Stratum | Species | Mean total length (mm) | SE | N |
|---|---|---|---|---|
| Stratum 1 | Largemouth bass | 63.14 | 1.04 | 185 |
| | Lepomis sp. | 46.57 | 1.12 | 35 |
| | Smallmouth bass | 72.72 | 3.22 | 18 |
| Stratum 2 | Banded killifish | 68.00 | 4.00 | 2 |
| | Brown bullhead | 69.00 | | 1 |
| | Carp | 47.67 | 0.88 | 3 |
| | Largemouth bass | 71.69 | 2.49 | 16 |
| Stratum 3 | Largemouth bass | 64.50 | 8.86 | 6 |
| | Lepomis sp. | 35.92 | 0.69 | 13 |
| Stratum 4 | Golden shiner | 67.00 | | 1 |
| | Largemouth bass | 64.76 | 1.21 | 128 |
| | Lepomis sp. | 40.28 | 1.06 | 119 |
| | Rock bass | 35.33 | 2.91 | 3 |
| | Smallmouth bass | 65.11 | 4.99 | 9 |
| | Tesselated darter | 45.00 | | 1 |
| Stratum 5 | Largemouth bass | 58.40 | 1.10 | 96 |
| | Lepomis sp. | 36.33 | 1.94 | 9 |
| | Rock bass | 33.00 | 2.00 | 2 |
| | Smallmouth bass | 70.10 | 3.27 | 21 |

**Table A8-28. YOY mean total length in August in each stratum and the entire lake in 2007.**

| Species | Stratum | Mean total length (mm) | SE | N |
|---|---|---|---|---|
| Largemouth bass | Stratum 1 | 65.55 | 0.82 | 85 |
| Lepomis sp. | Stratum 1 | 37.57 | 0.37 | 7 |
| Smallmouth bass | Stratum 1 | 65.86 | 3.18 | 7 |
| Largemouth bass | Stratum 2 | 67.25 | 1.14 | 12 |
| Largemouth bass | Stratum 3 | 56.80 | 5.38 | 5 |
| Lepomis sp. | Stratum 3 | 35.92 | 0.69 | 13 |
| Largemouth bass | Stratum 4 | 66.32 | 1.02 | 72 |
| Lepomis sp. | Stratum 4 | 36.93 | 0.53 | 29 |
| Rock bass | Stratum 4 | 30.00 | | 1 |
| Smallmouth bass | Stratum 4 | 69.50 | 7.50 | 2 |
| Tesselated darter | Stratum 4 | 45.00 | | 1 |
| Largemouth bass | Stratum 5 | 62.50 | 0.81 | 46 |
| Lepomis sp. | Stratum 5 | 36.33 | 1.94 | 9 |
| Rock bass | Stratum 5 | 33.00 | 2.00 | 2 |
| Smallmouth bass | Stratum 5 | 69.08 | 1.92 | 13 |
| Largemouth bass | Whole Lake | 65.06 | 0.52 | 220 |
| Lepomis sp. | Whole Lake | 36.69 | 0.43 | 58 |
| Rock bass | Whole Lake | 32.00 | 1.53 | 3 |
| Smallmouth bass | Whole Lake | 68.09 | 1.59 | 22 |
| Tesselated darter | Whole Lake | 45.00 | | 1 |

**Table A8-29. Growth rates of YOY between all sampling periods in 2007.**

| Time period | Species | Stratum | Growth rate (ln(Wt/Wo)) | N |
|---|---|---|---|---|
| late June - early July to mid July | Largemouth bass | Stratum 1 | 1.171 | 50 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 0.576 | 45 |
| | | Whole Lake | 0.643 | 133 |
| | Smallmouth bass | Stratum 1 | 0.000 | 0 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 1.897 | 3 |
| | | Whole Lake | 1.833 | 9 |
| late June - early July to August | Largemouth bass | Stratum 1 | 2.305 | 52 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 0.936 | 48 |
| | | Whole Lake | 1.308 | 155 |
| | Smallmouth bass | Stratum 1 | 0.000 | 0 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 2.572 | 8 |
| | | Whole Lake | 2.619 | 14 |
| late June - early July to late August | Largemouth bass | Stratum 1 | 2.385 | 37 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 1.115 | 8 |
| | | Whole Lake | 1.530 | 68 |
| | Smallmouth bass | Stratum 1 | 0.000 | 0 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 2.737 | 7 |
| | | Whole Lake | 2.806 | 9 |
| late June - early July to mid September | Largemouth bass | Stratum 1 | 2.651 | 50 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 1.906 | 10 |
| | | Whole Lake | 1.932 | 75 |
| | Smallmouth bass | Stratum 1 | 0.000 | 0 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 3.243 | 6 |
| | | Whole Lake | 3.163 | 15 |

**Table A8-29. Growth rates of YOY between all sampling periods in 2007. (continued)**

| Time period | Species | Stratum | Growth rate (ln(Wt/Wo)) | N |
|---|---|---|---|---|
| late June - early July to October | Largemouth bass | Stratum 1 | 2.862 | 4 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 0.000 | 0 |
| | | Whole Lake | 2.113 | 12 |
| | Smallmouth bass | Stratum 1 | 0.000 | 0 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 0.000 | 0 |
| | | Whole Lake | 3.332 | 4 |
| mid July to August | Largemouth bass | Stratum 1 | 1.134 | 98 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.473 | 93 |
| | | Stratum 5 | 0.360 | 83 |
| | | Whole Lake | 0.665 | 274 |
| | Smallmouth bass | Stratum 1 | 2.438 | 6 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.380 | 6 |
| | | Stratum 5 | 0.675 | 9 |
| | | Whole Lake | 0.786 | 21 |
| mid July to late August | Largemouth bass | Stratum 1 | 1.214 | 83 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.778 | 51 |
| | | Stratum 5 | 0.539 | 43 |
| | | Whole Lake | 0.887 | 187 |
| | Smallmouth bass | Stratum 1 | 2.700 | 3 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 0.840 | 8 |
| | | Whole Lake | 0.973 | 16 |
| mid July to mid September | Largemouth bass | Stratum 1 | 1.481 | 96 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 1.437 | 51 |
| | | Stratum 5 | 1.330 | 45 |
| | | Whole Lake | 1.289 | 194 |
| | Smallmouth bass | Stratum 1 | 2.824 | 9 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 1.195 | 6 |
| | | Stratum 5 | 1.346 | 7 |
| | | Whole Lake | 1.331 | 22 |

**Table A8-29. Growth rates of YOY between all sampling periods in 2007. (continued)**

| Time period | Species | Stratum | Growth rate (ln(Wt/Wo)) | N |
|---|---|---|---|---|
| mid July to October | Largemouth bass | Stratum 1 | 1.692 | 50 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 0.000 | 0 |
| | | Whole Lake | 1.470 | 131 |
| | Smallmouth bass | Stratum 1 | 3.002 | 3 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 1.457 | 6 |
| | | Stratum 5 | 0.000 | 0 |
| | | Whole Lake | 1.500 | 11 |
| August to late August | Largemouth bass | Stratum 1 | 0.080 | 85 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.305 | 68 |
| | | Stratum 5 | 0.179 | 46 |
| | | Whole Lake | 0.222 | 209 |
| | Smallmouth bass | Stratum 1 | 0.262 | 7 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.000 | 0 |
| | | Stratum 5 | 0.165 | 13 |
| | | Whole Lake | 0.187 | 21 |
| August to mid September | Largemouth bass | Stratum 1 | 0.347 | 98 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.964 | 68 |
| | | Stratum 5 | 0.970 | 48 |
| | | Whole Lake | 0.624 | 216 |
| | Smallmouth bass | Stratum 1 | 0.386 | 13 |
| | | Stratum 2 | 0.000 | 0 |
| | | Stratum 3 | 0.000 | 0 |
| | | Stratum 4 | 0.815 | 2 |
| | | Stratum 5 | 0.670 | 12 |
| | | Whole Lake | 0.544 | 27 |

## Table A8-30(a-b). 2007 YOY relative weight.

*a. Sorted by sample period and stratum.*

| Sample period | Stratum | Species | Relative weight | SE | N |
|---|---|---|---|---|---|
| late June - early July | Stratum 1 | Largemouth bass | 211.89 | 12.28 | 2 |
| | Stratum 5 | Largemouth bass | 143.38 | 15.65 | 5 |
| | | Smallmouth bass | 108.08 | | 1 |
| mid July | Stratum 1 | Largemouth bass | 122.63 | 5.11 | 48 |
| | | Smallmouth bass | 89.31 | | 1 |
| | Stratum 4 | Largemouth bass | 120.94 | 3.07 | 38 |
| | | Smallmouth bass | 124.09 | 5.35 | 5 |
| | Stratum 5 | Largemouth bass | 137.25 | 2.86 | 40 |
| | | Smallmouth bass | 133.02 | 1.18 | 2 |
| August | Stratum 1 | Largemouth bass | 128.21 | 2.49 | 50 |
| | | Smallmouth bass | 181.06 | 26.01 | 5 |
| | Stratum 4 | Largemouth bass | 112.85 | 1.69 | 55 |
| | | Smallmouth bass | 121.54 | | 1 |
| | Stratum 5 | Largemouth bass | 115.59 | 2.42 | 43 |
| | | Smallmouth bass | 119.66 | 4.58 | 7 |
| late August | Stratum 1 | Largemouth bass | 138.01 | 5.56 | 35 |
| | | Smallmouth bass | 130.42 | 16.27 | 2 |
| | Stratum 2 | Largemouth bass | 133.90 | 5.29 | 9 |
| | Stratum 3 | Largemouth bass | 137.25 | | 1 |
| | Stratum 4 | Largemouth bass | 113.41 | 5.64 | 13 |
| | Stratum 5 | Largemouth bass | 116.72 | 12.10 | 3 |
| | | Smallmouth bass | 112.68 | 6.69 | 6 |
| mid September | Stratum 1 | Largemouth bass | 109.40 | 1.06 | 48 |
| | | Smallmouth bass | 116.40 | 1.67 | 8 |
| | Stratum 2 | Largemouth bass | 112.72 | | 1 |
| | Stratum 3 | Largemouth bass | 97.71 | | 1 |
| | Stratum 4 | Largemouth bass | 103.82 | 1.61 | 13 |
| | | Smallmouth bass | 103.85 | | 1 |
| | Stratum 5 | Largemouth bass | 106.51 | 4.49 | 5 |
| | | Smallmouth bass | 99.52 | 5.40 | 5 |
| October | Stratum 1 | Largemouth bass | 104.71 | 0.11 | 2 |
| | | Smallmouth bass | 106.97 | 5.87 | 2 |
| | Stratum 2 | Largemouth bass | 103.40 | 4.75 | 3 |
| | Stratum 4 | Smallmouth bass | 108.26 | | 1 |

## Table A8-30(a-b). 2007 YOY relative weight. (continued)

*b. Sorted by sample period for whole lake*

| Sample period | Species | Relative weight | SE | N |
|---|---|---|---|---|
| late June - early July | Largemouth bass | 162.96 | 16.84 | 7 |
| | Smallmouth bass | 108.08 | | 1 |
| mid July | Largemouth bass | 126.76 | 2.41 | 126 |
| | Smallmouth bass | 121.98 | 5.84 | 8 |
| August | Largemouth bass | 118.84 | 1.37 | 148 |
| | Smallmouth bass | 143.42 | 12.89 | 13 |
| late August | Largemouth bass | 131.11 | 3.74 | 61 |
| | Smallmouth bass | 117.11 | 6.47 | 8 |
| mid September | Largemouth bass | 108.00 | 0.91 | 68 |
| | Smallmouth bass | 109.48 | 3.01 | 14 |
| October | Largemouth bass | 103.93 | 2.62 | 5 |
| | Smallmouth bass | 107.40 | 3.42 | 3 |

**Table A8-31. Shannon Diversity Index for YOY fish in 2007 with and without clupeids.**

| Stratum | With Clupeids | Without Clupeids |
|---|---|---|
| Stratum 1 | 0.25 | 0.25 |
| Stratum 2 | 0.42 | 0.42 |
| Stratum 3 | 0.27 | 0.27 |
| Stratum 4 | 0.30 | 0.30 |
| Stratum 5 | 0.36 | 0.36 |
| Whole Lake | 0.40 | 0.40 |

**Table A8-32(a-c). Reproductive guilds, based on abundance of YOY taxa in 2007, with and without clupeids.**

*a) CPUE for the entire lake and each stratum with clupeids.*

| Reproductive Guild | Entire Lake | Stratum | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Guarder, nest spawner, ariadnophil | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Guarder, nest spawner, lithophil | 8.24 | 3.72 | 0.00 | 0.72 | 33.44 | 3.33 |
| Guarder, nest spawner, phytophil | 7.81 | 16.56 | 0.89 | 0.33 | 13.00 | 8.28 |
| Guarder, nest spawner, speleophil | 0.01 | 0.00 | 0.06 | 0.00 | 0.00 | 0.00 |
| Nonguarder, brood hider, lithophil | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Nonguarder, open substrate spawner, litho-pelagophil | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Nonguarder, open substrate spawner, lithophil | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Nonguarder, open substrate spawner, pelagophil | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Nonguarder, open substrate spawner, phyto-lithophil | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Nonguarder, open substrate spawner, phytophil | 0.30 | 0.00 | 1.44 | 0.00 | 0.06 | 0.00 |
| Nonguarder, open substrate spawner, psammophil | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **16.37** | **20.28** | **2.39** | **1.06** | **46.50** | **11.61** |

*b) Relative abundance for the entire lake and each stratum with clupeids*

| Reproductive Guild | Entire Lake | Stratum | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Guarder, nest spawner, ariadnophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Guarder, nest spawner, lithophil | 50.37% | 18.36% | 0.00% | 68.42% | 71.92% | 28.71% |
| Guarder, nest spawner, phytophil | 47.73% | 81.64% | 37.21% | 31.58% | 27.96% | 71.29% |
| Guarder, nest spawner, speleophil | 0.07% | 0.00% | 2.33% | 0.00% | 0.00% | 0.00% |
| Nonguarder, brood hider, lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, litho-pelagophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, pelagophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, phyto-lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, phytophil | 1.83% | 0.00% | 60.47% | 0.00% | 0.12% | 0.00% |
| Nonguarder, open substrate spawner, psammophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

*c) Relative abundance for the entire lake and each stratum without clupeids*

| Reproductive Guild | Entire Lake | Stratum | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Guarder, nest spawner, ariadnophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Guarder, nest spawner, lithophil | 50.37% | 18.36% | 0.00% | 68.42% | 71.92% | 28.71% |
| Guarder, nest spawner, phytophil | 47.73% | 81.64% | 37.21% | 31.58% | 27.96% | 71.29% |
| Guarder, nest spawner, speleophil | 0.07% | 0.00% | 2.33% | 0.00% | 0.00% | 0.00% |
| Nonguarder, brood hider, lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, litho-pelagophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, pelagophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, phyto-lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, phytophil | 1.83% | 0.00% | 60.47% | 0.00% | 0.12% | 0.00% |
| Nonguarder, open substrate spawner, psammophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

**Table A8-33. Presence/absence of Early Life History Stages and Adults in 2007.**

| Life Stages Present | Species | Count of Species |
|---|---|---|
| L | No Catch | 1 |
| L/Y/A | Alewife | 3 |
| | Bluegill | |
| | Pumpkinseed | |
| Y/A | Banded killifish | 12 |
| | Brown bullhead | |
| | Brown trout | |
| | Carp | |
| | Freshwater drum | |
| | Gizzard shad | |
| | Golden shiner | |
| | Largemouth bass | |
| | Rock bass | |
| | Smallmouth bass | |
| | Tesselated darter | |
| | White perch | |
| A | Bowfin | 11 |
| | Channel catfish | |
| | Longnose gar | |
| | Northern hog sucker | |
| | Northern pike | |
| | Rudd | |
| | Shorthead redhorse | |
| | Spotfin Shiner | |
| | Walleye | |
| | White sucker | |
| | Yellow perch | |

L = Larvae present (captured during larvae sampling)

Y = YOY present (captured during YOY seining)

A = Adult stage present

**Table A8-34(a-c). Presence/absence and CPUE of larval and YOY fishes in samples collected from Onondaga Lake from 2000-2007.**

*a) Larvae Seines (# per seine haul). Note: littoral sampling for larval fish was discontinued after 2003.*

| **Species** | **2000** | **2001** | **2002** | **2003** |
|---|---|---|---|---|
| Alewife | 0.03 | | | 0.01 |
| Banded killifish | 0.06 | | 0.27 | 0.45 |
| Brook silverside | 16.9 | 3.8 | 43.6 | 2.8 |
| Carp | 1.1 | 15.8 | 1.9 | 18.9 |
| Crappie sp. | 0.01 | | | 0.01 |
| Fathead minnow | 0.1 | | | |
| Freshwater drum | 0.58 | | <0.01 | |
| Gizzard shad | 0.36 | | 0.02 | |
| Golden shiner | 0.93 | 0.1 | 0.45 | 0.47 |
| Johnny darter | <0.01 | 0.1 | | |
| Largemouth bass | 0.01 | | <0.01 | |
| Lepomis[1] | 17.22 | 3.2 | 36.2 | 45.3 |
| Logperch | 0.02 | | | |
| Longnose dace | <0.01 | | | |
| Shorthead redhorse | <0.01 | | | |
| Tessellated darter | <0.01 | | | |
| Trout perch | | | 0.03 | |
| White perch | 0.19 | | <0.01 | |
| White sucker | 1.4 | 3.7 | | |
| Yellow perch | 0.66 | 0.5 | 0.2 | 1.8 |
| **Richness[2]** | **20** | **8** | **12** | **9** |

<u>*Notes:*</u>

[1] Lepomis are likely a combination of both bluegill and pumpkinseed.

[2] Richness assumes Lepomis is composed both bluegill and pumpkinseed.

**Table A8-34(a-c). Presence/absence and CPUE of larval and YOY fishes in samples collected from Onondaga Lake from 2000-2007. (continued)**

*b) Larvae Trawls (#/ m3). Note: trawls in 2000 were done at night. Trawls in 2001 and 2002 were done during the day.*

| Species | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Alewife | | | | | 0.0041 | 0.0522 | 0.0004 | 0.0205 |
| Bluegill | | | | | | | | 0.0080 |
| Brook silverside | | | | | 0.0020 | | | |
| Carp | | | 0.0050 | | | 0.0030 | | |
| Freshwater drum | 0.31 | 0.01 | 0.0310 | | | | | |
| Gizzard shad[1] | 2.472 | 0.49 | 0.8500 | 0.0590 | 0.0271 | | 0.0147 | |
| Lepomis[2] | 0.382 | 0.01 | 0.3440 | 0.0950 | 0.0019 | 0.0028 | 0.0047 | |
| Logperch | <0.01 | | | | | | | |
| Pumpkinseed | | | | | | | | 0.0025 |
| White perch | 0.027 | 0.04 | 0.0480 | | | | | |
| White sucker | | 0.07 | | | | | | |
| Yellow perch | | 0.14 | 0.019 | | | 0.0031 | | |
| **Richness[3]** | **5** | **6** | **6** | **2** | **4** | **4** | **3** | **3** |

*Notes:*

[1] Gizzard shad cpue in 2000 trawls is a combination of gizzard shad (0.017) and herring family (2.46).

[2] Lepomis are likely a combination of both bluegill and pumpkinseed.

[3] Richness assumes Lepomis is composed both bluegill and pumpkinseed.

**Table A8-34(a-c). Presence/absence and CPUE of larval and YOY fishes in samples collected from Onondaga Lake from 2000-2007. (continued)**

*c) Young-of-the-Year (# per seine haul)*

| Species | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Banded killifish* | | | | | 0.07 | 0.54 | | 0.26 |
| Bluntnose minnow* | | | | | | | 0.01 | |
| Brook silverside* | | | | | | | | |
| Brook stickleback* | | | | | | | | |
| Brown bullhead | | 0.03 | 0.02 | 0.03 | | 0.20 | | 0.01 |
| Carp | 0.02 | 0.03 | 0.48 | 0.63 | 0.64 | 0.33 | | 0.03 |
| Channel catfish | | | 0.02 | | | | | |
| Emerald shiner* | | | | | | | | |
| Fathead minnow* | | | | | | | | |
| Gizzard shad | 70.30 | 26.10 | 0.03 | 2.70 | 1.98 | 0.02 | | |
| Golden shiner* | | | | | | 0.02 | | 0.01 |
| Johnny darter* | | | | | | | | |
| Largemouth bass | 1.50 | 4.30 | 5.00 | 1.90 | 6.87 | 16.99 | 5.10 | 7.81 |
| Lepomis[1] | 25.20 | 92.40 | 157.00 | 42.20 | 16.12 | 33.36 | 4.64 | 7.66 |
| Logperch* | | | | | | | | |
| Longnose gar | 0.02 | | | | 0.01 | | | |
| Northern hogsucker | 0.02 | | | | | | | |
| Pumpkinseed | | | | | | | 0.01 | |
| Rock bass | | | | | | 0.07 | 0.04 | 0.06 |
| Smallmouth bass | 2.70 | 3.30 | 1.10 | 0.70 | 1.57 | 4.01 | 0.50 | 0.53 |
| Tessellated darter* | | | | | | 0.02 | | |
| White perch | 2.60 | 0.60 | 0.13 | 0.12 | 0.02 | | | |
| White sucker | 0.06 | 0.15 | 0.02 | | | | | |
| Yellow perch | | 5.60 | 0.03 | | | 0.13 | | |
| **Richness[2]** | **14** | **18** | **17** | **15** | **14** | **14** | **11** | **10** |

*Notes:*

[1] Lepomis are likely a combination of both bluegill and pumpkinseed.

[2] Richness assumes Lepomis is composed both bluegill and pumpkinseed

* denotes species that are difficult to distinguish in the YOY stage due to their small size as adults. These species are assumed to be present as YOY if captured in littoral seines, but a CPUE is not included because the catch may include both YOY and adults.

**Table A8-35(a-b). 2007 Angler Diary Summary.**

a) Number of hours fished by section in 2007.

| Zone | Location | Total hours |
|---|---|---|
| 1 | Onondaga Lake | 667.2 |
| 2 | Seneca River Upstream | 41.2 |
| 3 | Seneca River Downstream | 240.9 |
| 4 | Oneida River | 60.8 |
| | Total | 1010.1 |

b) Catch-per-unit-effort of fish species by zone in 2007.

| Zone | Species | Total | CPUE |
|---|---|---|---|
| 1 | All Fish | 944 | 1.415 |
| | Channel Catfish | 2 | 0.003 |
| | Largemouth Bass | 323 | 0.484 |
| | Other | 45 | 0.067 |
| | Pumpkinseed/Bluegill | 38 | 0.057 |
| | Smallmouth Bass | 499 | 0.748 |
| | Walleye | 1 | 0.001 |
| | Yellow Perch | 36 | 0.054 |
| 2 | All Fish | 36 | 0.874 |
| | Channel Catfish | 1 | 0.024 |
| | Largemouth Bass | 11 | 0.267 |
| | Other | 6 | 0.146 |
| | Pumpkinseed/Bluegill | 1 | 0.024 |
| | Smallmouth Bass | 16 | 0.389 |
| | Yellow Perch | 1 | 0.024 |
| 3 | All Fish | 453 | 1.881 |
| | Channel Catfish | 10 | 0.042 |
| | Largemouth Bass | 86 | 0.357 |
| | Other | 93 | 0.386 |
| | Pumpkinseed/Bluegill | 26 | 0.108 |
| | Smallmouth Bass | 219 | 0.909 |
| | Yellow Perch | 19 | 0.079 |
| 4 | All Fish | 92 | 1.512 |
| | Channel Catfish | 3 | 0.049 |
| | Largemouth Bass | 15 | 0.247 |
| | Other | 35 | 0.575 |
| | Pumpkinseed/Bluegill | 2 | 0.033 |
| | Smallmouth Bass | 30 | 0.493 |
| | Yellow Perch | 7 | 0.115 |

# APPENDIX 8: FIGURES

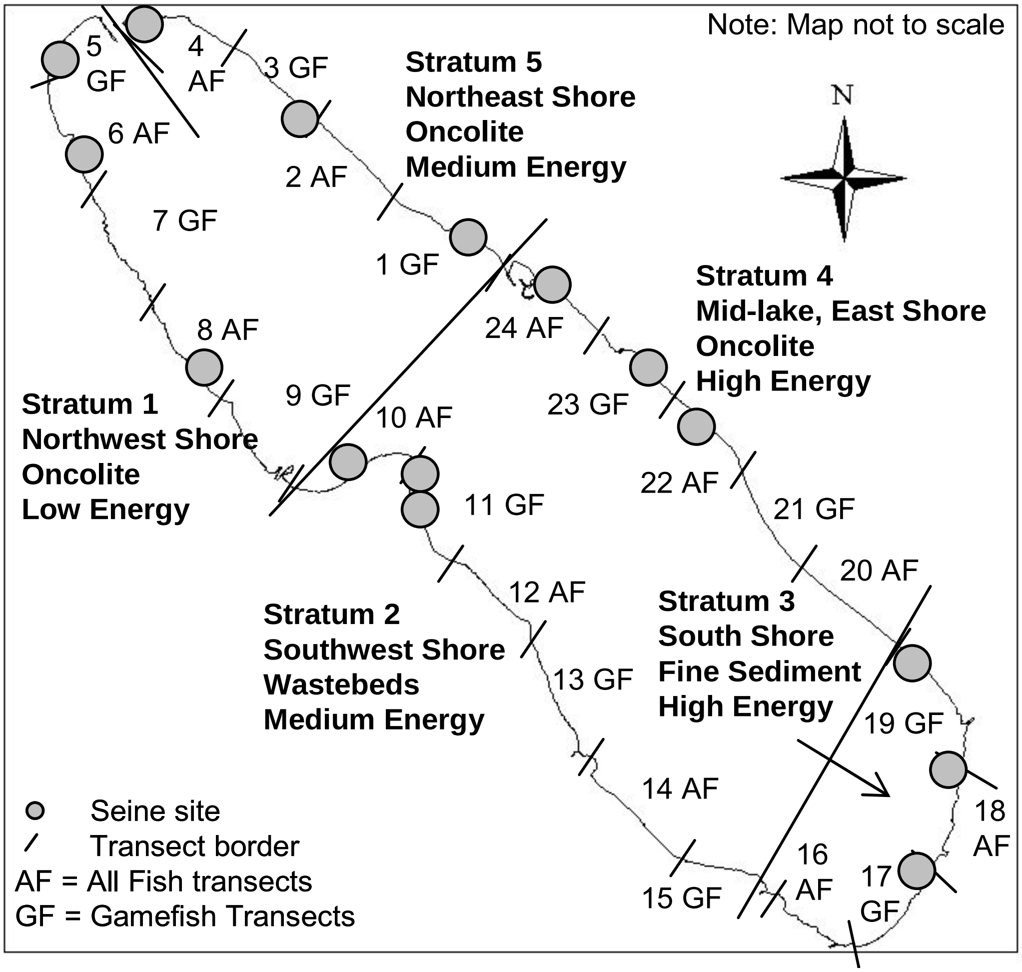
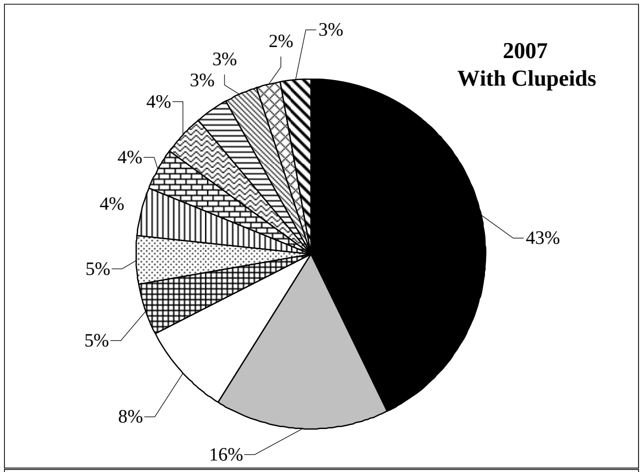
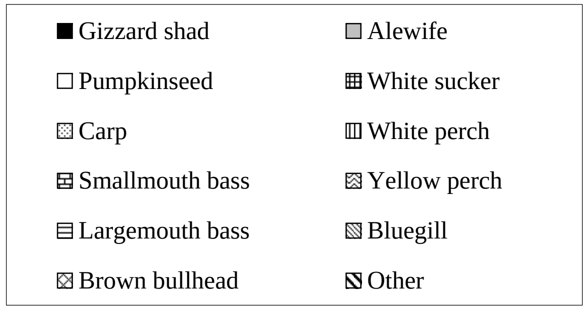


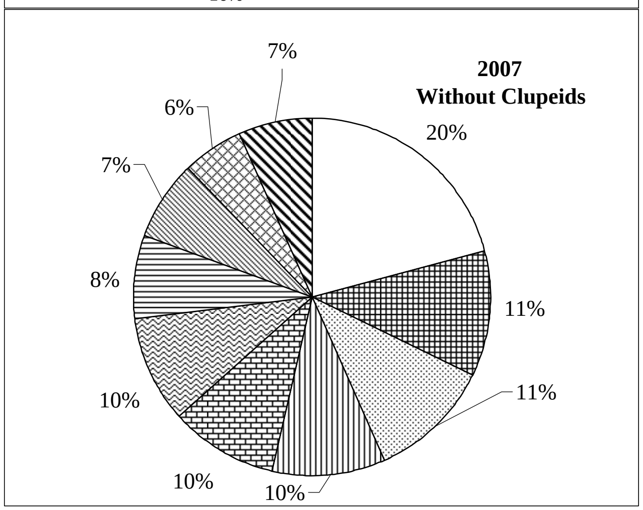

**Figure A8-1.** Location and description of strata, boat electrofishing transects, and seining sites in Onondaga Lake.

**Figure A8-2. Whole lake electrofishing relative abundance in 2007.**

***Note: CPUE (catch per hour) for gamefish (bolded) is calculated from all 24 transects. CPUE for non-gamefish are calculated from only the one-half of the transects where all fish are collected (every other transect). Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from a combination of fish that are boated and estimates of the number of fish missed. Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water.***



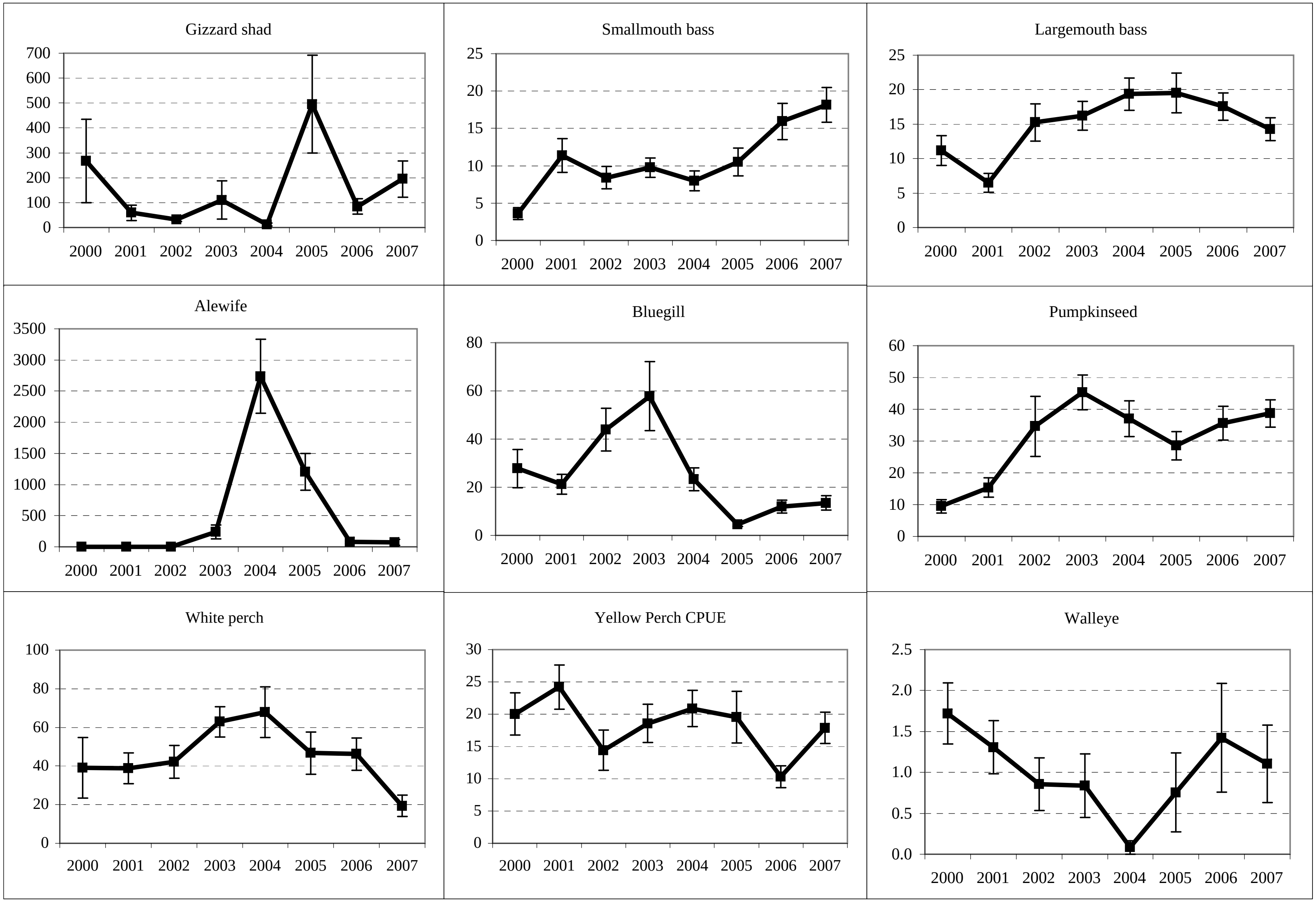




**Graph Data With Clupeids**

| Species | Mean CPUE | SE | Number | Relative Abundance with Clupeids | Relative Abundance without Clupeids |
|---|---|---|---|---|---|
| Gizzard shad | 194.6 | 72.1 | 1026 | 42.7% | - |
| Alewife | 74.4 | 48.3 | 345 | 16.3% | - |
| **Pumpkinseed** | 38.7 | 4.3 | 379 | 8.5% | 20.7% |
| White sucker | 21.7 | 5.4 | 109 | 4.8% | 11.6% |
| Carp | 20.6 | 4.8 | 96 | 4.5% | 11.0% |
| White perch | 19.4 | 5.4 | 94 | 4.3% | 10.4% |
| **Smallmouth bass** | 18.1 | 2.3 | 176 | 4.0% | 9.7% |
| **Yellow perch** | 17.9 | 2.4 | 174 | 3.9% | 9.6% |
| **Largemouth bass** | 14.2 | 1.7 | 137 | 3.1% | 7.6% |
| **Bluegill** | 13.5 | 2.9 | 133 | 3.0% | 7.2% |
| **Brown bullhead** | 10.5 | 1.7 | 101 | 2.3% | 5.6% |
| Other | 12.3 | 5.7 | 80.0 | 3% | 7% |

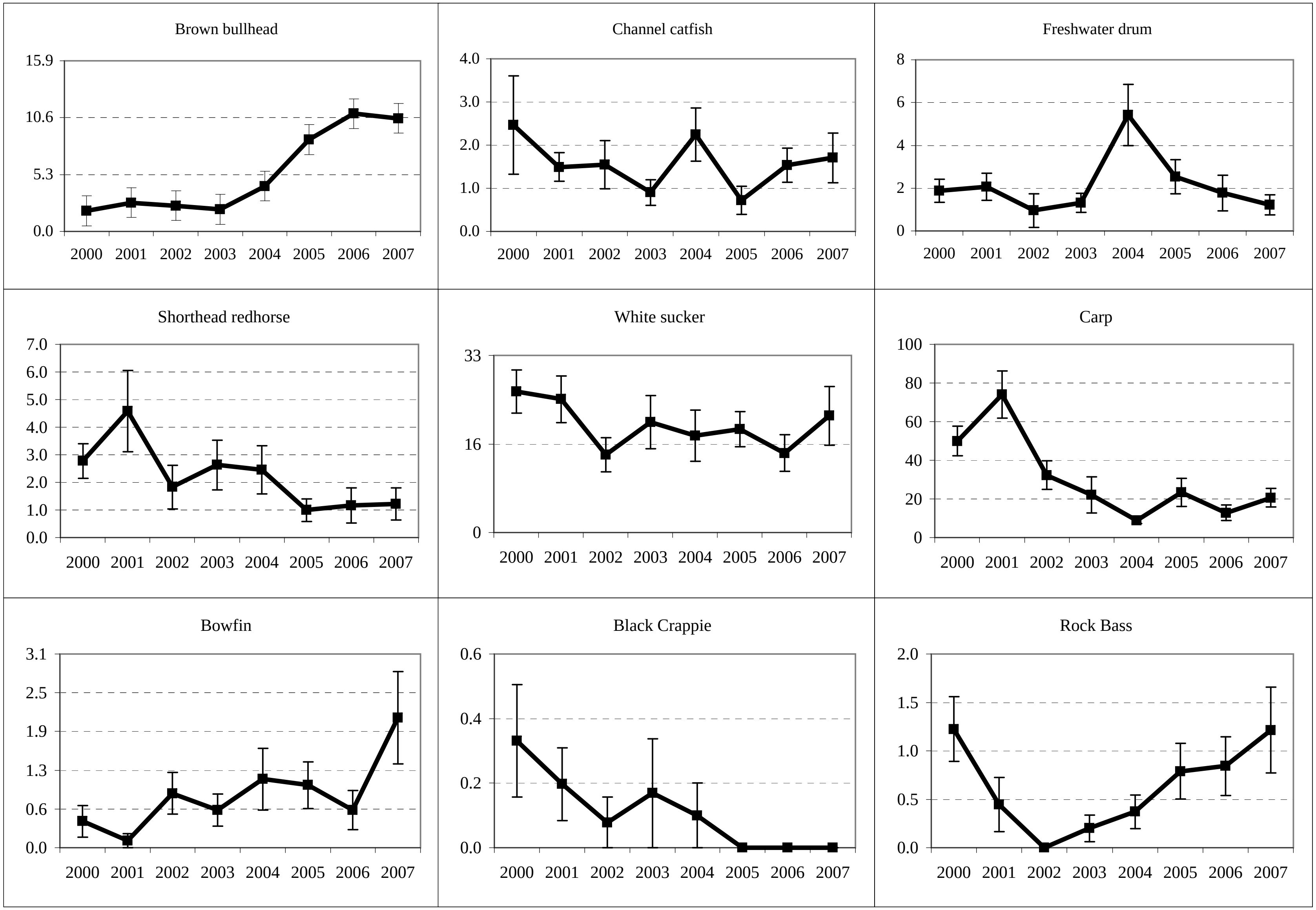
## Figure A8-3. Trends in CPUE (catch per hour) of select species caught by electrofishing from 2000-2007.

***Note: CPUE for gamefish (bolded) is calculated from all 24 transects. CPUE for non-gamefish are calculated from only the one-half of the transects where all fish are collected (every other transect). Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from a combination of fish that are boated and estimates of the number of fish missed. Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water. Note: Y-axis differs for each species.***



## Figure A8-3. Trends in CPUE (catch per hour) of select species caught by electrofishing from 2000-2007. (continued)

***Note: CPUE for gamefish (bolded) is calculated from all 24 transects. CPUE for non-gamefish are calculated from only the one-half of the transects where all fish are collected (every other transect). Because of the difficulty in netting clupeids (shad and alewives), the CPUE for these species is calculated from a combination of fish that are boated and estimates of the number of fish missed. Because of their large size carp are not boated; instead carp within netting distance are counted while still in the water. Note: Y-axis differs for each species.***



## Figure A8-3. Trends in CPUE (catch per hour) of select species caught by electrofishing from 2000-2007. (continued)

**Graph Data**

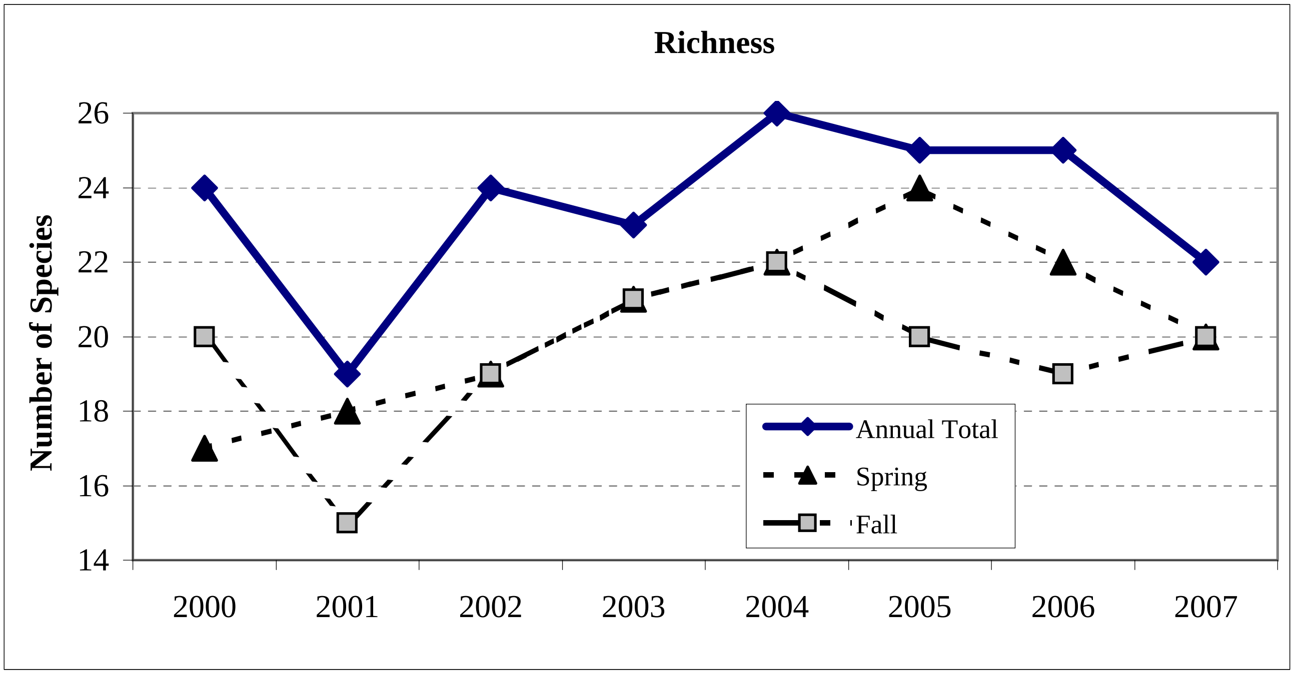
CPUE

| Common name | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Gizzard shad | 266.70 | 59.08 | 31.76 | 110.20 | 12.23 | 495.25 | 84.28 | 194.63 |
| **Bluegill** | 27.74 | 21.28 | 43.94 | 57.81 | 23.31 | 4.56 | 11.96 | 13.50 |
| **Pumpkinseed** | 9.47 | 15.34 | 34.66 | 45.28 | 37.00 | 28.55 | 35.61 | 38.71 |
| White perch | 39.07 | 38.88 | 42.27 | 62.90 | 67.89 | 46.69 | 46.22 | 19.39 |
| Carp | 49.91 | 74.06 | 32.32 | 22.04 | 8.79 | 23.44 | 12.77 | 20.60 |
| **Largemouth bass** | 11.16 | 6.49 | 15.26 | 16.21 | 19.37 | 19.51 | 17.56 | 14.24 |
| **Yellow perch** | 20.03 | 24.20 | 14.42 | 18.55 | 20.87 | 19.55 | 10.29 | 17.88 |
| **Smallmouth bass** | 3.57 | 11.36 | 8.41 | 9.75 | 7.99 | 10.51 | 15.94 | 18.14 |
| White sucker | 26.12 | 24.71 | 14.42 | 20.48 | 17.96 | 19.16 | 14.74 | 21.66 |
| **Brown bullhead** | 1.91 | 2.68 | 2.40 | 2.06 | 4.22 | 8.56 | 10.97 | 10.53 |
| **Channel catfish** | 2.46 | 1.49 | 1.55 | 0.90 | 2.25 | 0.72 | 1.53 | 1.71 |
| **Walleye** | 1.72 | 1.31 | 0.86 | 0.84 | 0.08 | 0.75 | 1.42 | 1.10 |
| Shorthead redhorse | 2.78 | 4.58 | 1.83 | 2.63 | 2.46 | 1.00 | 1.17 | 1.22 |
| Bowfin | 0.43 | 0.11 | 0.88 | 0.61 | 1.11 | 1.02 | 0.61 | 2.11 |
| Alewife | 0.00 | 0.62 | 1.58 | 238.38 | 2737.62 | 1203.90 | 78.65 | 74.44 |
| **Rock bass** | 1.22 | 0.44 | 0.00 | 0.20 | 0.37 | 0.79 | 0.84 | 1.21 |
| Freshwater drum | 1.87 | 2.07 | 0.95 | 1.31 | 5.42 | 2.54 | 1.77 | 1.23 |
| Longnose gar | 0.47 | 0.97 | 0.72 | 0.00 | 0.56 | 1.19 | 0.31 | 2.30 |
| **Northern pike** | 0.19 | 0.15 | 0.18 | 0.22 | 0.10 | 0.20 | 0.30 | 0.20 |
| Rainbow trout | 0.06 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Northern hog sucker | 0.25 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.18 | 0.38 |
| Logperch | 0.22 | 0.31 | 0.20 | 0.20 | 0.18 | 0.00 | 0.00 | 0.00 |
| Black crappie | 0.33 | 0.20 | 0.08 | 0.17 | 0.10 | 0.00 | 0.00 | 0.00 |
| Tiger muskellunge | 0.00 | 0.08 | 0.00 | 0.00 | 0.10 | 0.19 | 0.00 | 0.00 |
| Golden shiner | 0.47 | 0.00 | 0.00 | 0.66 | 1.10 | 1.15 | 4.08 | 0.61 |
| Banded killifish | 0.11 | 0.00 | 0.00 | 0.19 | 0.20 | 0.00 | 0.00 | 0.00 |
| **Black bullhead** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.19 | 0.00 |
| Quillback | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 |
| **Brown trout** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.21 | 0.12 | 0.00 |
| Emerald shiner | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.50 | 0.00 |
| Greater Redhorse | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 |
| Rudd | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.23 |
| Yellow bullhead | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 |

Standard Error of CPUE

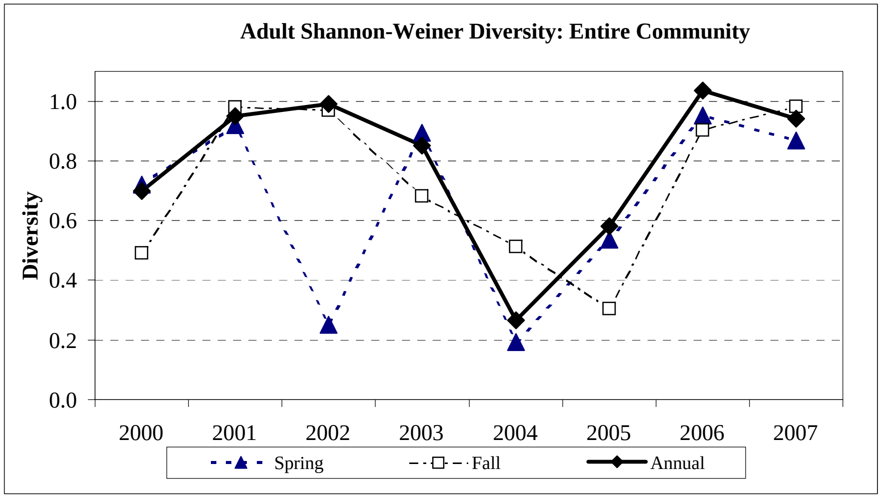
| Common name | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Gizzard shad | 167.47 | 30.48 | 8.35 | 76.54 | 6.15 | 196.33 | 31.42 | 72.09 |
| **Bluegill** | 7.92 | 4.07 | 8.89 | 14.26 | 4.81 | 0.85 | 2.60 | 2.90 |
| **Pumpkinseed** | 2.07 | 3.05 | 9.43 | 5.48 | 5.61 | 4.49 | 5.26 | 4.27 |
| White perch | 15.57 | 7.96 | 8.49 | 7.82 | 13.11 | 10.89 | 8.33 | 5.45 |
| Carp | 7.68 | 12.24 | 7.45 | 9.33 | 1.57 | 7.32 | 4.00 | 4.79 |
| **Largemouth bass** | 2.18 | 1.36 | 2.71 | 2.12 | 2.35 | 2.90 | 1.97 | 1.66 |
| **Yellow perch** | 3.26 | 3.44 | 3.13 | 2.96 | 2.81 | 3.98 | 1.68 | 2.45 |
| **Smallmouth bass** | 0.81 | 2.24 | 1.49 | 1.30 | 1.33 | 1.85 | 2.43 | 2.31 |
| White sucker | 4.02 | 4.31 | 3.13 | 4.95 | 4.71 | 3.23 | 3.40 | 5.44 |
| **Brown bullhead** | 0.40 | 0.69 | 0.68 | 0.51 | 0.83 | 1.89 | 2.99 | 1.70 |
| **Channel catfish** | 1.14 | 0.33 | 0.55 | 0.30 | 0.62 | 0.33 | 0.40 | 0.58 |
| **Walleye** | 0.37 | 0.33 | 0.32 | 0.39 | 0.08 | 0.48 | 0.66 | 0.47 |
| Shorthead redhorse | 0.62 | 1.47 | 0.79 | 0.90 | 0.88 | 0.41 | 0.64 | 0.58 |
| Bowfin | 0.26 | 0.11 | 0.34 | 0.26 | 0.50 | 0.38 | 0.32 | 0.75 |
| Alewife | 0.00 | 0.36 | 1.01 | 109.99 | 594.57 | 297.91 | 20.22 | 48.32 |
| **Rock bass** | 0.33 | 0.28 | 0.00 | 0.14 | 0.17 | 0.29 | 0.30 | 0.44 |
| Freshwater drum | 0.55 | 0.63 | 0.79 | 0.44 | 1.43 | 0.80 | 0.83 | 0.47 |
| Longnose gar | 0.36 | 0.48 | 0.56 | 0.00 | 0.30 | 0.53 | 0.31 | 1.43 |
| **Northern pike** | 0.11 | 0.10 | 0.13 | 0.15 | 0.00 | 0.20 | 0.17 | 0.20 |
| Rainbow trout | 0.06 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Northern hog sucker | 0.17 | 0.00 | 0.18 | 0.00 | 0.00 | 0.00 | 0.18 | 0.26 |
| Logperch | 0.16 | 0.31 | 0.20 | 0.20 | 0.18 | 0.00 | 0.00 | 0.00 |
| Black crappie | 0.17 | 0.11 | 0.08 | 0.17 | 0.10 | 0.00 | 0.00 | 0.00 |
| Tiger muskellunge | 0.00 | 0.08 | 0.00 | 0.00 | 0.13 | 0.13 | 0.00 | 0.00 |
| Golden shiner | 0.28 | 0.00 | 0.00 | 0.48 | 0.50 | 0.59 | 1.70 | 0.32 |
| Banded killifish | 0.11 | 0.00 | 0.00 | 0.19 | 0.20 | 0.00 | 0.00 | 0.00 |
| **Black bullhead** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.13 | 0.00 |
| Quillback | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 |
| **Brown trout** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.12 | 0.00 |
| Emerald shiner | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.35 | 0.00 |
| Greater Redhorse | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.00 | 0.00 |
| Rudd | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.15 | 0.00 | 0.23 |
| Yellow bullhead | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.00 | 0.00 |

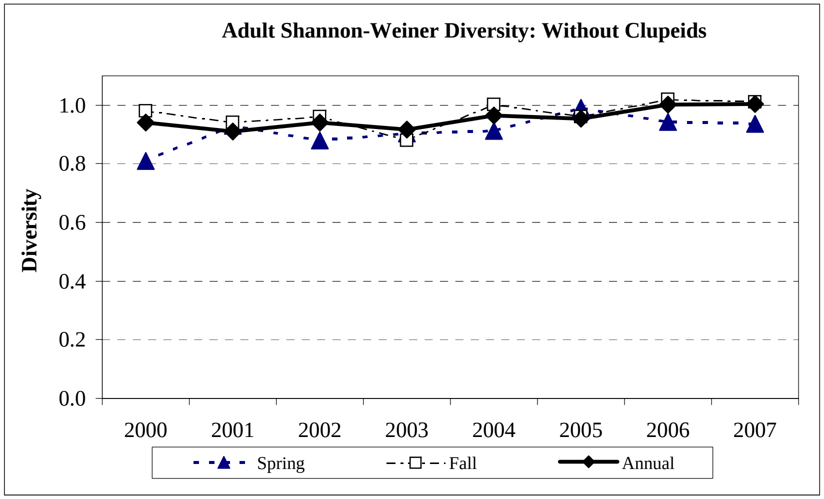
**Figure A8-4. Electrofishing species richness in "all fish" transects from 2000-2007.**




| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Annual Total | 24 | 19 | 24 | 23 | 26 | 25 | 25 | 22 |
| Spring | 17 | 18 | 19 | 21 | 22 | 24 | 22 | 20 |
| Fall | 20 | 15 | 19 | 21 | 22 | 20 | 19 | 20 |

**Figure A8-5. Electrofishing diversity in "all fish" transects from 2000-2007.**




**2000-2007 Trends**

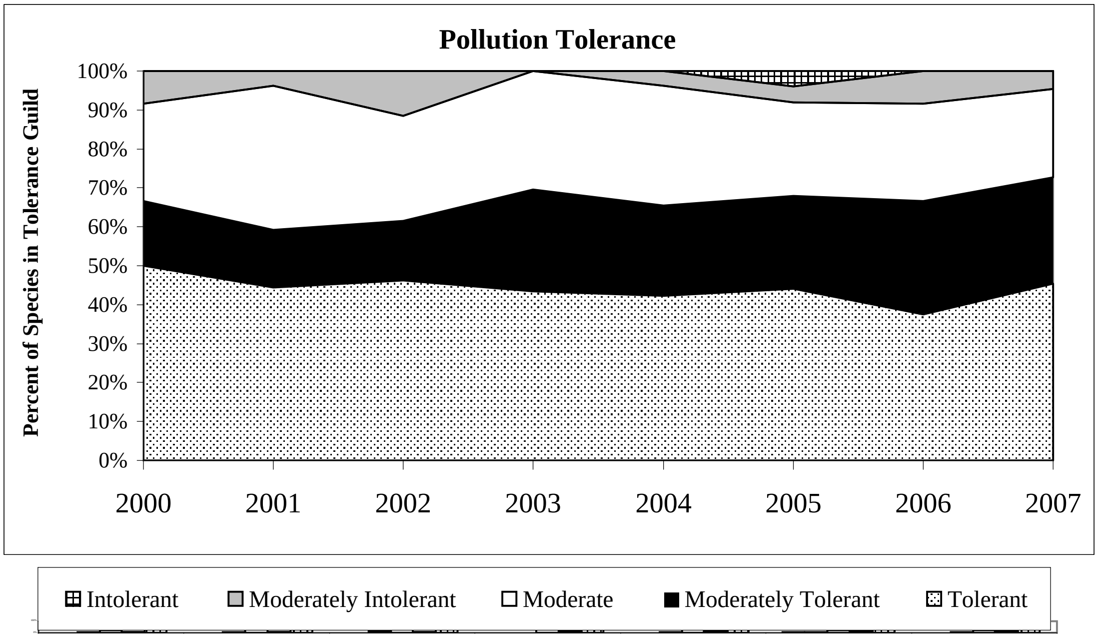
**Diversity with Clupeids**

| Sample Period | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Spring | 0.72 | 0.92 | 0.25 | 0.89 | 0.19 | 0.54 | 0.953 | 0.869 |
| Fall | 0.49 | 0.98 | 0.97 | 0.68 | 0.51 | 0.30 | 0.903 | 0.983 |
| Annual | 0.7 | 0.95 | 0.99 | 0.85 | 0.27 | 0.58 | 1.035 | 0.940 |

**Diversity without Clupeids**

| Sample Period | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Spring | 0.81 | 0.93 | 0.88 | 0.90 | 0.91 | 0.99 | 0.944 | 0.936 |
| Fall | 0.98 | 0.94 | 0.96 | 0.88 | 1.00 | 0.96 | 1.019 | 1.009 |
| Annual | 0.94 | 0.91 | 0.94 | 0.92 | 0.96 | 0.95 | 1.003 | 1.003 |

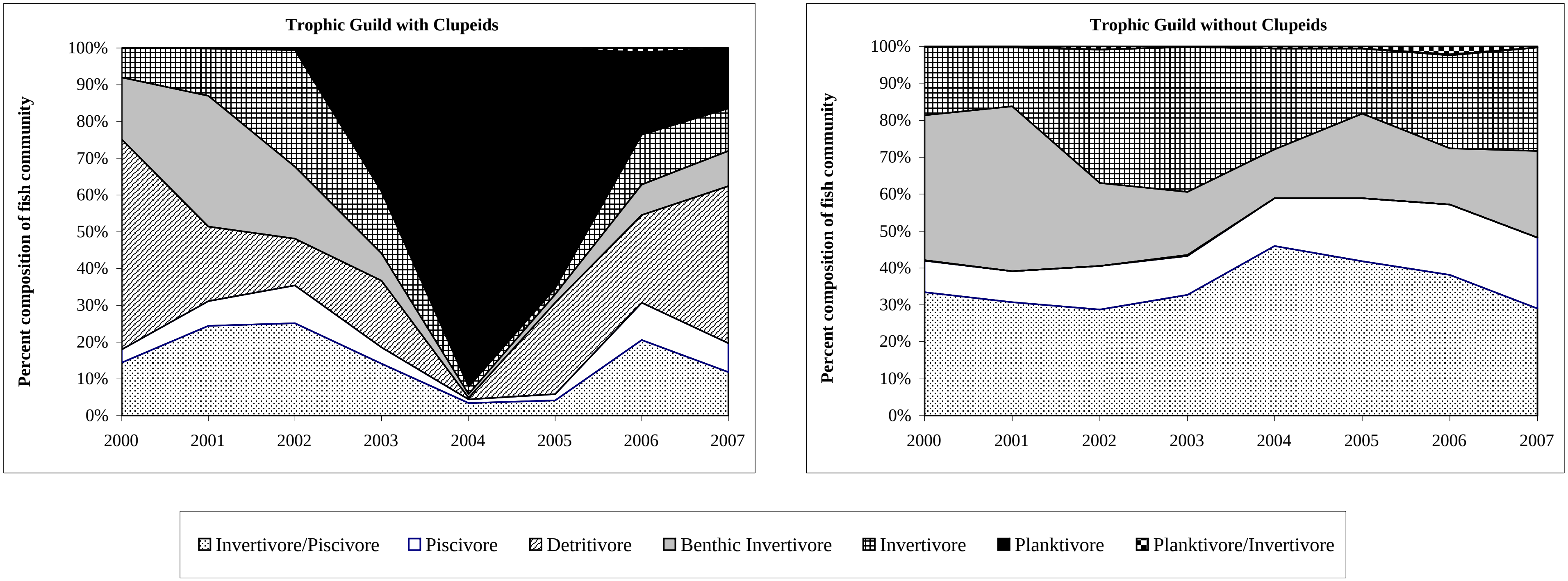
**Figure A8-6. Pollution tolerance guild trends from electrofishing data in 2000-2007 based on species richness in each tolerance category.**




**Graph Data**

| Pollution Tolerance | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Tolerant | 50.0% | 44.4% | 46.2% | 43.5% | 42.3% | 44.0% | 37.5% | 45.5% |
| Moderately Tolerant | 16.7% | 14.8% | 15.4% | 26.1% | 23.1% | 24.0% | 29.2% | 27.3% |
| Moderate | 25.0% | 37.0% | 26.9% | 30.4% | 30.8% | 24.0% | 25.0% | 22.7% |
| Moderately Intoleran | 8.3% | 3.7% | 11.5% | 0.0% | 3.8% | 4.0% | 8.3% | 4.5% |
| Intolerant | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 4.0% | 0.0% | 0.0% |

## Figure A8-7. Trophic guild trends from electrofishing data in 2000-2007.




**Graph Data**

Trophic Guilds with Clupeids

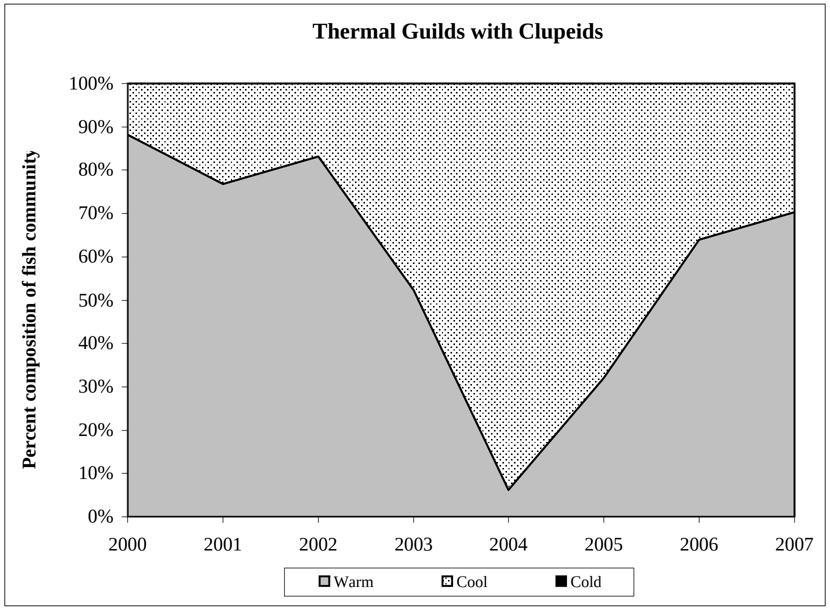
| Trophic Guild | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Benthic Invertivore | 17% | 36% | 20% | 7% | 1% | 2% | 8% | 10% |
| Piscivore | 4% | 7% | 10% | 5% | 1% | 2% | 10% | 8% |
| Detritivore | 57% | 20% | 13% | 18% | 0% | 25% | 24% | 43% |
| Invertivore | 8% | 13% | 32% | 17% | 2% | 2% | 14% | 11% |
| Invertivore/Piscivore | 14% | 24% | 25% | 14% | 3% | 4% | 21% | 12% |
| Planktivore | 0% | 0% | 1% | 39% | 92% | 65% | 22% | 16% |
| Planktivore/Invertivore | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 0% |

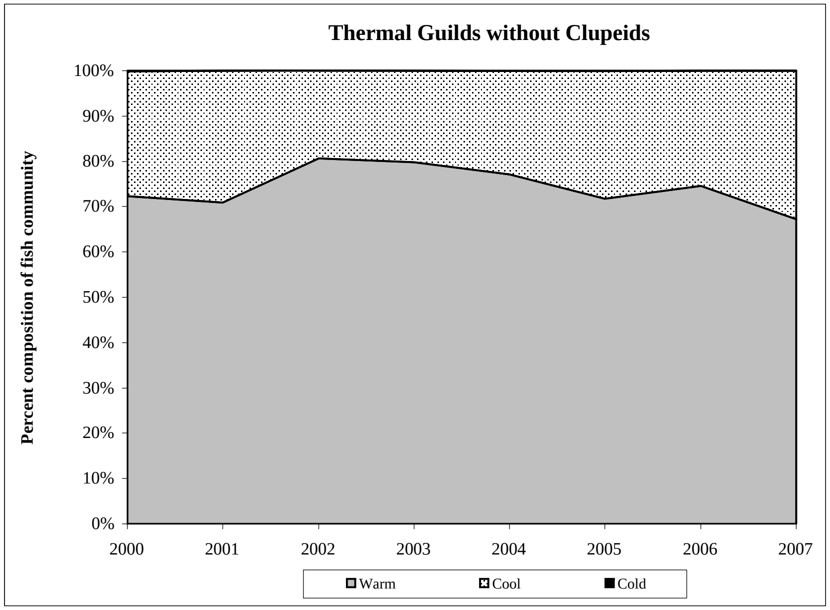
**Graph Data**

Trophic Guilds without Clupeids

| Trophic Guild | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Benthic Invertivore | 39% | 45% | 22% | 17% | 13% | 23% | 15% | 23% |
| Piscivore | 8% | 8% | 12% | 10% | 13% | 17% | 19% | 19% |
| Detritivore | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Invertivore | 19% | 16% | 36% | 39% | 27% | 18% | 25% | 28% |
| Invertivore/Piscivore | 33% | 31% | 29% | 33% | 46% | 42% | 38% | 29% |
| Planktivore | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| Planktivore/Invertivore | 0% | 0% | 1% | 0% | 1% | 1% | 2% | 0% |

## Figure A8-8. Thermal guild trends from electrofishing data in 2000-2007.




Graph Data

**Relative abundance of thermal guilds with Clupeids**

| Thermal Guild | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Cold | 0.04% | 0.00% | 0.04% | 0.00% | 0.003% | 0.01% | 0.03% | 0.00% |
| Cool | 11.81% | 23.13% | 16.83% | 47.66% | 94% | 68% | 36% | 30% |
| Warm | 88.15% | 76.87% | 83.13% | 52.30% | 6% | 32% | 64% | 70% |

**Relative abundance of thermal guilds without Clupeids**

| Thermal Guild | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Cold | 0.08% | 0.00% | 0.05% | 0.00% | 0.04% | 0.1% | 0.06% | 0.00% |
| Cool | 27.55% | 29.06% | 19.29% | 20.19% | 23% | 28% | 25% | 33% |
| Warm | 72.37% | 70.94% | 80.66% | 79.70% | 77% | 72% | 75% | 67% |

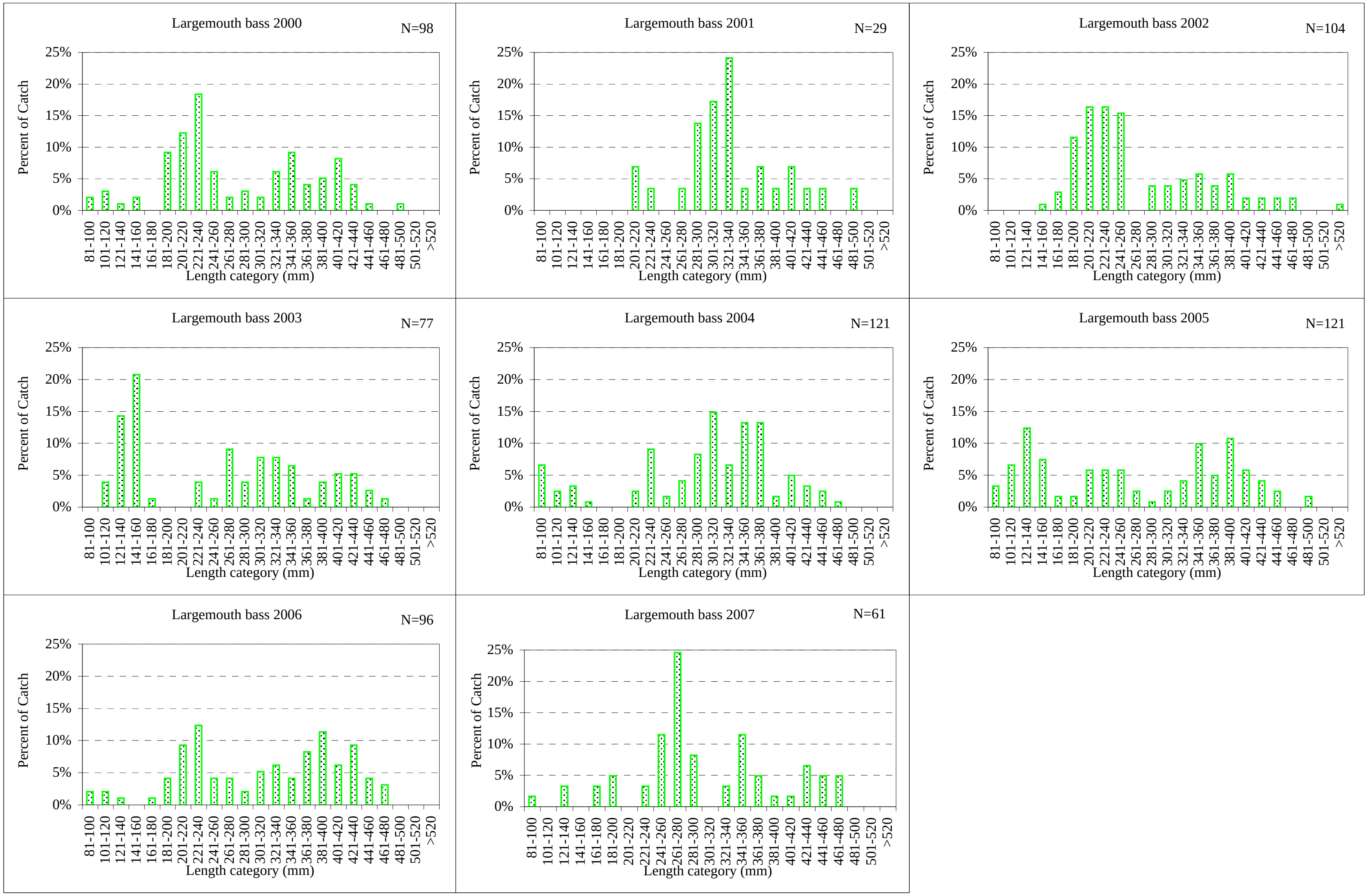



**Figure A8-9(a). Largemouth bass length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**

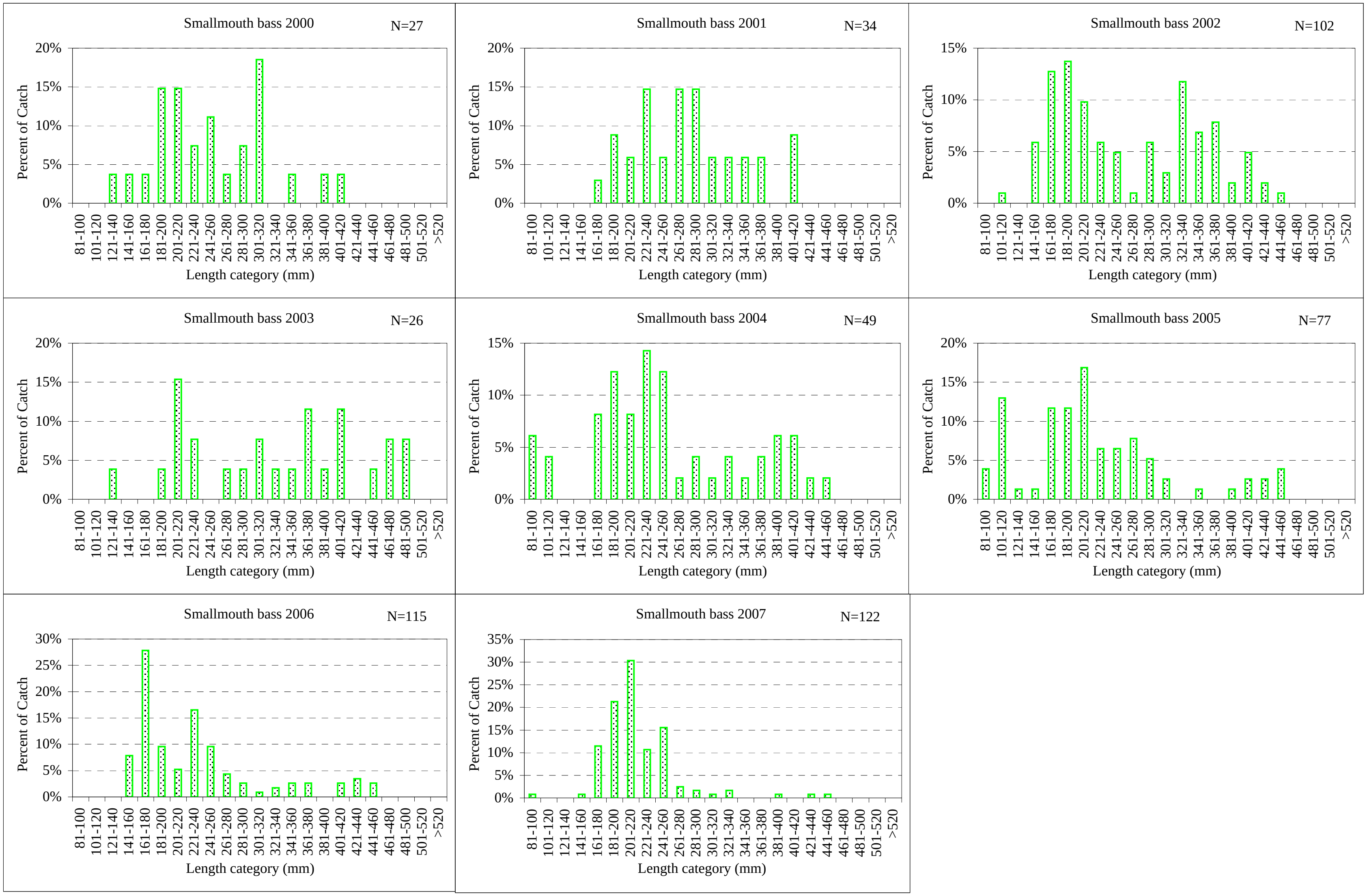



**Figure A8-9(b). Smallmouth bass length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**

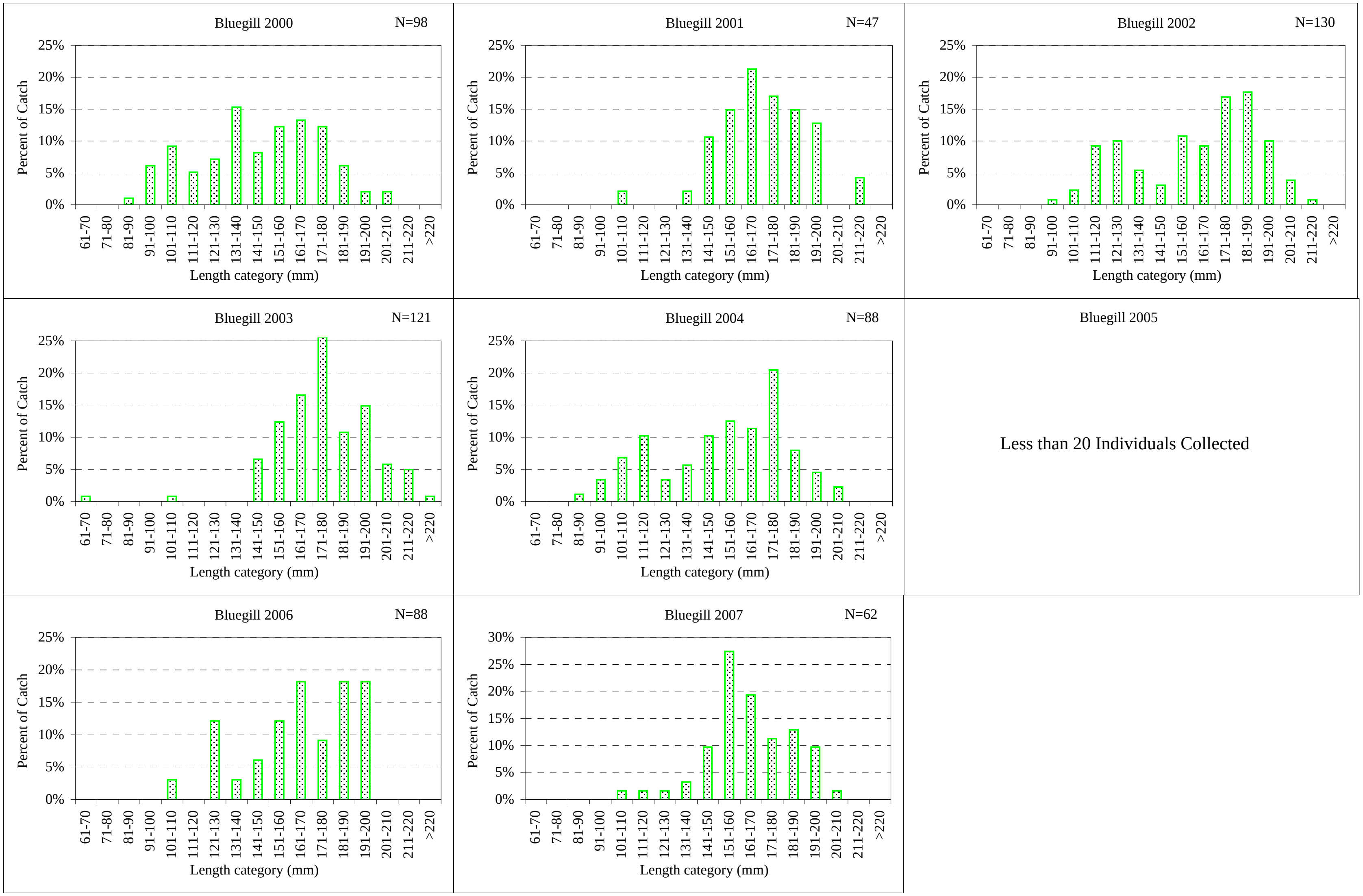



**Figure A8-9(c). Bluegill length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**


**Figure A8-9(d). Pumpkinseed length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**

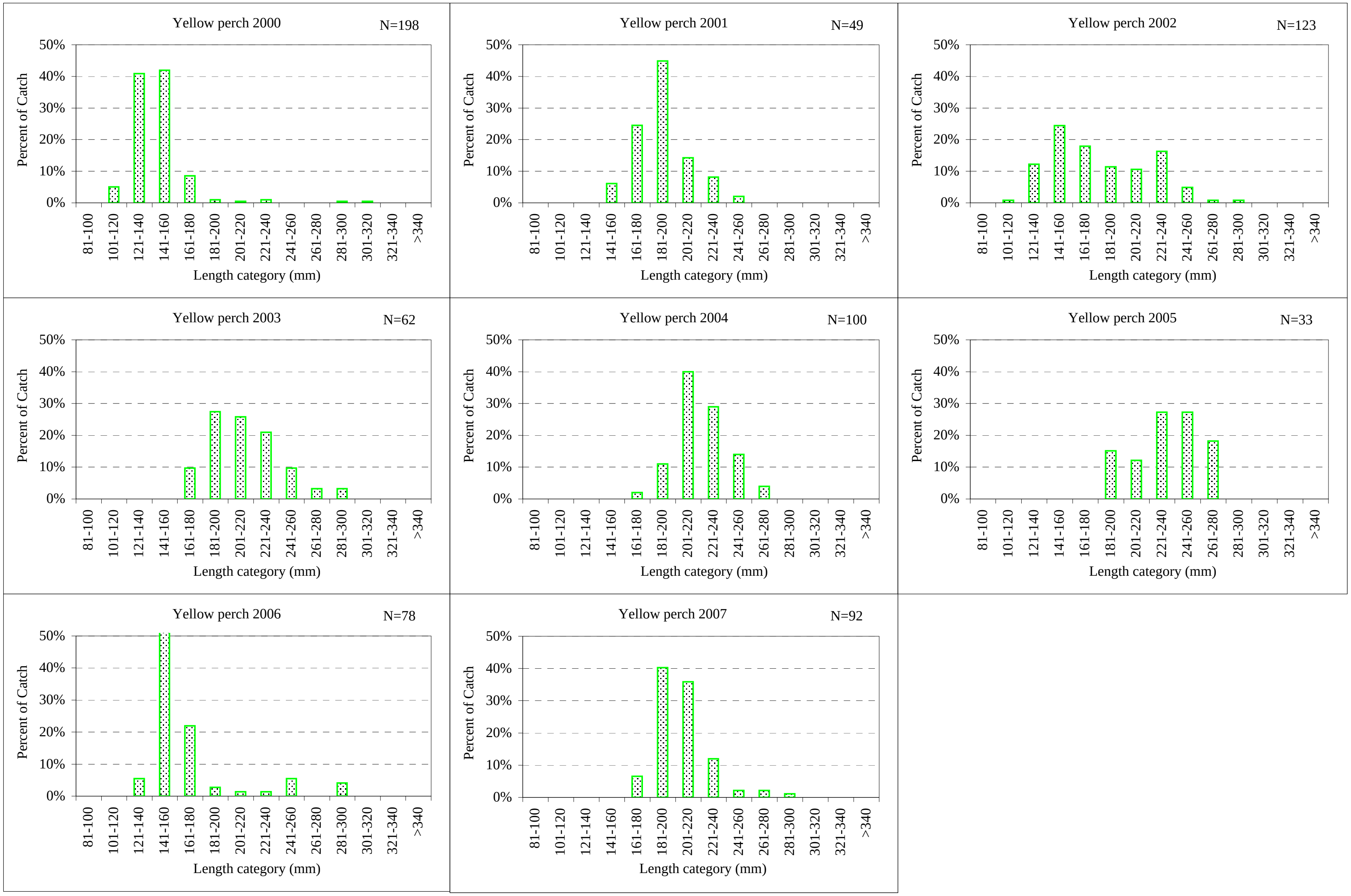



**Figure A8-9(e). Yellow perch length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**

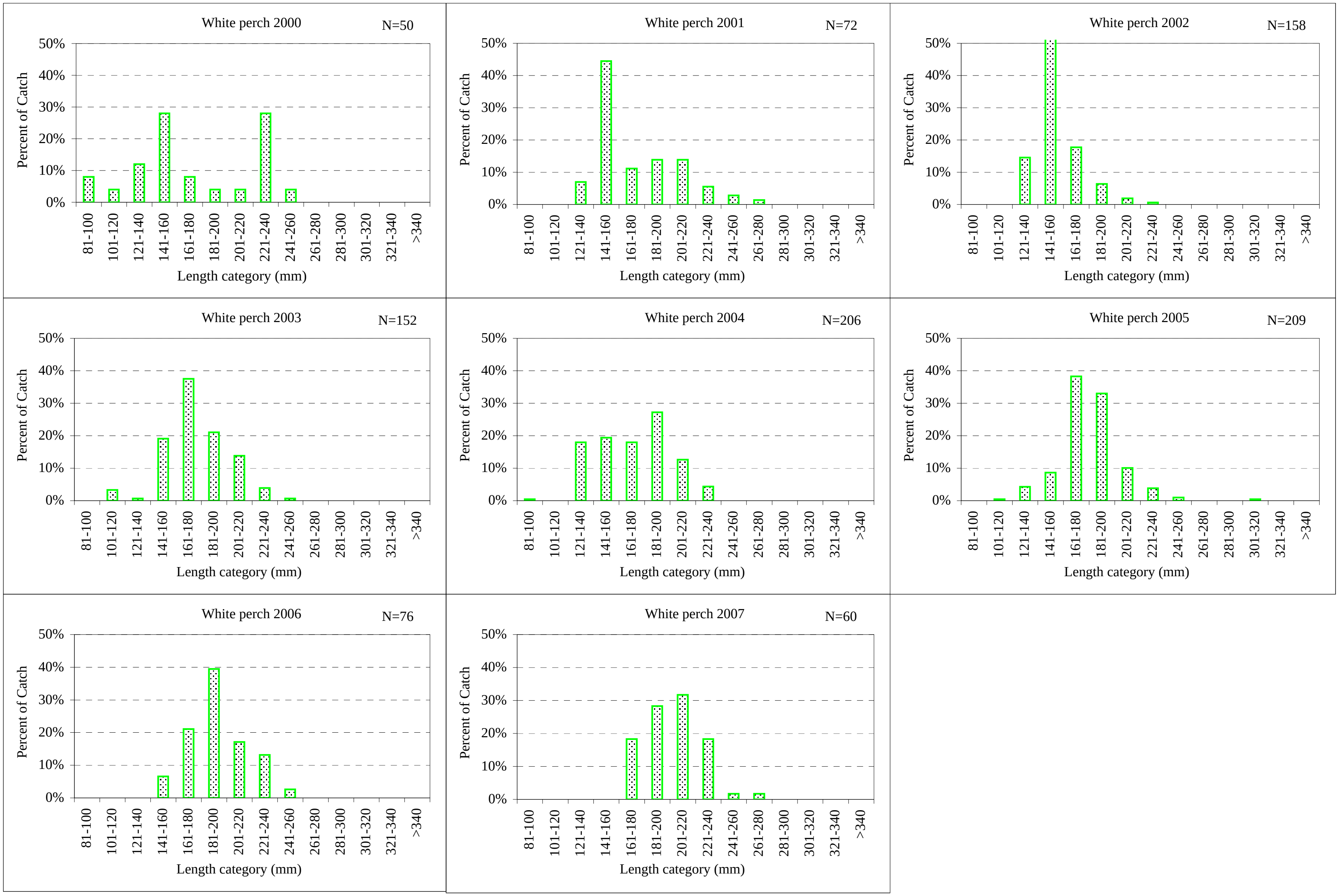



**Figure A8-9(f). White perch length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**

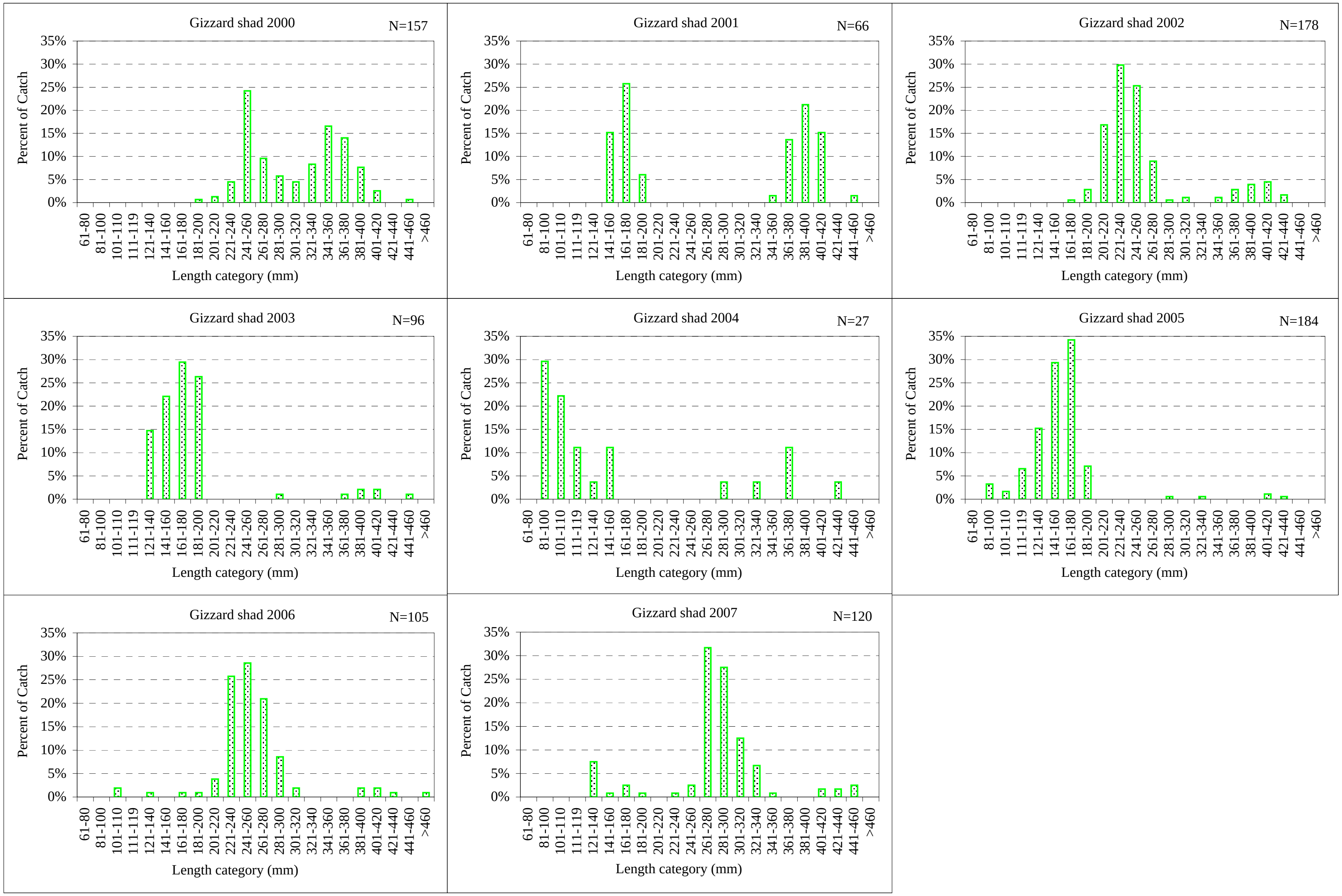



**Figure A8-9(g). Gizzard shad length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**

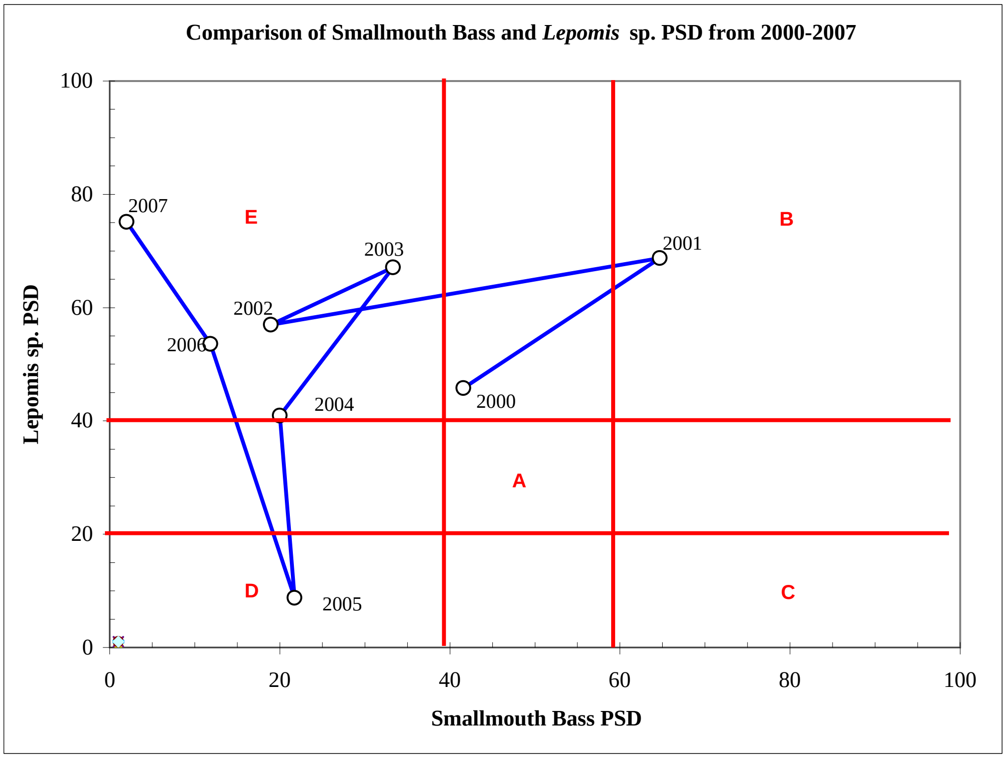

**Figure A8-9(h). Brown bullhead length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**

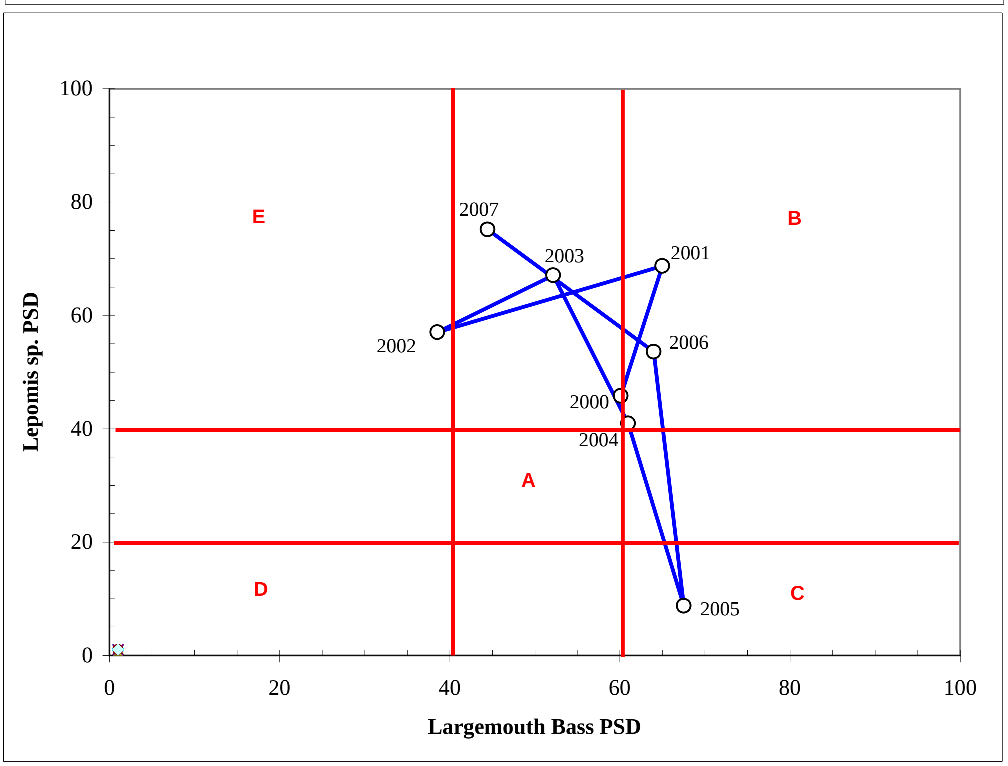

**Figure A8-9(i). White sucker length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**


**Figure A8-9(j). Lepomis length frequency in Fall electrofishing and Gill netting combined from 2000 to 2007.**

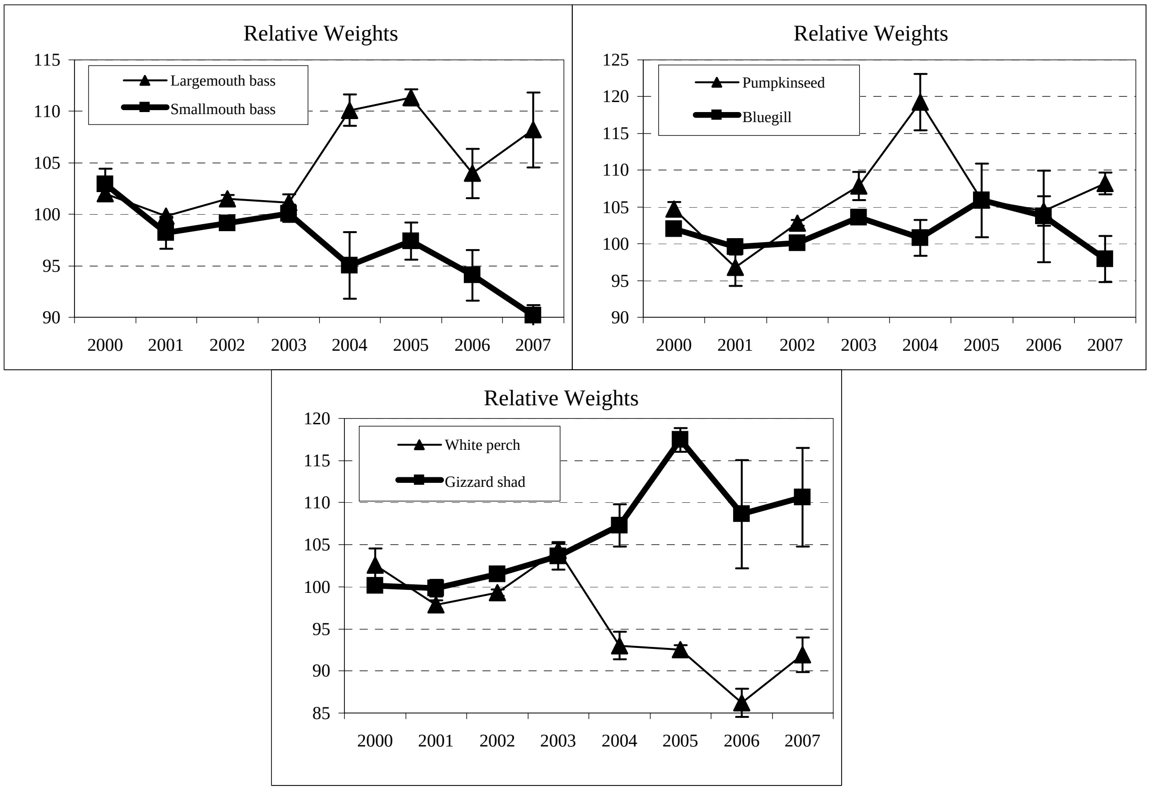
**Figure A8-10. Comparison of largemouth and smallmouth bass Proportional Stock Density (PSD) vs. Lepomis PSD from electrofishing data in 2000-2007.**

Potential interpretations for the different combinations are : A = mutual balance for satisfactory fishing; B = community comprised of large, old specimens, indicative of an unfished population; C = large predators excessively cropping large prey; D = overfishing of predators and stunting of prey; and E = high population of small predators excessively cropping young prey.



## Figure A8-11. Relative weights trends of select species from 2000-2007.

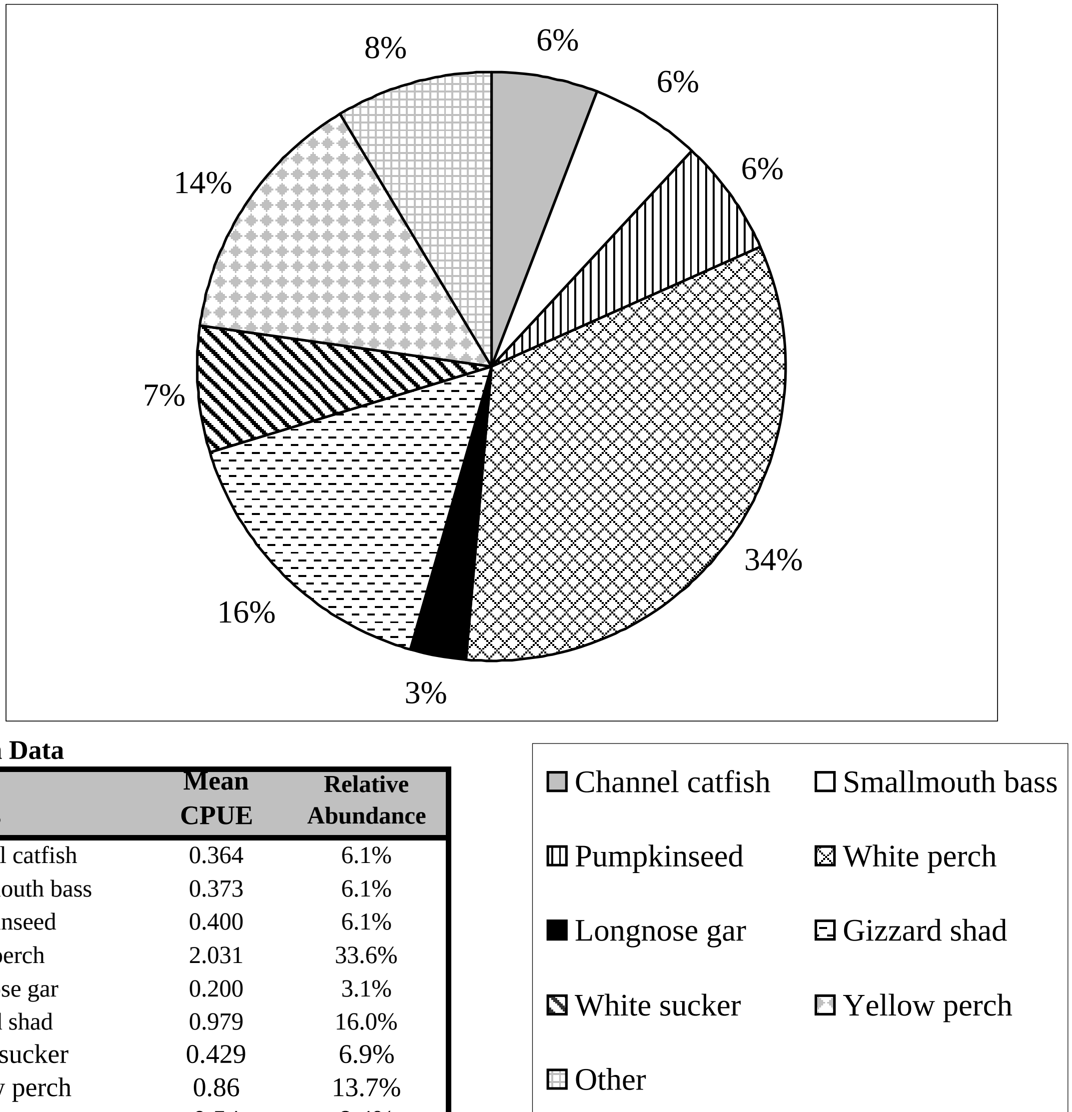



**Graph Data**

**Relative weights of select species captured during electrofishing in the fall of 2000-2007.**

| Bluegill | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Rel. Wt | 101.97 | 99.56 | 100.11 | 103.57 | 100.81 | 105.91 | 103.74 | 97.95 |
| SE | 0.42 | 1.04 | 0.37 | 0.61 | 2.46 | 5.03 | 6.23 | 3.11 |
| Count | 174 | 51 | 60 | 31 | 71 | 20 | 33 | 61 |
| **Gizzard shad** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| Rel. Wt | 100.17 | 99.83 | 101.50 | 103.62 | 107.32 | 117.47 | 108.6 | 110.6 |
| SE | 0.48 | 0.96 | 0.58 | 1.56 | 2.50 | 1.43 | 6.4 | 5.9 |
| Count | 191 | 15 | 60 | 30 | 20 | 172 | 98 | 105 |
| **Largemouth bass** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| Rel. Wt | 102.02 | 99.82 | 101.50 | 101.15 | 110.12 | 111.36 | 103.96 | 108.19 |
| SE | 0.34 | 0.17 | 0.39 | 0.77 | 1.51 | 0.80 | 2.38 | 3.61 |
| Count | 127 | 21 | 181 | 54 | 108 | 122 | 94 | 61 |
| **Pumpkinseed** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| Rel. Wt | 104.76 | 96.79 | 102.82 | 107.86 | 119.25 | 105.91 | 104.46 | 108.19 |
| SE | 0.92 | 2.55 | 0.41 | 1.93 | 3.80 | 0.82 | 2.02 | 1.47 |
| Count | 50 | 3 | 67 | 31 | 108 | 164 | 90 | 104 |
| **Smallmouth bass** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| Rel. Wt | 102.93 | 98.23 | 99.14 | 100.10 | 95.03 | 97.41 | 94.09 | 90.18 |
| SE | 1.53 | 1.56 | 0.41 | 0.83 | 3.23 | 1.82 | 2.45 | 1.03 |
| Count | 31 | 9 | 58 | 11 | 36 | 72 | 96 | 115 |
| **White perch** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** |
| Rel. Wt | 102.59 | 97.86 | 99.27 | 104.31 | 93.02 | 92.53 | 86.21 | 91.94 |
| SE | 1.98 | 0.55 | 0.38 | 0.97 | 1.65 | 0.56 | 1.67 | 2.05 |
| Count | 51 | 42 | 92 | 31 | 158 | 139 | 62 | 43 |

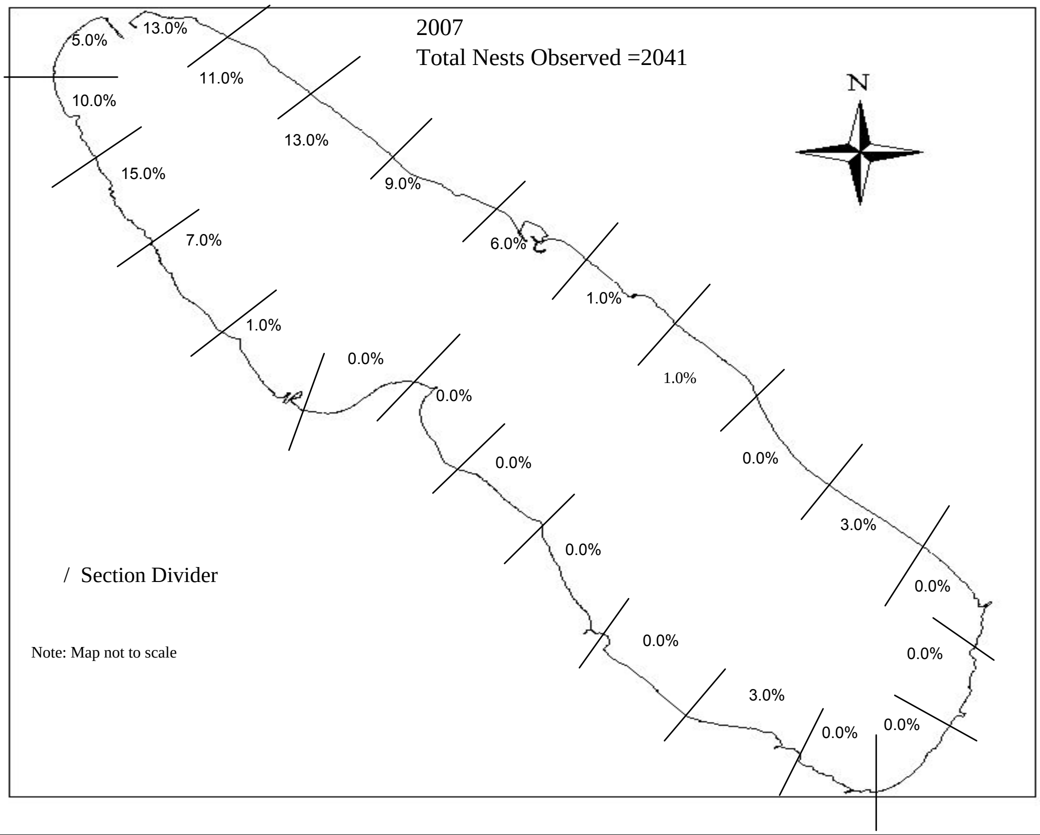
**Figure A8-12. Gill net relative abundance in 2007.**

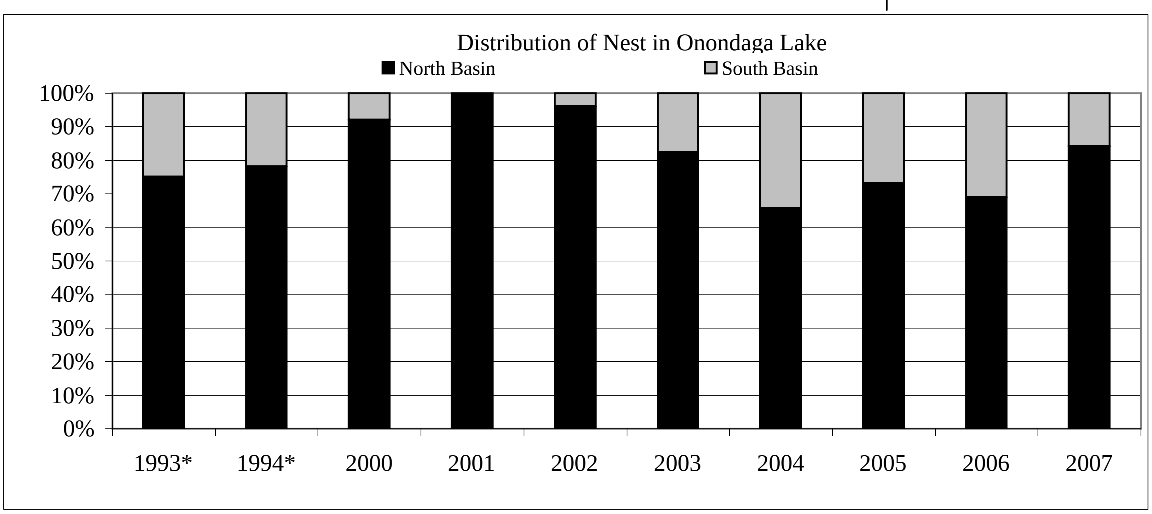



**Graph Data**

| Species | Mean CPUE | Relative Abundance |
|---|---|---|
| Channel catfish | 0.364 | 6.1% |
| Smallmouth bass | 0.373 | 6.1% |
| Pumpkinseed | 0.400 | 6.1% |
| White perch | 2.031 | 33.6% |
| Longnose gar | 0.200 | 3.1% |
| Gizzard shad | 0.979 | 16.0% |
| White sucker | 0.429 | 6.9% |
| Yellow perch | 0.86 | 13.7% |
| Other | 0.54 | 8.4% |

**Figure A8-13. 2007 Nesting survey map and comparison of north vs. south nests from 2000-2007.**

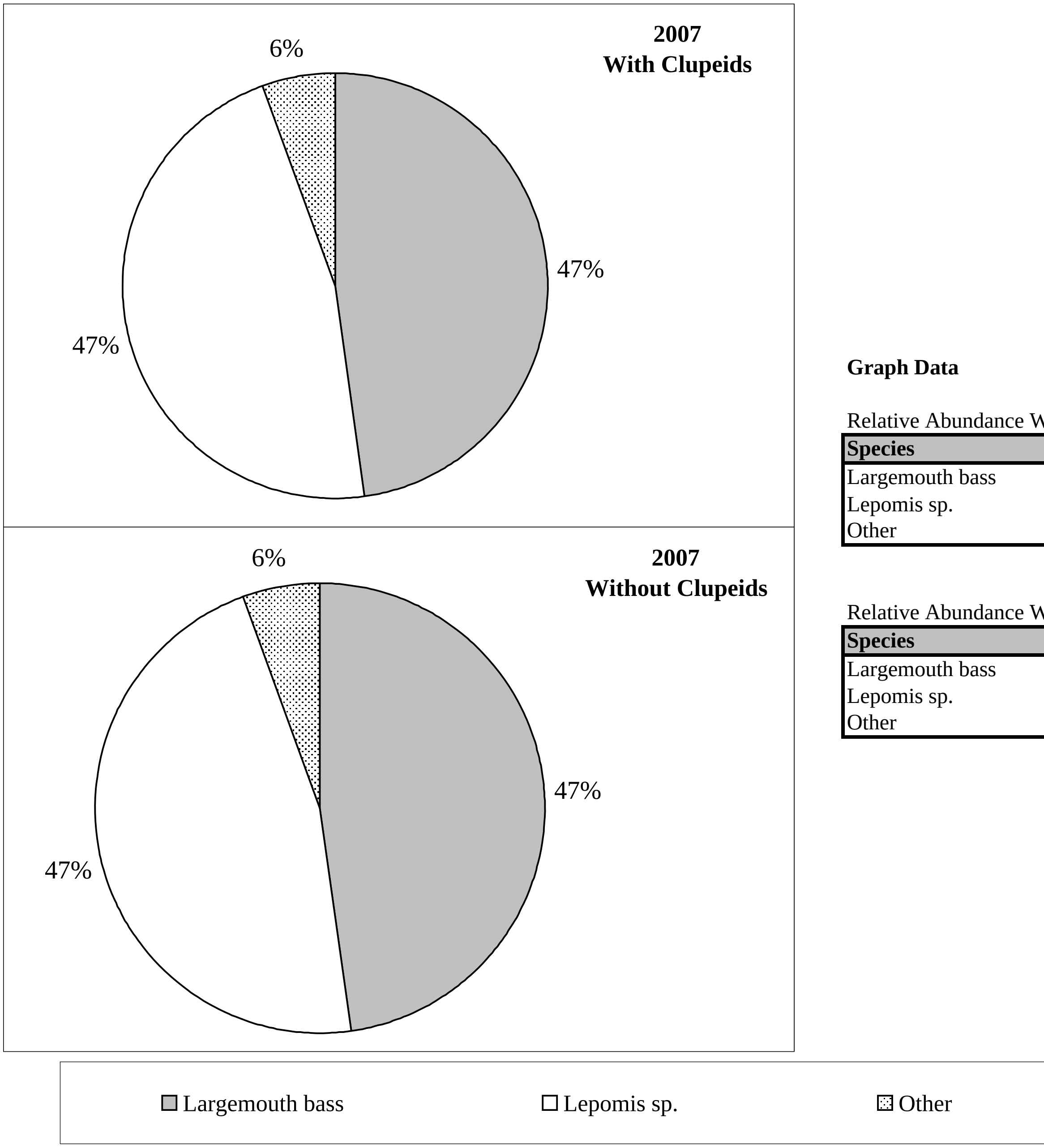



***Historic nest distribution. 1993 and 1994 data from Arrigo 1998.***

| | 1993* | 1994* | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|---|
| North Basin | 75% | 78% | 92% | 100% | 96% | 82% | 66% | 73% | 68.9% | 84.1% |
| South Basin | 25% | 22% | 8% | 0% | 4% | 18% | 34% | 27% | 31.1% | 15.9% |

**Figure A8-14. 2007 YOY Relative abundance with and without clupeids.**




**Graph Data**

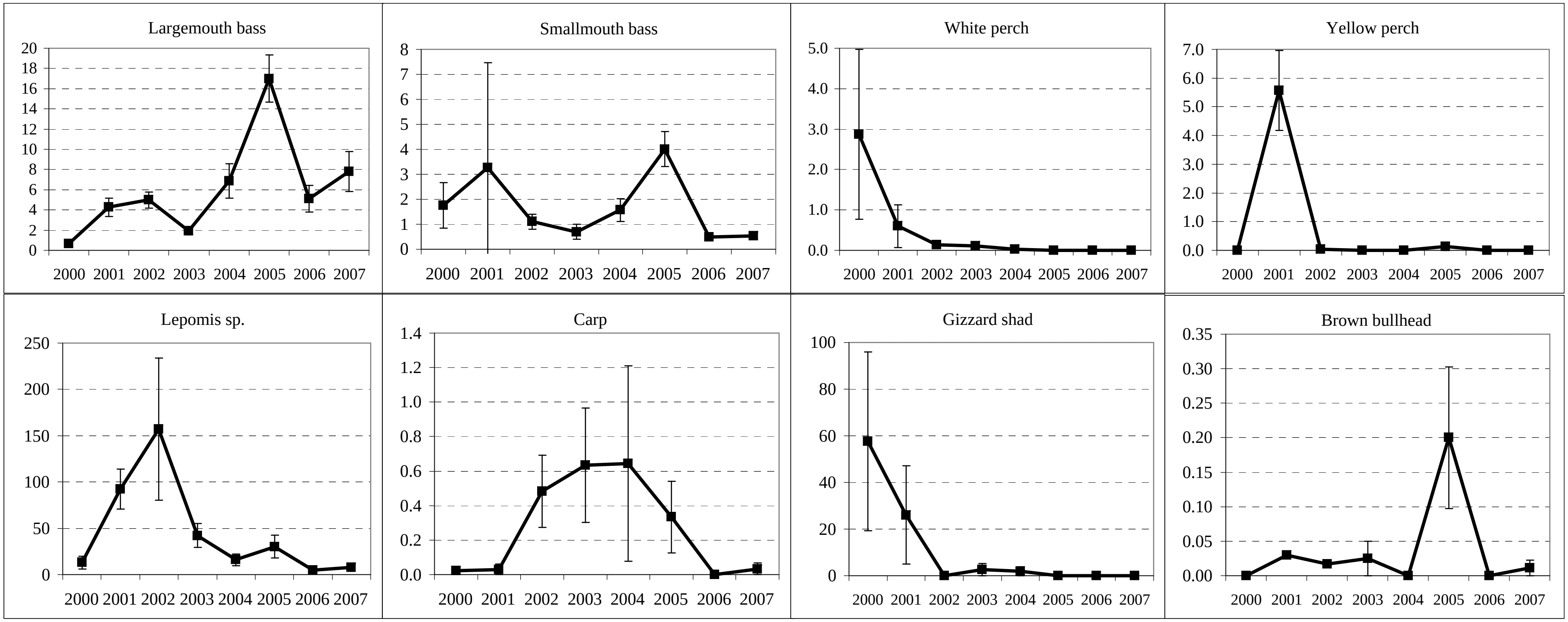
Relative Abundance W/Clupeids

| Species | Entire Lake |
|---|---|
| Largemouth bass | 47.69% |
| Lepomis sp. | 46.74% |
| Other | 5.56% |

Relative Abundance W/O Clupeids

| Species | Entire Lake |
|---|---|
| Largemouth bass | 47.69% |
| Lepomis sp. | 46.74% |
| Other | 5.56% |

# Figure A8-15. YOY CPUE (#/haul) trends for select species from 2000-2007.




**Graph Data**

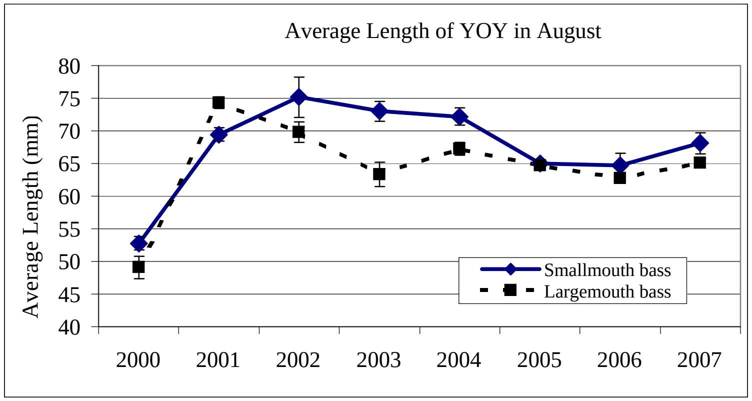
***YOY Annual CPUE from 2000-2007***

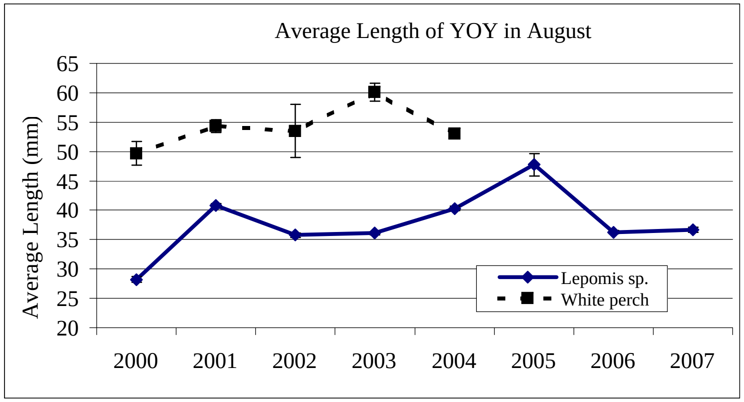
| Species | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Lepomis sp. | 12.96 | 92.48 | 156.93 | 42.13 | 16.12 | 30.17 | 4.64 | 7.66 |
| Largemouth bass | 0.64 | 4.27 | 4.98 | 1.94 | 6.87 | 16.99 | 5.10 | 7.81 |
| Smallmouth bass | 1.76 | 3.27 | 1.10 | 0.70 | 1.57 | 4.01 | 0.50 | 0.53 |
| Carp | 0.02 | 0.03 | 0.48 | 0.63 | 0.64 | 0.33 | 0.00 | 0.03 |
| White perch | 2.87 | 0.6 | 0.13 | 0.12 | 0.02 | 0.00 | 0.00 | 0.00 |
| Yellow perch | 0.00 | 5.57 | 0.03 | 0.00 | 0.00 | 0.13 | 0.00 | 0.00 |
| Brown bullhead | 0.00 | 0.03 | 0.02 | 0.03 | 0.00 | 0.20 | 0.00 | 0.01 |
| Gizzard shad | 57.56 | 26.05 | 0.03 | 2.68 | 1.98 | 0.02 | 0.00 | 0.00 |

***Standard Errors***

| Species | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Lepomis sp. | 6.73 | 21.56 | 76.80 | 13.04 | 6.30 | 12.14 | 2.41 | 3.94 |
| Largemouth bass | 0.23 | 0.91 | 0.80 | 0.42 | 1.71 | 2.35 | 1.33 | 1.98 |
| Smallmouth bass | 0.91 | 4.20 | 0.31 | 0.29 | 0.45 | 0.69 | 0.15 | 0.14 |
| Carp | 0.02 | 0.03 | 0.21 | 0.33 | 0.57 | 0.21 | 0.00 | 0.03 |
| White perch | 2.10 | 0.53 | 0.06 | 0.09 | 0.02 | 0.00 | 0.00 | 0.00 |
| Yellow perch | 0.00 | 1.4 | 0.03 | 0.00 | 0 | 0.13 | 0.00 | 0.00 |
| Brown bullhead | 0.00 | 0 | 0.00 | 0.03 | 0 | 0.10 | 0.00 | 0.01 |
| Gizzard shad | 38.32 | 21.05 | 0.03 | 2.62 | 1.91 | 0.02 | 0.00 | 0.00 |

**Figure A8-16. Mean length of select YOY species in August from 2000-2007.**




**Graph Data**

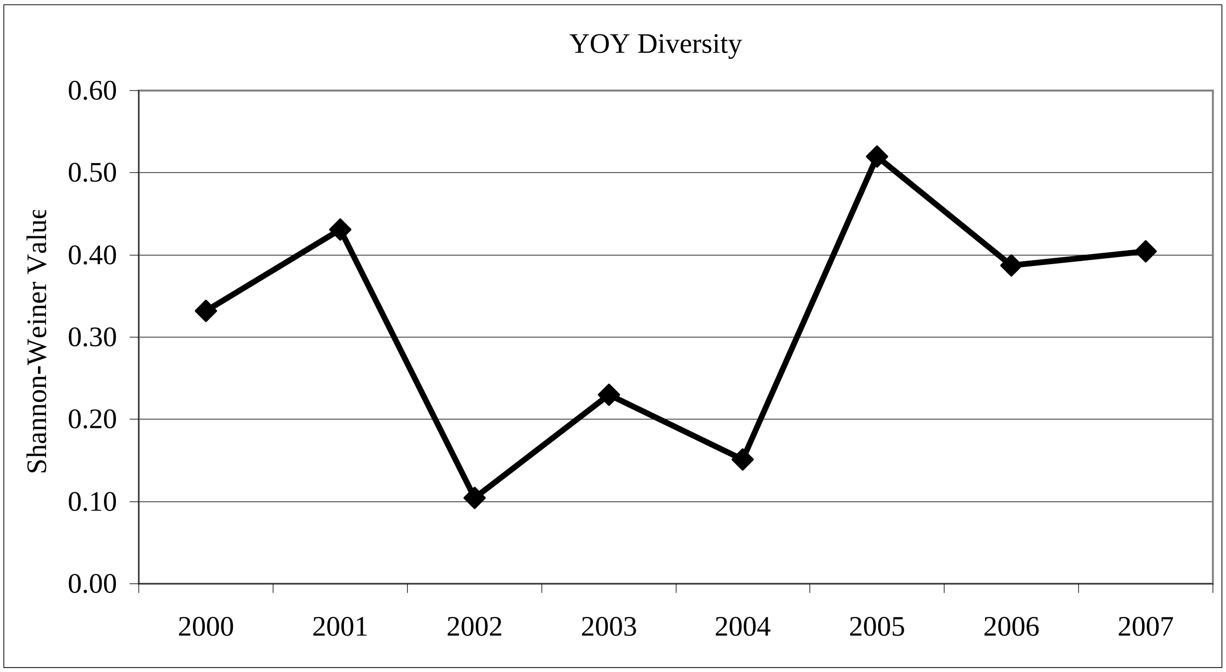
***YOY mean length in August in the entire lake from 2000-2007***

| Species | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Lepomis sp. | 28.2 | 40.9 | 35.7 | 36.09 | 40.30 | 47.75 | 36.29 | 36.69 |
| White perch | 49.7 | 54.3 | 53.5 | 60.10 | 53.00 | | | |
| Largemouth bass | 49.1 | 74.3 | 69.8 | 63.33 | 67.29 | 64.75 | 62.77 | 65.06 |
| Smallmouth bass | 52.8 | 69.5 | 75.2 | 73.00 | 72.18 | 65.00 | 64.72 | 68.09 |

***Standard error of mean length in August in the entire lake from 2000-2007***

| Species | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Lepomis sp. | 0.476 | 0.264 | 0.355 | 0.26 | 0.37 | 1.93 | 0.32 | 0.43 |
| White perch | 2.053 | 1.111 | 4.500 | 1.53 | | | | |
| Largemouth bass | 1.715 | 0.891 | 1.593 | 1.90 | 0.99 | 0.40 | 0.45 | 0.52 |
| Smallmouth bass | 0.989 | 1.006 | 3.071 | 1.56 | 1.31 | 0.54 | 1.84 | 1.59 |

**Figure A8-17. YOY whole lake diversity from 2000 to 2007.**

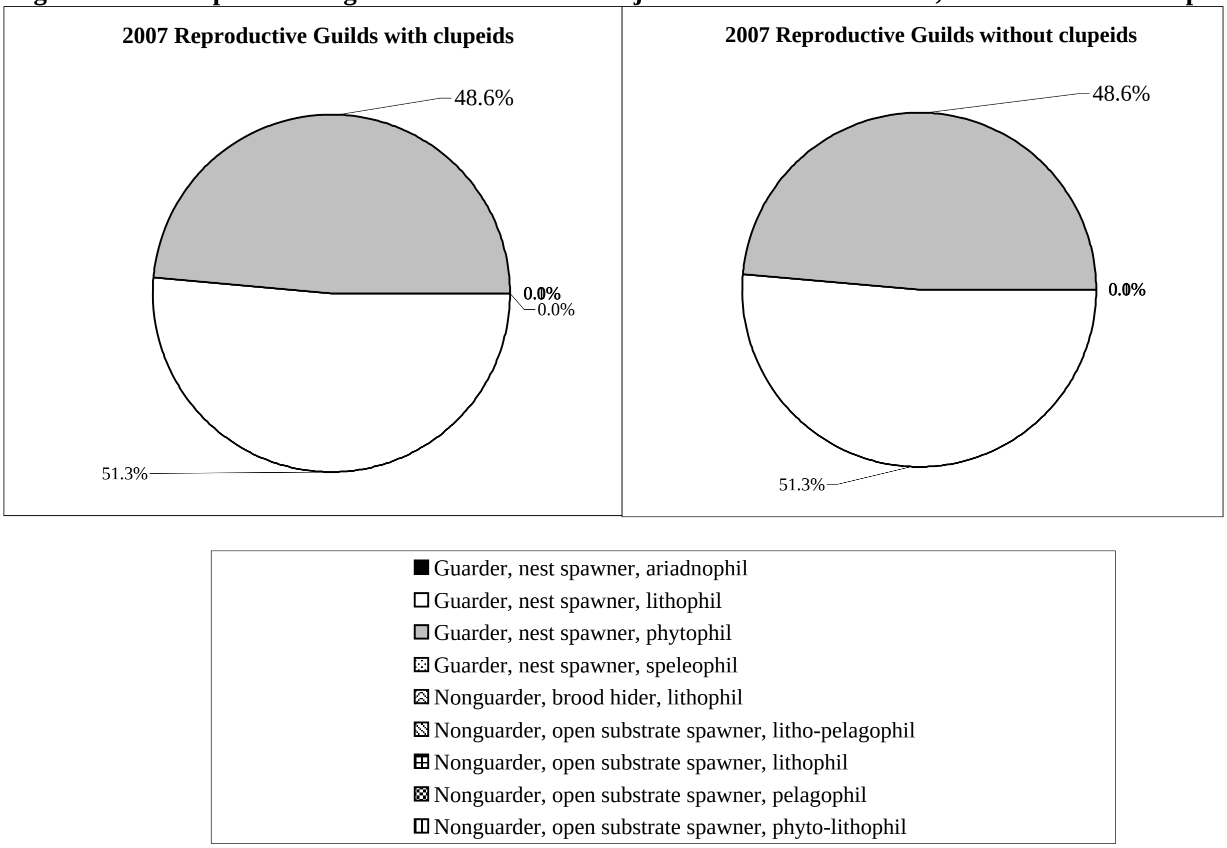



**Graph Data**

***Seine diversity indices from 2000-2007***

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|
| Shannon-Weiner value | 0.33 | 0.43 | 0.10 | 0.23 | 0.15 | 0.52 | 0.39 | 0.40 |

**Figure A8-18. Reproductive guild relative abundance juvenile seine data in 2007, with and without clupeids.**



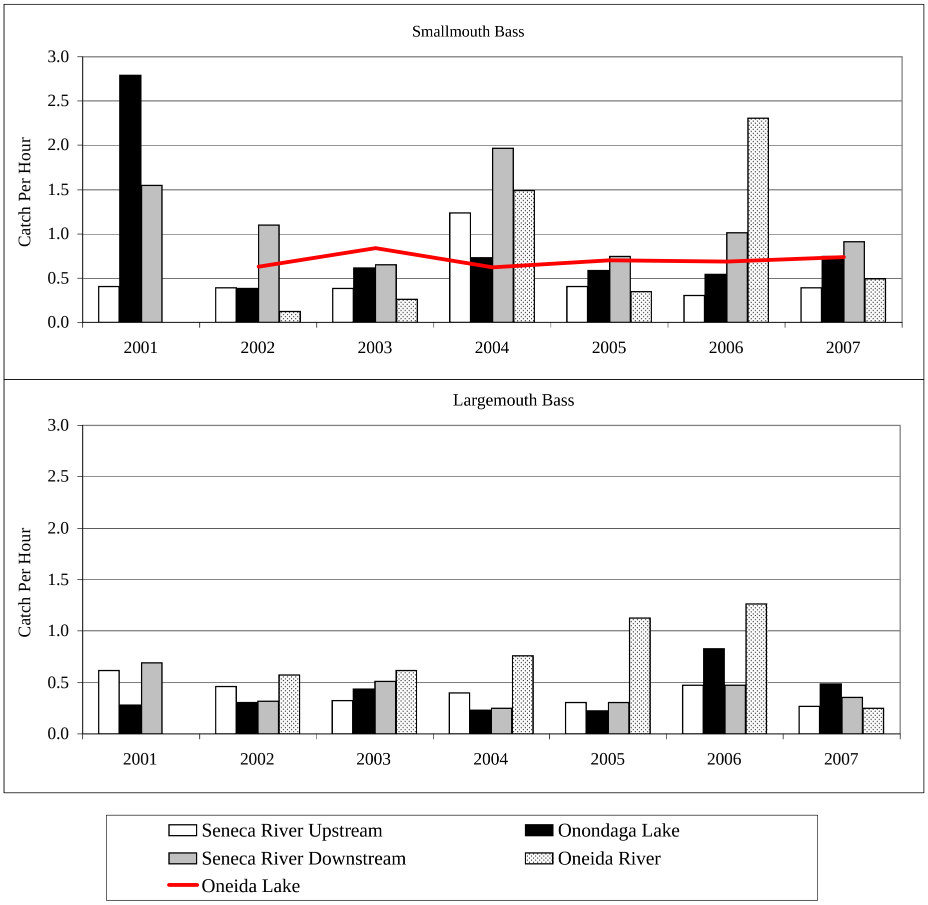

**Reproductive guild relative abundance for the entire lake and each stratum in 2007 without clupeids**

| Repro Guild | Entire Lake | Stratum 1 | Stratum 2 | Stratum 3 | Stratum 4 | Stratum 5 |
|---|---|---|---|---|---|---|
| Guarder, nest spawner, ariadnophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Guarder, nest spawner, lithophil | 50.37% | 18.36% | 0.00% | 68.42% | 71.92% | 28.71% |
| Guarder, nest spawner, phytophil | 47.73% | 81.64% | 37.21% | 31.58% | 27.96% | 71.29% |
| Guarder, nest spawner, speleophil | 0.07% | 0.00% | 2.33% | 0.00% | 0.00% | 0.00% |
| Nonguarder, brood hider, lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, litho-pelagophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, pelagophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, phyto-lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

**Reproductive guild relative abundance for the entire lake and each stratum in 2007 with clupeids**

| Repro Guild | Entire Lake | Stratum 1 | Stratum 2 | Stratum 3 | Stratum 4 | Stratum 5 |
|---|---|---|---|---|---|---|
| Guarder, nest spawner, ariadnophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Guarder, nest spawner, lithophil | 50.37% | 18.36% | 0.00% | 68.42% | 71.92% | 28.71% |
| Guarder, nest spawner, phytophil | 47.73% | 81.64% | 37.21% | 31.58% | 27.96% | 71.29% |
| Guarder, nest spawner, speleophil | 0.07% | 0.00% | 2.33% | 0.00% | 0.00% | 0.00% |
| Nonguarder, brood hider, lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, litho-pelagophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, pelagophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Nonguarder, open substrate spawner, phyto-lithophil | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |

**Figure A8-19. 2001-2007 angler catch summary, from diaries, in Onondaga Lake, Seneca River, and Oneida River. Smallmouth bass catch rates are compared to catch rates for trips specifically targeting bass in Oneida Lake from 2002 to 2007.**




*Note that Oneida Lake data are from creel surveys (Scott Krueger Personal Communication) which tend to estimate catch rates lower than diary programs.

**Graph Data**

***Smallmouth Bass***

| Year | Onondaga Lake | Seneca River Upstream | Seneca River Downstream | Oneida River | Oneida Lake |
|---|---|---|---|---|---|
| 2001 | 2.8 | 0.4 | 1.5 | | |
| 2002 | 0.4 | 0.4 | 1.1 | 0.1 | 0.63 |
| 2003 | 0.6 | 0.4 | 0.7 | 0.3 | 0.84 |
| 2004 | 0.7 | 1.2 | 2.0 | 1.5 | 0.62 |
| 2005 | 0.6 | 0.4 | 0.7 | 0.3 | 0.7 |
| 2006 | 0.5 | 0.3 | 1.0 | 2.3 | 0.69 |
| 2007 | 0.7 | 0.4 | 0.9 | 0.5 | 0.74 |

***Largemouth Bass***

| Year | Onondaga Lake | Seneca River Upstream | Seneca River Downstream | Oneida River |
|---|---|---|---|---|
| 2001 | 0.28 | 0.61 | 0.69 | |
| 2002 | 0.31 | 0.46 | 0.32 | 0.57 |
| 2003 | 0.43 | 0.33 | 0.51 | 0.62 |
| 2004 | 0.23 | 0.40 | 0.25 | 0.76 |
| 2005 | 0.23 | 0.31 | 0.30 | 1.13 |
| 2006 | 0.83 | 0.47 | 0.47 | 1.26 |
| 2007 | 0.48 | 0.27 | 0.36 | 0.25 |

SUB-APPENDIX A8-A

# *DRAFT*
# Food web effects and the disappearance of the spring clear water phase in Onondaga Lake following enhancements at the Metropolitan Syracuse Wastewater Treatment Facility

# Food web effects and the disappearance of the spring clear water phase in Onondaga Lake following enhancements at the Metropolitan Syracuse Wastewater Treatment Facility

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**ABSTRACT**

Wang, R. W., L. G. Rudstam, T. E. Brooking, D. J. Snyder, M. A. Arrigo, E. L. Mills and J. J. Mastriano. Food web effects and the disappearance of the spring clear water phase in Onondaga Lake following enhancements at the Metropolitan Syracuse Wastewater Treatment Facility. Lake and Reserv. Manage. Vol. XX(X):XX-XX.

Onondaga County has improved the treatment of wastewater that discharges into Onondaga Lake through upgrades at the Metropolitan Syracuse Wastewater Treatment Facility to reduce nutrient loading into the lake in order to decrease the incidence of algae blooms and increase water clarity. But as the quality of the discharged wastewater improved, the spring clear water phase present since 1988 disappeared, due to changes in the food web. In September 2002, the abundance of large zooplankton (*Daphnia*) declined and were virtually absent between 2003 and 2007 while abundance of small zooplankton (*Bosmina*) increased. Catches of alewife (*Alosa pseudoharengus*) from electrofishing surveys conducted since 2000 increased beginning in 2003. Hydroacoustic estimates of open water fish abundance ranged from 1600 to 2300 fish/ha in the spring of 2005, 2006, and 2007, with alewife dominating catches in vertical gill nets. The alewife population in 2005 was dominated by the 2002 year class and additional year classes were present in 2006 and 2007 catches. The development of the strong 2002 year class coincides with the observed shift from *Daphnia* to *Bosmina*. Alewife diets consisted primarily of small zooplankton on June 6, 2007 as well as *Daphnia* sp. on July 18, 2007. We conclude that the strong 2002 alewife year class initiated a classic trophic cascade causing the decline and continuing low abundance of *Daphnia* in Onondaga Lake and the disappearance of the spring clear water phase. Evaluations of the response of lakes to improved waste water treatment can be

complicated by changes in food web structure.

Key Words: alewife, food web interactions, Onondaga Lake, spring clear water phase, trophic cascade, wastewater treatment, zooplankton.

Since 1995, the Metropolitan Syracuse Wastewater Treatment Facility (Metro) has received several upgrades to reduce nutrient loading into Onondaga Lake, New York, particularly phosphorus and ammonia. In-lake ammonia concentration decreased from 2 mg/L during the 1990s to less than 1 mg/L beginning in 2000. In-lake phosphorus concentration decreased from 100 µg/L during the late 1990s to 30 µg/L in 2007 (Fig. 1). However, despite reductions of in-lake phosphorus concentrations, water clarity unexpectedly decreased in 2003 and the spring clear water phase that was present since 1988 disappeared. Water clarity has remained low through 2007 (Fig. 2).

Water clarity in Onondaga Lake is dependent on phytoplankton concentration in the lake, which in turn is regulated both by nutrient availability and by grazing pressure from zooplankton, particularly larger, more efficient zooplankton like *Daphnia* (Brooks and Dodson 1965, Carpenter and Kitchell 1984, Lampert et al. 1986, McQueen et al. 1986). The typical seasonal progression of phytoplankton in temperate lakes includes a spring diatom bloom followed by an increase in *Daphnia*, resulting in a spring clear water phase (Sommer et al. 1986). The timing and extent of the spring clear water phase correlates with peak *Daphnia* abundance (Lampert et al. 1986, Sommer et al. 1986, Rudstam et al. 1993, Meijer et al. 1999). As the biomass of age-0 planktivorous fish increase in early summer, predation on *Daphnia* increases. Coupled with low birth rates due to low food availability (Lampert 1978), the abundance of *Daphnia* declines, thus lowering their grazing pressure on phytoplankton and allowing the phytoplankton biomass to increase. The spring clear water phase disappears and water clarity declines (Sommer et al. 1986). Alewife is an efficient planktivore throughout its life and is known to shift zooplankton communities from dominance of large *Daphnia* to smaller species like *Bosmina* and copepods throughout the year (Brooks and Dodson 1965, Wells 1970, Hutchinson 1971, Warshaw 1972, Gannon 1976, Kohler and Ney 1981, Evans and Jude 1986, Harman et al. 2002), which are less efficient grazers. Therefore, the unexpected decrease in water clarity in Onondaga Lake in 2003, while improvements at Metro were underway, is likely to be the result of changes in the food web structure in the lake.

In this paper, we examined a dataset (Ambient Monitoring Program (AMP) Onondaga County, New York) for fish and zooplankton (2000 through 2006), complemented with hydroacoustic surveys from 2005 through 2007 and small mesh vertical gill nets. Our objectives were to investigate if food web changes were the likely explanation for the decrease in spring water clarity at the same time as improvement to the Metro Sewage Treatment Facility were ongoing. We also compare abundance estimates of alewife in Onondaga Lake with abundance in other lakes where large *Daphnia* were rare or absent in order to investigate if alewife abundance was likely to be sufficient to cause observed changes in the zooplankton community.

## Methods

### *Study area*

Located within Syracuse, New York, USA, Onondaga Lake has an approximate surface area of 11.7 $km^2$ and a maximum length and width of 8 km and 1.5 km, respectively. The lake has a mean depth of 10.9 m and a maximum depth of 19.5 m (Effler and Harnett 1996). The lake flushes rapidly and responds quickly to changes in external loading (OCDWEP 2008). Onondaga Lake discharges through a single outlet at its north end to the Seneca River, which, after combining with the Oneida River, flows into Lake Ontario at Oswego, New York. Prior to

European settlement in the late 1700s, Onondaga Lake was mesotrophic (Rowell 1996). Although the lake has received loads of domestic and industrial waste from the metropolitan area for more than a century (Meyer and Effler 1980, Spada et al. 2002), the quality of the lake has improved substantially during the past 20 years as a result of closures of industrial pollution sources and reductions of nutrient inputs (OCDWEP 2007).

Metro is an advanced, surface discharge wastewater treatment facility that serves approximately 300,000 residents and many industrial and commercial customers in Syracuse and other areas of Onondaga County, New York (OCDWEP 2007). Metro is designed to treat a mean flow of 84.2 million gallons/day of wastewater (3.7 $m^3$/sec) (OCDWEP 2007). Treated wastewater is discharged directly into the southern end of the lake (Matthews et al. 2000). Metro currently accounts for approximately 15% to 20% of the annual flow into the lake and, until recently, was the dominant source of total phosphorus and ammonia loading (OCDWEP 2007). As part of an Amended Consent Judgment, Onondaga County has been required to conduct extensive monitoring of water quality (since 1998) and lake biota (since 2000), including zooplankton and fish (AMP).

***Zooplankton***

Calculations of zooplankton density, species composition, size structure, and biomass were based on vertical hauls using a 0.50 m diameter net with 80 µ nylon mesh. Vertical tows were taken from the epilimnion when the lake was thermally stratified or from a depth of 6 m when no thermocline was present. In addition, a second sample was collected with a vertical tow to a depth of 15 m. Zooplankton samples were collected at a single site (South Deep, Fig. 3) throughout the year. Samples were preserved in 70% ethanol. Flowmeter readings were taken to determine the volume of water strained in each haul.

Identification and length measurement of zooplankton were performed using a compound microscope (40X-200X magnification) equipped with a drawing tube and a digitizing pad interfaced with a computer. For each sample, one to three 1-ml subsamples were withdrawn with a Henson-Stemple pipette from a known volume of sample, until at least 100 individual zooplankton were counted. Zooplankton length was converted to percent dry weight (%DW) using standard equations (α and β values) for each zooplankton species derived for Oneida Lake, New York (E. L. Mills, unpublished data).

The zooplankton were grouped into four categories: (1) *Daphnia* sp. (*D. mendotae, D. pulicaria*, and *D. retrocurva*) (2) small cladocera (*Bosmina longirostris*, *Eubosmina coregoni*, and *Chydorus sphaericus*); (3) other cladocera (*Ceriodaphnia quadrangula*, *Diaphanosoma* sp., *Alona* sp., *Sida crystallina*); and (4) calanoid and cyclopoid copepods (*Diaptomus minutus*, *D. oregonensis*, *D. sicilis*, *D. ashlandi*, *D. siciloides*, *Epischura lacustris*, *Limnocalanus macrurus*, *Eurytemora* sp., *Diacyclops thomasi*, *Tropocylcops prasinus*, *Mesocyclops edax*, *Acanthocyclops* sp., and *Eucyclops* sp.).

### *Vertical gill nets*

Four vertical gill nets were set in four quadrants around the lake: SE, SW, NE, and NW on October 7, 2004, May 17, 2005, June 4, 2006 and June 6, 2007 (Fig. 3). The 6 m deep and 21 m long nets consisted of seven panels, each with a different mesh size: 6.25, 8, 10, 12.5, 15, 18.75, and 25 mm bar mesh. These mesh sizes were selected to catch alewife from 50 to 300 mm in length (Warner et al. 2002). The nets were set for approximately two hours during the acoustic survey. On June 18, 2007, two vertical gill nets were set in the NE and SE quadrant of the lake for approximately one hour.

Alewives were obtained from each net for aging and %DW analysis. The fish were measured (total length (mm) and weight (g)) in all years and aged from the otoliths in 2004 and 2007. Otoliths were not available for aging in 2006. The otoliths were cleared with immersion oil and observed whole under a dissecting microscope. Fish for diet analysis were dissected and 30 fish from the June 6, 2007 sample (10 fish from the SW, SE, and NW quadrants) and 30 fish from the July 18, 2007 sample (15 fish from the SE and NE quadrants) were analyzed. The stomach contents were inspected under a 50X magnification. Diet contents from both sampling days were categorized into five groups: small cladocerans (mostly *Bosmina longirostris*), large cladocerans (*Daphnia* sp.), cyclopoids (mostly *Diacyclops thomasi*), insects (mostly *Chironomids*), and other (mostly amphipods). The first 50 identifiable organisms were enumerated in each stomach. We did not use stomachs with very few prey items and prey items so digested that identification was impossible.

Fish condition was based on the %DW. Fish caught in 2004, 2005, and 2007 were oven dried for four days at 70 ºC after which the fish were weighed and %DW calculated.

***Hydroacoustics***

The lake was surveyed on May 17, 2005, June 4, 2006, and June 6, 2007 using a 70 kHz split beam transducer (11.4º beam angle, 2 ping/sec) with either a Simrad EY500 (2005 and 2006, power 50 W, pulse length 0.2 ms) or a Simrad EY60 deck unit (2007, power 60 W, pulse length 0.256 ms). Both configurations were calibrated with a standard target (−39.2 dB copper sphere) before each survey. The survey track consisted of seven zig-zag transects in 2005 and 2006 and six parallel transects in 2007 (Fig. 3). The transducer was mounted on a rigid pole 0.5 m below the surface. Since the near field of this transducer is approximately 1.5 m (Rudstam et al. 2002), the acoustic analysis is restricted to depth below 2 m from the surface. Acoustic data were recorded directly to a laptop computer in the field and analyzed with the EchoView software (version 4.40, Myriax 2008). All data were visually inspected for consistent bottom detection and corrected when needed. Any area with excess interference from bubbles, vegetation, or other noise was removed from the analysis.

We used −60 dB as the lower threshold for alewife target strengths (TS) in our analysis based on results from *in situ* measures in a large net cage (Brooking and Rudstam submitted). Since the acoustic return from a −60 dB target will be 6 dB smaller at half power beam angle of the sound beam (−3 dB one way gain reduction, −6 dB two way reduction), the threshold for data to be included in the area backscattering coefficient (ABC) calculations was set to −66 dB in the TS domain (Parker Stetter et al. 2008). A lower threshold of −60 dB will include most fish present in the lake in May through June, excluding newly hatched larvae and invertebrates (Rudstam et al. 2002). Alewife abundance estimates are based on the total fish abundance estimates and the proportion of alewife caught in the vertical gill nets.

The data was used to calculate total fish density for each transect. Each transect was considered a sampling unit for variance calculations. Data collected during transit between transects were not included in these estimates. Fish density ($\rho$, fish/ha) is calculated from:

$$\rho = \frac{\overline{ABC}}{\overline{\sigma_{bs}}}$$

where $\overline{ABC}$ is the mean area backscattering coefficient for each transect ($m^2$/ha), and $\overline{\sigma_{bs}}$ is the mean backscattering cross section obtained from *in situ* single targets along each transect ($m^2$) where $\sigma_{bs} = 10^{(TS/10)}$. Mean fish densities were weighted using the length of each transect as the weighting factor. Data were also analyzed in 200 m sections to visualize spatial distributions across the lake using the mean *in situ* $\sigma_{bs}$ for each year.

To account for fish in the top 2 m of water that is not accessible to acoustics, we adjusted the acoustic density estimates based on the proportion of fish caught in 0-2 m relative to the proportion of fish caught in 2-6 m in our vertical gill nets. This assumes that the catchability in 0-2 m is the same as the catchability in 2-6 m. The adjustment was based on the mean of the proportions of alewife caught in the top 2 m in each of the four gill nets.

***Electrofishing***

Since 2000, adult fish in the littoral zone have been sampled by Onondaga County during May and September using boat electrofishing (EF) as part of the AMP. The lake's littoral zone was divided into 24 equal length sections. A GPS unit was used in the field to locate the start and end points during sampling events. The EF boat was navigated parallel to shore in approximately 1 m of water and the time to cover each section was recorded. Sampling occurred at night, from 30 minutes after sunset to 30 minutes before sunrise. The EF unit (Smith-Root Type GPP 9.0) was set at a pulsed DC frequency of 120 Hz, 340 V, and 21-25 amps. Alewife were collected in 12 of the 24 transects as part of the fish community samples. Only game fish were collected in the other 12 transects. Fish collected for processing were identified to species, measured for total length (nearest mm) and, for the fall samples, weighed (nearest g). All fish were measured in samples with <30 fish per species. In samples with high numbers of one or more species, subsamples of 30 fish of each species were measured for length and weight (September only) and the remaining fish were identified to species and counted.

## Results

### *Zooplankton*

The zooplankton community changed dramatically in August through September 2002 (Fig. 4). Prior to September 2002, the zooplankton biomass was dominated by large cladocera, specifically *Daphnia mendotae*. In addition, there was a relatively high abundance of calanoid and cyclopoid copepods. Small cladocera were uncommon in the lake. After September 2002, *D. mendotae* and other large cladocera along with calanoid and cyclopoid copepods declined while small cladocera, specifically *Bosmina longirostris*, became very abundant. Abundance of calanoid and cyclopoid cyclopoids remained relatively constant, albeit low, in the lake. Mean annual zooplankton biomass declined in 2003 and remained at 75% of the values in 2000 to 2002 though 2007. *Daphnia* sp. did not return to pre-2003 densities by the fall of 2007.

### *Electrofishing*

EF surveys caught eleven large alewives ranging from 200-239 mm in fall of 2000. Such large alewives are typically found in productive lakes when alewife is uncommon and zooplankton consists of large cladocerans (Brooking et al. 2005). No alewives were caught in fall of 2001 and only nine were caught in fall of 2002 ranging from 80-298 mm. In fall of 2003, catches increased and have remained high through spring 2007 ($N$ = 539 in fall 2003 and spring 2004; $N$ = 320 in 2004-2005; $N$ = 352 in 2005-2006; and $N$ = 164 in 2006-2007). Since fall of 2005, the alewife population has consisted of at least two size classes (Fig. 5).

### *Vertical gill nets*

Alewife dominated vertical gill net catches from 2004 through 2007 (Table 1). Mean spring catch rates varied from 56.4 fish/hr on June 4, 2006 to 94.9 fish/hr on June 6, 2007. In depth 2-6 m, over 94% of the fish caught were alewife in all years. Alewives were spread out across the top 6 m of water in all years (Table 1). The proportion of alewife caught in 0-2 m compared to 2-6 m in spring samples ranged from 38% to 43 % (Table 1). Other fish species caught include white perch (*Morone Americana*), yellow perch (*Perca flavescens*), emerald shiner (*Notropis atherinoides*), and brown trout (*Salmo trutta*). Gizzard shad (*Dorosoma cepedianum*) is the only other abundant fish species caught (3.1 fish/hr on October 7, 2004 and 6.7 fish/hr on June 4, 2006).

### *Hydroacoustics*

Density of targets larger than −60 dB in spring of 2005, 2006, and 2007 was, respectively, 2242, 2328, and 1632 targets/ha. (Table 2, Fig. 6). Spatial variability was high and densities in different transects varied an order of magnitude in all three years. Fish were concentrated in the north end of the lake in 2005 and in the south end in 2006 and 2007 (Fig. 3). This was mirrored in the catches in the four gill net sets. Mean TS (TS >−60 dB) were similar among years (−43.84 dB in 2005, −44.24 dB in 2006, −43.34 dB in 2007). This is consistent with the small variation in average length of alewife in the lake over these years and similar to expectation based on published TS to length regression for alewife (Warner et al. 2002) and the size of adult alewife present in the lake.

***Age, growth, diet, and condition***

Otolith aging indicated that most of the alewives in 2004 (84%) were from the 2002 year class. More year classes were present in 2007 with most alewives (45%) from the 2004 year class (Table 3). Alewives from the 2002 through 2006 year classes were also present in 2007. The presence of small fish (<120 mm) in the length distributions from 2005 through 2007 also indicate recruitment of alewife in 2003 through 2006 in addition to the strong 2002 year class.

The %DW declined with age in 2004 and declined with length in 2007 with a mean %DW of 29%. Yearling and older alewife in 2004 and 2007 ranged between 104 and 195 mm. The observed growth rates were typical of abundant landlocked alewife populations in the region (Anderson and Neumann 2002). Alewives as large as those found in 2000 were not collected in 2003 through 2007.

The diets of alewife from June 6, 2007 gill nets consisted primarily of small zooplankton (44% of *B. longirostris* and 41% of *D. thomasi*) as well as insects, primarily *Chironomids*, and amphipods (Table 4). *Daphnia* sp. were present in the July 18, 2007 gill nets and accounted for

46% of the diets in addition to *B. longirostris* and *D. thomasi*. Based on Ivlev's (1961) electivity index, alewife selected against *B. longirostris* (−0.12 and −0.22) and for *D. thomasi* (+0.18 and +0.24) and *Daphnia* sp. (+0.10) at these two sampling occasions.

## Discussion

The disappearance of the spring clear water phase in Onondaga Lake in 2003 coincided with the disappearance of large *Daphnia* sp. and the appearance of large numbers of planktivorous alewife. The large changes in the open water food web were associated with a strong 2002 year class of alewife, indicated by an increase of 130-145 mm alewife abundance in the EF survey in 2003 and by the results of the age structure of the population in 2004. These fish had grown to 140-165 mm by the following fall of 2004. The strong 2002 year class is likely to have been produced from the resident alewife population in Onondaga Lake. A large scale immigration event is unlikely because the number of fish present in the lake in the spring of 2005 was estimated to be 2.6 million fish (1170 ha*2242 fish/ha) and the only upstream source of alewife (Otisco Lake) is smaller than Onondaga Lake. This strong 2002 year class would have exerted high predation pressure on zooplankton by fall of 2002 when the age-0 fish have increased in size and population biomass. Thus, the decline of *Daphnia* in fall of 2002 coincides with expectation of a strong alewife effect on zooplankton. Alewife has maintained high abundance through the spring of 2007.

Alewife is the classic size-selective fish species known to depress large zooplankton where they occur in large abundance (Brooks and Dodson 1965). They will consume progressively smaller zooplankton as larger zooplankton becomes depleted (Brooks and Dodson 1965, Wells 1970, Meyer and Effler 1980). The diet samples of alewife collected in the June 6, 2007 and July 18, 2007 illustrate this phenomenon. On both days, alewife selected for the large *Diacyclops thomasi* as well as for *Daphnia retrocurva* (only present July 17) although they also fed on large numbers of *Bosmina longirostris* on both dates (Table 4, Fig 4).

The abundance of small zooplankton in the lake and in the diets might account for the declining %DW with length and the slow growth rate of 2+ age fish in 2007. In general, fish growth largely depends on the availability of appropriate food items (Graeb et al. 2004). Smaller alewife may grow better on small zooplankton than large alewife, as indicated by the relatively high growth rate of alewife during the first year of life in Onondaga Lake. The declining %DW with fish length suggests poor foraging conditions for large alewife, which is often associated with high fish density, high intra-specific competition, and low abundance of *Daphnia*. Poor alewife growth rate and condition when abundant are consistent with observed changes in zooplankton species composition and consistent with observations in other Northeastern lakes with high alewife abundance (Anderson and Neumann 2002).

In contrast, the large sizes of alewives caught by EF in 2000 indicate that the population was small at that time. In Canadarago Lake, New York, alewife experienced fast growth rate for both their first and second year of life reaching 125 mm (18 g) as age-0 and 235 mm (135 g) as age-1 in the fall due to low alewife abundance. In this lake, large *Daphnia* continue to be abundant (Brooking et al 2005). These growth rates are characteristic of lakes where alewife abundance is low and abundance of large zooplankton is high.

Thus, all available evidence indicates that the increase of alewife in 2002 initiated a classic trophic cascade causing the decline and continuing low abundance of *Daphnia* in Onondaga Lake and the disappearance of the spring clear water phase. The timing of the decline in *Daphnia* in the fall of 2002 is consistent with the expected increase in biomass of young-of-year alewife from the 2002 year class, the continued depression of *Daphnia* is consistent with continued high abundance of alewife, and the growth rates of alewife became depressed after the decline in *Daphnia* compared to the high growth rates at low abundance in the early 2000s. In other lakes with alewife densities around 1000-2000 fish/ha, *Daphnia* are also depressed (Cayuta Lake, Otsego Lake, Brooking and Rudstam submitted).

Why did alewife abundance increase in 2002? Alewife has been present in Onondaga Lake as early as the 1950s (Dence 1956, Meyer and Effler 1980) but conditions for fish reproduction have always been considered poor due to excessive loading of municipal and industrial waste into the lake and high in-lake ammonia concentrations. With the closures of a primary source of industrial pollution in 1987 and the continued improvements in the Metro Wastewater Treatment Facility, ammonia concentration decreased to less then 1 mg/L in 2000 and has remained below that value through 2007 (2007 annual mean = 0.16 mg/L (OCDWEP 2008)) (Fig. 1). At high concentrations, however, ammonia is toxic to fish (Thurston et al. 1986, Wajsbrot et al. 1991, Bergerhouse 1992), particularly during the larval stage. Holt and Arnold (1983) studied red drum (*Sciaenops ocellatus*) larvae susceptibility to ammonia toxicity during the critical period from endogenous to exogenous feeding. Larval mortality increased to as high as 50% when ammonia concentration exceeded 0.55 mg/L. Although there are no existing studies of alewife larval susceptibility to ammonia toxicity in Onondaga Lake, the enhancement of ammonia removal by

Metro could have improved the reproductive success of alewife and thus the increase in abundance in 2003. Thus, improved wastewater treatment may have initiated the trophic cascade that eliminated the spring clear water phase in Onondaga Lake. Such food web effects need to be accounted for when evaluating the lakes response to improvements at the Metro plant or other similar projects where reductions in nutrient loading occur.

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Table 1.–Mean fish catches in the vertical gill nets with variable mesh size set in Onondaga Lake in 2004 through 2007. Four nets were set in each survey, except on July 18, 2007 where two nets were set.

| **Means** | **Oct 7, 2004** | **May 17, 2005** | **June 4, 2006** | **June 6, 2007** | **July 18, 2007** |
|---|---|---|---|---|---|
| Soak time (hrs) | 3.42 | 2.45 | 5.61 | 2.34 | 1.08 |
| Proportion (0-2 m) | 0.35 | 0.38 | 0.43 | 0.42 | 0.28 |
| (2-4 m) | 0.37 | 0.41 | 0.24 | 0.31 | 0.4 |
| (4-6 m) | 0.28 | 0.21 | 0.32 | 0.27 | 0.32 |
| | | | | | |
| Alewife | | | | | |
| Catch/hour | 58.51 | 75.4 | 56.4 | 94.9 | 143.5 |
| Mean length (range) (mm) | 148 (132-165) | 149 (108-164) | 132 (110-169) | 153 (104-195) | 150 (110-173) |
| Mean weight (g) | 29.8 | 33.7 | 24.9 | 28.4 | 26.8 |
| | | | | | |
| Other fish species (catch/hr) | | | | | |
| Gizzard shad | 3.1 | 0 | 6.7 | 1.0 | 0 |
| White perch | 0.1 | 0.1 | 0.1 | 0.4 | 0 |
| Yellow perch | 0 | 0 | 0 | 0.5 | 0.5 |
| Emerald shiner | 0 | 0 | 1.4 | 0 | 0 |
| Golden shiner | 0.1 | 0 | 0 | 0 | 0 |
| Smallmouth bass | 0 | 0 | 0 | 0.2 | 0 |
| Pumpkin seed | 0 | 0 | 0 | 0 | 0.5 |
| Brown trout | 0 | 0.1 | 0.02 | 0 | 0 |
| Channel catfish | 0.1 | 0 | 0 | 0 | 0.5 |

Table 2.–Acoustic estimates of fish in Onondaga Lake using 70 kHz split beam unit during surveys on May 17, 2005, June 4, 2006, and June 6, 2007. Density is also corrected to include fish in the top 2 m of water (Table 1, see methods). ABC is the area backscattering coefficient.

| | **Total transect length, m (*N*)** | **Mean TS, dB (range)** | **Mean ABC, $m^2$/ha (range)** | **Mean density from 2 m to the bottom, fish/ha (range)** | **Mean corrected density, fish/ha (range, SE)** |
|---|---|---|---|---|---|
| May 17, 2005 | 12,226 (7) | –43.84 | 0.094 | 1890 | 2242 |
| | | (–45.20-–41.97) | (0.032-0.188) | (909-3978) | (1156-4579, 472) |
| June 4, 2006 | 11,870 (7) | –44.24 | 0.055 | 1656 | 2328 |
| | | (–45.61-–42.55) | (0.022-0.078) | (693-2546) | (949-3646, 360) |
| June 6, 2007 | 9,655 (6) | –43.34 | 0.058 | 1084 | 1632 |
| | | (–44.39-–42.37) | (0.011-0.204) | (259-3528) | (387-5165, 738) |

Table 3.–Age and growth data for alewife caught in vertical gill nets in 2004 and 2007 in Onondaga Lake. The number of fish aged was a random subsample of all fish caught. Alewives caught in 2005 and 2006 were not aged.

| **Age (yrs)** | **Percent of all fish aged in July 11 and Oct 7, 2004 (*N*)** | **Mean fish length in July 11 and Oct 7, 2004, mm (SD)** | **Percent of all fish aged in June 6, 2007 (*N*)** | **Mean fish length in June 6, 2007, mm (SD)** |
|---|---|---|---|---|
| 1 | 10 (5) | 133 (5.9) | 20 (8) | 118 (4.6) |
| 2 | 84 (42) | 138 (6.3) | 7.5 (3) | 143 (5.3) |
| 3 | 6 (3) | 152 (1.2) | 45 (18) | 152 (5.5) |
| 4 | | | 20 (8) | 155 (9.7) |
| 5 | | | 7.5 (3) | 157 (9.9) |

Table 4.–Percent composition by number of diet contents of alewife caught in the vertical gill nets in Onondaga Lake on June 6 and July 18, 2007.

| | **June 6, 2007** | | | **July 18, 2007** | |
|---|---|---|---|---|---|
| | **SW** | **SE** | **NW** | **SE** | **NE** |
| *N* | 10 | 10 | 10 | 15 | 15 |
| Mean length (mm) (range) | 156 (132-164) | 140 (122-164) | 164 (151-188) | 156 (128-184) | 150 (126-169) |
| % *Daphnia* sp. | 0 | 0 | 0 | 42.8 | 48.9 |
| % *B. longirostris* | 34.5 | 79.3 | 44.4 | 29.8 | 24.8 |
| % *D. thomasi* | 52.3 | 20.0 | 41.4 | 27.4 | 25.9 |
| % Insects | 13.2 | 0.7 | 5.3 | 0 | 0.4 |
| % Other | 0 | 0 | 8.9 | 0 | 0 |

Figure Legends

Figure 1.–Annual mean total phosphorus and ammonia in-lake concentrations from January to December 1990 through 2007 in the upper 6 m of the southern end of Onondaga Lake. Metro loading is from Outfall 001. Loading from other sources are East Flume, Harbor Brook, Ley Creek, Ninemile Creek, Outfall 002, Onondaga Creek, and Tributary 5A.

Figure 2.–Mean secchi disk transparency from May 1 to June 15, 1990 through 2007 at the southern end of Onondaga Lake. Lines at the end of bars represent one standard deviation.

Figure 3.–Spatial distribution of alewife in Onondaga Lake on May 17, 2005, June 4, 2006, and June 6, 2007 based on densities from 2 m to the bottom in 200 m sections. Location of zooplankton sampling site (South Deep), gill net sets, and Metro are shown.

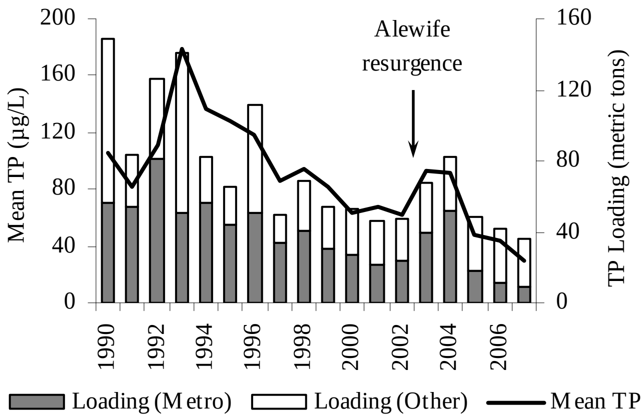
Figure 4.–Total biomass of four major groups of zooplankton collected in Onondaga Lake from 2000 through 2007 based on vertical hauls using a 0.50 m diameter net with 80 µ nylon mesh from the epilimnion. Zooplankton samples were collected at the southern end of the lake throughout the year.

Figure 5.–Proportion of length distribution of alewife caught in Onondaga Lake in electrofishing surveys from 2003 through 2007 (top graph) and in vertical gill nets in May 17, 2005, June 4, 2006 and June 6, 2007 (bottom graph).

Figure 6.–Alewife mean corrected density obtained with acoustic surveys and mean catch per hour obtained with vertical gill nets in Onondaga Lake. Error bars represent one standard error.

Figures

Figure 1



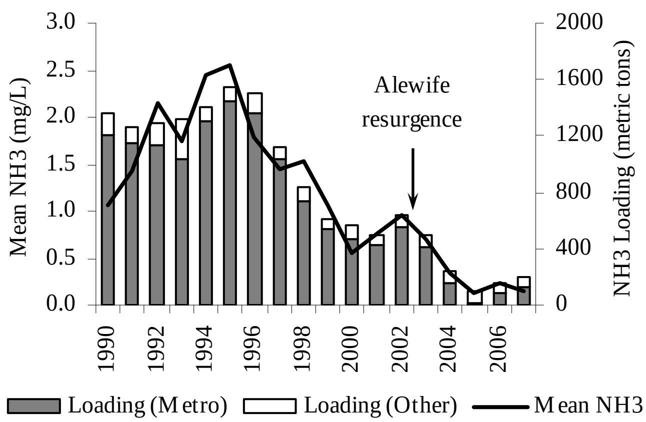



Figure 2

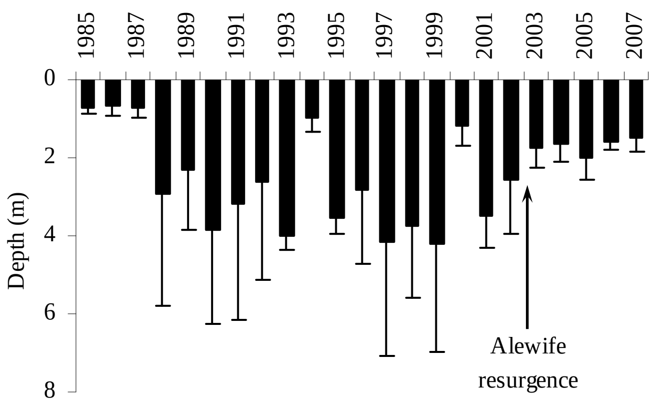
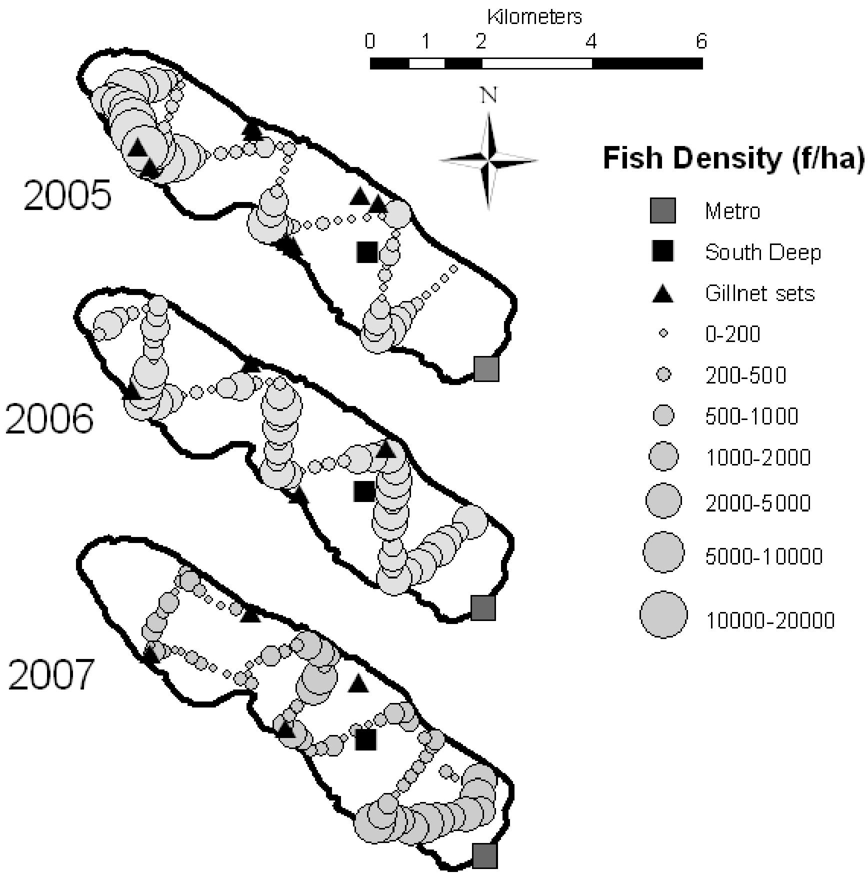
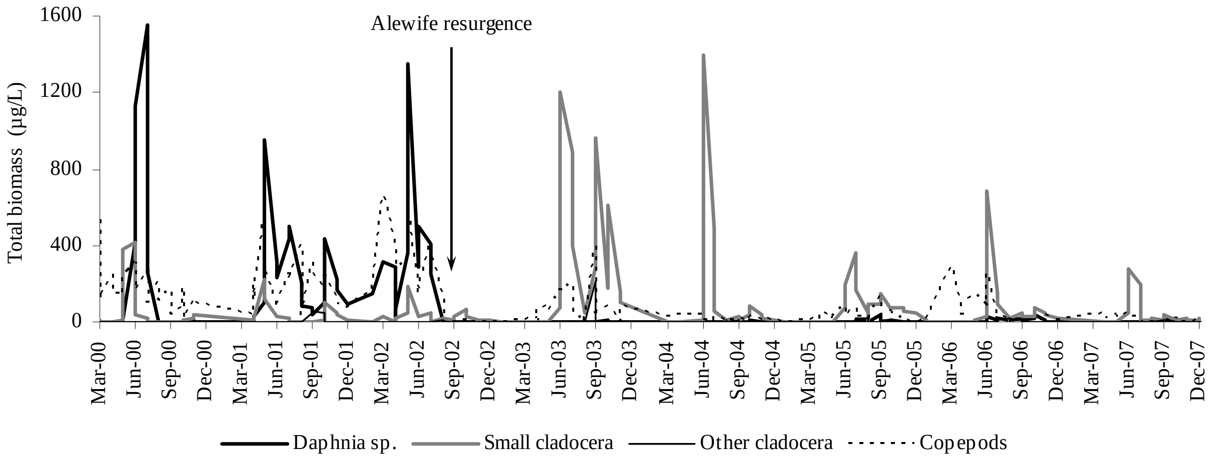

1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
0
2
4
6
8
Depth (m)
Alewife
resurgence

Figure 3



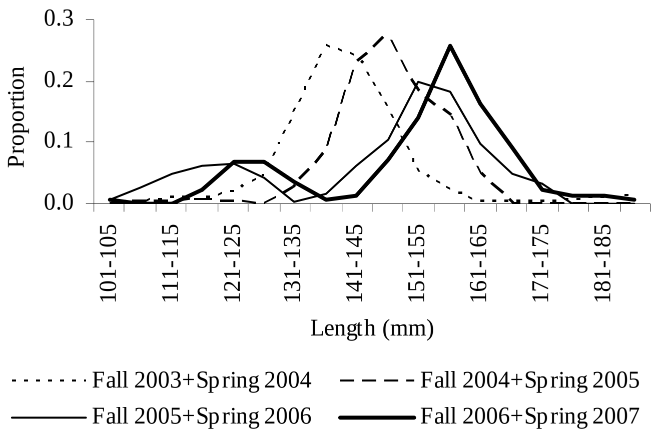
Kilometers
0 1 2 4 6
N
2005
2006
2007
Fish Density (f/ha)
Metro
South Deep
Gillnet sets
0-200
200-500
500-1000
1000-2000
2000-5000
5000-10000
10000-20000

Figure 4



Alewife resurgence
Total biomass (µg/L)
1600
1200
800
400
0
Mar-00
Jun-00
Sep-00
Dec-00
Mar-01
Jun-01
Sep-01
Dec-01
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Dec-06
Mar-07
Jun-07
Sep-07
Dec-07
Daphnia sp.
Small cladocera
Other cladocera
Copepods

Figure 5


0.3
0.2
0.1
0.0
Proportion
101-105
111-115
121-125
131-135
141-145
151-155
161-165
171-175
181-185
Length (mm)
Fall 2003+Spring 2004
Fall 2004+Spring 2005
Fall 2005+Spring 2006
Fall 2006+Spring 2007

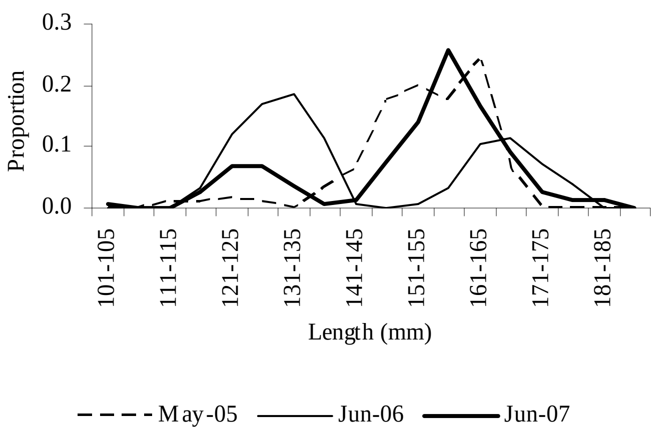
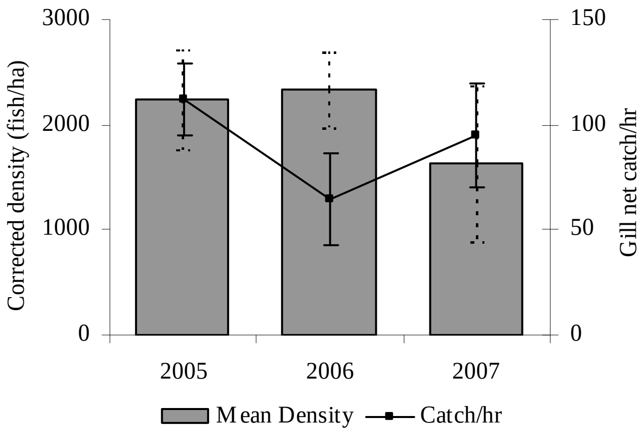

0.3
0.2
0.1
0.0
Proportion
101-105
111-115
121-125
131-135
141-145
151-155
161-165
171-175
181-185
Length (mm)
May-05
Jun-06
Jun-07

Figure 6


3000
2000
1000
0
150
100
50
0
Corrected density (fish/ha)
Gill net catch/hr
2005
2006
2007
Mean Density
Catch/hr

# APPENDIX 9: SENECA RIVER

## LIST OF TABLES:



## LIST OF FIGURES:

# APPENDIX 9: 2007 SENECA RIVER CONDITIONS

(by QEA, LLC)

In 2007, OCDWEP completed three full water quality surveys of the Seneca River. The surveys were designed to assess current water quality status with respect to ambient water quality standards and to support the river and lake modeling effort being carried out by Quantitative Environmental Analysis, LLC (QEA). The AMP calls for annual water quality monitoring at Buoy 316; this sampling and analysis has been incorporated into the full river surveys. The study area for these water quality surveys, which is shown in **Figure A9-1**, spans the Seneca River from Cross Lake to Three Rivers Junction, as well as portions of the Oneida and Oswego Rivers. A summary of sampling locations and numbers of samples collected in 2007 is shown in **Table A9-1**.

River sampling events in 2007 occurred on July 12$^{th}$, August 9$^{th}$ and September 26$^{th}$. During each survey, grab samples of "bottom" and "top" waters (1m above the bottom and 1m below the surface, respectively) were collected and analyzed for several water quality parameters at numerous locations (defined by navigational buoys) throughout the study area. To further characterize the extent of stratification and variations in water quality with depth at Buoy 269, grab samples were also collected from a point halfway between the top and bottom samples at this location. In addition to the grab sampling, depth profiles of in-situ water quality parameters (dissolved oxygen (DO), salinity, redox potential, pH, and temperature) were collected at each sampling location during the AMP surveys

Spatial profiles of water quality constituents (i.e., DO, organic and inorganic forms of nitrogen, phosphorus, and carbon, as well as solids, turbidity, chloride, chlorophyll-*a*, phaeophytin-*a*, salinity, and temperature) measured during the July, August and September river sampling events in 2007 are shown in **Figures A9-2** through **A9-11**. A discussion of the 2007 Seneca and Oneida River sampling results is presented in **Chapter 6.** The dates when DO and N species collected during the 2007 river surveys were not in compliance with applicable ambient water quality standards are summarized in **Table 6-1**.

In addition, YSI data sondes were deployed at three locations within the system: Cross Lake (Buoy 409), Buoy 316, and the Onondaga Lake outlet. The deployment dates of the YSI data sondes are summarized in **Table A9-2**. The purpose of these sondes was to evaluate changes in water quality conditions over the course of a day, as suggested by the river modeling peer review panel (**QEA 2005, Appendix M**). In-situ water quality parameters measured by the sondes (temperature, salinity, DO, pH, and chlorophyll) were recorded every 15 minutes for top and bottom depths at each location. Temporal profiles of the sonde data collected at Buoys 409 and 316 and the Onondaga lake outlet between June and October are provided in **Figures A9-12** through **A9-16.** Note that in 2007, chlorophyll data were only collected at Buoy 409 near Cross Lake; the chlorophyll probes from the Buoy 316 were removed due to unexplainably high data variability observed in previous years.

References

Quantitative Environmental Analysis, LLC, 2005. *Phase 2 Report – Three Rivers Water Quality Model.* Submitted to Onondaga County Department of Water Environment Protection. Syracuse, NY.

**Table A9-1.** Summary of AMP river sampling locations and total numbers of samples collected in 2007.

| Buoy | Buoy 412 | Buoy 409 | Buoy 397 | Buoy 362 | Buoy 334 | Buoy 316 | Buoy 294 | Buoy 269 | Buoy 260 | Buoy 255 | Buoy 240 | Buoy 222 | Buoy 178 | Buoy 182 | Buoy 212 | Buoy 10 | LO1 | LO2 | LO3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| River | Seneca | Seneca | Seneca | Seneca | Seneca | Seneca | Seneca | Seneca | Seneca | Seneca | Seneca | Seneca | Oneida | Oneida | Oneida | Oswego | Lake Outlet | Lake Outlet | Lake Outlet |
| Kilometer[1] | -36.5 | -35.4 | -33.3 | -26.9 | -21.6 | -18.4 | -14.1 | -10.1 | -8.3 | -6.4 | -3.5 | -0.4 | -7.3 | -6.7 | -0.9 | 2.4 | -11.7 | -12.4 | -11.4 |
| DO-field | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Chlorophyll-a | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Phaeophytin-a | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| TOC | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| TOC-F | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| POC | 6 | 0 | 6 | 6 | 0 | 6 | 0 | 9 | 0 | 6 | 0 | 6 | 6 | 0 | 6 | 6 | 6 | 0 | 0 |
| NH3-N | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| NO2 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| NO3 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| ORG-N | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| TKN | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| TKN-F | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| TP | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| SRP | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| TDP | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Chloride | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| COND-field | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Salinity-field | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Temp-field | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| pH-field | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Turbidity | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| TSS | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 9 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |

*Note: [1] River kilometers measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego.*

**Table A9-2.** Summary of YSI data sonde deployment dates in 2007.

| Location | Start Date | End Date |
|---|---|---|
| Buoy 409 | 6/15/2007 | 10/10/2007 |
| Buoy 316 | 6/14/2007 | 10/18/2007 |
| Onondaga Lake Outlet | 4/20/2007 | 12/1/2007 |

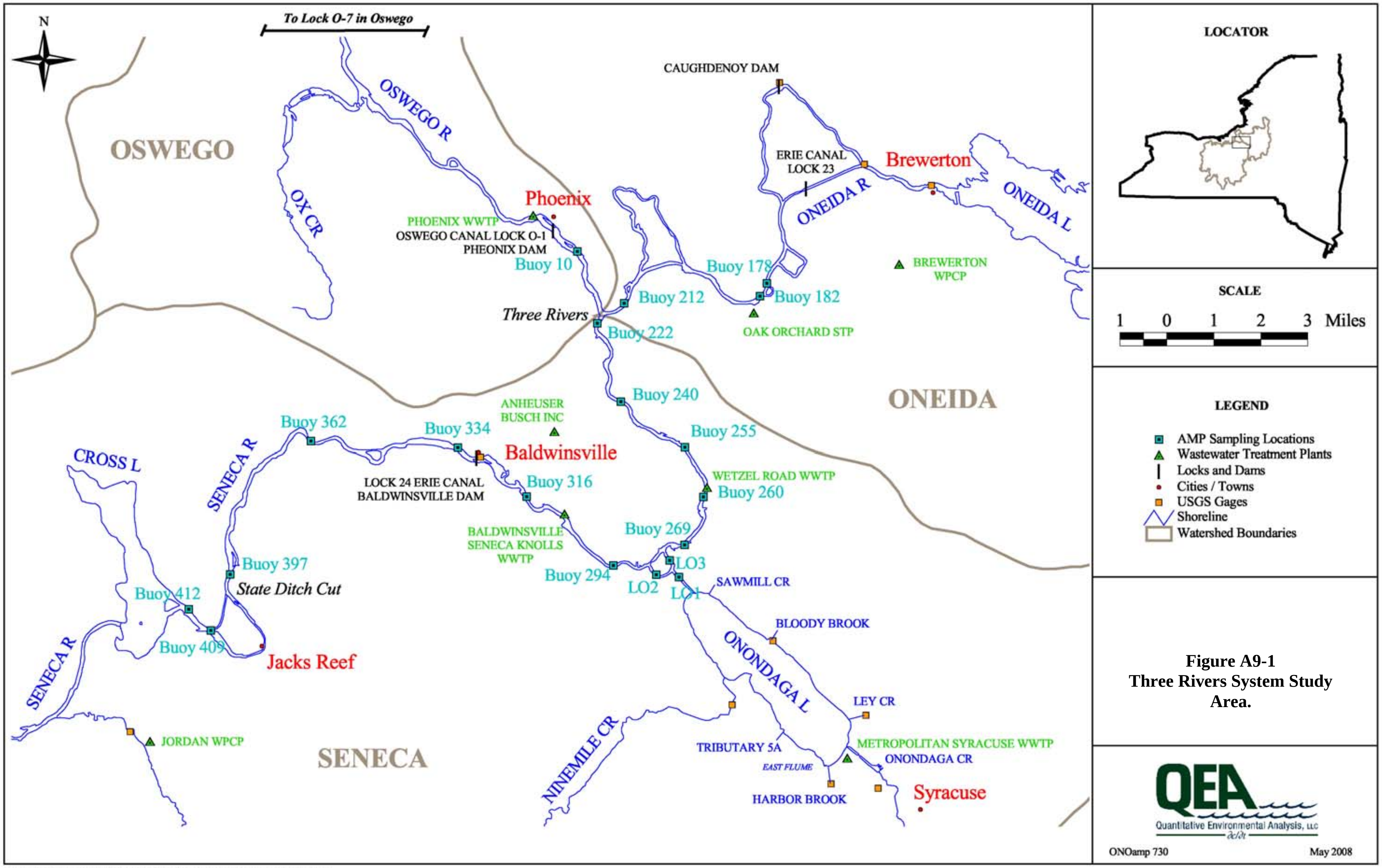



**Figure A9-1**
**Three Rivers System Study Area.**

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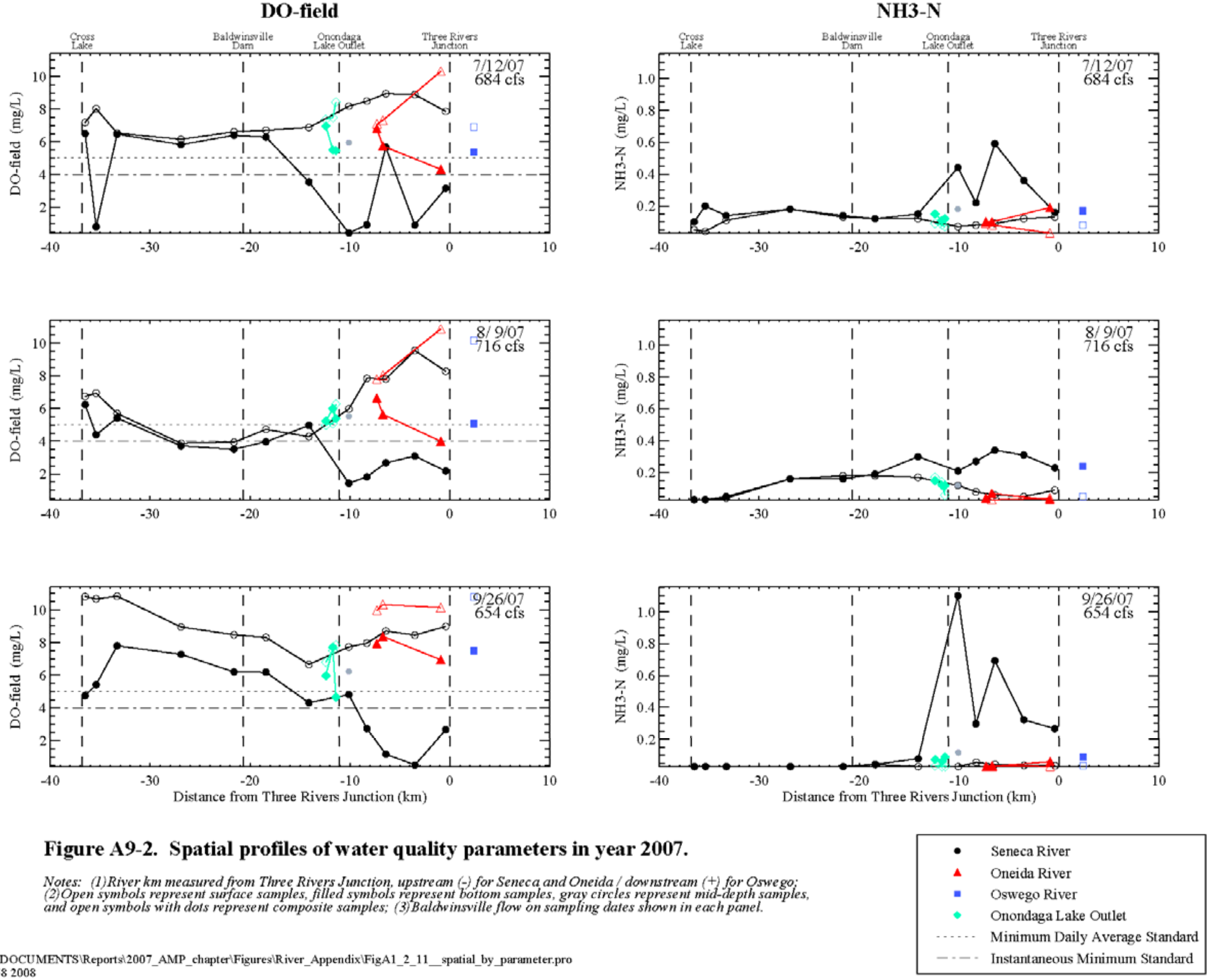


**Figure A9-2. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

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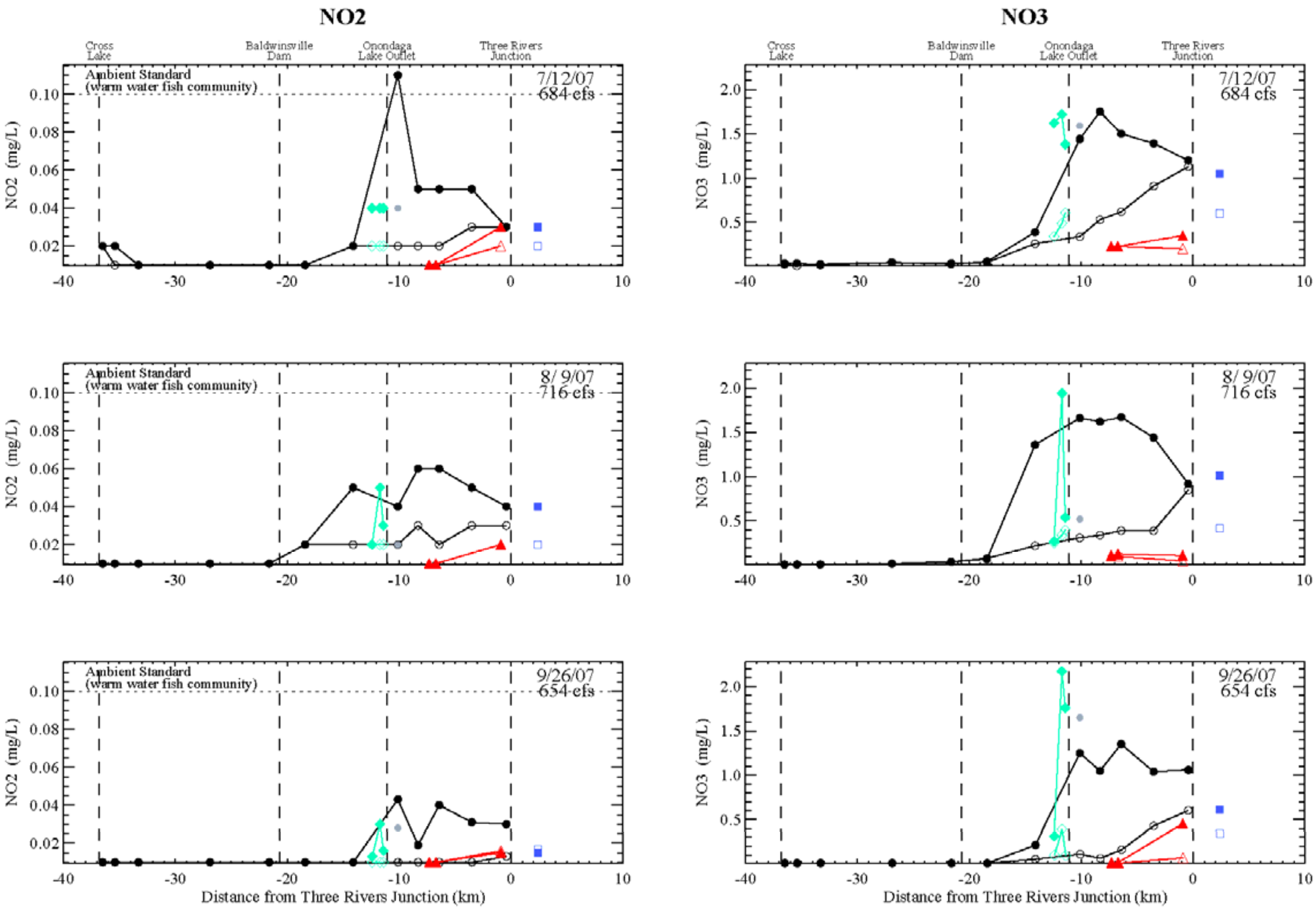


**Figure A9-3. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

- Seneca River
- Oneida River
- Oswego River
- Onondaga Lake Outlet

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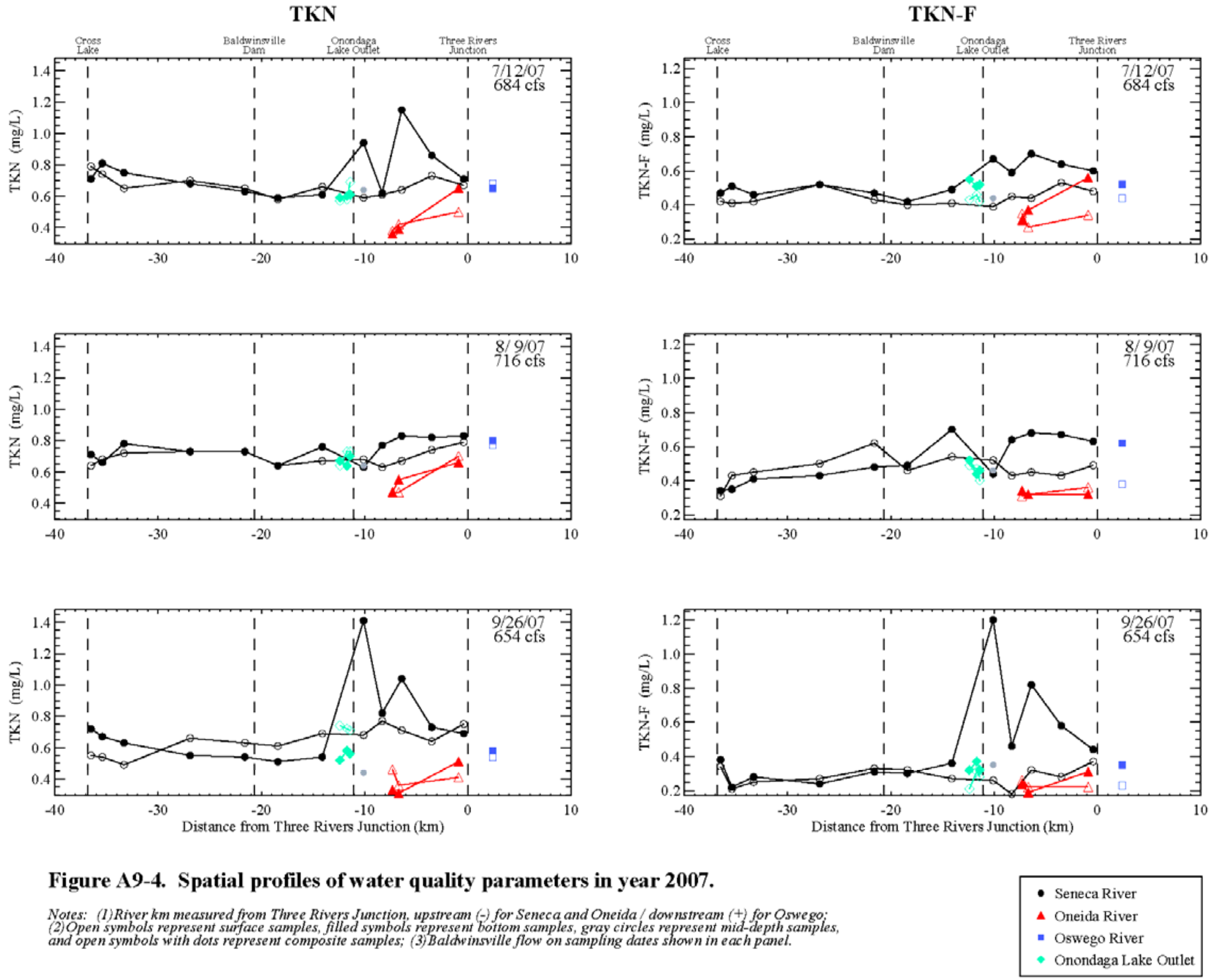


**Figure A9-4. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

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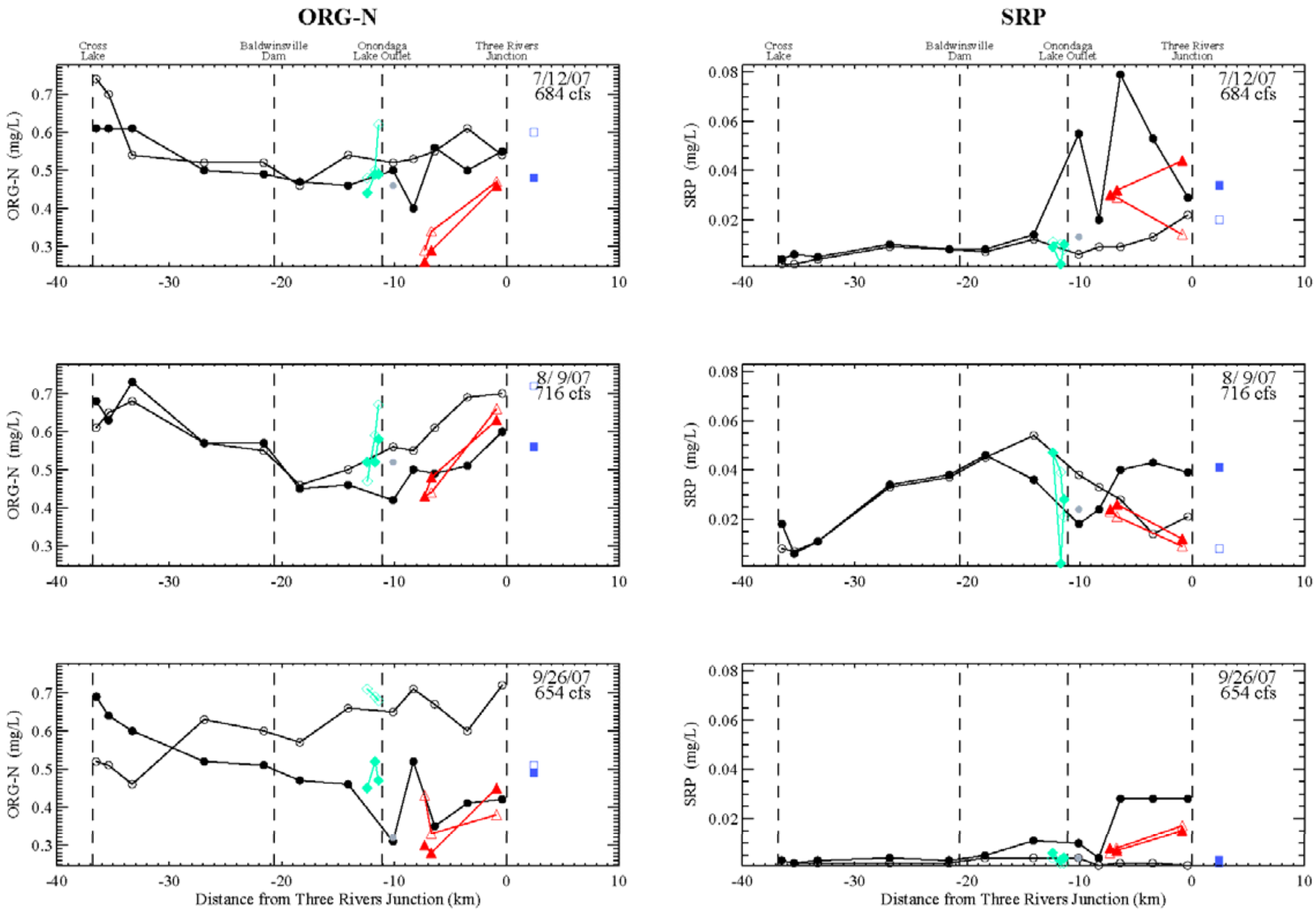


**Figure A9-5. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

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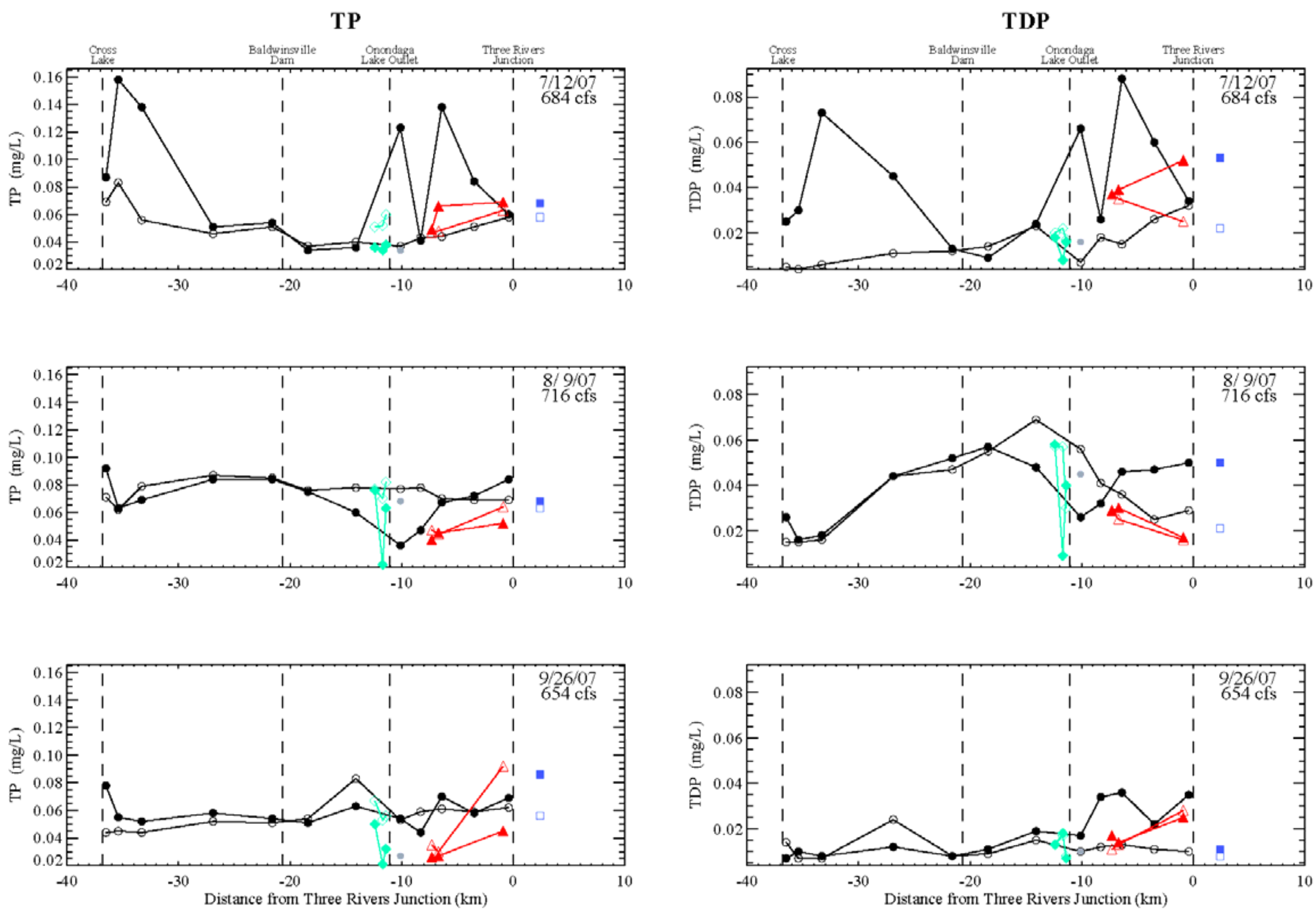


**Figure A9-6. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

- Seneca River
- Oneida River
- Oswego River
- Onondaga Lake Outlet

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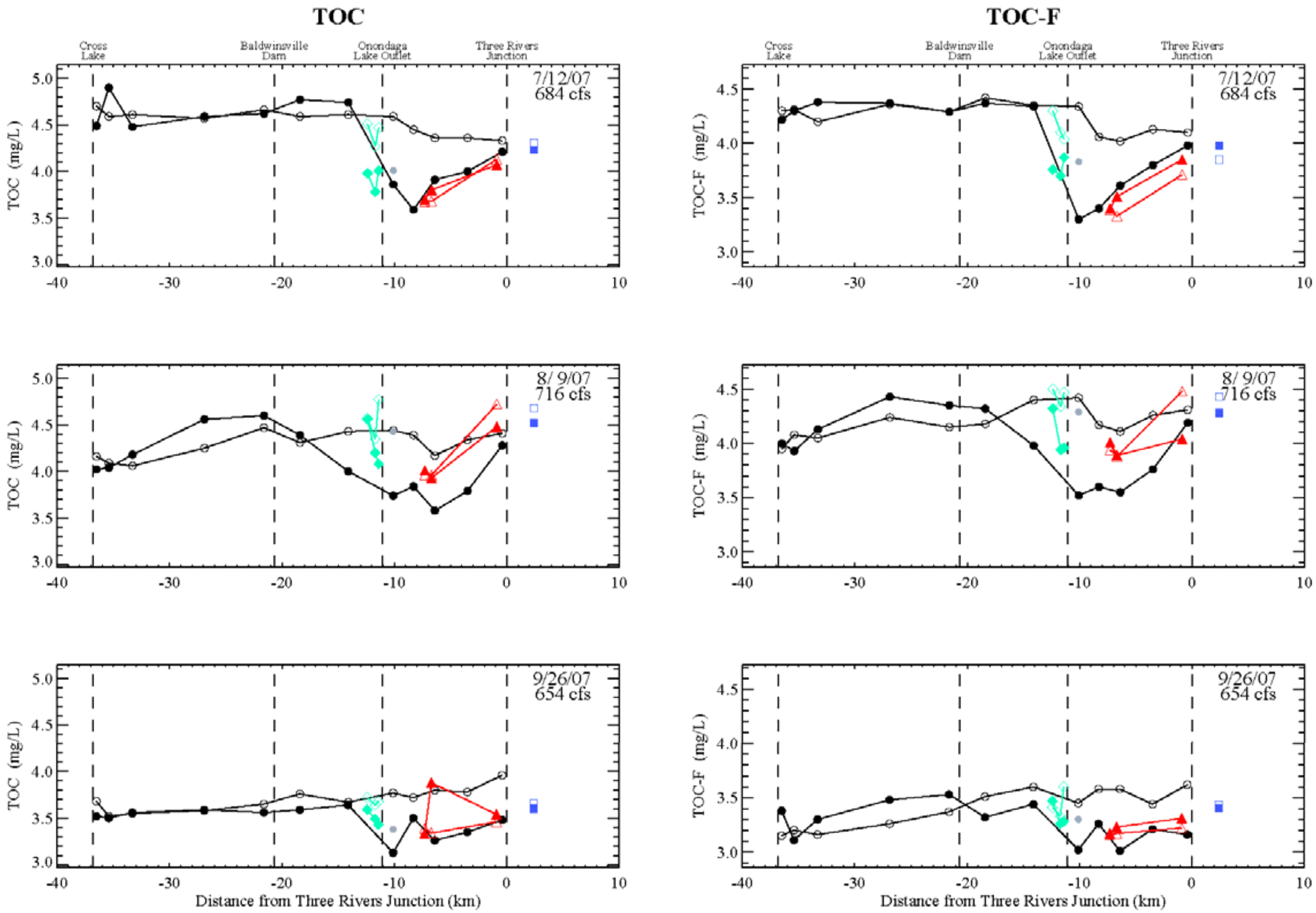


**Figure A9-7. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

- Seneca River
- Oneida River
- Oswego River
- Onondaga Lake Outlet

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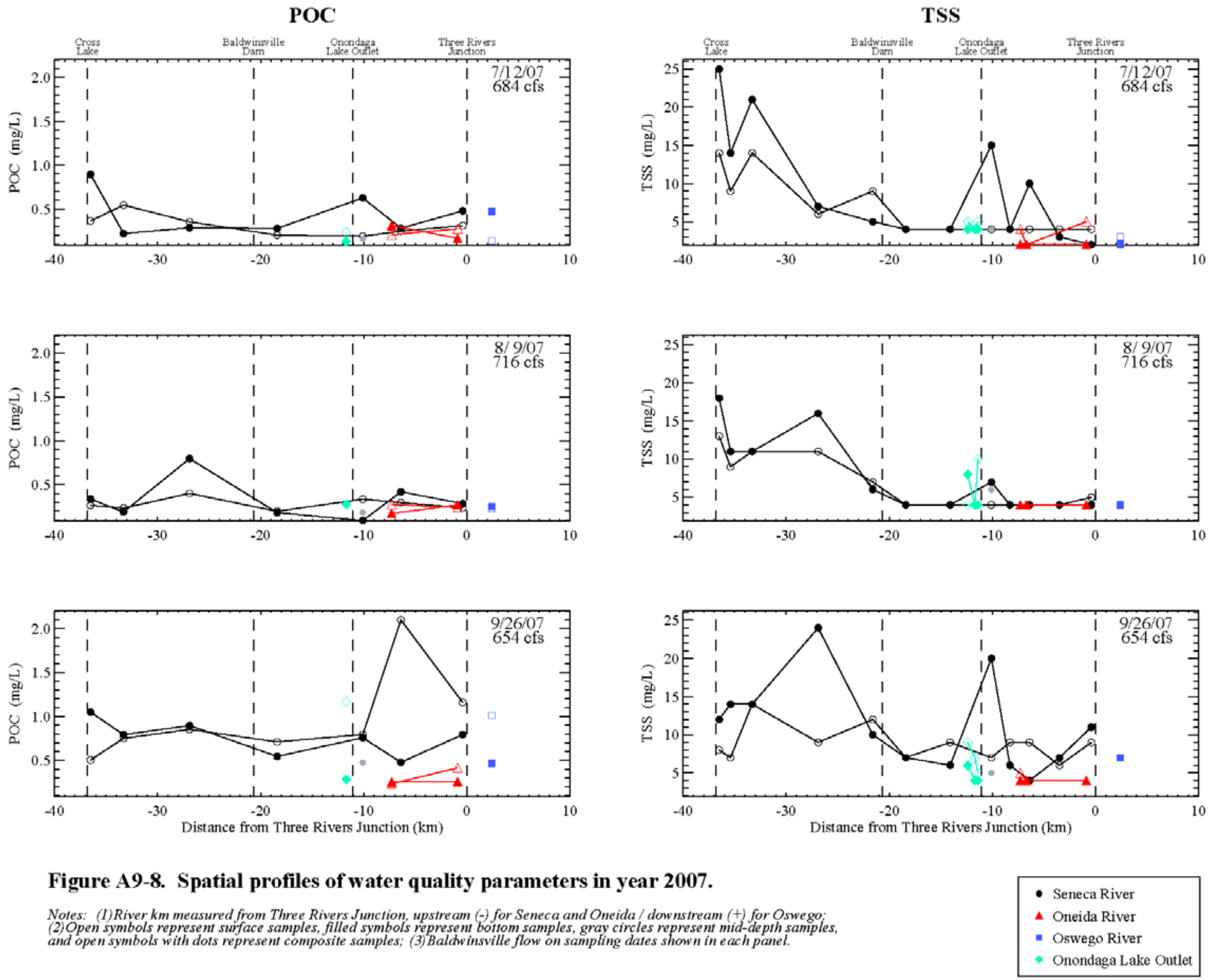


**Figure A9-8. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

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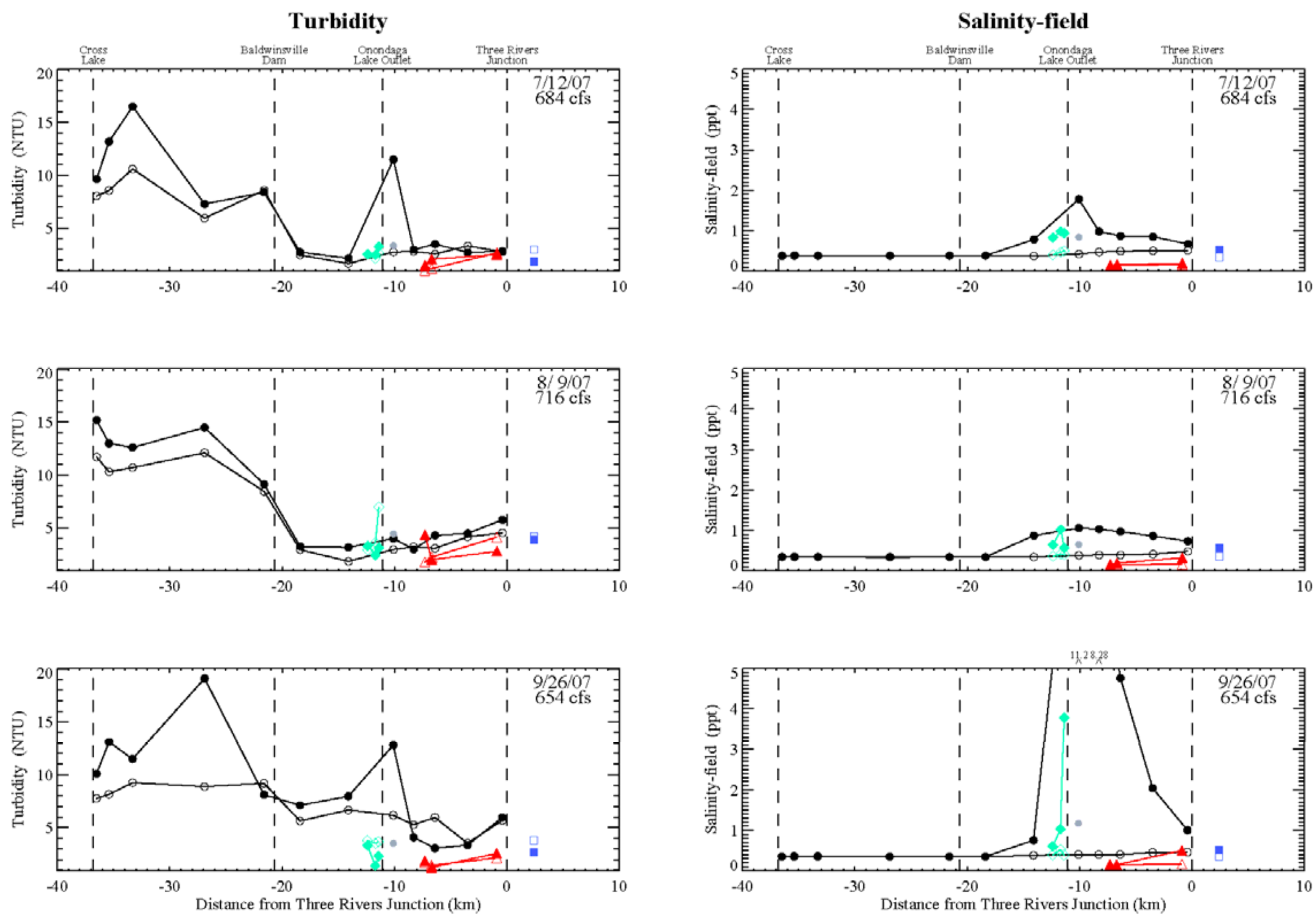


**Figure A9-9. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

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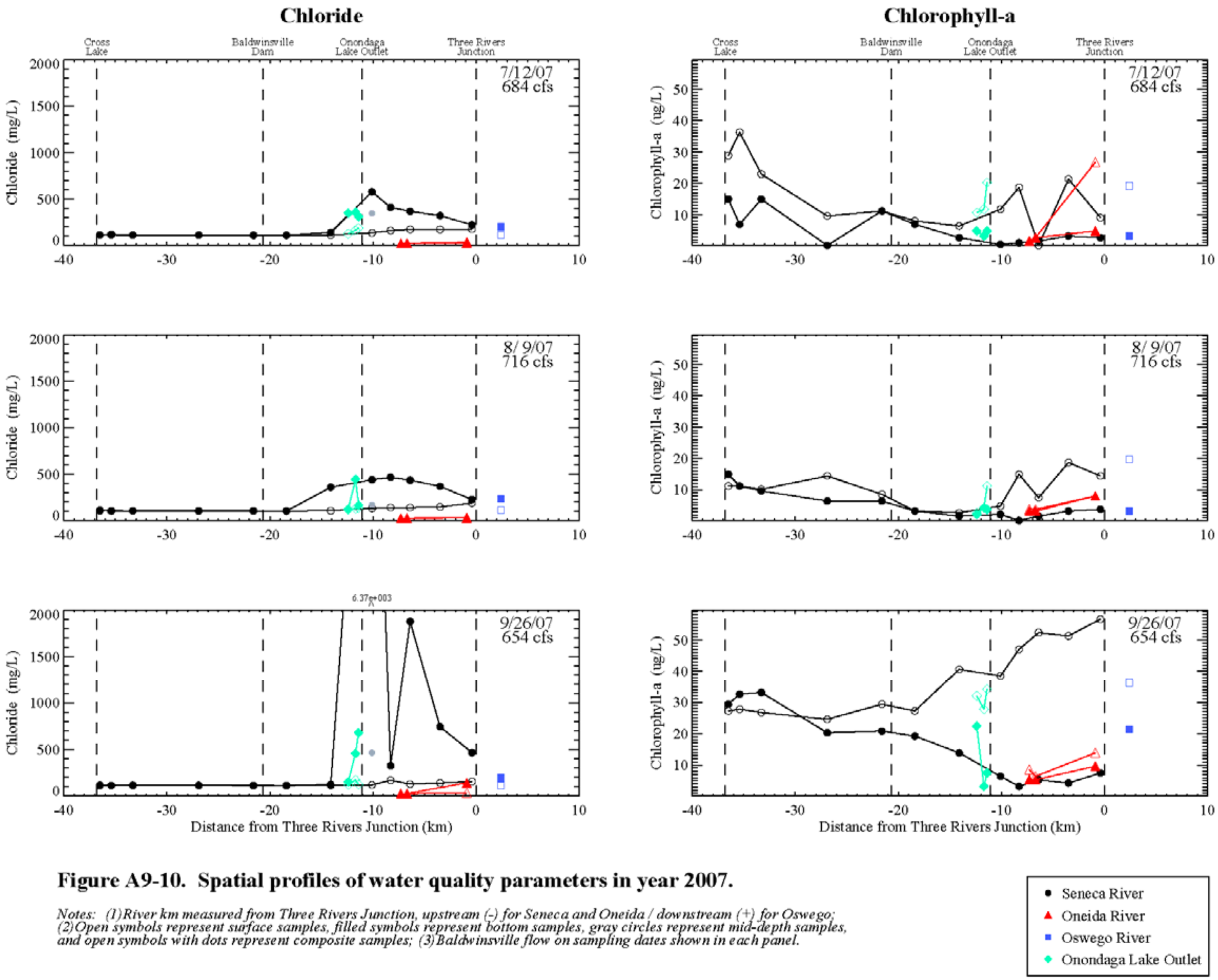


**Figure A9-10. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

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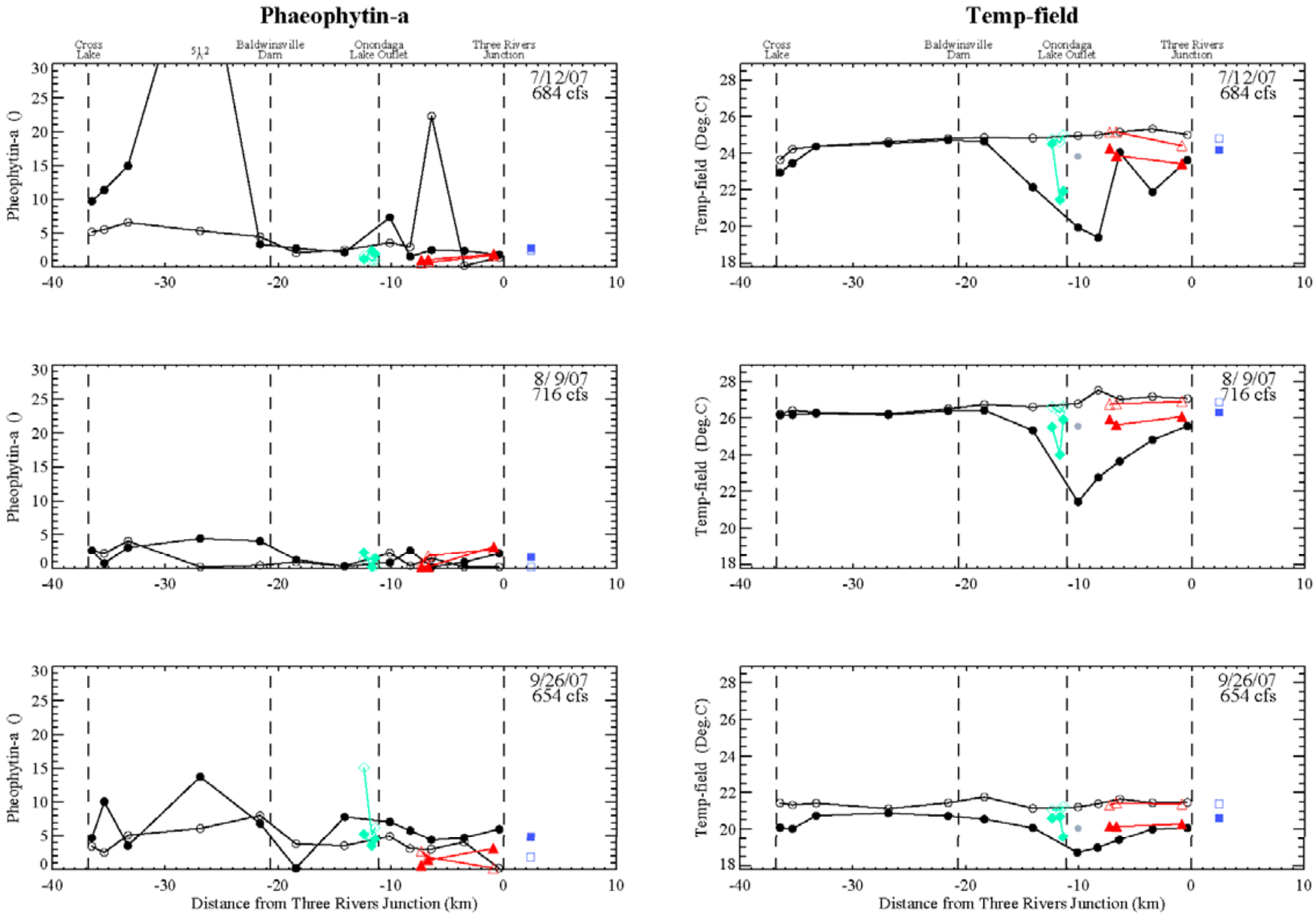


**Figure A9-11. Spatial profiles of water quality parameters in year 2007.**

*Notes: (1)River km measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego; (2)Open symbols represent surface samples, filled symbols represent bottom samples, gray circles represent mid-depth samples, and open symbols with dots represent composite samples; (3)Baldwinsville flow on sampling dates shown in each panel.*

- Seneca River
- Oneida River
- Oswego River
- Onondaga Lake Outlet

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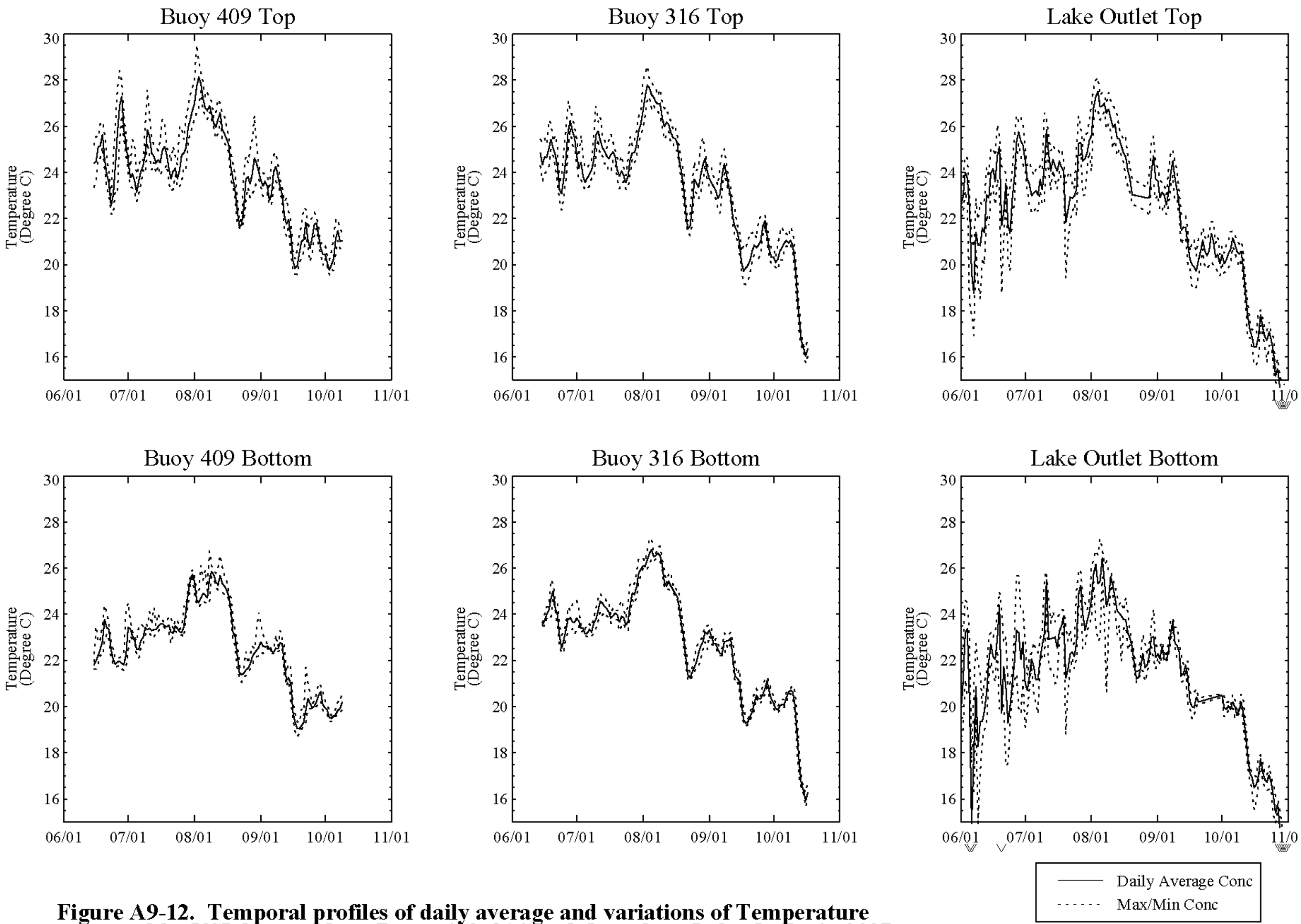


**Figure A9-12. Temporal profiles of daily average and variations of Temperature measured by YSI data sonde at Buoys 409, 316, and Onondaga Lake Outlet in 2007.**

*Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.*

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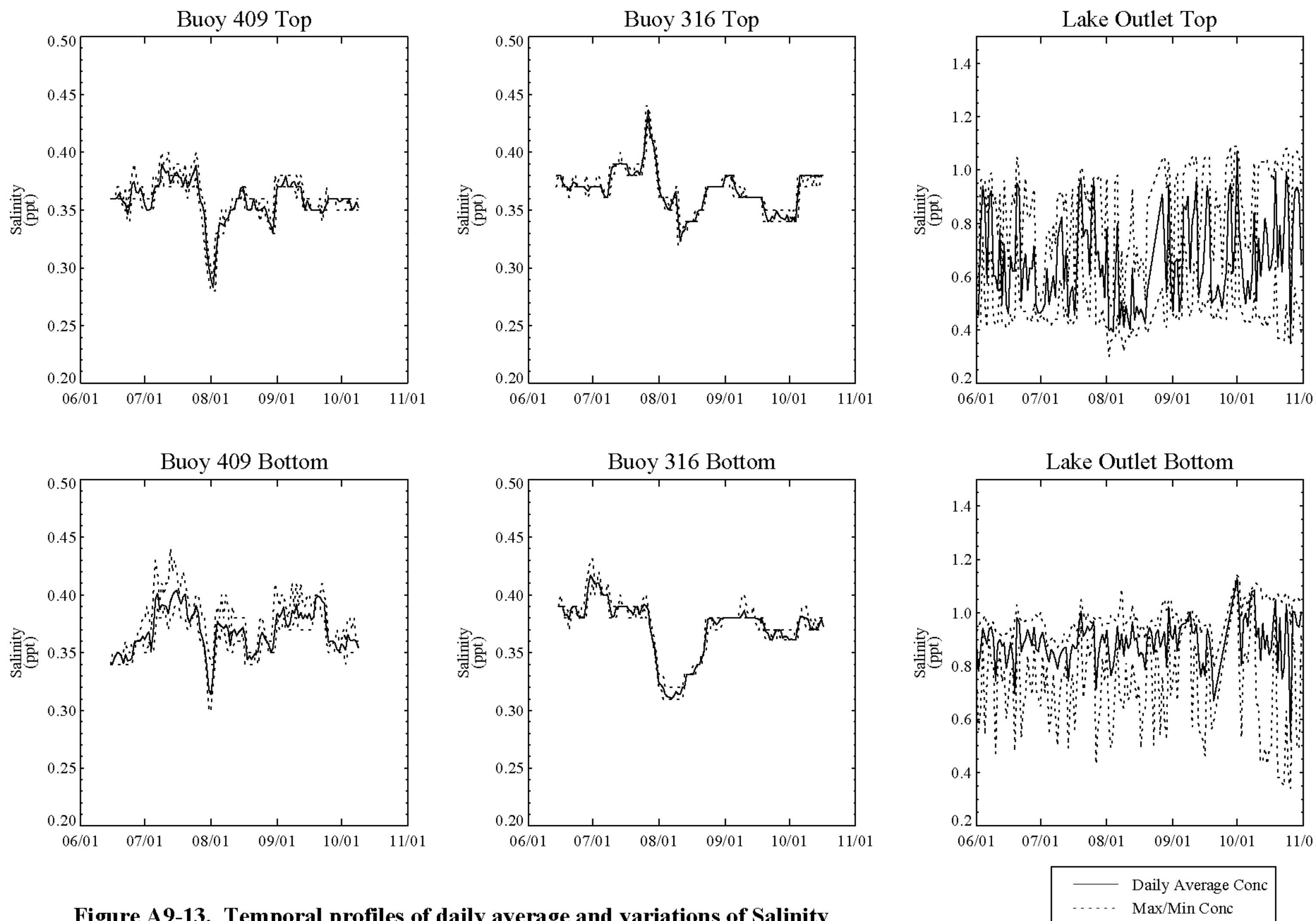


**Figure A9-13. Temporal profiles of daily average and variations of Salinity measured by YSI data sonde at Buoys 409, 316, and Onondaga Lake Outlet in 2007.**

*Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.*

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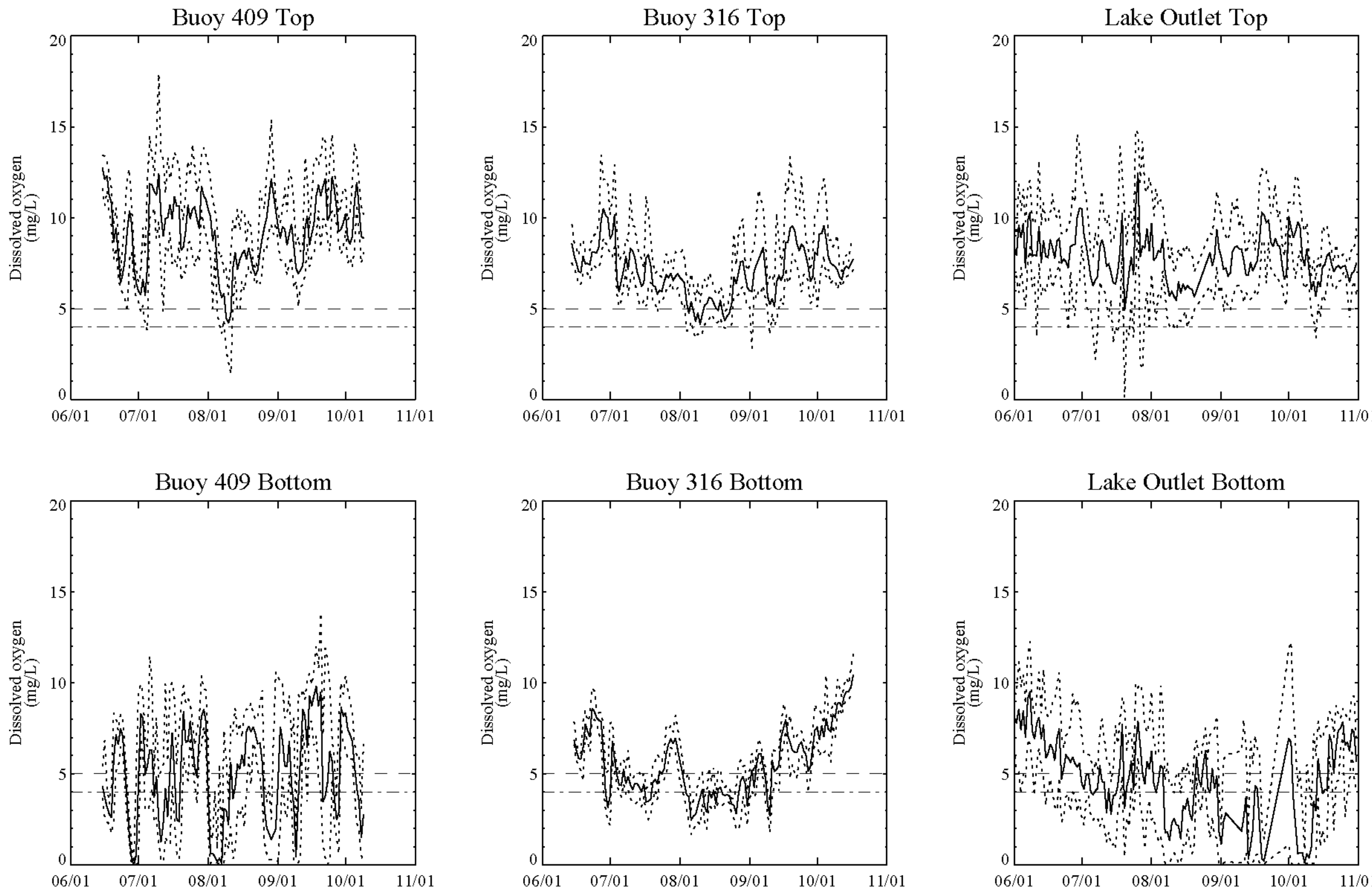


**Figure A9-14. Temporal profiles of daily average and variations of Dissolved oxygen measured by YSI data sonde at Buoys 409, 316, and Onondaga Lake Outlet in 2007.**

*Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.*

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Fri Jul 25 14:04:18 2008

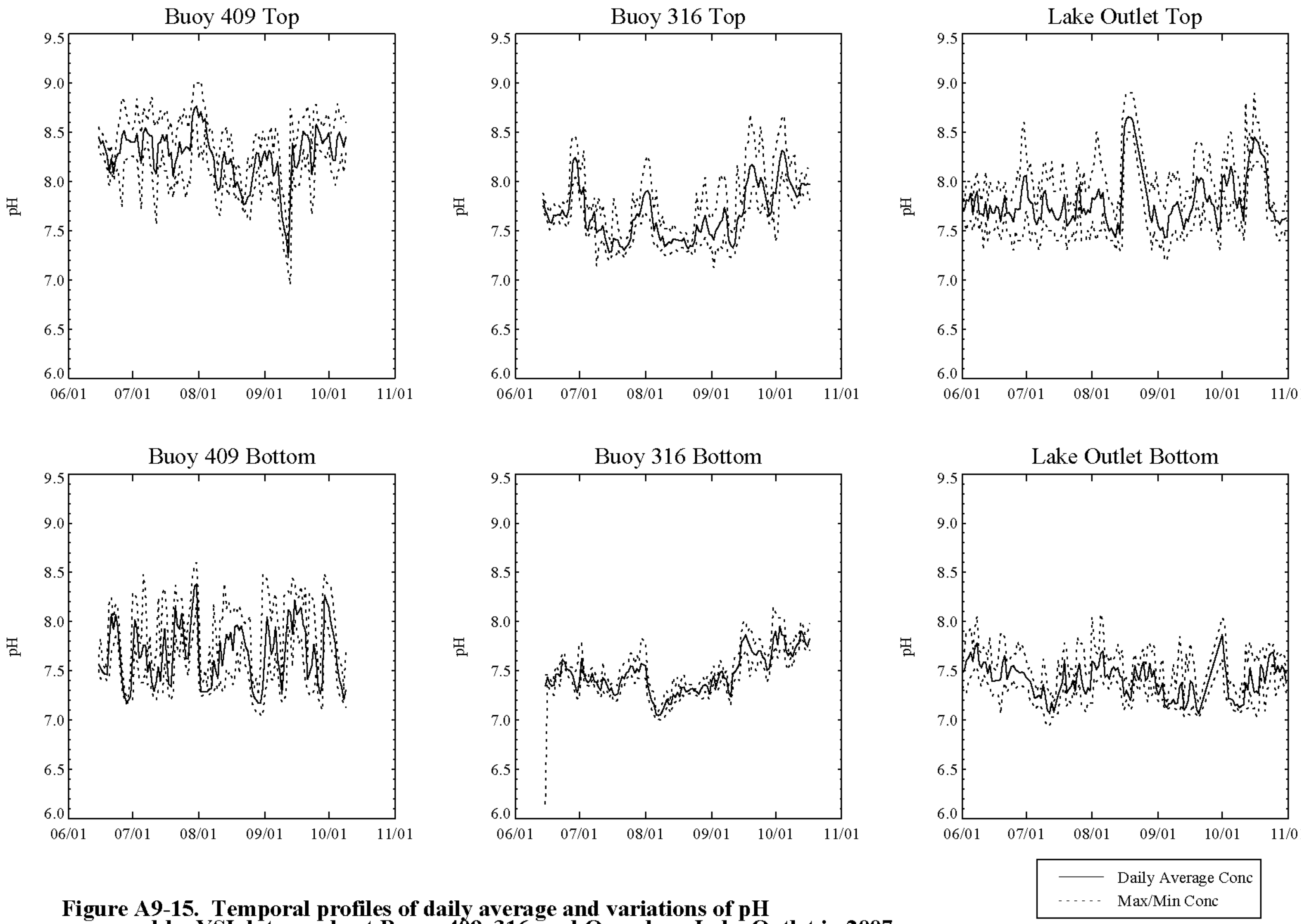


**Figure A9-15. Temporal profiles of daily average and variations of pH measured by YSI data sonde at Buoys 409, 316, and Onondaga Lake Outlet in 2007.**

*Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.*

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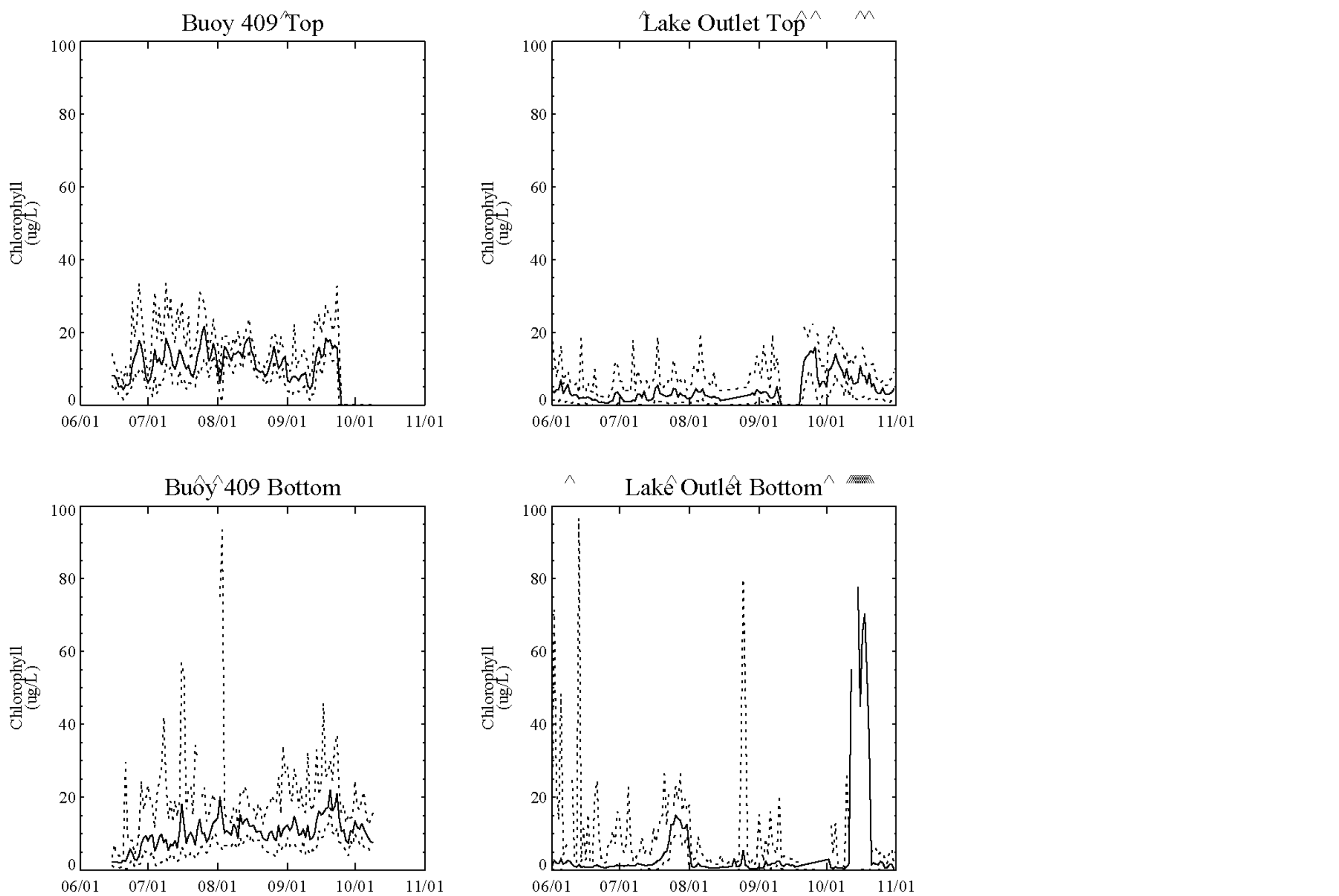


**Figure A9-16. Temporal profiles of daily average and variations of Chlorophyll measured by YSI data sonde at Buoy 409 and Onondaga Lake Outlet in 2007.**

*Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.*

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Fri Jul 25 14:04:23 2008

# APPENDIX 10: SOUTH AND NORTH COMPARISON

**List of tables**

# North Deep and South Deep Comparison

There are two basins in Onondaga Lake, identified as North Deep and South Deep. Overall, the analysis of the lake's water quality presented in the AMP annual report is based on the higher-frequency data collected at South Deep rather than quarterly data collected at North Deep. The rationale for this approach is that conditions in both basins are very similar. Paired sample analysis of both basins is conducted each year as part of the AMP in order to verify that water quality in both basins is similar.

Paired sampling was conducted on these dates in 2007, for the parameter lists shown in **Table A10-1**. The sample dates were grouped into four events.

**Table A10-1.** Paired sample dates for 2007 AMP.

| Event | Sample Date | Low resolution mercury | List of 48 parameters* |
|---|---|---|---|
| 1 | April 10 | X | X |
| 2 | June 5 | X | -- |
| | June 19 | -- | X |
| 3 | August 28 | X | -- |
| | October 9 | -- | X |
| 4 | October 24 | X | -- |
| | November 20 | -- | X |

**List of 48 parameters*:*
ALK-T, As, BOD5, Ca, Cd, Chloride, Chlorophyll-a, COND-field, Cr, Cu, DO-field, ECOLI-MF, FCOLI-MF, Fe, Hardness, K, Mg, Mn, Na, NH3-N, Ni, NO2, NO3, ORG-N, Pb, Phaeophytin-a, pH-field, Salinity-field, Se, Secchi Disk, SiO2, SO4, SRP, TDP, TDS, Temp-field, TIC, TKN, TKN-F, TOC, TOC-F, TP, TS, TSS, Turbidity, TVS, VSS, Zn

Based on 2007 paired sampling results from the North Deep and South Deep stations, the lake is laterally well-mixed. With minor exceptions, there does not appear to be a strong gradient in water quality conditions from the south, where most of the inflows enter the lake, to the north.

Results of the four paired sampling events during 2007 are included in this AMP appendix as **Tables A10-2**, **A10-3**, **A10-4**, and **A10-5**.

**Table A10-2**. Comparison of South and North data, April 10, 2007.

| Parameter | Units | Upper Mixed Layer South | Upper Mixed Layer North | Lower Water Layer South | Lower Water Layer North |
|---|---|---|---|---|---|
| Secchi Disc Depth | meters | 1.7 | 1.4 | NA | NA |
| pH | Std Units | *7.9 | *7.9 | *7.73 | *7.65 |
| Temperature | °C | *3.97 | *3.87 | *3.54 | *3.35 |
| Specific conductance | umHos/cm | *1,591 | *1,627 | *1,910 | *2,091 |
| Dissolved oxygen | mg/L | *12.26 | *12.38 | *10.4 | *9.02 |
| 5-day BOD | mg/L | <2 | <2 | <2 | <2 |
| Total Alkalinity | mg/L | 190 | 188 | 200 | 200 |
| Total Organic Carbon | mg/L | *2.98 | *2.93 | *2.93 | *2.92 |
| TOC Filtered | mg/L | *2.78 | *2.75 | *2.80 | *2.77 |
| Total Inorganic Carbon | mg/L | *50.3 | *50.6 | *54.7 | *53.3 |
| Total Kjeldahl Nitrogen | mg/L | *0.78 | *0.72 | *0.80 | *0.79 |
| TKN Filtered | mg/L | *0.63 | *0.62 | *0.61 | *0.65 |
| Organic Nitrogen | mg/L | *0.40 | *0.32 | *0.29 | *0.26 |
| Ammonia-N | mg/L | *0.38 | *0.40 | *0.51 | *0.53 |
| Nitrite-N | mg/L | 0.03 | 0.03 | 0.03 | 0.03 |
| Nitrate-N | mg/L | 1.81 | 1.8 | 1.8 | 1.88 |
| Total Phosphorus | mg/L | *0.027 | *0.025 | *0.025 | *0.023 |
| Soluble Reactive Phosphorus | mg/L | *0.002 | *0.002 | *0.004 | *0.004 |
| Silica | mg/L | *3.16 | *4.19 | *4.45 | *3.84 |
| Calcium | mg/L | 127 | 130 | 137 | 139 |
| Sodium | mg/L | 205 | 208 | 268 | 248 |
| Potassium | mg/L | 3.48 | 3.6 | 3.79 | 3.88 |
| Sulfate | mg/L | 118 | 105 | 128 | 116 |
| Chloride | mg/L | 375 | 390 | 470 | 454 |
| Total Solids | mg/L | *1,027 | *1,054 | *1,299 | *1,185 |
| Total Volatile Solids | mg/L | *128 | *128 | *139 | *132 |
| Total Suspended Solids | mg/L | *3.0 | *3.0 | *3.0 | *2.5 |
| Volatile Suspended Solids | mg/L | <2 | <2 | <2 | <2 |
| Total Dissolved Solids | mg/L | *982 | *1033 | *1,266 | *1,138 |
| Turbidity | NTU | *4.81 | 5.98 | NA | NA |
| Arsenic | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |
| Iron | mg/L | 0.134 | 0.126 | 0.188 | 0.135 |
| Copper | mg/L | <0.0031 | <0.0031 | <0.0031 | <0.0031 |
| Chromium | mg/L | <0.0025 | <0.0025 | <0.0025 | <0.0025 |
| Cadmium | mg/L | <0.0008 | <0.0008 | <0.0008 | <0.0008 |
| Mercury | ng/l | 3.53 | 1.86 | 1.97 | 1.58 |
| Methyl mercury | ng/l | 0.047 | 0.04 | 0.098 | 0.036 |
| Lead | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |

**Table A10-2**. Comparison of South and North data, April 10, 2007.

| | | Upper Mixed Layer | | Lower Water Layer | |
|---|---|---|---|---|---|
| **Parameter** | **Units** | **South** | **North** | **South** | **North** |
| Magnesium | mg/L | 21.9 | 22.4 | 23.6 | 23.5 |
| Manganese | mg/L | 0.0313 | 0.0343 | 0.106 | 0.0497 |
| Nickel | mg/L | <0.0038 | <0.0038 | <0.0038 | <0.0038 |
| Selenium | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |
| Zinc | mg/L | 0.0075 | 0.0063 | 0.0063 | 0.0063 |
| Phaeophytin-a | mg/m3 | 0.20 | 0.48 | NA | NA |
| Chlorophyll-a | mg/m3 | 6.94 | 5.87 | NA | NA |
| Fecal Coliforms | count/100 | 320 | 360 | NA | NA |
| E. Coli | count/100 | 56 | 8 | NA | NA |

*Notes:* * indicates the data were averaged over several depths: UML = 0m, 3m and 6m; LWL = 12m, 15m, 18m
The averages are based on concentration data, and are not volume-averages. Phaeophytin-a and Chlorophyll-a were collected in the Photic Zone. Averages were calculated using the laboratory Minimum Reportable Limit when an observation was reported at or below that limit.
NA: Not Analyzed.

**Table A10-3**. Comparison of South and North data, June 5, and June 19, 2007.

| | | Upper Mixed Layer | | Lower Water Layer | |
|---|---|---|---|---|---|
| **Parameter** | **Units** | **South** | **North** | **South** | **North** |
| Secchi Disc Depth | meters | 1.7 | 2.1 | NA | NA |
| pH | Std Units | *7.91 | *7.94 | *7.50 | *7.51 |
| Temperature | °C | *22.08 | *21.98 | *7.8 | *8.09 |
| Specific conductance | umHos/cm | *1,935 | *1,924 | *1,816 | *1,813 |
| Dissolved oxygen | mg/L | *9.14 | *9.29 | *3.59 | *3.79 |
| 5-day BOD | mg/L | <2 | 2.0 | <2 | <2 |
| Total Alkalinity | mg/L | 170 | 168 | 206 | 206 |
| Total Organic Carbon | mg/L | *3.44 | *3.49 | *2.67 | *2.73 |
| TOC Filtered | mg/L | *3.04 | *3.06 | *2.38 | *2.50 |
| Total Inorganic Carbon | mg/L | *44.8 | *44.8 | *54.7 | *53.7 |
| Total Kjeldahl Nitrogen | mg/L | *0.61 | *0.553 | *0.973 | *0.893 |
| TKN Filtered | mg/L | *0.46 | *0.38 | *0.843 | *0.73 |
| Organic Nitrogen | mg/L | *0.523 | *0.493 | *0.317 | *0.313 |
| Ammonia-N | mg/L | *0.087 | *0.06 | *0.657 | *0.58 |
| Nitrite-N | mg/L | 0.04 | 0.03 | 0.03 | 0.04 |
| Nitrate-N | mg/L | 2.39 | 2.27 | 1.37 | 1.41 |
| Total Phosphorus | mg/L | *0.025 | *0.022 | *0.015 | *0.016 |
| Soluble Reactive Phosphorus | mg/L | *0.001 | *0.001 | *0.001 | *0.001 |
| Silica | mg/L | *1.32 | *1.32 | *3.77 | *4.63 |
| Calcium | mg/L | 142 | 139 | 133 | 134 |
| Sodium | mg/L | 235 | 220 | 218 | 217 |
| Potassium | mg/L | 4.43 | 4.35 | 3.7 | 3.71 |
| Sulfate | mg/L | 158 | 159 | 129 | 134 |
| Chloride | mg/L | 427 | 430 | 399 | 403 |
| Total Solids | mg/L | *1,286 | *1,280 | *1,161 | *1,152 |
| Total Volatile Solids | mg/L | *230 | *252 | *213 | *205 |
| Total Suspended Solids | mg/L | *2.5 | *3 | *2 | *2 |
| Volatile Suspended Solids | mg/L | *2 | *2 | *2 | *2 |
| Total Dissolved Solids | mg/L | *1,229 | *1,215 | *1,100 | *1,104 |
| Turbidity | NTU | *3.28 | 2.34 | NA | NA |
| Arsenic | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 |
| Iron | mg/L | 0.0709 | <0.050 | 0.0664 | <0.050 |
| Copper | mg/L | <0.0031 | <0.0031 | <0.0031 | <0.0031 |
| Chromium | mg/L | <0.0025 | <0.0025 | <0.0025 | <0.0025 |
| Cadmium | mg/L | <0.00080 | <0.00080 | <0.00080 | <0.00080 |
| Mercury | ng/l | 2.37 | 1.78 | 1.65 | 1.21 |
| Methyl mercury | ng/l | 0.092 | 0.074 | 0.036 | 0.03 |
| Lead | mg/L | 0.0036 | <0.0020 | <0.0020 | <0.0020 |

**Table A10-3**. Comparison of South and North data, June 5, and June 19, 2007.

| | | Upper Mixed Layer | | Lower Water Layer | |
|---|---|---|---|---|---|
| **Parameter** | **Units** | **South** | **North** | **South** | **North** |
| Magnesium | mg/L | 25.8 | 25.2 | 22.9 | 23.3 |
| Manganese | mg/L | <0.025 | <0.025 | 0.197 | 0.225 |
| Nickel | mg/L | 0.0042 | <0.0038 | <0.0038 | <0.0038 |
| Selenium | mg/L | <0.0020 | <0.0020 | <0.0020 | <0.0020 |
| Zinc | mg/L | <0.0063 | 0.0068 | <0.0063 | <0.0063 |
| Phaeophytin-a | mg/m3 | 0.21 | <0.20 | NA | NA |
| Chlorophyll-a | mg/m3 | 4.27 | 3.74 | NA | NA |
| Fecal Coliforms | count/100 | <5 | <5 | NA | NA |
| E. Coli | count/100 | 1 | <1 | NA | NA |

*Notes:* * indicates the data were averaged over several depths: UML = 0m, 3m and 6m; LWL = 12m, 15m, 18m
The averages are based on concentration data, and are not volume-averages. Phaeophytin-a and Chlorophyll-a were collected in the Photic Zone. Averages were calculated using the laboratory Minimum Reportable Limit when an observation was reported at or below that limit.
NA: Not Analyzed.

**Table A10-4**. Comparison of South and North data, August 28 and October 9, 2007.

| Parameter | Units | Upper Mixed Layer | | Lower Water Layer | |
|---|---|---|---|---|---|
| | | South | North | South | North |
| Secchi Disc Depth | meters | 2.6 | 2.7 | NA | NA |
| pH | Std Units | *7.97 | *8.08 | *7.31 | *7.27 |
| Temperature | °C | *20.77 | *20.08 | *9.97 | *11.55 |
| Specific conductance | umHos/cm | *1,974 | *1,995 | *1,890 | *1,921 |
| Dissolved oxygen | mg/L | *10.97 | *9.87 | *1.10 | *1.07 |
| 5-day BOD | mg/L | <2 | <2 | 6.0 | 4.0 |
| Total Alkalinity | mg/L | 134 | 144 | 210 | 196 |
| Total Organic Carbon | mg/L | *3.74 | *3.56 | *2.9 | *2.91 |
| TOC Filtered | mg/L | *3.53 | *3.30 | *2.71 | *2.75 |
| Total Inorganic Carbon | mg/L | *35.2 | *37.15 | *59.7 | *53.2 |
| Total Kjeldahl Nitrogen | mg/L | *0.577 | *0.543 | *1.547 | *1.053 |
| TKN Filtered | mg/L | *0.39 | *0.4 | *1.34 | *0.923 |
| Organic Nitrogen | mg/L | *0.523 | *0.493 | *0.34 | *0.353 |
| Ammonia-N | mg/L | *0.053 | *0.05 | *1.21 | *0.70 |
| Nitrite-N | mg/L | 0.04 | 0.04 | 0.05 | 0.01 |
| Nitrate-N | mg/L | 2.26 | 2.06 | 0.27 | 0.41 |
| Total Phosphorus | mg/L | *0.03 | *0.029 | *0.17 | *0.049 |
| Soluble Reactive Phosphorus | mg/L | *0.001 | *0.001 | *0.114 | *0.018 |
| Silica | mg/L | *2.59 | *2.78 | *5.67 | *5.46 |
| Calcium | mg/L | 135 | 140 | 132 | 138 |
| Sodium | mg/L | 254 | 252 | 242 | 261 |
| Potassium | mg/L | 5.19 | 5.08 | 3.94 | 4.12 |
| Sulfate | mg/L | 192 | 204 | 149 | 164 |
| Chloride | mg/L | 466 | 482 | 432 | 465 |
| Total Solids | mg/L | *1,335 | *1,379 | *1,289 | *1,304 |
| Total Volatile Solids | mg/L | *238 | *280 | *245 | *213 |
| Total Suspended Solids | mg/L | *2 | *2 | *2 | *2 |
| Volatile Suspended Solids | mg/L | *2 | *2 | *2 | *2 |
| Total Dissolved Solids | mg/L | *1,272 | *1,337 | *1,205 | *1,228 |
| Turbidity | NTU | *1.915 | 1.65 | NA | NA |
| Arsenic | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |
| Iron | mg/L | <0.05 | <0.05 | 0.166 | 0.064 |
| Copper | mg/L | <0.0031 | <0.0031 | <0.0031 | <0.0031 |
| Chromium | mg/L | <0.0025 | <0.0025 | <0.0025 | <0.0025 |
| Cadmium | mg/L | <0.0008 | <0.0008 | <0.0008 | <0.0008 |
| Mercury | ng/l | 2.51 | 1.68 | 1.86 | 1.65 |
| Methyl mercury | ng/l | 0.09 | 0.067 | 0.214 | 0.212 |
| Lead | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |

**Table A10-4**. Comparison of South and North data, August 28 and October 9, 2007.

| | | Upper Mixed Layer | | Lower Water Layer | |
|---|---|---|---|---|---|
| **Parameter** | **Units** | **South** | **North** | **South** | **North** |
| Magnesium | mg/L | 25.5 | 25.2 | 23 | 23.8 |
| Manganese | mg/L | <0.025 | <0.025 | 0.865 | 0.572 |
| Nickel | mg/L | <0.0038 | <0.0038 | <0.0038 | <0.0038 |
| Selenium | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |
| Zinc | mg/L | 0.0063 | 0.0094 | <0.0063 | <0.0063 |
| Phaeophytin-a | mg/m3 | 1.39 | 1.01 | NA | NA |
| Chlorophyll-a | mg/m3 | 16.6 | 16.6 | NA | NA |
| Fecal Coliforms | count/100 | 16 | 24 | NA | NA |
| E. Coli | count/100 | 23 | 27 | NA | NA |

*Notes:* * indicates the data were averaged over several depths: UML = 0m, 3m and 6m; LWL = 12m, 15m, 18m
The averages are based on concentration data, and are not volume-averages. Phaeophytin-a and Chlorophyll-a were collected in the Photic Zone. Averages were calculated using the laboratory Minimum Reportable Limit when an observation was reported at or below that limit.
NA: Not Analyzed.

**Table A10-5**. Comparison of South and North data, October 24 and November 20, 2007.

| | | Upper Mixed Layer | | Lower Water Layer | |
|---|---|---|---|---|---|
| **Parameter** | **Units** | **South** | **North** | **South** | **North** |
| Secchi Disc Depth | meters | 2.6 | 2.5 | NA | NA |
| pH | Std Units | *7.6 | *7.8 | *7.7 | *7.7 |
| Temperature | °C | *9.0 | *9.0 | *9.0 | *8.7 |
| Specific conductance | umHos/cm | *2,038 | *2,043 | *2,041 | *2,059 |
| Dissolved oxygen | mg/L | *9.1 | *9.1 | *9.0 | *9.1 |
| 5-day BOD | mg/L | <2 | <2 | <2 | <2 |
| Total Alkalinity | mg/L | 164 | 166 | 164 | 166 |
| Total Organic Carbon | mg/L | *3.4 | *3.3 | *3.4 | *3.3 |
| TOC Filtered | mg/L | *3.2 | *3.2 | *3.2 | *3.2 |
| Total Inorganic Carbon | mg/L | *43 | *43 | *43 | *44 |
| Total Kjeldahl Nitrogen | mg/L | *0.73 | *0.75 | *0.76 | *0.73 |
| TKN Filtered | mg/L | *0.64 | *0.61 | *0.60 | *0.60 |
| Organic Nitrogen | mg/L | *0.29 | *0.31 | *0.33 | *0.30 |
| Ammonia-N | mg/L | *0.44 | *0.43 | *0.43 | *0.43 |
| Nitrite-N | mg/L | 0.05 | 0.05 | 0.06 | 0.05 |
| Nitrate-N | mg/L | 1.8 | 1.7 | 1.8 | 1.7 |
| Total Phosphorus | mg/L | *0.046 | *0.047 | *0.046 | *0.046 |
| Soluble Reactive Phosphorus | mg/L | *0.024 | *0.025 | *0.026 | *0.026 |
| Silica | mg/L | *3.8 | *4.2 | *4.1 | *4.3 |
| Calcium | mg/L | 135 | 135 | 137 | 135 |
| Sodium | mg/L | 249 | 247 | 251 | 246 |
| Potassium | mg/L | 4.9 | 4.9 | 5.0 | 4.9 |
| Sulfate | mg/L | 168 | 174 | 168 | 173 |
| Chloride | mg/L | 477 | 473 | 485 | 464 |
| Total Solids | mg/L | *1,297 | *1,287 | *1,306 | *1,303 |
| Total Volatile Solids | mg/L | *200 | *185 | *205 | *189 |
| Total Suspended Solids | mg/L | *2 | *2 | *2 | *2 |
| Volatile Suspended Solids | mg/L | *2 | *2 | *2 | *2 |
| Total Dissolved Solids | mg/L | *1,228 | *1,265 | *1,283 | *1,263 |
| Turbidity | NTU | *2.08 | 2.03 | NA | NA |
| Arsenic | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |
| Iron | mg/L | <0.05 | <0.05 | <0.05 | <0.05 |
| Copper | mg/L | <0.0031 | <0.0031 | <0.0031 | <0.0031 |
| Chromium | mg/L | <0.0025 | <0.0025 | <0.0025 | <0.0025 |
| Cadmium | mg/L | <0.0008 | <0.0008 | <0.0008 | <0.0008 |
| Mercury | ng/l | 5.24 | 1.97 | 5.28 | 4.63 |
| Methyl mercury | ng/l | 0.12 | 0.072 | 1.69 | 1.9 |
| Lead | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |

**Table A10-5**. Comparison of South and North data, October 24 and November 20, 2007.

| Parameter | Units | Upper Mixed Layer | | Lower Water Layer | |
|---|---|---|---|---|---|
| | | South | North | South | North |
| Magnesium | mg/L | 24.5 | 24.6 | 24.7 | 24.8 |
| Manganese | mg/L | 0.0347 | 0.0356 | 0.0356 | 0.0351 |
| Nickel | mg/L | <0.0038 | <0.0038 | <0.0038 | <0.0038 |
| Selenium | mg/L | <0.002 | <0.002 | <0.002 | <0.002 |
| Zinc | mg/L | <0.0063 | <0.0063 | <0.0063 | <0.0063 |
| Phaeophytin-a | mg/m3 | 2.3 | 2.03 | NA | NA |
| Chlorophyll-a | mg/m3 | 4.81 | 6.94 | NA | NA |
| Fecal Coliforms | count/100 | 168 | 175 | NA | NA |
| E. Coli | count/100 | 84 | 154 | NA | NA |

*Notes:* * indicates the data were averaged over several depths: UML = 0m, 3m and 6m; LWL = 12m, 15m, 18m
The averages are based on concentration data, and are not volume-averages. Phaeophytin-a and Chlorophyll-a were collected in the Photic Zone. Averages were calculated using the laboratory Minimum Reportable Limit when an observation was reported at or below that limit.
NA: Not Analyzed.

As part of the update of the statistical framework, Dr. Walker examined whether the trophic state indicator parameters used to track algal abundance (an important restoration goal for Onondaga Lake) differed between North Deep and South Deep. Three parameters: phytoplankton biomass, chlorophyll-a concentrations, and Secchi disk transparency were evaluated using a paired t-test of log-transformed values. No statistically significant differences were evident between the two stations.

Dr. Walker also examined whether the calculated precision and trends of nutrient concentrations in the upper mixed layer at South Deep station were consistent with the calculated precision and trends of nutrient concentrations measured in the lake outlet (12-ft depth). Dr. Walker's finding of comparable results for the two sites supports the conclusion that there are no large differences in water quality conditions along the north-south axis of Onondaga Lake. Additional support for this conclusion is presented in **Table A10-6**, which summarizes statistical analysis of the rest of the parameters measured at North and South Deep in the upper and lower waters for the years 1999 – 2007.

The statistical analysis indicates that, for most parameters, measured water quality conditions at North Deep and South Deep are comparable. However, there are several slight, but statistically significant, differences in average concentrations of certain parameters (**Table A10-7**). Most of the differences can be attributed to the effect of the location of inflows of Metro and the major tributaries.

**Table A10-6**. Statistical comparison of mean results between South and North deep stations from 1999 to 2007 combined. Statistically significant results (P<0.05) are shaded. NA= No data available.

| | | Upper Mixed Layer | | | | Lower Water Layer | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Units** | **N** | **South** | **North** | **P** | **N** | **South** | **North** | **P** |
| Secchi Disc Depth | meters | 35 | 1.95 | 2.05 | 0.112 | 0 | NA | NA | NA |
| pH | Std Units | 36 | 7.87 | 7.91 | 0.002 | 36 | 7.52 | 7.53 | 0.383 |
| Temperature | °C | 36 | 14.2 | 14.1 | 0.284 | 36 | 8.76 | 8.73 | 0.797 |
| Specific conductance | umHos/cm | 36 | 1914 | 1932 | 0.013 | 36 | 1975 | 2003 | 0.046 |
| Dissolved oxygen | mg/L | 36 | 10.2 | 10.2 | 0.866 | 36 | 5.32 | 5.06 | 0.036 |
| 5-day BOD | mg/L | 36 | 2.72 | 2.88 | 0.224 | 36 | 3.53 | 3.69 | 0.336 |
| Total Alkalinity | mg/L | 36 | 165 | 166 | 0.916 | 36 | 193 | 193 | 0.695 |
| Total Organic Carbon | mg/L | 36 | 4.20 | 4.28 | 0.434 | 36 | 3.90 | 4.01 | 0.528 |
| TOC Filtered | mg/L | 36 | 3.79 | 3.85 | 0.406 | 36 | 3.51 | 3.68 | 0.405 |
| Total Inorganic Carbon | mg/L | 36 | 43 | 43 | 0.213 | 36 | 51 | 51 | 0.702 |
| Total Kjeldahl Nitrogen | mg/L | 36 | 1.11 | 1.07 | 0.0053 | 36 | 1.76 | 1.75 | 0.617 |
| TKN Filtered | mg/L | 36 | 0.92 | 0.89 | 0.086 | 36 | 1.60 | 1.58 | 0.600 |
| Organic Nitrogen | mg/L | 36 | 0.57 | 0.53 | 0.020 | 36 | 0.39 | 0.39 | 0.734 |
| Ammonia-N | mg/L | 36 | 0.54 | 0.54 | 0.952 | 36 | 1.37 | 1.36 | 0.629 |
| Nitrite-N | mg/L | 36 | 0.086 | 0.082 | 0.002 | 36 | 0.081 | 0.083 | 0.889 |
| Nitrate-N | mg/L | 36 | 1.53 | 1.45 | 0.00000002 | 36 | 1.09 | 1.05 | 0.098 |
| Total Phosphorus | mg/L | 36 | 0.07 | 0.07 | 0.156 | 36 | 0.21 | 0.20 | 0.470 |
| Soluble Reactive Phosphorus | mg/L | 36 | 0.03 | 0.03 | 0.142 | 36 | 0.17 | 0.16 | 0.573 |
| Silica | mg/L | 36 | 2.38 | 2.42 | 0.411 | 36 | 3.87 | 3.93 | 0.445 |
| Calcium | mg/L | 36 | 131 | 133 | 0.075 | 36 | 134 | 137 | 0.054 |
| Sodium | mg/L | 36 | 222 | 224 | 0.285 | 36 | 231 | 232 | 0.831 |
| Potassium | mg/L | 36 | 4.60 | 4.55 | 0.099 | 36 | 4.38 | 4.36 | 0.573 |
| Sulfate | mg/L | 36 | 164 | 164 | 0.836 | 36 | 155 | 155 | 0.880 |
| Chloride | mg/L | 36 | 427 | 431 | 0.094 | 36 | 439 | 442 | 0.477 |
| Total Solids | mg/L | 36 | 1240 | 1254 | 0.078 | 36 | 1268 | 1276 | 0.311 |
| Total Volatile Solids | mg/L | 36 | 212 | 221 | 0.204 | 36 | 208 | 210 | 0.682 |
| Total Suspended Solids | mg/L | 36 | 3.54 | 3.26 | 0.149 | 36 | 2.85 | 2.65 | 0.363 |

**Table A10-6**. Statistical comparison of mean results between South and North deep stations from 1999 to 2007 combined. Statistically significant results (P<0.05) are shaded. NA= No data available.

| | | Upper Mixed Layer | | | | Lower Water Layer | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Units** | **N** | **South** | **North** | **P** | **N** | **South** | **North** | **P** |
| Volatile Suspended Solids | mg/L | 36 | 2.49 | 2.43 | 0.692 | 36 | 2.03 | 1.96 | 0.443 |
| Total Dissolved Solids | mg/L | 36 | 1160 | 1183 | 0.030 | 36 | 1190 | 1203 | 0.107 |
| Turbidity | NTU | 24 | 4.03 | 3.66 | 0.168 | 0 | NA | NA | NA |
| Arsenic | mg/L | 36 | 0.002 | 0.002 | — | 36 | 0.002 | 0.002 | 0.141 |
| Iron | mg/L | 36 | 0.089 | 0.069 | 0.007 | 36 | 0.11 | 0.08 | 0.186 |
| Copper | mg/L | 36 | 0.0020 | 0.0019 | 0.746 | 36 | 0.0017 | 0.0016 | 0.194 |
| Chromium | mg/L | 36 | 0.0011 | 0.0012 | 0.283 | 36 | 0.0012 | 0.0011 | 0.149 |
| Cadmium | mg/L | 36 | 0.00070 | 0.00055 | 0.252 | 36 | 0.00067 | 0.00068 | 0.324 |
| Mercury | ng/L | 8 | 3.28 | 2.19 | 0.025 | 8 | 3.07 | 2.92 | 0.658 |
| Methyl mercury | ng/L | 8 | 0.11 | 0.08 | 0.103 | 8 | 0.50 | 0.60 | 0.302 |
| Lead | mg/L | 35 | 0.0038 | 0.0029 | 0.190 | 35 | 0.00 | 0.00 | 0.359 |
| Magnesium | mg/L | 36 | 23.87 | 24.12 | 0.016 | 36 | 23.59 | 24.08 | 0.023 |
| Manganese | mg/L | 36 | 0.031 | 0.052 | 0.331 | 36 | 0.03 | 0.05 | 0.549 |
| Nickel | mg/L | 36 | 0.0042 | 0.0047 | 0.313 | 36 | 0.0039 | 0.0040 | 0.693 |
| Selenium | mg/L | 36 | 0.0020 | 0.0020 | — | 36 | 0.0020 | 0.0020 | — |
| Zinc | mg/L | 36 | 0.0077 | 0.0063 | 0.168 | 36 | 0.0069 | 0.0066 | 0.408 |
| Phaeophytin-a | meters | 36 | 1.45 | 1.56 | 0.444 | 0 | NA | NA | NA |
| Chlorophyll-a; Log Transformed | mg/m3 | 36 | 1.04 | 1.04 | 0.955 | 0 | NA | NA | NA |
| Fecal Coliforms; Log Transformed | count/100 | 36 | 1.40 | 1.24 | 0.0164 | 0 | NA | NA | NA |
| E. coli; Log Transformed | count/100 | 27 | 120 | 55 | 0.138 | 0 | NA | NA | NA |

*Notes:* UML = 0m, 3m and 6m; LWL = 12m, 15m, 18m
The averages are based on concentration data, and are not volume-averages. Phaeophytin-a and Chlorophyll-a were collected in the Photic Zone. Averages were calculated using the laboratory Minimum Reportable Limit when an observation was reported at below that limit.
NA: Not Analyzed.

**Table A10-7.** Summary of parameters with statistically significant differences (P<0.05), 1999-2007

| Parameters | Observations: *Upper Waters (UML)* | Observations: *Lower Waters (LWL)* | Interpretation |
|---|---|---|---|
| Nitrogen (Total Kjeldahl Nitrogen, Organic Nitrogen, Nitrite-N, and Nitrate-N) | Higher at South | Not different | Higher concentrations of nitrogen species at South Deep are likely due to the Metro discharge. |
| Specific conductance | Higher at North | Higher at North | The higher specific conductance may be related to the proximity of Ninemile Creek, which is a higher salinity inflow as compared with Metro and the southern tributaries. |
| pH | Higher at North | Not different | |
| Dissolved solids | Higher at North | Not different | |
| Dissolved oxygen | Not different | Higher at South | |
| Iron | Higher at South | Not different | Higher concentrations of iron at South Deep are likely due to the Metro discharge. |
| Mercury | Higher at South | Not different | Higher mercury concentrations at South Deep may be related to proximity to historic industrial discharge of mercury. |
| Magnesium | Higher at North | Higher at North | The reason for the elevated Mg concentration at North Deep is unknown. |
| Fecal coliforms | Higher at South | Not sampled | The higher fecal coliform bacteria concentrations at South Deep are likely due to the proximity of the larger tributaries (CSOs and urban storm water) and the requirement for seasonal disinfection of the Metro effluent. |

# APPENDIX 11: LICOR DATA ANALYSIS

# LiCor Data Analysis

Light penetration through the water column is a measure of light availability and spectral quality. OCDWEP collects these data in Onondaga Lake using a LI-192SA Underwater Quantum Sensor, manufactured by LiCor. This instrument measures the intensity of Photosynthetically Active Radiation (PAR, 400-700 nm) by lowering a light detector unit through the water column, and measuring downwelling and upwelling radiation using two underwater sensors. Data are analyzed using the Beer-Lambert law to calculate the light extinction coefficient using the function:

$$I = I_0 e^{-kz}$$

Where:

$I$ = light intensity at depth, z
$I_0$= light intensity at surface
k = extinction coefficient

Higher values of k are associated with more turbid conditions; these conditions cause light to be scattered and/or absorbed by material in the water column and thus to limit the depth of penetration.

The temporal plot of light extinction measured in 2007 (**Figure A11-1**) illustrates the variability in this measurement. The concentration of chlorophyll-*a* in the photic zone is also plotted to indicate the extent to which algal abundance is correlated with the light extinction coefficients. The chlorophyll-*a* data are presented paired by sample date with the LiCor data. Chlorophyll-*a* data are measured weekly during the summer; the LiCor measurements are obtained biweekly throughout the sampling season.

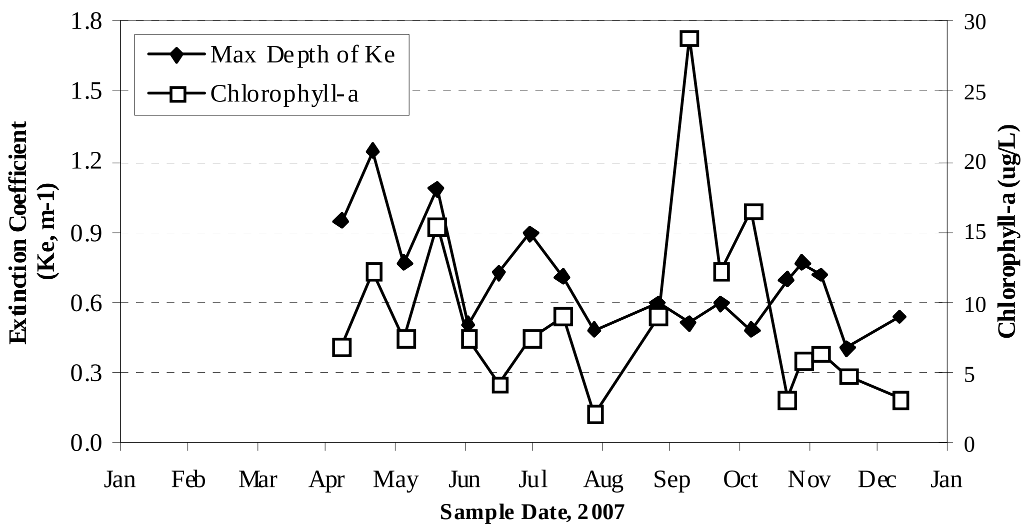


**Figure A11-1**. Temporal distribution of light extinction data (Ke) paired with chlorophyll-a data (photic zone), Onondaga Lake South Deep 2007. The greater the extinction coefficient number, the greater the turbidity in the water column.

*Note: Ke is based on Licor data reading at the maximum depth for each sample date. Ke (extinction coefficient) represents the slope of the line formed when the natural log of the ratio of light penetration at the surface to light* *penetration at depth is plotted against depth. Field Notes: May 22 upwelling readings from 0 to 1.2m were anomalous, as though the cap for the probe was left on. Nov 8 spike in downwelling reading at 0.6m attributed to sun breaking through clouds.*

LiCor data from 1996 – 2007 have been compiled into a database and light extinction coefficients have been calculated for each sampling date over this eleven-year period. Summary statistics for the time period (**Table A11-1**) indicate that the minimum light extinction (clearest water) conditions are measured either early in the season (May and June) or in the late fall –winter period. This is consistent with the dynamics of the phytoplankton community. It is also evident from the data that there is no trend in the average value calculated for light extinction over the period (**Figure A11-2**).

This finding is consistent with the trend analysis for Secchi disk transparency at South Deep. Secchi disk transparency can be considered a "low tech" estimator of light penetration which correlates reasonably well with the LiCor data (**Figure A11-3**); high Secchi disk transparency and low extinction coefficients indicate clear waters, while low Secchi depth and high extinction coefficients indicate turbid water. There is a lot of scatter at the extremes of the graph.

**Table A11-1**. Summary of light extinction data, Onondaga Lake South Deep, 1996-2007.

| Year | Extinction Coefficient ($m^{-1}$) | | | | | |
|---|---|---|---|---|---|---|
| | N | Minimum | | Maximum | | Average |
| | | $K_e$ | On Date | $K_e$ | On Date | |
| 1996 | 17 | 0.74 | 05/29/96 | 3.6 | 07/10/96 | 1.7 |
| 1997 | 12 | 0.74 | 06/30/97 | 1.9 | 04/10/97 | 1.3 |
| 1998 | 14 | 0.39 | 11/17/98 | 1.7 | 09/08/98 | 1.0 |
| 1999 | 17 | 0.39 | 06/29/99 | 2.6 | 07/27/99 | 1.1 |
| 2000 | 19 | 0.64 | 06/27/00 | 2.3 | 05/16/00 | 1.1 |
| 2001 | 17 | 0.32 | 11/27/01 | 2.3 | 09/18/01 | 0.94 |
| 2002 | 22 | 0.47 | 01/23/02 | 1.4 | 09/04/02 | 0.87 |
| 2003 | 17 | 0.36 | 01/07/03 | 1.9 | 10/14/03 | 1.1 |
| 2004 | 18 | 0.71 | 12/07/04 | 1.6 | 08/31/04 | 0.92 |
| 2005 | 19 | 0.64 | 08/30/05 | 1.2 | 04/14/05 | 0.85 |
| 2006 | 22 | 0.56 | 11/08/06 | 1.6 | 10/24/06 | 0.88 |
| 2007 | 18 | 0.41 | 11/20/07 | 1.2 | 04/24/07 | 0.71 |

*Notes:*
*Extinction Coefficient ($K_e$) represents the penetration of incoming solar radiation into the water column. $K_e$ represents the slope of the line formed when the natural log of the ratio of light penetration at the surface to light penetration at depth is plotted against depth. The greater the number, the steeper the slope of the line, therefore the more rapidly light is extinguished with depth, indicating greater turbidity in the water column.*

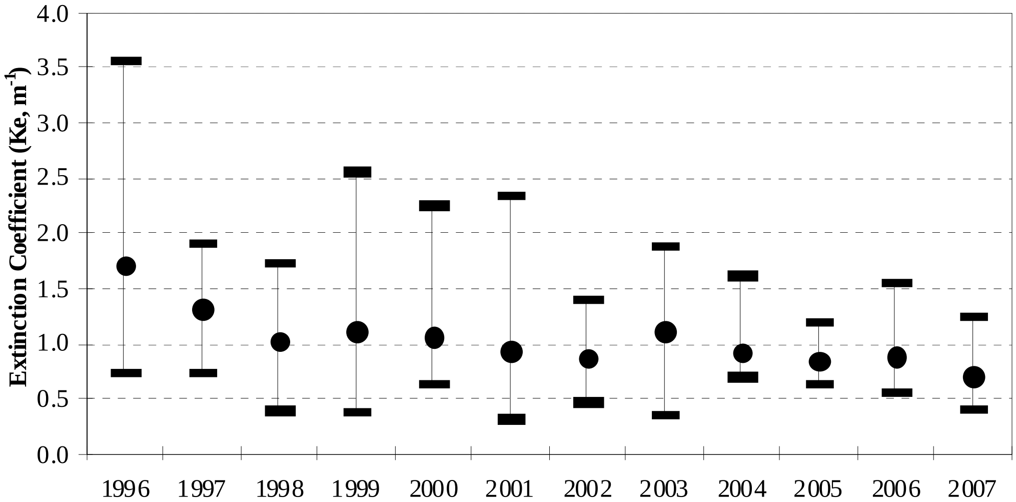


**Figure A11-2**. Maximum, minimum, and average of light extinction (Ke) data, Onondaga Lake South Deep, 1996-2007.

*Notes: The Extinction coefficient represents the slope of the line formed when the natural log of the ratio of light penetration at the surface to light penetration at depth is plotted against depth. The greater the number, the steeper the slope of the line, therefore the more rapidly light is extinguished with depth, indicating greater turbidity in the water column. Annual statistics for Extinction Coefficient are based on the maximum depth of light extinction measured for each sample date.*

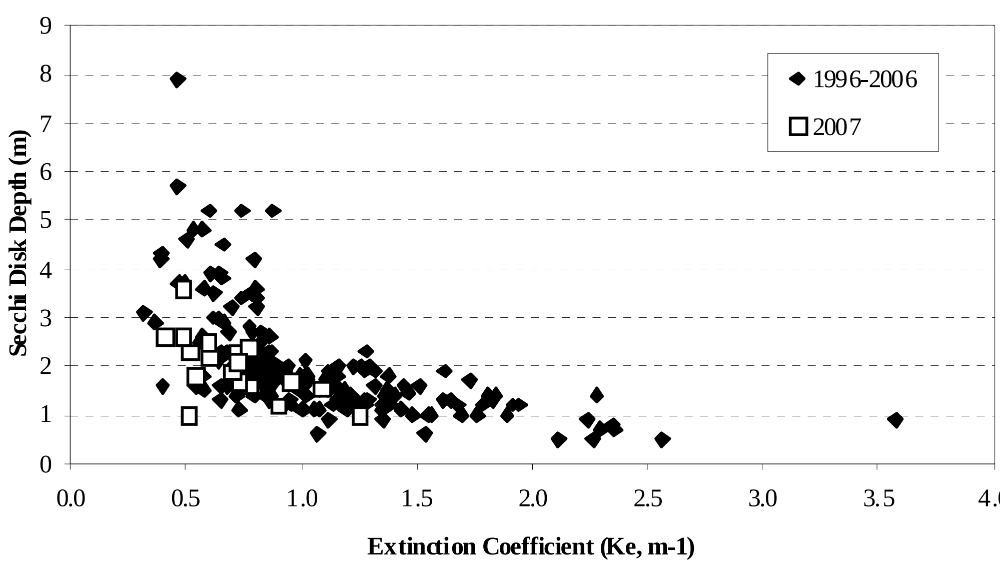


**Figure A11-3**. Correlation of light extinction (Ke) data with Secchi depth, Onondaga Lake South Deep 1996-2007.

*Note: The extinction coefficient (Ke) represents the slope of the line formed when the natural log of the ratio of light penetration at the surface to light penetration at depth is plotted against depth. The greater the number, the steeper the slope of the line, therefore the more rapidly light is extinguished with depth, indicating greater turbidity in the water column. Based on the Licor data reading at maximum depth for each sample date.*

# APPENDIX 12: FLOW-WEIGHTED RESULTS

# Contents

**Table A12-1**. Flow-weighted average of limnological parameters, 2007, in Onondaga Lake tributaries, with standard error of estimate.

| Parameter | Units | Nine Mile Creek Concentration | Nine Mile Creek *RSE* | Harbor Brook Concentration | Harbor Brook *RSE* | Onondaga Creek @ Kirpatrick Street Concentration | Onondaga Creek @ Kirpatrick Street *RSE* | Ley Creek Concentration | Ley Creek *RSE* |
|---|---|---|---|---|---|---|---|---|---|
| 5-day BOD | mg/l | 2.3 | *13.8%* | 3.0 | *30.2%* | 2.1 | *17.3%* | 2.4 | *23.9%* |
| Total Alkalinity | mg/l | 190 | *2.3%* | 226 | *4.9%* | 218 | *2.7%* | 192 | *4.4%* |
| Total Organic Carbon | mg/l | 2.7 | *20.2%* | 2.4 | *27.2%* | 2.2 | *24.9%* | 5.9 | *8.0%* |
| TOC-filtered | mg/l | 2.5 | *15.5%* | 2.2 | *28.6%* | 2.1 | *26.9%* | 5.5 | *7.8%* |
| Total Inorganic Carbon | mg/l | 49.7 | *2.3%* | 60.4 | *5.0%* | 56.0 | *3.0%* | 50.7 | *5.9%* |
| Total Kjeldahl Nitrogen as N | mg/l | 0.61 | *11.4%* | 0.58 | *22.3%* | 0.45 | *14.1%* | 0.70 | *12.4%* |
| Organic Nitrogen as N | mg/l | 0.41 | *14.5%* | 0.51 | *29.1%* | 0.36 | *19.7%* | 0.41 | *13.1%* |
| Ammonia as N | mg/l | 0.20 | *8.7%* | 0.08 | *19.6%* | 0.07 | *13.8%* | 0.28 | *14.7%* |
| Nitrate as N | mg/l | 0.94 | *7.6%* | 1.52 | *5.7%* | 1.01 | *7.1%* | 0.42 | *16.8%* |
| Nitrite as N | mg/l | 0.02 | *12.9%* | 0.02 | *13.2%* | 0.03 | *49.8%* | 0.02 | *18.8%* |
| Arsenic | ug/l | 2.1 | *3.5%* | 2.0 | *2.5%* | 2.0 | *14.9%* | 2.1 | *3.2%* |
| Total Phosphorus | ug/l | 53.9 | *20.6%* | 115.1 | *26.0%* | 63.6 | *30.3%* | 65.9 | *23.9%* |
| Soluble Reactive Phosphorus | ug/l | 9.5 | *27.5%* | 37.6 | *18.6%* | 9.3 | *30.9%* | 10.5 | *16.1%* |
| Silica | mg/l | 4.1 | *5.4%* | 4.8 | *5.4%* | 5.0 | *7.7%* | 5.7 | *6.0%* |
| Calcium | mg/l | 181.4 | *2.3%* | 188.7 | *4.9%* | 113.1 | *2.0%* | 109.8 | *5.8%* |
| Sodium | mg/l | 93.6 | *4.7%* | 146.8 | *14.6%* | 336.5 | *5.7%* | 250.4 | *21.2%* |
| Sulfate | mg/l | 156.3 | *4.7%* | 286.8 | *6.6%* | 116.2 | *3.9%* | 108.1 | *7.5%* |
| Chloride | mg/l | 280.4 | *3.7%* | 262.0 | *12.8%* | 548.8 | *6.5%* | 421.0 | *21.2%* |
| Total Suspended Solids | mg/l | 31 | *31.5%* | 46 | *97.5%* | 49 | *50.9%* | 14 | *44.8%* |
| Total Dissolved Solids | mg/l | 969 | *2.9%* | 1114 | *6.0%* | 1271 | *4.2%* | 1057 | *12.4%* |
| Zinc | ug/l | 8.5 | *27.0%* | 11.1 | *28.5%* | 7.8 | *33.5%* | 14.3 | *20.2%* |
| Copper | ug/l | 6.1 | *12.5%* | 3.2 | *33.0%* | 4.6 | *42.0%* | 4.0 | *23.0%* |
| Chromium | ug/l | 2.5 | *27.1%* | 2.5 | *40.7%* | 2.5 | *45.1%* | 2.5 | *27.4%* |
| Cadmium | ug/l | 0.8 | *13.4%* | 0.8 | *14.6%* | 0.8 | *15.6%* | 0.8 | *9.7%* |
| Lead | ug/l | 2.1 | *15.4%* | 2.0 | *20.5%* | 2.2 | *29.5%* | 3.9 | *30.6%* |
| Iron | mg/l | 0.91 | *20.6%* | 1.12 | *89.5%* | 1.9 | *75.9%* | 0.8 | *30.5%* |
| Magnesium | mg/l | 26.4 | *1.8%* | 35.0 | *4.8%* | 23.9 | *2.1%* | 21.0 | *6.1%* |
| Manganese | ug/l | 58.9 | *11.7%* | 39.2 | *31.2%* | 75.5 | *36.5%* | 98.0 | *9.8%* |
| Nickel | ug/l | 3.8 | *15.1%* | 3.8 | *21.7%* | 3.8 | *36.1%* | 3.9 | *11.0%* |
| Fecal Coliforms | cells/100ml | 462 | *146.8%* | 3,373 | *158.0%* | 1,285 | *77.9%* | 770 | *66.9%* |

RSE = relative standard error of the concentration estimate. ** METRO BOD5, NH3-N, TP, TSS based on observations made daily,
Calculated using a multiple regression algorithm relating concentration to flow, season, and trend with residual interpolation.
METRO TKN based on observations made 5 times each 2 week period. Other values are based on data collected bi-weekly; heavy metals sampled quarterly.
Calculations use the laboratory reported minimal reportable limit (MRL) when observations were below the MRL.

**Table A12-1**. Flow-weighted average of limnological parameters, 2007, in Onondaga Lake tributaries, with standard error of estimate. (Continued)

| | | Trib. 5A | | METRO Effluent ** | | METRO By-Pass | | East Flume | |
|---|---|---|---|---|---|---|---|---|---|
| **Parameter** | **Units** | Concentration | ***RSE*** | Concentration | ***RSE*** | Concentration | ***RSE*** | Concentration | ***RSE*** |
| 5-day BOD | mg/l | 3.0 | *15.2%* | 5.2 | *3.4%* | 56.0 | *6.2%* | 3.9 | *14.1%* |
| Total Alkalinity | mg/l | 166 | *2.5%* | 156 | *3.0%* | 209 | *12.4%* | 157 | *5.0%* |
| Total Organic Carbon | mg/l | 4.4 | *5.7%* | 7.6 | *5.2%* | 18.1 | *20.4%* | 4.3 | *7.7%* |
| TOC-filtered | mg/l | 4.1 | *5.4%* | 6.8 | *4.4%* | 15.2 | *21.1%* | 3.9 | *7.8%* |
| Total Inorganic Carbon | mg/l | 42.3 | *3.6%* | 43.2 | *3.2%* | 52.6 | *14.4%* | 38.8 | *5.3%* |
| Total Kjeldahl Nitrogen as N | mg/l | 0.54 | *35.6%* | 1.9 | *3.1%* | 9.6 | *7.3%* | 1.0 | *10.4%* |
| Organic Nitrogen as N | mg/l | 0.36 | *15.9%* | 0.8 | *15.3%* | 2.9 | *25.7%* | 0.53 | *14.1%* |
| Ammonia as N | mg/l | 0.18 | *83.9%* | 0.9 | *4.8%* | 5.3 | *11.1%* | 0.40 | *13.4%* |
| Nitrate as N | mg/l | 0.69 | *13.9%* | 9.8 | *6.9%* | 1.8 | *35.2%* | 3.4 | *7.5%* |
| Nitrite as N | mg/l | 0.03 | *20.2%* | 0.07 | *13.6%* | 0.09 | *68.9%* | 1.14 | *19.9%* |
| Arsenic | ug/l | 2.1 | *11.5%* | 2.0 | *6.4%* | 2.0 | *6.9%* | 2.6 | *17.5%* |
| Total Phosphorus | ug/l | 107.2 | *8.1%* | 118.9 | *3.2%* | 1262.4 | *6.7%* | 127.6 | *17.2%* |
| Soluble Reactive Phosphorus | ug/l | 28.2 | *13.0%* | 4.5 | *31.7%* | 278.0 | *82.2%* | 45.9 | *19.8%* |
| Silica | mg/l | 8.4 | *5.8%* | 5.3 | *3.8%* | 5.5 | *18.1%* | 9.7 | *7.3%* |
| Calcium | mg/l | 131.4 | *3.6%* | 134.8 | *6.7%* | 100.8 | *31.4%* | 118.4 | *7.4%* |
| Sodium | mg/l | 160.3 | *5.3%* | 234.5 | *12.0%* | 299.3 | *35.4%* | 415.2 | *8.0%* |
| Sulfate | mg/l | 87.1 | *11.9%* | 147.8 | *4.2%* | 77.6 | *17.3%* | 296.8 | *9.6%* |
| Chloride | mg/l | 340.4 | *5.3%* | 415.9 | *5.8%* | 488.5 | *40.3%* | 543.4 | *8.8%* |
| Total Suspended Solids | mg/l | 16 | *72.4%* | 6.0 | *4.9%* | 78 | *9.7%* | 17 | *42.8%* |
| Total Dissolved Solids | mg/l | 941 | *4.6%* | 1170 | *3.6%* | 1150 | *27.5%* | 1551 | *7.1%* |
| Zinc | ug/l | 7.9 | *46.6%* | 23.5 | *6.9%* | 40.1 | *16.8%* | 20.3 | *54.6%* |
| Copper | ug/l | 12.7 | *38.7%* | 11.9 | *6.4%* | 21.6 | *14.8%* | 3.1 | *68.8%* |
| Chromium | ug/l | 19.0 | *40.3%* | 9.1 | *7.0%* | 10.0 | *19.5%* | 2.5 | *48.9%* |
| Cadmium | ug/l | 0.80 | *26.4%* | 0.9 | *9.9%* | 5.0 | *10.9%* | 0.80 | *52.9%* |
| Lead | ug/l | 2.7 | *30.1%* | 2.0 | *6.1%* | 30.0 | *16.6%* | 2.0 | *69.5%* |
| Iron | mg/l | 1.1 | *50.2%* | 1.28 | *7.5%* | 1.7 | *16.2%* | 0.34 | *41.7%* |
| Magnesium | mg/l | 16.0 | *2.7%* | 23.6 | *3.2%* | 19.7 | *17.5%* | 21.5 | *7.3%* |
| Manganese | ug/l | 84.3 | *26.4%* | 39.5 | *7.6%* | 41.8 | *16.9%* | 28.4 | *20.3%* |
| Nickel | ug/l | 89.7 | *19.5%* | 13.8 | *5.3%* | 15.0 | *19.2%* | 3.8 | *25.5%* |
| Fecal Coliforms | cells/100ml | 646 | *516.4%* | 2,079 | *60.1%* | 776,088 | *45.0%* | 360 | *95.8%* |

RSE = relative standard error of the concentration estimate. ** METRO BOD5, NH3-N, TP, TSS based on observations made daily,
Calculated using a multiple regression algorithm relating concentration to flow, season, and trend with residual interpolation.
METRO TKN based on observations made 5 times each 2 week period. Other values are based on data collected bi-weekly; heavy metals sampled quarterly.
Calculations use the laboratory reported minimal reportable limit (MRL) when observations were below the MRL.

**Table A12-2. Loading of major water quality parameters to Onondaga Lake, January to December 2007.**

| Parameter | Units | Onondaga Crk at Kirkpatrick(3,4) | Ninemile Creek at Rt. 48(3,4) | Metro(1) Outfall 001 | Bypass(2) Outfall 002 | Ley Creek at Park(3,4) | Harbor Brook at Hiawatha(3,4) | East Flume(3) | Tributary 5A(3) | Total Monitored |
|---|---|---|---|---|---|---|---|---|---|---|
| Water | $hm^3$ | 183 | 170 | 88 | 1.44 | 39 | 14 | 0.7 | 0.56 | 496 |
| Total P | mt | 12 | 9.2 | 10 | 1.8 | 2.6 | 1.61 | 0.09 | 0.06 | 37 |
| SRP | mt | 1.7 | 1.6 | 0 | 0.40 | 0.41 | 0.52 | 0.03 | 0.02 | 5 |
| TKN | mt | 82 | 104 | 166 | 14 | 27 | 8.1 | 0.7 | 0.3 | 402 |
| Nitrate-N | mt | 184 | 160 | 856 | 2.5 | 16 | 21 | 2.3 | 0.4 | 1,243 |
| Nitrite-N | mt | 5.0 | 3.6 | 6 | 0.13 | 0.64 | 0.24 | 0.77 | 0.02 | 17 |
| Ammonia-N | mt | 13 | 34 | 75 | 7.7 | 10.8 | 1.2 | 0.27 | 0.10 | 142 |
| Organic-N | mt | 66 | 69 | 67 | 4.2 | 16.0 | 7.1 | 0.36 | 0.20 | 230 |
| Ca | mt | 20,673 | 30,900 | 11,830 | 145 | 4,267 | 2,633 | 80 | 73 | 70,602 |
| Cl | mt | 100,322 | 47,749 | 36,502 | 703 | 16,366 | 3,655 | 368 | 190 | 205,855 |
| Na | mt | 61,509 | 15,943 | 20,584 | 431 | 9,736 | 2,048 | 281 | 90 | 110,621 |
| TSS | mt | 8,927 | 5,197 | 523 | 113 | 543 | 635 | 11 | 9 | 15,958 |
| Fecal Coli (annual) | $10^{10}$ cfu | 234,859 | 78,652 | 182,473 | 1,117,480 | 29,931 | 47,051 | 244 | 361 | 1,691,052 |
| Fecal Coli (May-Sept) | $10^{10}$ cfu | 52,329 | 8,246 | 6,517 | 106,693 | 13,788 | 7,164 | 67 | 243 | 195,048 |
| BOD -5 day | mt | 382 | 385 | 459 | 81 | 94 | 42 | 3 | 2 | 1,447 |
| T-Alk | mt | 39,927 | 32,379 | 13,712 | 301 | 7,474 | 3,158 | 106 | 93 | 97,150 |
| TOC | mt | 408 | 462 | 663 | 26 | 230 | 34 | 3 | 2 | 1,827 |
| TIC | mt | 10,245 | 8,458 | 3,789 | 76 | 1,972 | 843 | 26 | 24 | 25,433 |

NOTES

Notes: mt = metric tons; hm3 = million cubic meters; cfu = colony forming units

(1) Metro Outfall 001 calculated loads of BOD5, NH3-N, TP, TSS are based on daily measurements; METRO TKN based on 5 measurements/2 wks

(2) Metro Bypass Outfall 002 estimates based on periodic grab samples when outfall is active (high flow events)

(3) Natural tributaries, East Flume and Tributary 5A calculations based on biweekly program, plus high flow events and storms

(4) Tributary BOD samples include a large percentage of observations reported as less than the minimal reportable limit; for these observations, the minimal reportable limit was used in loading calculations.

**Table A12-3. Annual (January to December) tributary loadings to Onondaga Lake 1990-2007, and comparison of 2007 to long-term average conditions.**

| Parameter | Units | Annual Load 1990 | Annual Load 1991 | Annual Load 1992 | Annual Load 1993 | Annual Load 1994 | Annual Load 1995 | Annual Load 1996 | Annual Load 1997 | Annual Load 1998 | Annual Load 1999 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5-day BOD | mt | 2,835 | 2,109 | 4,059 | 4,226 | 2,928 | 2,433 | 3,300 | 2,134 | 2,220 | 1,745 |
| Total Alkalinity | mt | 127,204 | 86,082 | 104,777 | 107,504 | 92,308 | 64,728 | 101,576 | 75,112 | 83,374 | 59,355 |
| Total Organic Carbon | mt | 5,836 | 4,531 | 3,324 | 4,344 | 2,558 | 2,369 | 3,867 | 2,269 | 2,072 | 1,682 |
| Total Inorganic Carbon | mt | 32,160 | 21,471 | 26,846 | 26,429 | 23,876 | 16,533 | 26,113 | 18,466 | 22,172 | 15,203 |
| Total Kjeldahl N | mt | 1,907 | 1,745 | 1,880 | 2,003 | 1,927 | 1,883 | 2,081 | 1,494 | 1,274 | 907 |
| Ammonia-N | mt | 1,364 | 1,265 | 1,287 | 1,321 | 1,408 | 1,541 | 1,498 | 1,118 | 833 | 614 |
| Nitrate-N | mt | 779 | 488 | 485 | 515 | 476 | 295 | 534 | 465 | 869 | 625 |
| Nitrite-N | mt | 84 | 88 | 61 | 53 | 49 | 46 | 44 | 62 | 46 | 41 |
| Organic-N | mt | 551 | 436 | 584 | 666 | 514 | 324 | 580 | 376 | 413 | 276 |
| Total Phosphorus | mt | 149 | 83 | 126 | 140 | 83 | 65 | 112 | 50 | 68 | 54 |
| Soluble Reactive P | mt | 29 | 24 | 22 | 30 | 20 | 19 | 24 | 12 | 12 | 9 |
| Calcium | mt | 98,242 | 72,741 | 77,957 | 76,011 | 67,176 | 50,443 | 72,581 | 57,271 | 61,175 | 49,142 |
| Sodium | mt | 88,765 | 75,504 | 76,862 | 91,093 | 82,787 | 58,656 | 77,378 | 65,721 | 76,469 | 76,776 |
| Chloride | mt | 220,065 | 182,969 | 180,697 | 196,525 | 164,121 | 119,322 | 156,452 | 138,290 | 156,969 | 144,908 |
| Total Suspended Solids | mt | 24,975 | 13,120 | 22,603 | 15,568 | 11,670 | 5,694 | 19,230 | 5,404 | 10,397 | 11,342 |
| Fecal Coliform | $10^{10}$ cfu | 1,120,878 | 1,099,838 | 3,040,649 | 5,519,621 | 1,103,861 | 9,182,161 | 3,254,615 | 1,833,174 | 2,849,618 | 3,957,407 |

**Table A12-3. Annual (January to December) tributary loadings to Onondaga Lake 1990-2007, and comparison of 2007 to long-term average conditions (continued).**

| Parameter | Units | Annual Load 2000 | Annual Load 2001 | Annual Load 2002 | Annual Load 2003 | Annual Load 2004 | Annual Load 2005 | Annual Load 2006 | Annual Load 2007 | Average Load 1990-2006 | % Change 2007 from Average |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5-day BOD | mt | 1,981 | 1,734 | 2,325 | 2,696 | 2,054 | 1,495 | 1,495 | 1,447 | 2,457 | -41% |
| Total Alkalinity | mt | 90,576 | 75,898 | 85,765 | 102,123 | 110,499 | 104,601 | 109,320 | 97,141 | 92,988 | 4.5% |
| Total Organic Carbon | mt | 2,224 | 1,895 | 1,975 | 2,896 | 3,121 | 2,196 | 2,073 | 1,828 | 2,896 | -37% |
| Total Inorganic Carbon | mt | 23,876 | 19,667 | 22,533 | 26,978 | 29,222 | 27,387 | 27,469 | 25,431 | 23,906 | 6.4% |
| Total Kjeldahl N | mt | 982 | 824 | 1,018 | 932 | 580 | 363 | 405 | 402 | 1,306 | -69% |
| Ammonia-N | mt | 571 | 499 | 643 | 503 | 240 | 94 | 150 | 142 | 879 | -84% |
| Nitrate-N | mt | 772 | 667 | 463 | 977 | 1,379 | 1,541 | 1,261 | 1,244 | 741 | 68% |
| Nitrite-N | mt | 52 | 38 | 31 | 47 | 31 | 13 | 20 | 17 | 47 | -65% |
| Organic-N | mt | 403 | 319 | 332 | 440 | 318 | 255 | 241 | 230 | 414 | -44% |
| Total Phosphorus | mt | 53 | 46 | 48 | 68 | 83 | 49 | 42 | 37 | 78 | -52% |
| Soluble Reactive P | mt | 7 | 8 | 7 | 15 | 31 | 7 | 5 | 5 | 16 | -69% |
| Calcium | mt | 64,406 | 55,498 | 60,308 | 68,945 | 73,697 | 77,168 | 75,710 | 70,588 | 68,145 | 3.6% |
| Sodium | mt | 90,648 | 85,662 | 88,817 | 102,078 | 96,368 | 109,127 | 106,490 | 110,615 | 85,247 | 30% |
| Chloride | mt | 171,897 | 167,643 | 168,405 | 193,596 | 186,907 | 199,532 | 187,570 | 205,833 | 172,698 | 19% |
| Total Suspended Solids | mt | 14,034 | 9,567 | 9,109 | 10,368 | 16,157 | 14,209 | 17,923 | 15,959 | 13,610 | 17% |
| Fecal Coliform | $10^{10}$ cfu | 1,629,608 | 1,957,691 | 2,635,930 | 1,196,515 | 2,044,624 | 830,885 | 1,329,586 | 1,689,991 | 2,622,745 | -36% |

**Table A12-4. Percent contribution by gauged inflow, January to December 2007.**

| Parameter | Onondaga Crk at Kirkpatrick | Ninemile Creek at Rt. 48 | Metro Outfall 001 | Bypass Outfall 002 | Ley Creek at Park | Harbor Brook at Hiawatha | East Flume | Tributary 5A |
|---|---|---|---|---|---|---|---|---|
| Water | 37% | 34% | 18% | 0.29% | 7.8% | 2.8% | 0.14% | 0.11% |
| Total P | 31% | 25% | 28% | 4.9% | 6.9% | 4.3% | 0.23% | 0.16% |
| SRP | 33% | 32% | 7.7% | 7.9% | 8.0% | 10% | 0.61% | 0.31% |
| TKN | 20% | 26% | 41% | 3.4% | 6.8% | 2.0% | 0.17% | 0.075% |
| Nitrate-N | 15% | 13% | 69% | 0.20% | 1.3% | 1.7% | 0.19% | 0.031% |
| Nitrite-N | 30% | 21% | 38% | 0.75% | 3.9% | 1.4% | 4.6% | 0.11% |
| Ammonia-N | 9.1% | 24% | 53% | 5.4% | 7.6% | 0.83% | 0.19% | 0.071% |
| Organic-N | 29% | 30% | 29% | 1.8% | 6.9% | 3.1% | 0.16% | 0.087% |
| Ca | 29% | 44% | 17% | 0.21% | 6.0% | 3.7% | 0.11% | 0.10% |
| Cl | 49% | 23% | 18% | 0.34% | 8.0% | 1.8% | 0.18% | 0.092% |
| Na | 56% | 14% | 19% | 0.39% | 8.8% | 1.9% | 0.25% | 0.081% |
| TSS | 56% | 33% | 3.3% | 0.71% | 3.4% | 4.0% | 0.070% | 0.056% |
| Fecal Coli (annual) | 14% | 4.7% | 11% | 66% | 1.8% | 2.8% | 0.0144% | 0.0214% |
| Fecal Coli (May-Sept) | 27% | 4% | 3.3% | 55% | 7.1% | 3.7% | 0.0344% | 0.125% |
| BOD -5 day | 26% | 27% | 32% | 5.6% | 6.5% | 2.9% | 0.18% | 0.12% |
| T-Alk | 41% | 33% | 14% | 0.31% | 7.7% | 3.3% | 0.11% | 0.10% |
| TOC | 22% | 25% | 36% | 1.4% | 13% | 1.8% | 0.16% | 0.14% |
| TIC | 40% | 33% | 15% | 0.30% | 7.8% | 3.3% | 0.10% | 0.09% |

Note: Approximately 93.5% of flow to Onondaga lake is from gauged sources. The remainder of flow is attributed to non-point ungauged sources and precipitation.

**Table A12-5.** Ten Year Trends in Concentration (1998-2007) - Summary

| Symbol | Description |
|---|---|
| I | increasing trend ($p < 0.1$) |
| D | decreasing trend ($p > 0.1$) |
| blank | no trend indicated ($p = 0.1$) |
| p2 | significance level, two-tailed, seasonal kendall test accounting for serial correlation. |

| | Onondaga Lake | | | | | | Metro | | Onondaga Creek | | Harbor Brook | | Ley Creek | Ninemile Creek | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VARIABLE | SOUTH_U | SOUTH_L | NORTH_U | NORTH_L | OUTLET12 | OUTLET2 | METRO | BYPASS | DORWIN | KIRKPAT | VELASKO | HIAWATHA | PARK | RT48 | TRIB5A | EFLUME |
| ALK | | I | | I | I | I | | | | I | I | | | | I | |
| BOD5 | | | | | | | D | | | | | | | | | |
| CA | | | | | | I | I | | | | | | | D | | |
| CHLA | | | | | | | | | | | | | | | | |
| CL | D | | D | D | D | | I | | D | | | | I | D | | |
| COND | D | | D | D | D | | I | | D | | | | I | D | D | |
| CR | | | | | | | | | | | | | | | | |
| DO_F | I | | | | I | I | | | | I | | I | | I | | I |
| FCOLI | | | | | | | | | I | | | | | | | |
| FE | | | | | | | | D | I | | | | | D | I | |
| HARD | | | | | | I | I | | | | | | | D | | |
| MG | | | I | | I | I | I | | | | | D | | D | | |
| MN | | | I | | | | D | D | | | | | | | I | |
| NA | | | | | | | I | | D | | I | I | I | D | D | I |
| NH3N | D | D | D | D | D | D | D | D | | | | | | | | |
| NI | | | | | | | | | | | | | | | | |
| NO2N | D | | D | | D | D | D | | | | | | | | | |
| NO3N | I | I | I | I | I | I | I | | I | | I | I | | | D | |
| ORGN | D | D | D | D | D | D | D | D | I | | I | | | | I | D |
| PB | | | | | | | D | | | | | D | D | | | |
| PH_F | | | | | | | | | D | I | | | | | | |
| PHAEO | | | | | D | | | | | | | | | | | |
| SECCHI | | | | | | | | | | | | | | | | |
| SIO2 | I | I | I | | I | I | | | | | | | | | I | |
| SO4 | D | D | D | | D | | | D | D | | D | D | D | | D | |
| SRP | | D | | D | | | D | I | | | | I | D | | D | D |
| TDS | | | D | | | | I | | D | | | | | D | D | |
| TEMP | | | | D | | | I | | | | | | | | | |
| TIC | | | | I | | I | | | | | | | | | I | |
| TKN | D | D | D | D | D | D | D | D | | | | | D | D | | D |
| TOC | D | D | D | D | | D | D | | | | | | | | | D |
| TOC_F | D | D | D | D | D | D | D | | D | | | D | | | | D |
| TP | D | D | D | D | D | D | D | | I | | | I | D | | D | D |
| TS | D | D | D | | | | | | | | | | | | | |
| TSS | | I | | | I | I | | | I | I | I | I | | | I | |
| VSS | | I | | | | | | | | | | | | | | |
| ZN | | | | | | | | D | I | | | | | | | |

# APPENDIX 13: RAW DATA FILES

# Appendix 13 Contents