

Habitat Conditions: Data Visualization Tool (DVT) and Fish Space

The fish community in Onondaga Lake is composed of species that are adapted to a range of temperature and dissolved oxygen (DO) conditions and consist primarily of warmwater species, with several coolwater species, and limited coldwater species. The Data Visualization Tool (DVT) provides insight into the habitat available for coolwater and coldwater fish communities, referred to as “fish space”.

The fish space metric is useful for tracking changes in habitat based on DO and temperature during times of the year when conditions may not be sufficient to maintain a population. Fish species identified in Onondaga Lake are categorized by thermal guild:

<u>Warmwater</u>		<u>Coolwater</u>		<u>Coldwater</u>
Banded killifish	Freshwater drum	Logperch (Cool/Warm)	Northern pike	Lake sturgeon (Cold/Cool)
Black bullhead	Gizzard shad	Alewife	Shorthead redhorse	Brown trout
Black crappie	Largemouth bass	Brook stickleback	Smallmouth bass	Rainbow trout
Bluegill	Longnose gar	Golden shiner	Tessellated darter	Trout perch
Bowfin	Pumpkinseed	Greater redhorse	Tiger muskellunge	
Brook silverside	Quillback	Johnny darter	Walleye	
Brown bullhead	Rock bass	Longnose dace	White sucker	
Carp	Rudd	Northern hog sucker	Yellow perch	
Channel catfish	White perch			
Emerald shiner	Yellow bullhead			
Fathead minnow				

Available habitat for both the coolwater and coldwater fish community is calculated as a percent of the theoretical total, using volume-days as the measurement. For example; if half of the lake’s water volume had suitable DO and temperature conditions for half of the selected time period, the metric is 25% for a given year.

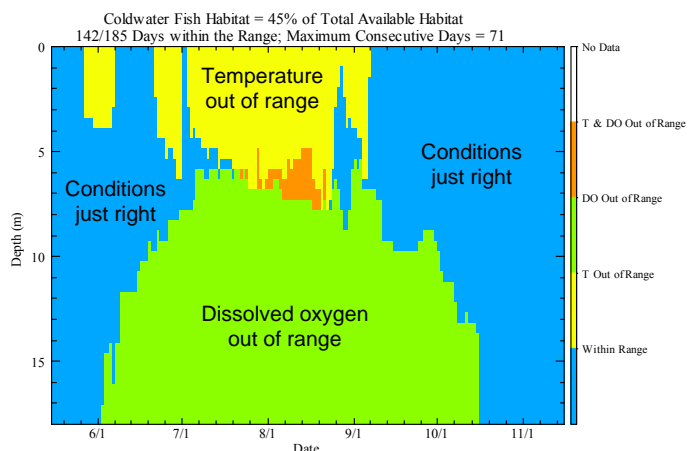
The six month period from May 15 through November 15 (185 days) is used because it encompasses the summer season when the upper waters of the lake can reach temperatures that are potentially stressful to the coldwater and coolwater fish community. Moreover, the County monitoring probes are deployed over this period and high frequency data are available. Optimal DO and temperature requirements differ for coolwater and coldwater fish species. Coolwater species prefer temperatures less than 25°C and DO concentrations of 5 mg/L or greater while coldwater species prefer temperatures less than 22°C and DO concentrations of 6 mg/L or greater. Habitat available in Onondaga Lake in 2010 is illustrated for (1) coldwater fish habitat (Table A, Figure A), and (2) coolwater fish habitat (Table B, Figure B). In both graphics, the blue color represents depth and temporal location of water temperatures and dissolved

oxygen concentrations suitable for coldwater and coolwater fish habitat, respectively. Yellow indicates where and when temperatures are out of range, while green shows where and when dissolved oxygen is out of range. Orange represents conditions where both temperature and dissolved oxygen are out of the range suitable for fish habitat.

Table A. Habitat availability for coldwater fishes in Onondaga Lake from 2000 to 2010 based on default DVT criteria¹.

Year	Coldwater Habitat		
	% of Lake Volume in Range	Total # Days In Range ² (max 185 days)	# Consecutive Days In Range ² (max 185 days)
2000	33	145	50
2001	33	140	72
2002	30	95	49
2003	31	125	47
2004	32	161	67
2005	34	115	59
2006	39	131	80
2007	36	138	65
2008	40	124	67
2009	47	156	80
2010	45	142	71

Figure A. Coldwater Fish Habitat in Onondaga Lake in 2010.



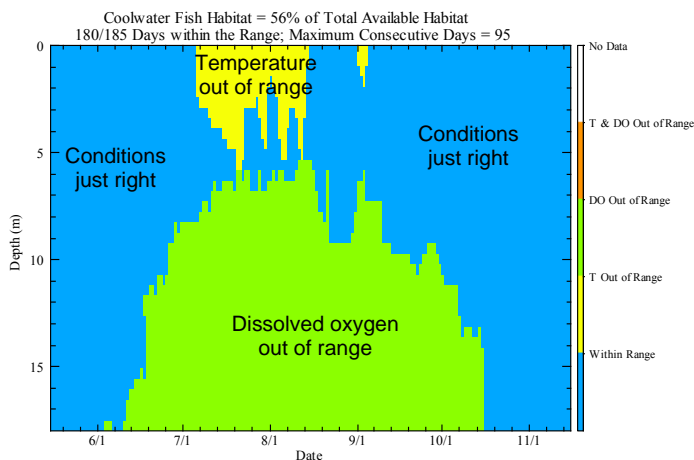
¹ Default criteria: temperature $\leq 22^{\circ}\text{C}$ and dissolved oxygen ≥ 6 mg/L, May 15 - November 15.

² Days with temperature and DO within range for a depth interval of at least one meter.

Table B. Habitat availability for cool water fishes in Onondaga Lake from 2000 to 2010 based on default DVT criteria¹.

Year	Coldwater Habitat		
	% of Lake Volume in Range	Total # Days In Range ² (max 185 days)	# Consecutive Days In Range ² (max 185 days)
2000	46	185	185
2001	46	185	185
2002	40	153	67
2003	39	172	87
2004	45	185	185
2005	43	162	89
2006	47	179	101
2007	49	184	102
2008	53	185	185
2009	56	185	185
2010	55	180	95

Figure B. Coolwater Fish Habitat in Onondaga Lake in 2010.



¹ Default criteria: temperature $\leq 25^{\circ}\text{C}$ and dissolved oxygen ≥ 5 mg/L, May 15 - November 15.

² Days with temperature and DO within range for a depth interval of at least one meter.

Library Reference 9.25

In 2010, Onondaga County began an additional quality control screening for data gathered from the river sondes and lake buoy. The Aquarius software tool screens data using pre- and post- deployment checks, in which the sondes are checked against other units, as well as the field profile data. Based on these quality control checks, the data from the sondes and lake buoy are corrected for calibration drift. The 2010 buoy and sonde data have been screened using this software tool. The following graphics (Figures C and D) illustrate the uncorrected and corrected dissolved oxygen high-resolution data obtained from the in-situ monitoring buoy at the South Deep station of Onondaga Lake.

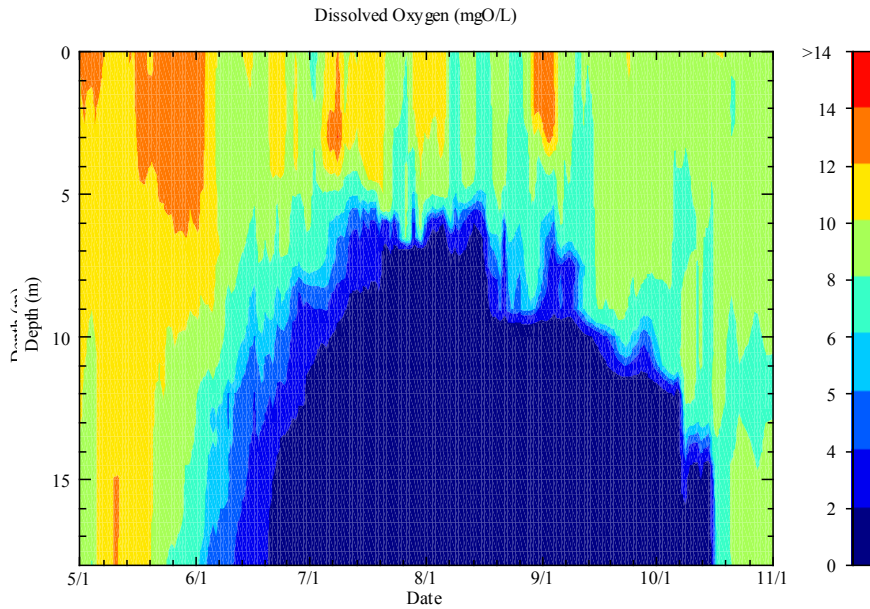


Figure C. Contour of Dissolved Oxygen at Onondaga Lake South Station in Year 2010, uncorrected buoy data. *Note: Concentrations are daily averaged.*

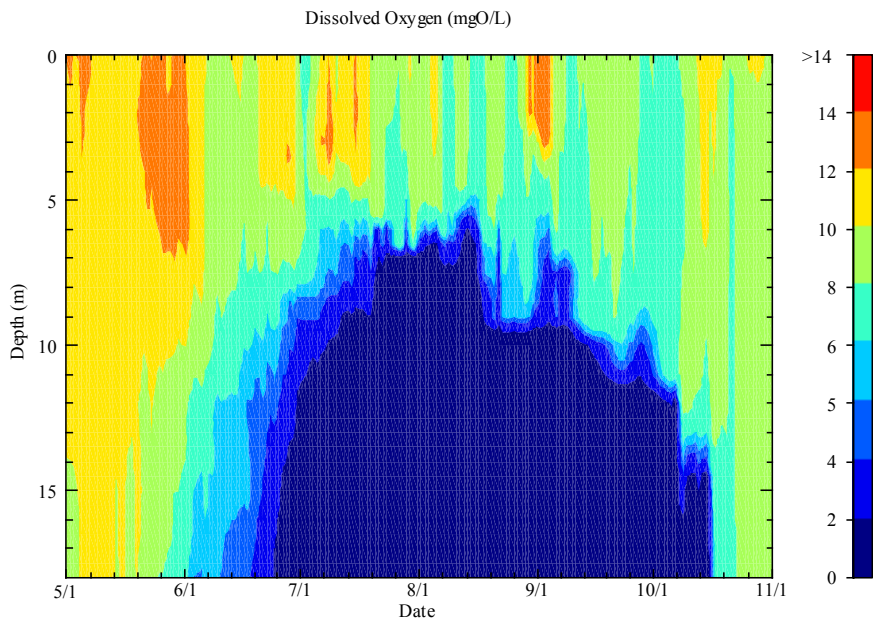


Figure D. Contour of Dissolved Oxygen at Onondaga Lake South Station in Year 2010, corrected buoy data. *Note: Concentrations are daily averaged.*