ANCHOR QEA

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MEMORANDUM

To:	Dr. Elizabeth Moran, EcoLogic, LLC	**Date:**	June 7, 2011
From:	Wen Ku, Anchor QEA Zhenyu, Lu, Anchor QEA Kevin Russell, Anchor QEA	**Project:**	090582-01.05 Task 3
Cc:	Kerry Thurston , EcoLogic, LLC		
Re:	Three Rivers System – Summary of 2010 Data		

Anchor QEA, LLC (Anchor QEA) has developed this memorandum to document our analysis of water quality data from the Seneca, Oneida, and Oswego Rivers (Three Rivers System) collected by the Onondaga County Department of Water Environment Protection (OCDWEP) during 2010. The narrative below describes the series of graphics, calculations, and tables that Anchor QEA has developed to support this assessment (attached to this memorandum), as well as our key observations.

Figure 1. Overview Map/Table 1. Summary of Sampling

- Three full water quality surveys of the Three Rivers System were conducted by OCDWEP on July 29, August 17, and September 21, 2010. During these surveys, samples were collected at several locations throughout the study area and were analyzed for a suite of water quality parameters, including phosphorus species, nitrogen species, chlorophyll-*a*, organic carbon, and dissolved oxygen (DO). In addition, in situ water quality parameters (e.g., DO, pH, salinity, and temperature) were measured at 15-minute intervals using YSI data sondes that were deployed from late May to early November at three buoy locations.

Figure 2. Temporal Plot of River Flows/Table 2. Summary of Flow Conditions

- The year 2010 can be characterized as a relatively higher flow year. Flow conditions in the Seneca River in 2010 exhibited a pattern of generally variable flows. Compared to the past two years, the summer flow conditions were higher and more variable,

with flows ranging from 1,000 to 8,000 cubic feet per second (cfs), with a relatively short low flow period in mid-September. The average summer flow rate in 2010 was approximately 2,400 cfs, which is higher than the long-term summer average of 1,700 cfs (average of summer values since 1950). During 2010, none of the reported daily average flows for the Seneca River dropped below the 7Q10 flow of approximately 350 cfs.

Figure 3. Spatial Profiles of Water Quality Parameters

- Between Cross Lake and Onondaga Lake, the Seneca River water column appeared to be vertically well-mixed during the July 29 (2,150 cfs), August 17 (1,330 cfs), and September 21 (788 cfs) surveys for most of the measured water quality parameters. However, the data exhibited stratification in certain cases, such as DO just downstream of Cross Lake for the July and August surveys. Likewise, stratified conditions were observed during one or more of the surveys for several of the measured parameters (i.e., DO, ammonia, nitrate, certain phosphorus species, total organic carbon, salinity/chloride, and chlorophyll-*a*) between the Onondaga Lake outlet and the Three Rivers Junction.
- Similar to 2009, there were seasonal differences between the July/August surveys and the September survey. The July/August surveys exhibited a strong spatial pattern indicating the prevalence of zebra mussel activities from Cross Lake to the Onondaga Lake outlet. The September survey exhibited little to no trend indicating the slowdown of zebra mussel activities.
- Generally, in 2010 the spatial trends of the water quality parameters were consistent with those measured under similar flow conditions in previous years (e.g., 2009). Although the flow rate in summer 2010 was in average higher than it was in 2009, all three water quality surveys in 2010 were conducted during lower flow periods. Thus, the spatial patterns in 2010 were somewhat more pronounced than they were in 2009, especially in the section from the Onondaga Lake outlet to the Three Rivers Junction. Overall, the spatial trends in 2010 were less pronounced than those typically observed under the lower flow conditions sampled in the past
- Water quality trends in 2010 from Cross Lake to the Onondaga Lake outlet were different from those between the Onondaga Lake outlet and the Three Rivers Junction; a general description of these trends is as follows:
  - Between Cross Lake and the Onondaga Lake outlet:

- During the July and August surveys, soluble reactive phosphorus (SRP) concentrations increased while Chlorophyll-*a* concentrations decreased, due to zebra mussel activities.
- During the September survey, the SRP concentrations exhibited little to no trend, while Chlorophyll-*a* concentrations were variable but did not show a strong spatial pattern either. Together, these patterns suggest that zebra mussel activities may have slowed down during this time of the year. In addition, unlike past years, the Chlorophyll-*a* concentration exhibited some level of vertical stratification in this section of the river, with higher concentrations observed in the bottom water samples at Buoys 397, 316, and 294.
- During the July and August surveys, DO concentrations generally exhibited slight stratification between Cross Lake and the Onondaga Lake outlet, with surface DO concentrations being approximately 1 milligram per liter (mg/L) higher than the bottom DO. Larger differences, with the bottom DO concentrations being up to 4 mg/L lower, were observed at the first two sampling stations downstream of Cross Lake in the July and August surveys. These conditions are likely a result from low DO concentration water entering the river from the deeper portions of the lake. Between Cross Lake and the Onondaga Lake outlet, DO concentrations in both surface and bottom layers gradually decreased by 2 to 3 mg/L across the area as a result of zebra mussel respiration and sediment oxygen demand. During the September survey, DO concentrations decreased only slightly (less than 1 mg/L) across the area possibly due to a slowdown of zebra mussel activities (consistent with the patterns noted above for SRP and Chlorophyll-*a*).
- Ammonia-N (NH3-N) exhibited an increasing trend between Cross Lake and the Onondaga Lake outlet during the July and August surveys (more prominent during the August survey) and remained relatively constant during the September survey. This change most likely reflected the change in zebra mussel activities during this time of the season, as noted above. Nitrite (NO2-N) and nitrate (NO3-N) concentrations exhibited little change across most of the area, except for anomalously large fluctuations of NO3-N in the surface samples at two locations near Cross Lake during the September survey. The reason for these large NO3-N fluctuations is unclear since no unusual results were observed for the other water quality parameters at these two locations.

- Between the Onondaga Lake outlet and the Three Rivers Junction:
  - SRP concentrations appeared to slightly decrease near the Onondaga Lake outlet during the July and August surveys, likely due to the mixing with deep waters and Onondaga Lake inflows (both of which have lower SRP concentrations). SRP concentrations generally increased moving downstream towards the Three Rivers Junction likely as a net result of zebra mussel activity and/or sediment flux. The surface SRP concentrations were somewhat lower than bottom SRP during the September survey, similar to the low flow surveys in September of 2007 and 2009. The SRP depletion in the surface waters during the September survey was also accompanied by an increase in DO and Chlorophyll-*a* concentrations, suggesting algal activity (and/or a diminishing of zebra mussel filtration) is responsible for the observed pattern.
  - Consistent with past years, stratification downstream of the outlet was observed for salinity, DO (August and September, but not in July), and to a much lesser extent, temperature. These observations were likely due to the influx of Onondaga Lake water, limited vertical mixing, and potential inflow of groundwater in the area of the "Deep Hole."
  - NH3-N concentrations exhibited little change during the July survey and stratified conditions during the August and September surveys. The stratification was probably due to algal uptake in the surface waters, inflow of dense water from Onondaga Lake, the limited vertical mixing in the area of the "Deep Hole," and possibly flux from sediments in this area.
  - NO3-N concentrations exhibited a strong vertical stratification, with high bottom layer concentrations (up to 1.8 mgN/L), just downstream of the Onondaga Lake outlet. This stratification was due to the relatively high concentration of bottom waters that entered the river from the lake and the limited vertical mixing in the area of the "Deep Hole." In all three surveys, the surface NO3-N concentrations increased as the river flowed to the Three Rivers Junction as a result of vertical mixing.

Figure 4. Temporal Profiles of YSI Sondes

- Temporal trends in the high frequency DO data recorded by the YSI sondes exhibited stratification at Buoy 409, with several periods of low concentrations in the bottom waters, as well as large diurnal variations. Similar to 2009, DO data at Buoys 316 and

236 showed less day-to-day variability and little stratification, except during mid-August at Buoy 236.

Tables 3 and 4. Summary of Compliance with Water Quality Standards in the Three Rivers System

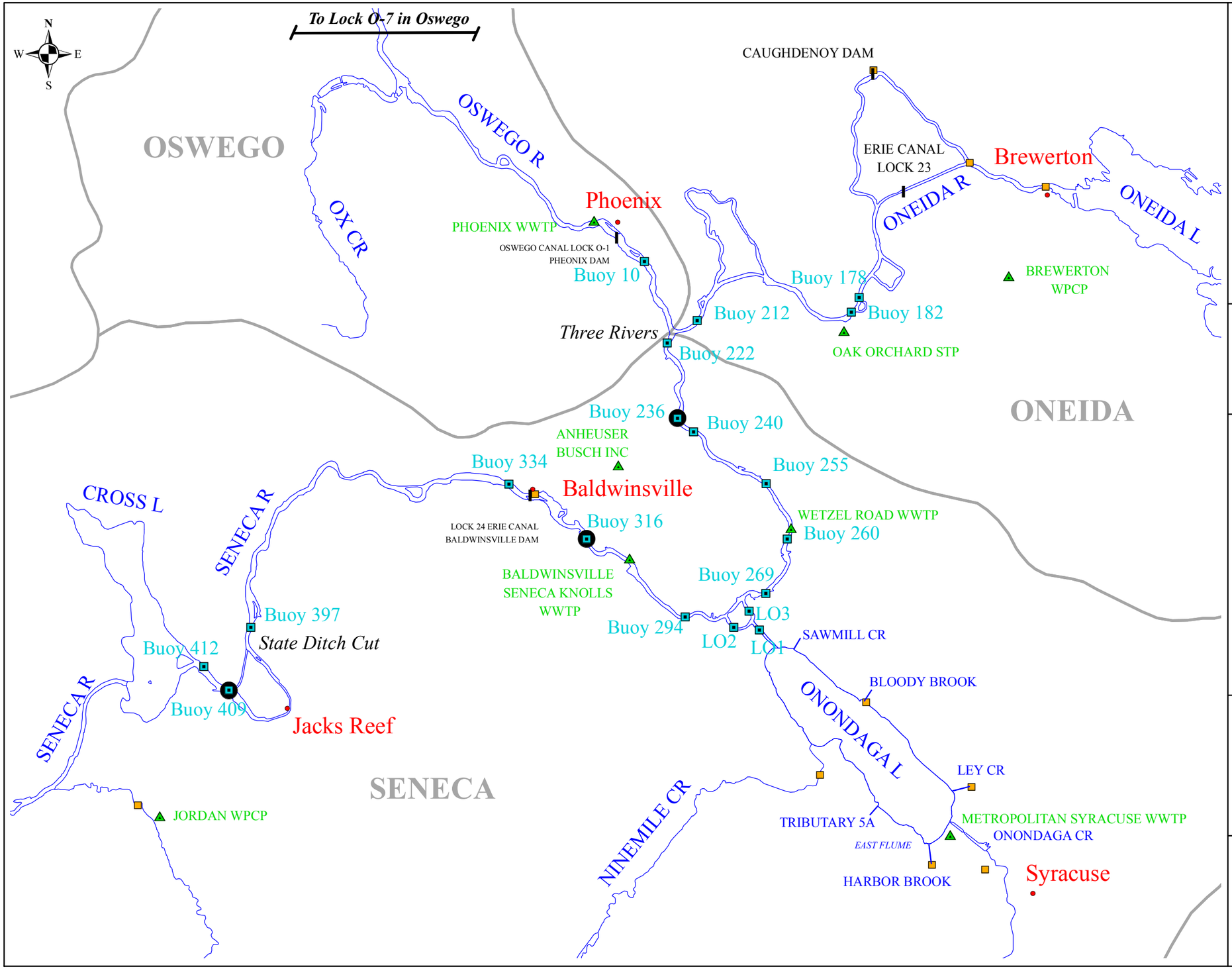
- From the three routine water quality surveys, the data showed 12 violations of the New York State Department of Environmental Conservation (NYSDEC) instantaneous minimum DO standard of 4 mg/L during the August survey. Violations occurred in both surface and bottom samples at Buoys 334, 316, and 294, and in the bottom samples only at Buoys 269, 260, 255, 240, 222, and 10. The DO standard was also violated in one sample collected from the Onondaga Lake outlet bottom waters during the September survey. There were no observed violations of the NH3-N or NO2 standards.
- In 2010, DO standard violations were observed in the 15-minute in situ data collected by the YSI sondes. For days during which the sondes were in operation, the daily instantaneous standard of 4 mg/L was exceeded in 18%, 17%, and 28% of those days at Buoys 409, 316, and 236, respectively. Likewise, the daily average DO standard of 5 mg/L was exceeded in 14%, 22%, and 28% of those days. The frequency of such violations in 2010 was slightly less than that from 2009 at Buoys 409 and 316, but slightly higher at Buoy 236, due to low DO concentrations at the bottom layer measured during mid-August in 2010. Overall, the water quality conditions in 2010 exhibited an improvement in terms of regulatory compliance when compared with previous lower flow years (e.g., 2007).

Three Rivers System – 2010 Major Findings

- The water quality data collected in 2010 during the three full river surveys were generally similar to data collected in previous years. The data measured during the individual surveys were reflective of the predominant processes occurring in the river at that time of the year, including varying flow conditions, zebra mussel activities, inflow from Onondaga Lake, and vertical mixing within the water column.
- The average summer flow rate in 2010 was slightly higher than the long-term summer average, but it was much higher than what might be considered a summer low flow condition. As a result, the spatial trends of water quality parameters during the July and August surveys were similar in surface and bottom waters and, overall,

less pronounced than those typically observed under the lower flow conditions sampled in the past.

- Similar to 2009, there were seasonal differences between the July/August surveys and the September survey. The spatial patterns for the water quality parameters were more pronounced during the July/August surveys than they were during the September survey. This was mostly reflected the prevalence of zebra mussel activities during the July and August surveys and the slowdown of activities during the September survey.
- Due to the somewhat higher flows, the water quality conditions in 2010 exhibited an improvement in terms of regulatory compliance when compared with previous lower flow years (e.g., 2007).



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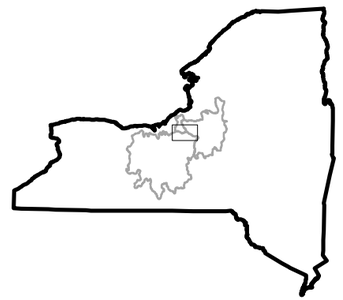

SCALE

1 0.5 0 1 2 3 Miles

LEGEND

- AMP Sampling Locations
- YSI Sonde Locations
- Wastewater Treatment Plants
- Locks and Dams
- Cities / Towns
- USGS Gages
- Shoreline
- Watershed Boundaries

Figure 1. Overview of AMP River Sampling Locations within the Three Rivers System

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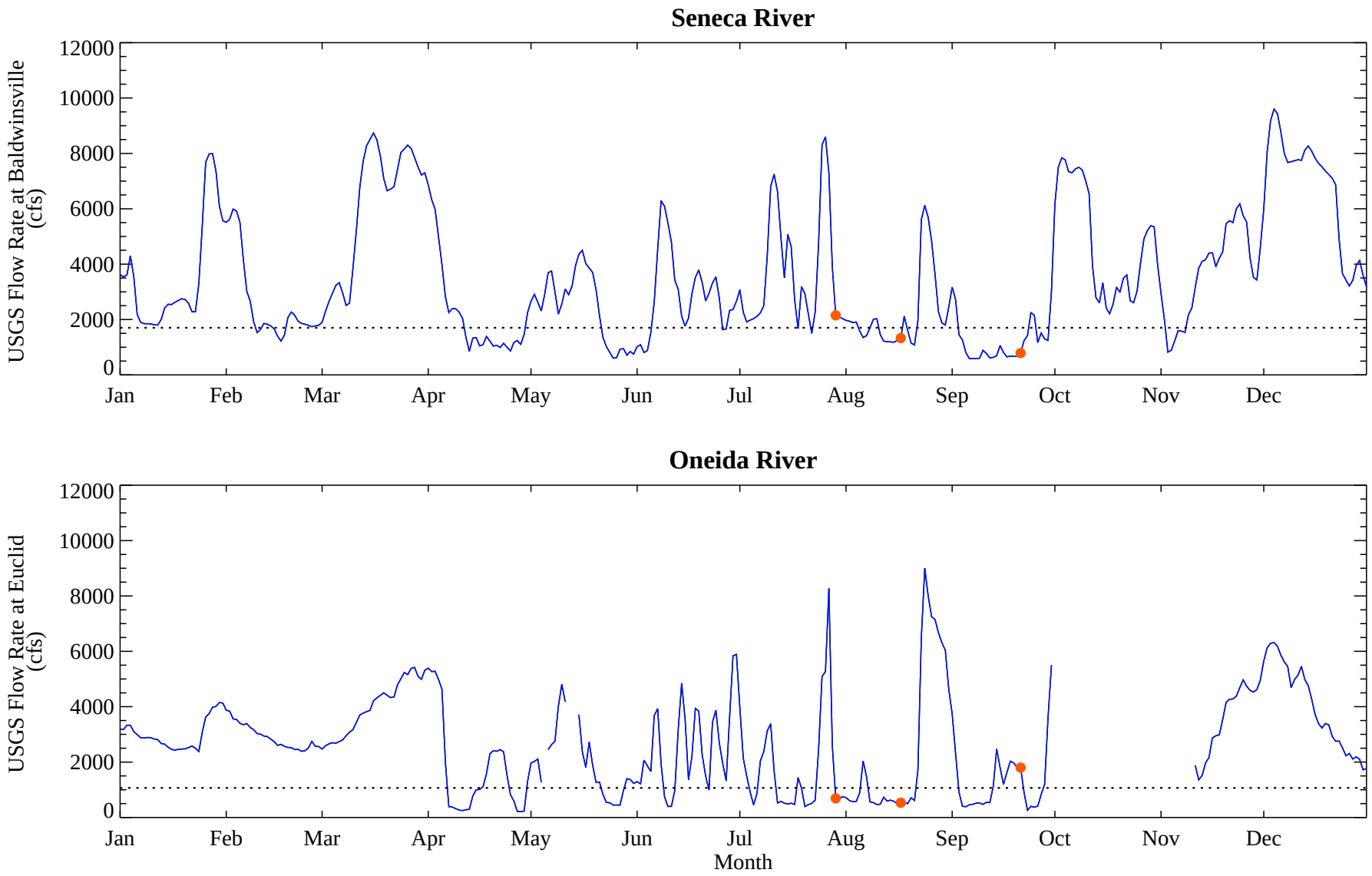

Figure 2. Temporal Plot of River Flows

Temporal plot of USGS flows at Seneca River and Oneida River as well as days that AMP river surveys were conducted during 2010.

Note: (1) Points represent OCDWEP water quality sampling dates.
(2) USGS gage did not report data for Euclid station in October and a few days in May and November.

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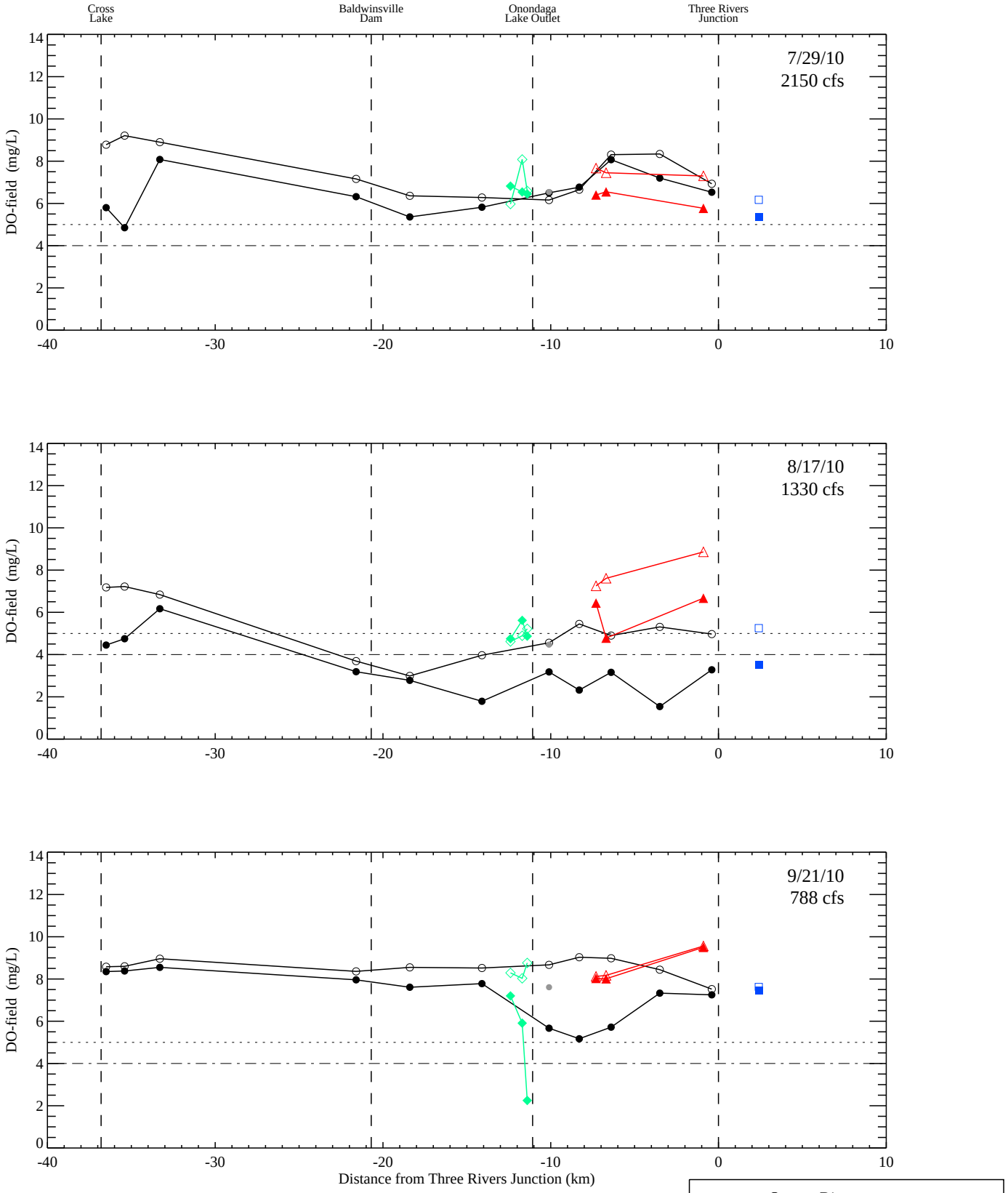

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of dissolved oxygen collected from the Three Rivers System during 2010.

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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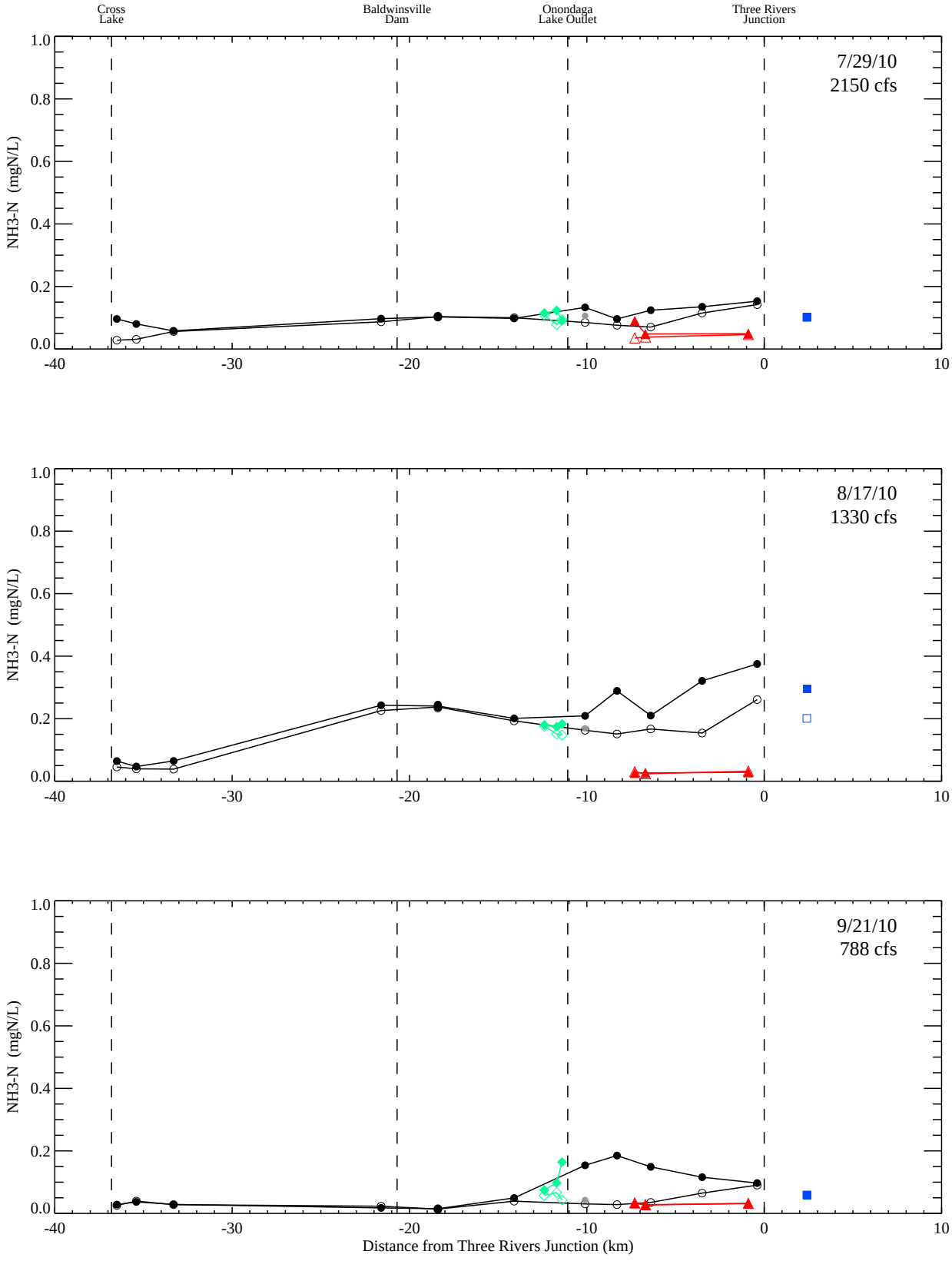

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of ammonia collected from the Three Rivers System during 2010.

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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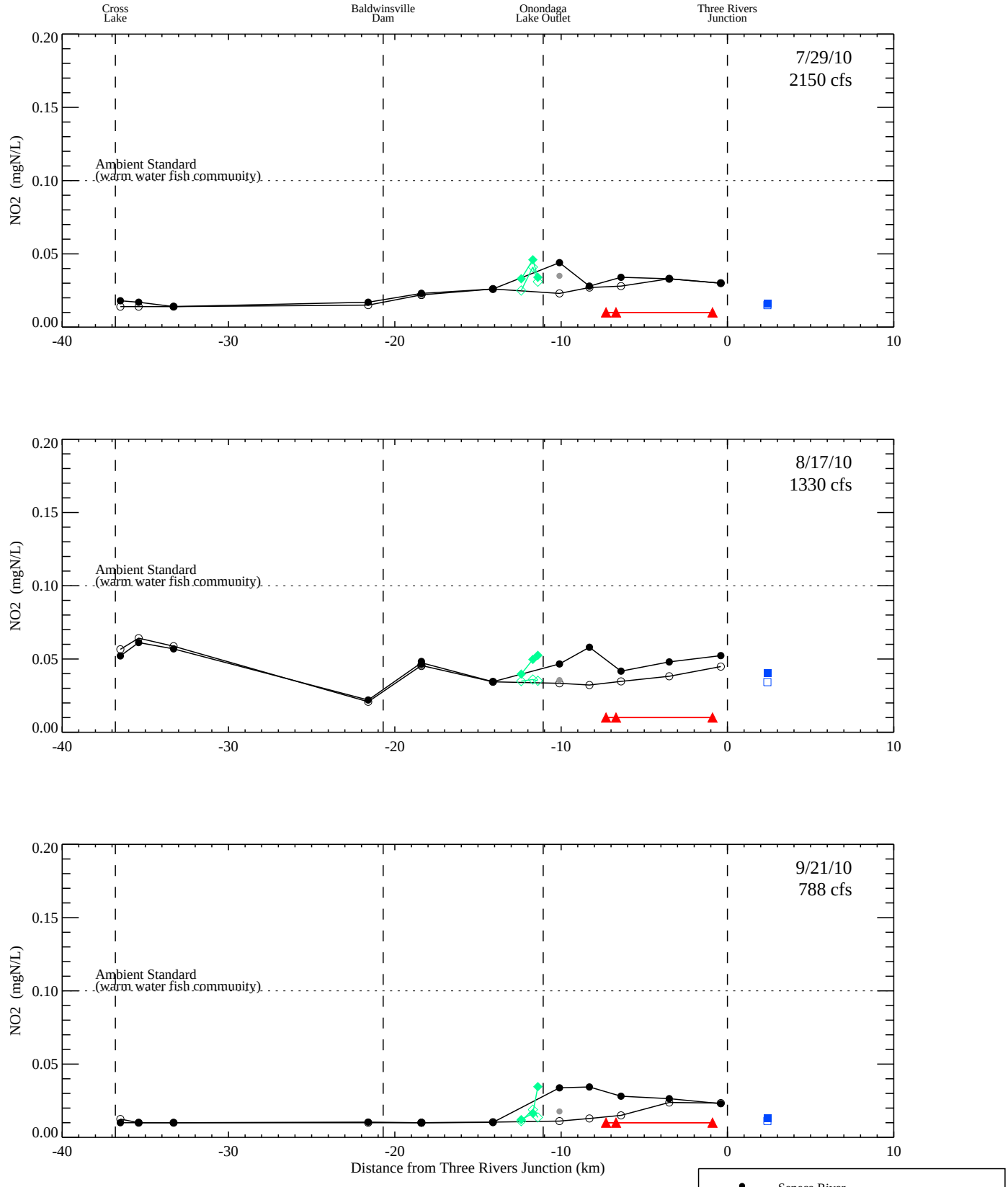

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of nitrite collected from the Three Rivers System during 2010.

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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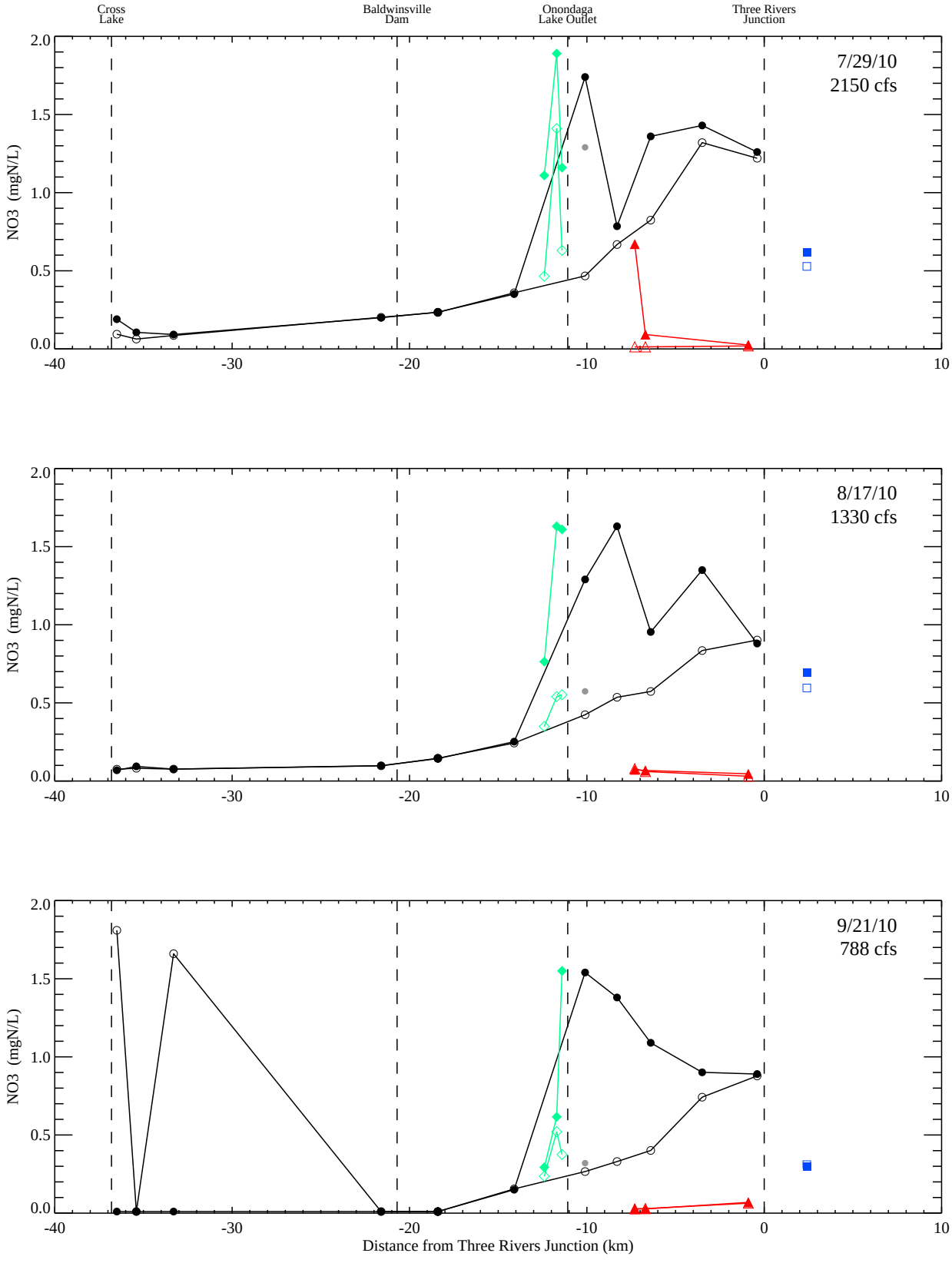

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of nitrate collected from the Three Rivers System during 2010.

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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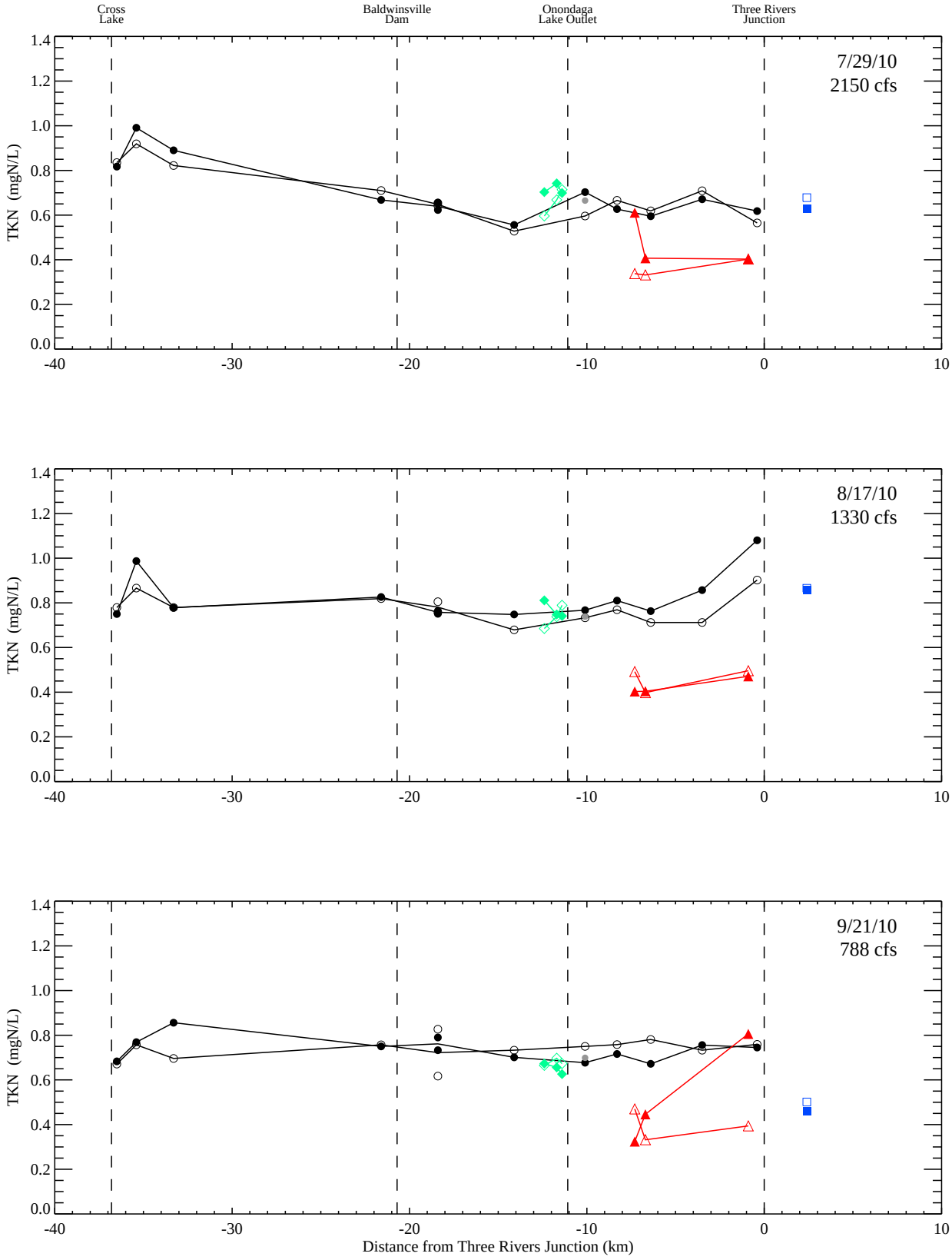

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of TKN collected from the Three Rivers System during 2010.

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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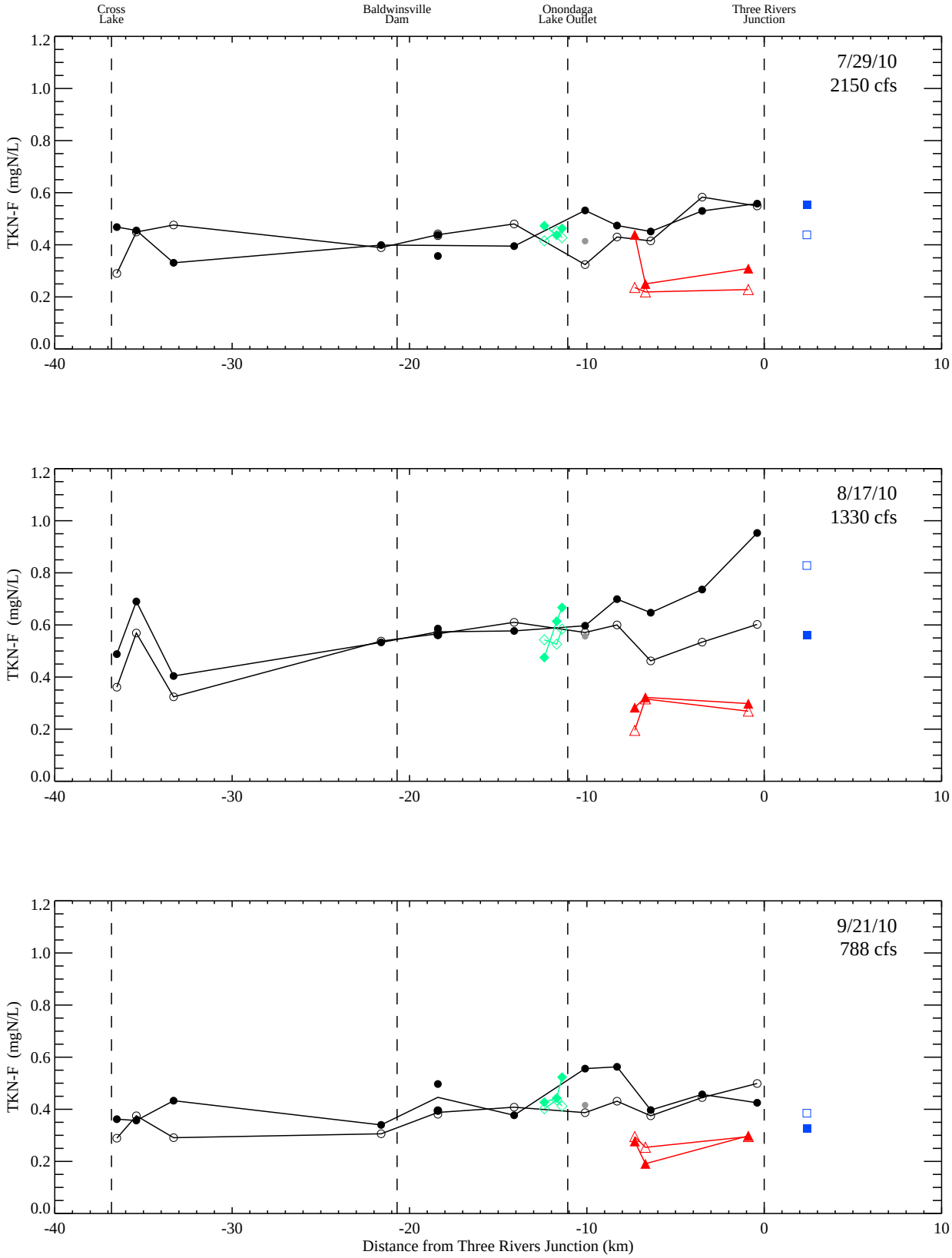

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of TKN (filtered) collected from the Three Rivers System during 2010.

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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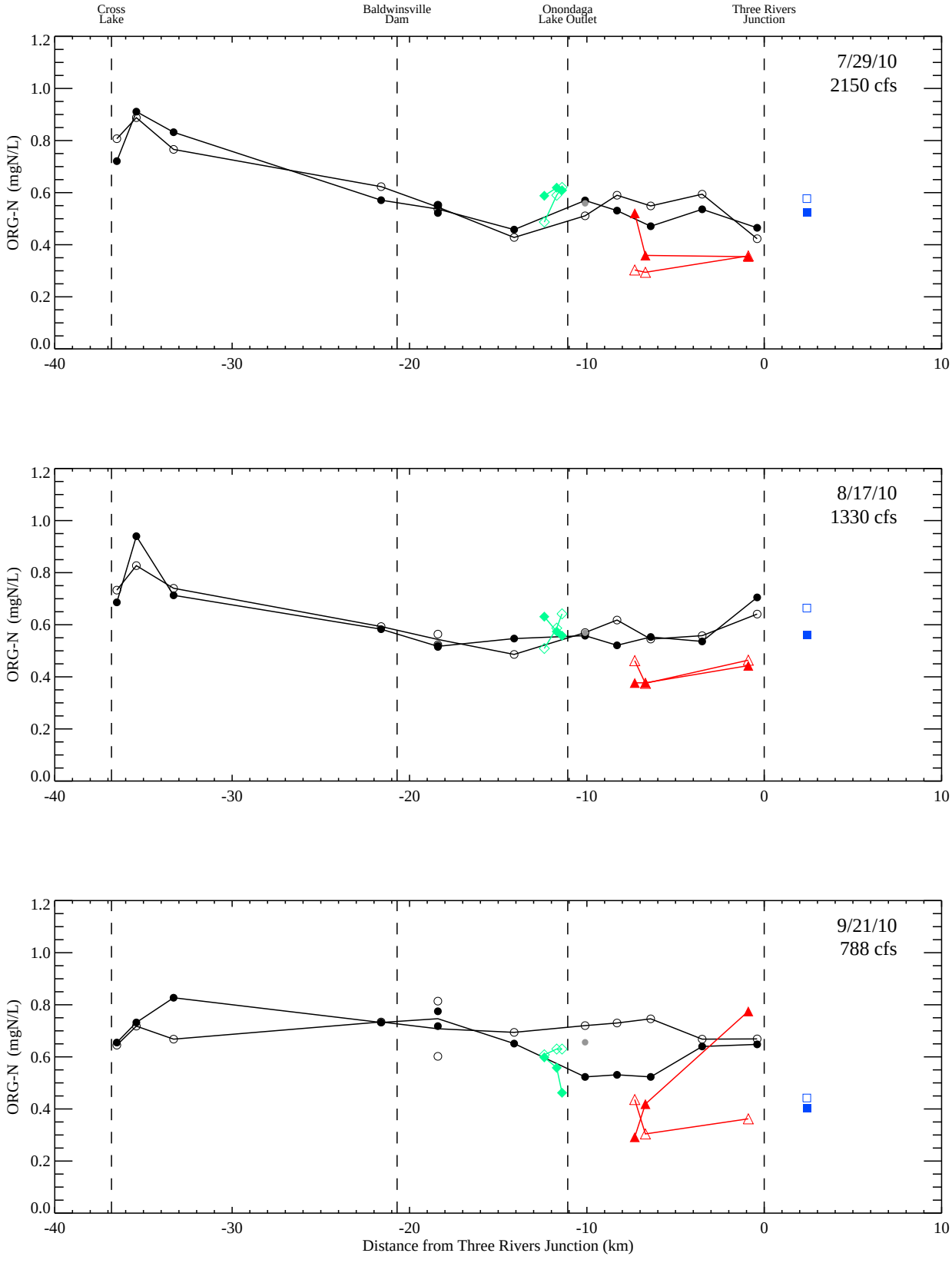

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of organic N collected from the Three Rivers System during 2010.

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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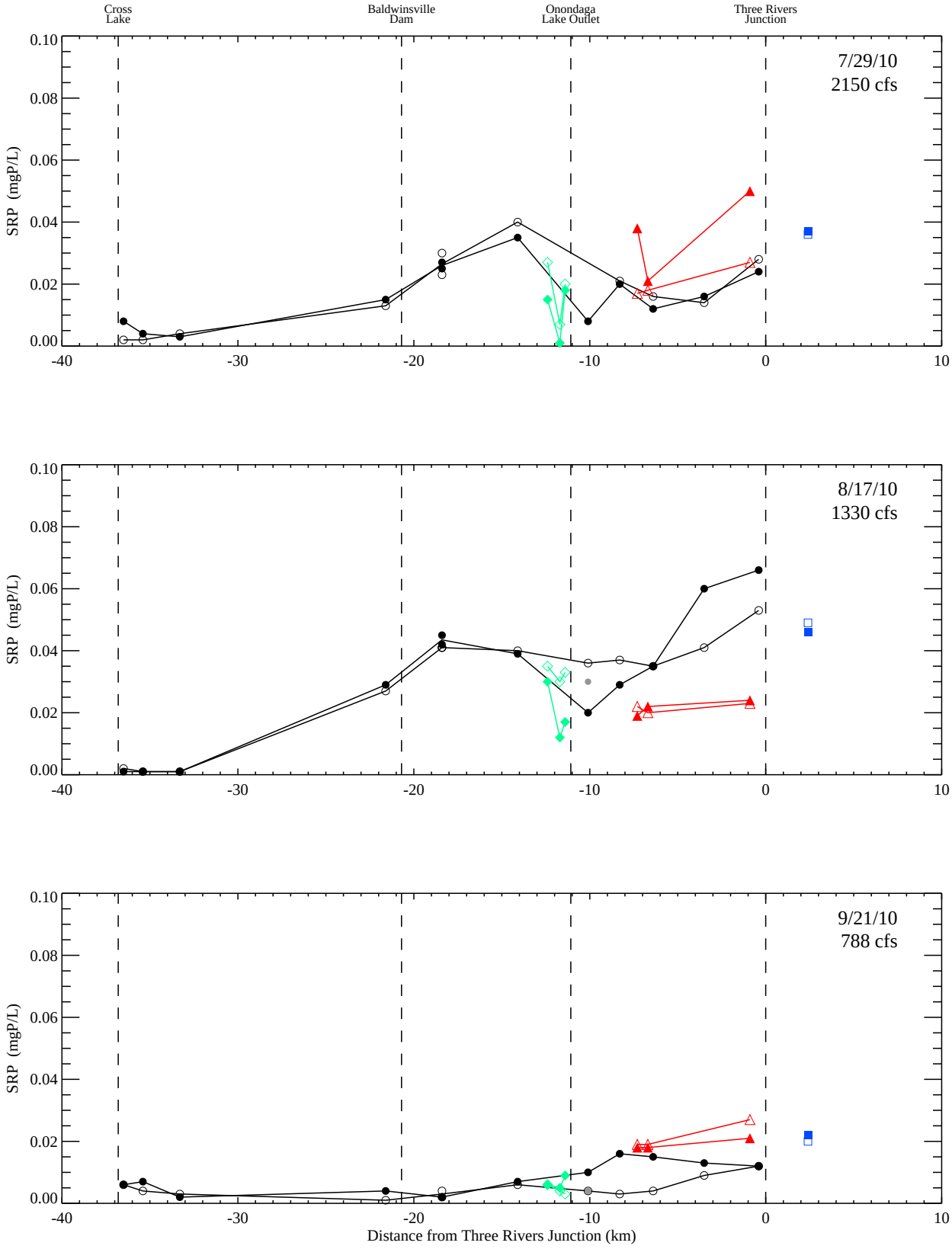

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of SRP collected from the Three Rivers System during 2010.

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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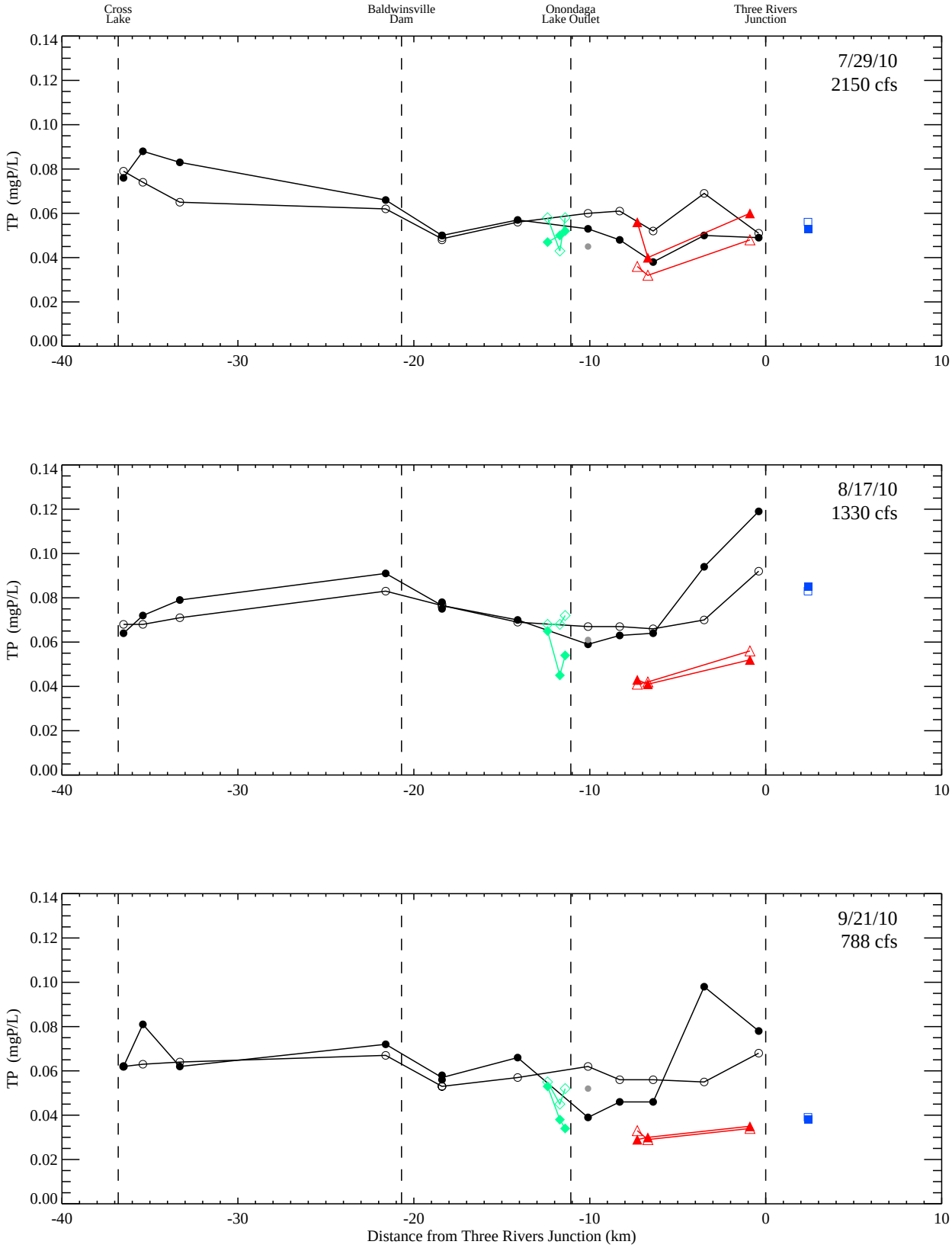

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of total P collected from the Three Rivers System during 2010.

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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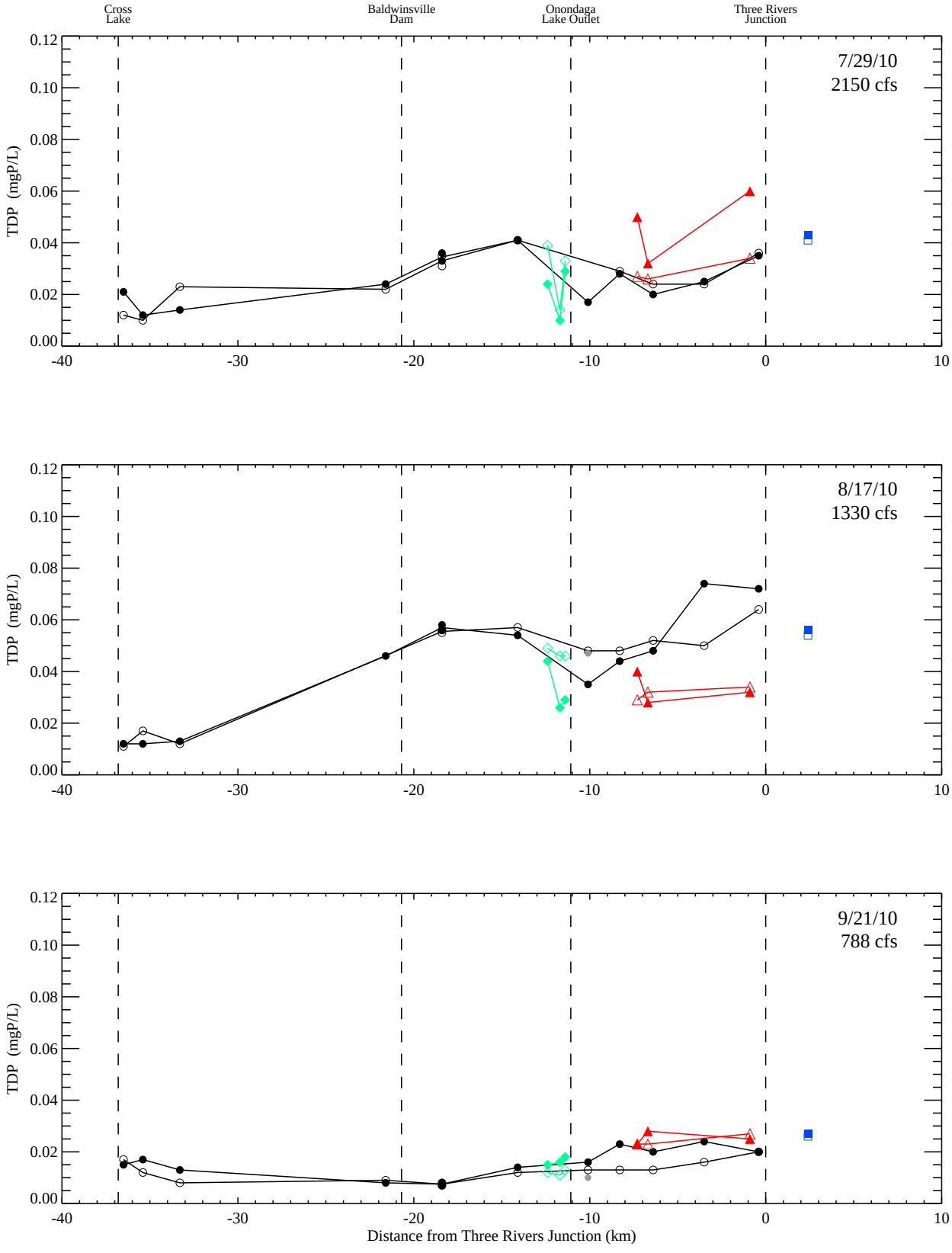

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of total dissolved P collected from the Three Rivers System during 2010.

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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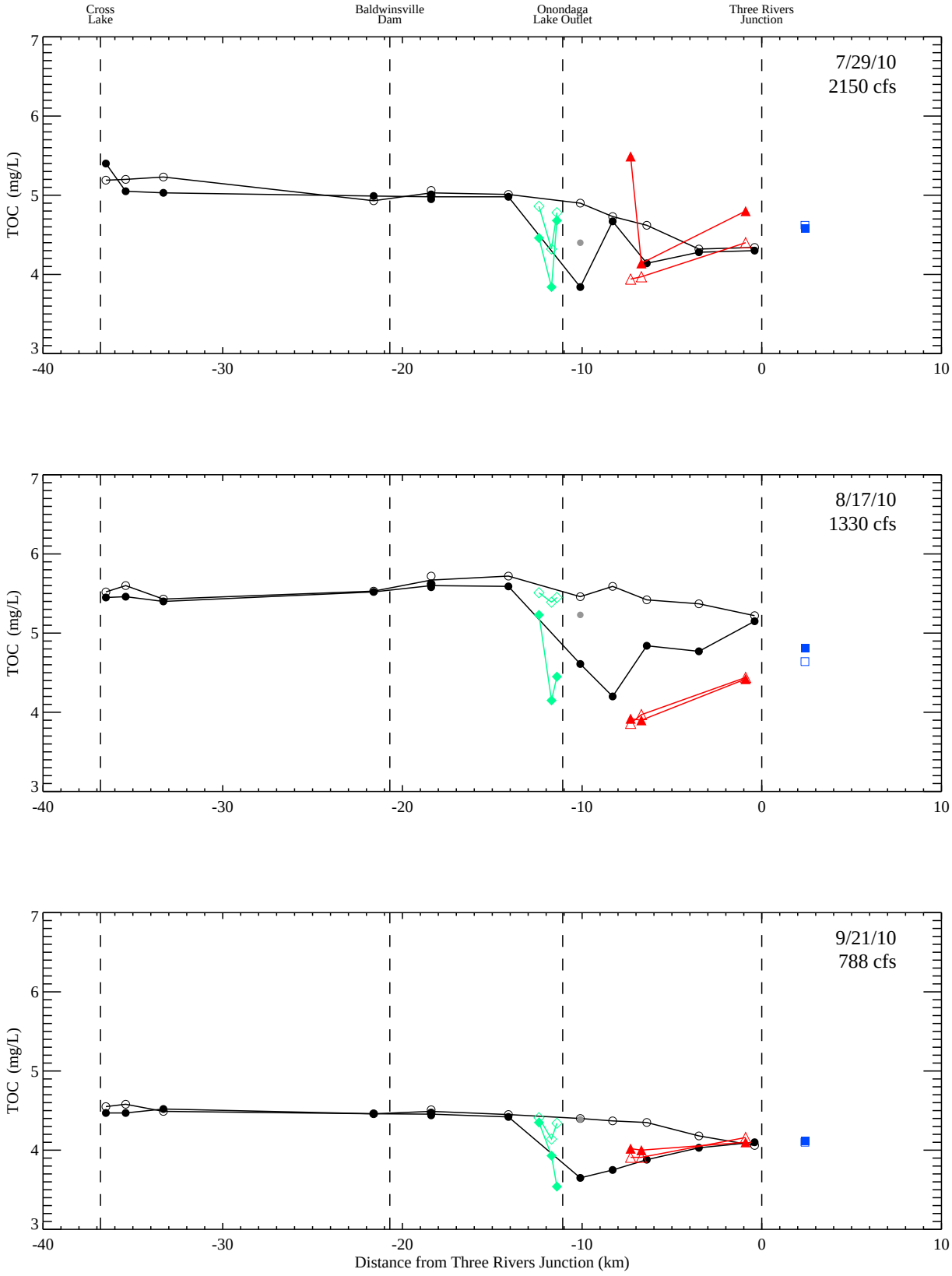

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of TOC collected from the Three Rivers System during 2010.

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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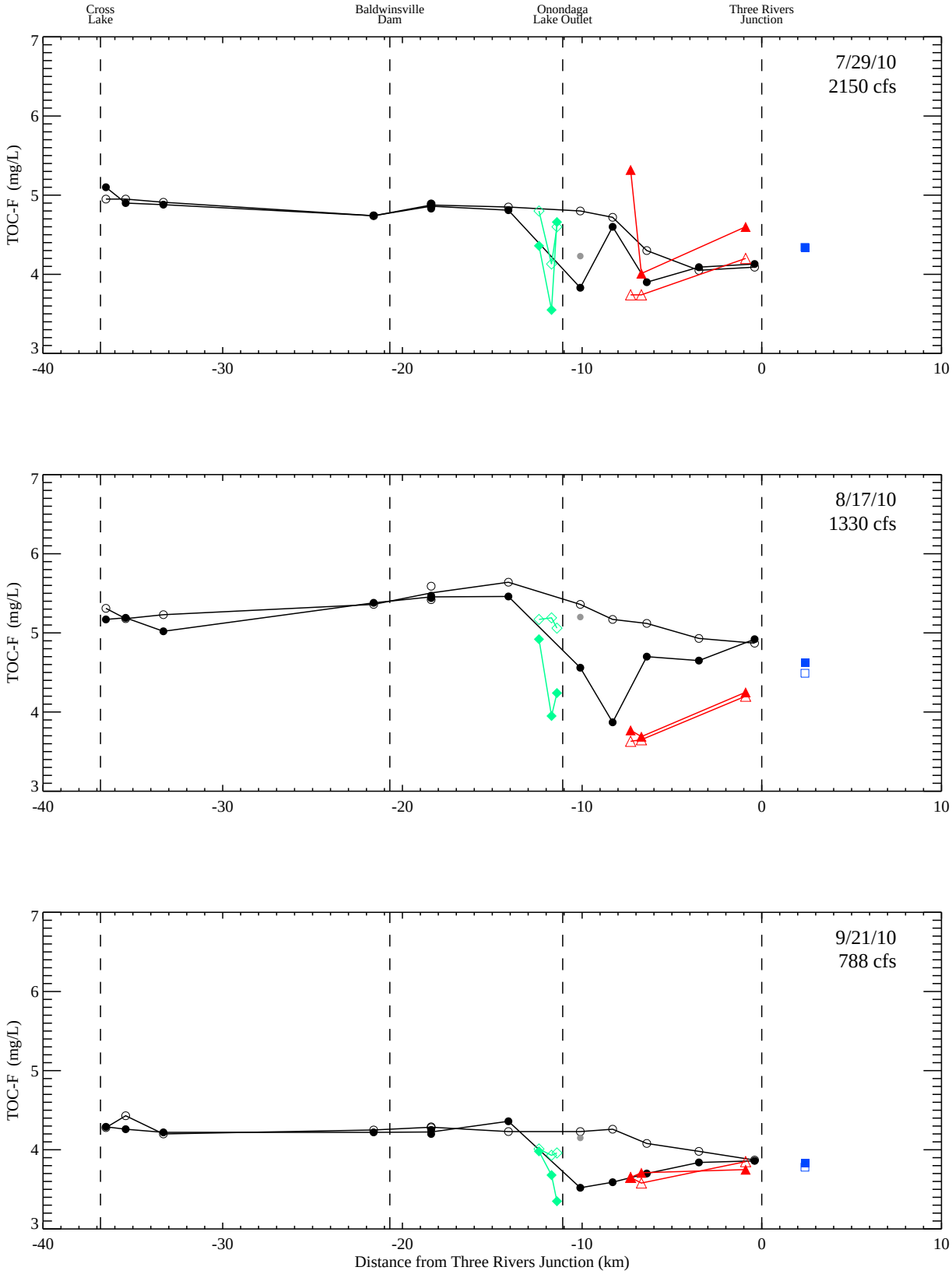

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of TOC (filtered) collected from the Three Rivers System during 2010.

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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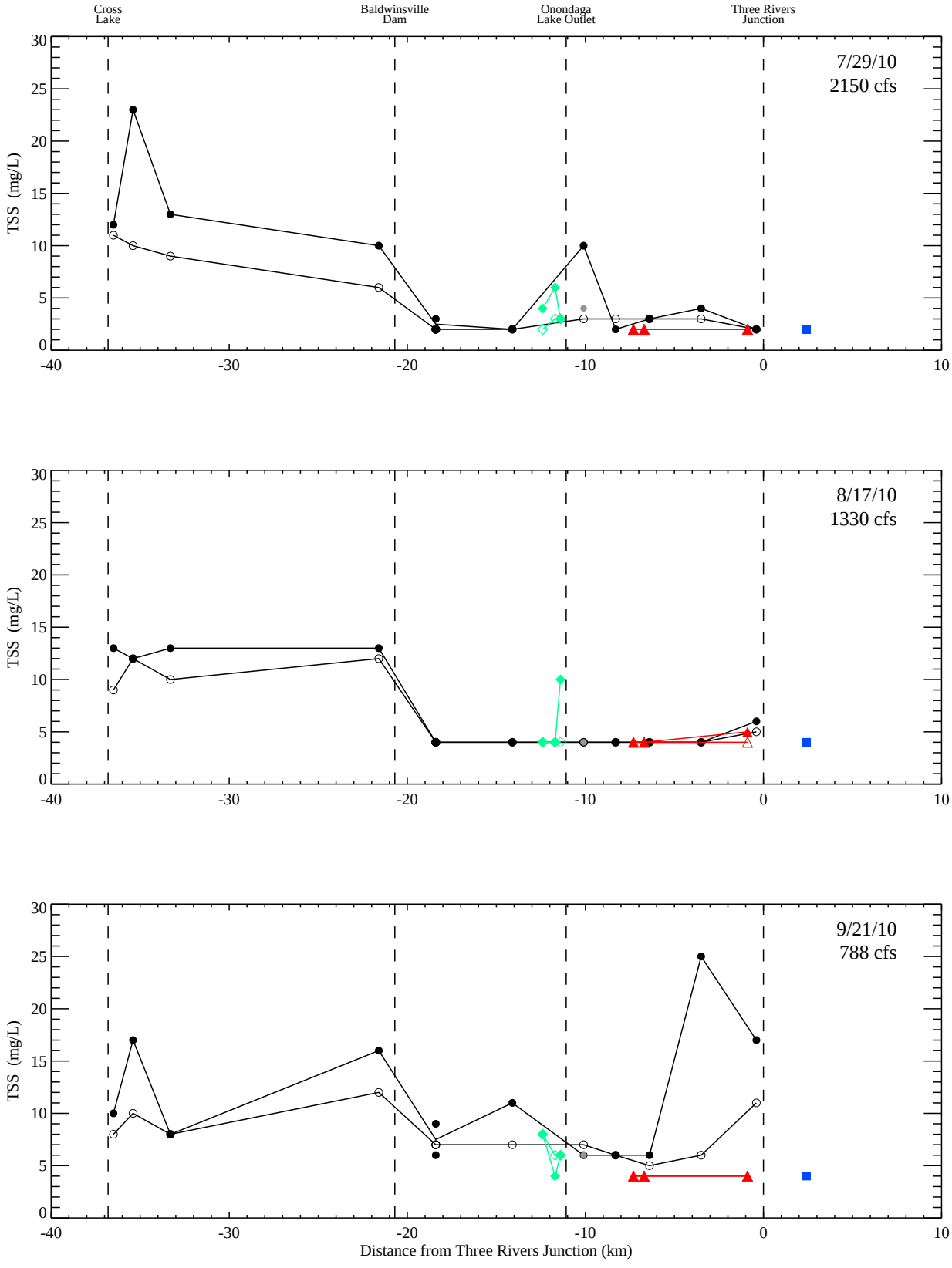

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of TSS collected from the Three Rivers System during 2010.

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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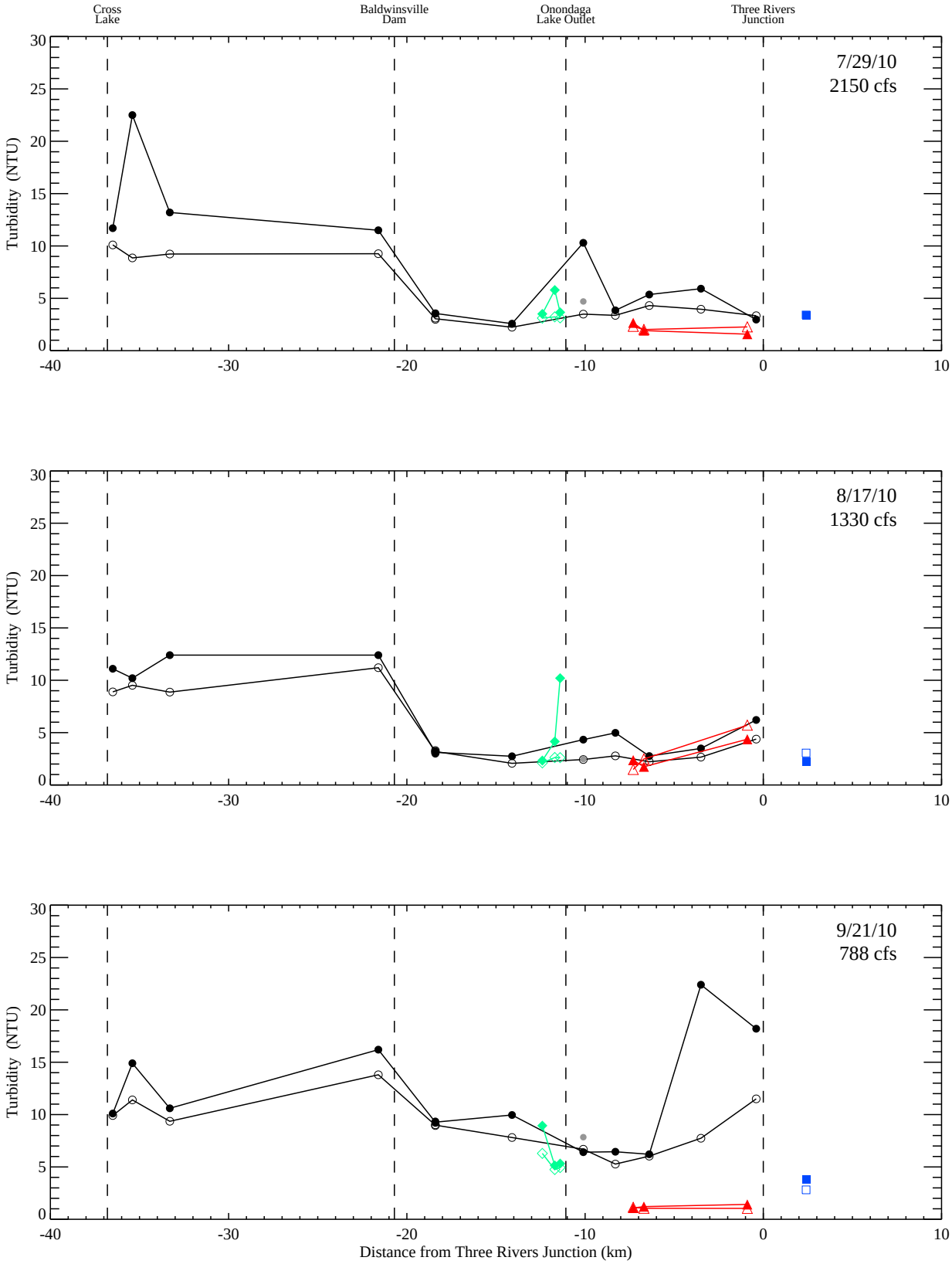

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of turbidity collected from the Three Rivers System during 2010.

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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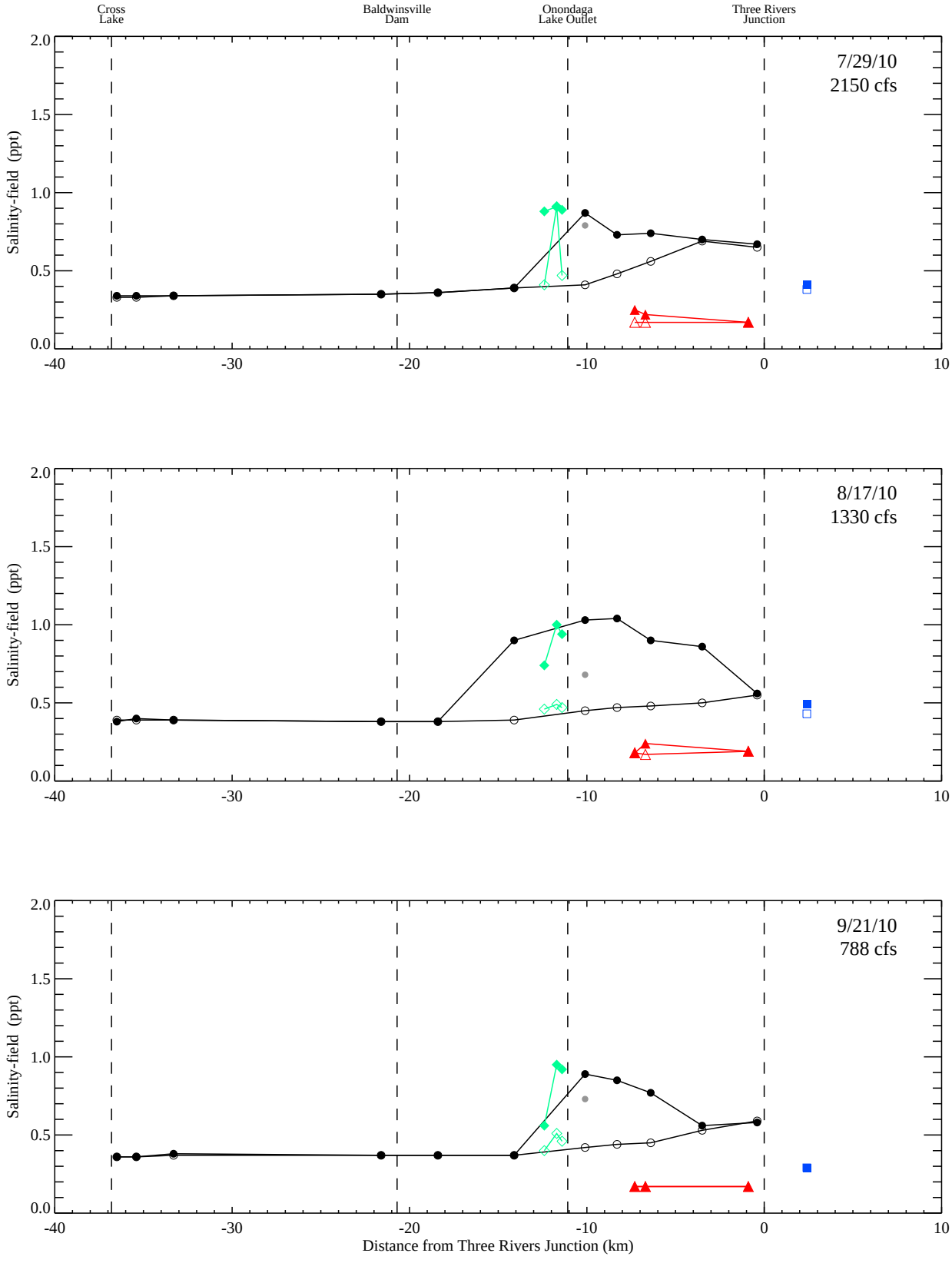

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of salinity collected from the Three Rivers System during 2010.

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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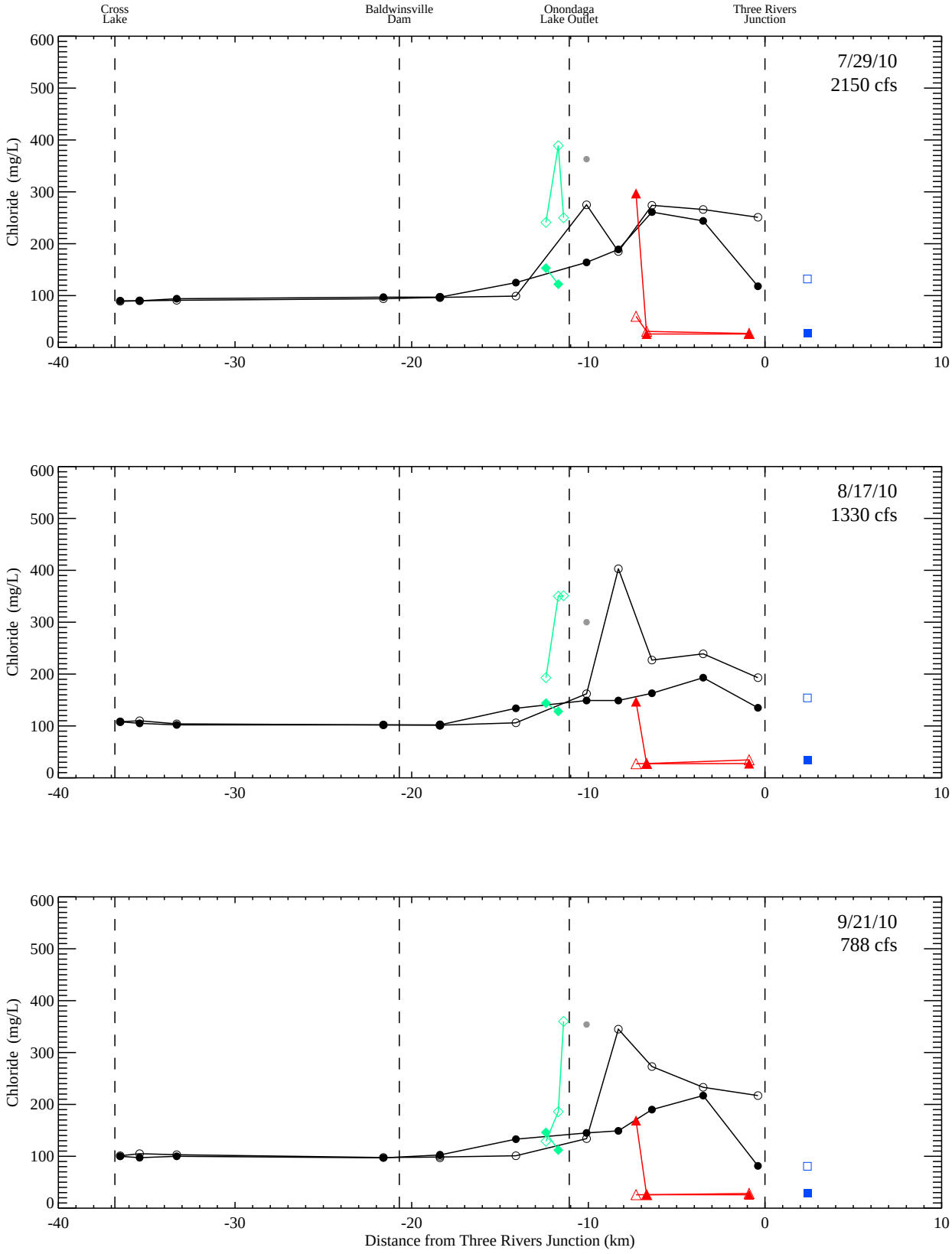

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of chloride collected from the Three Rivers System during 2010.

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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Fri Jun 03 11:32:52 2011

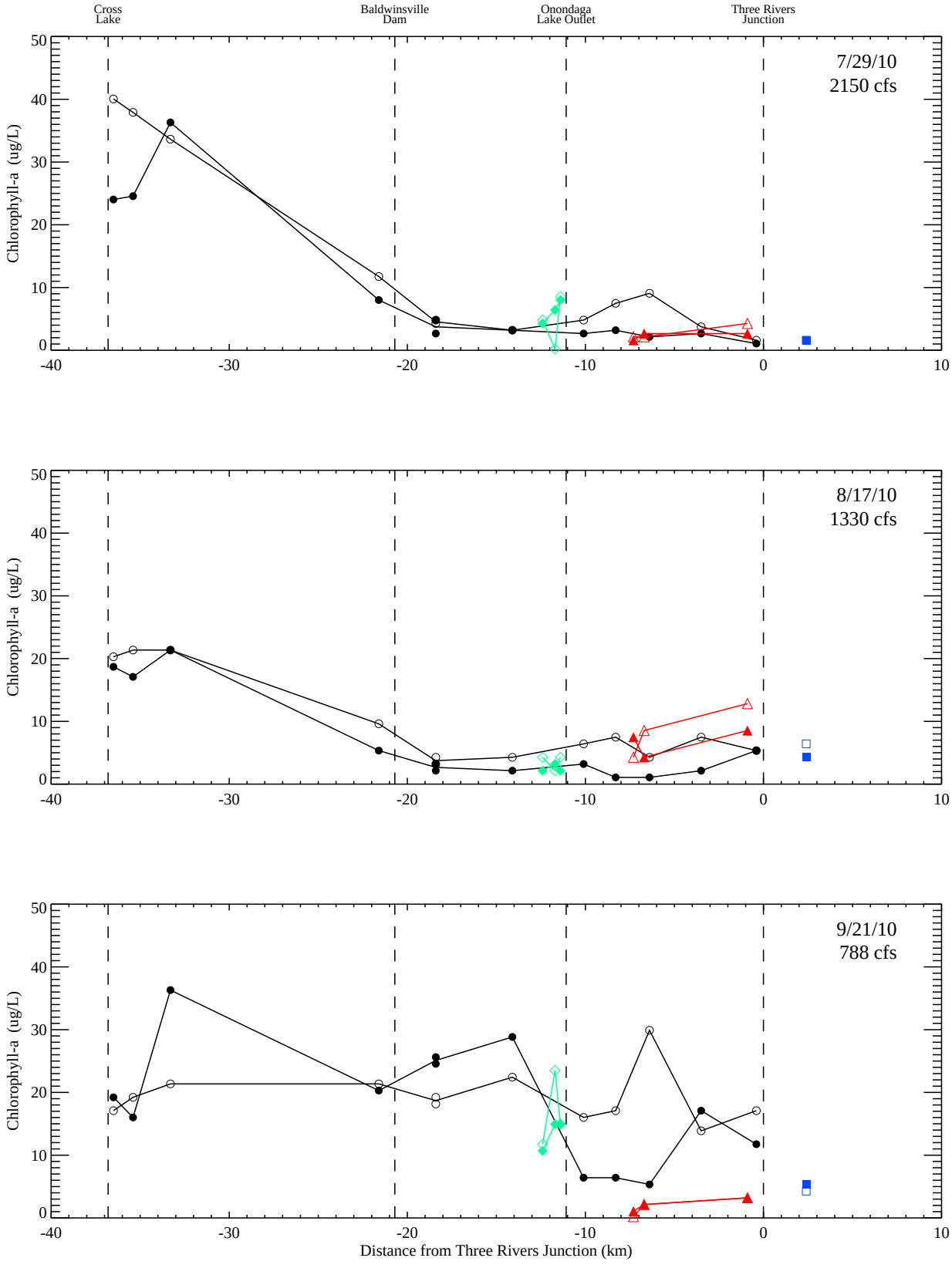

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of chlorophyll-a collected from the Three Rivers System during 2010.

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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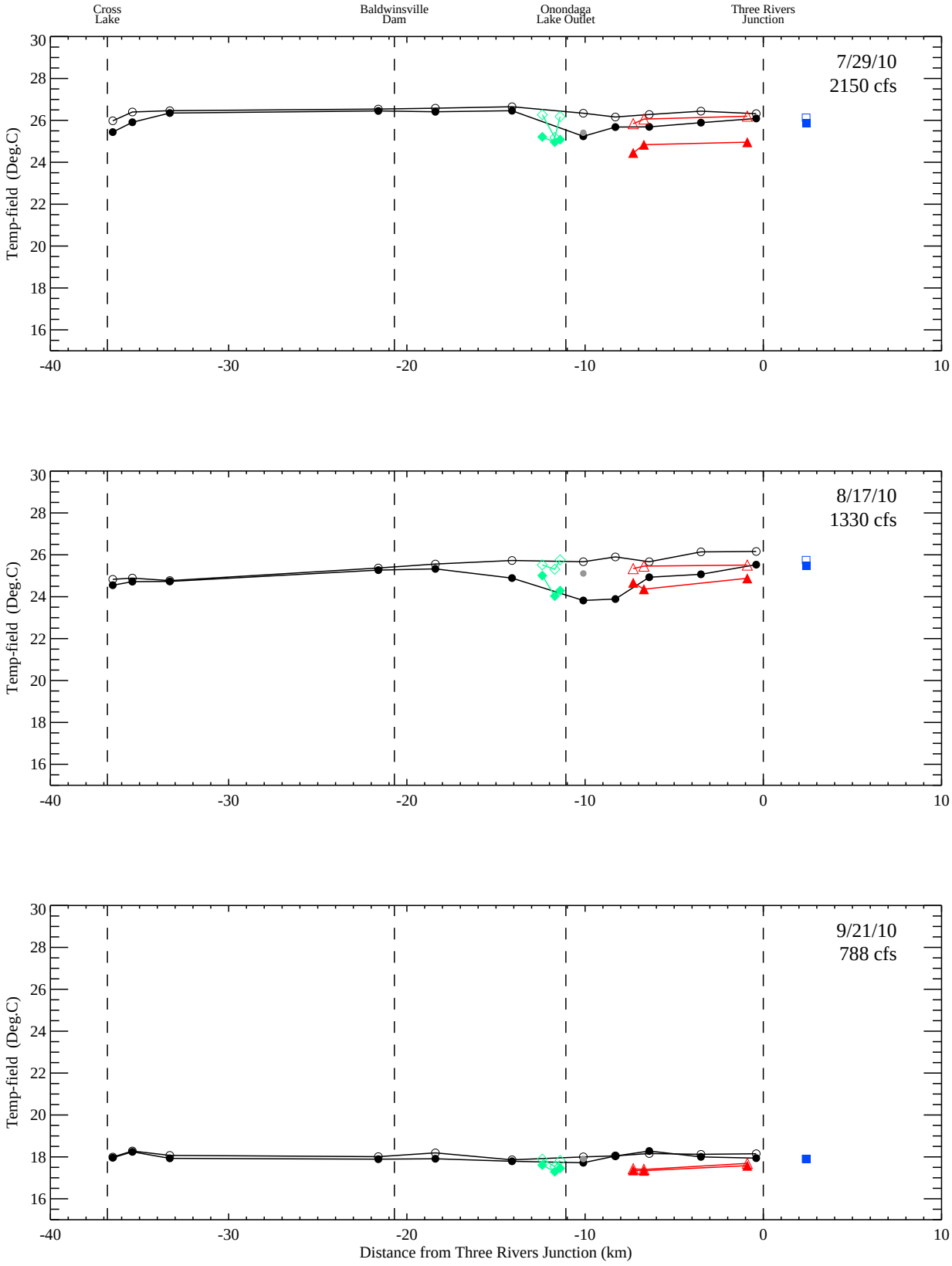

Figure 3. Spatial Profiles of Water Quality Parameters

Spatial profiles of pheophytin-a collected from the Three Rivers System during 2010.

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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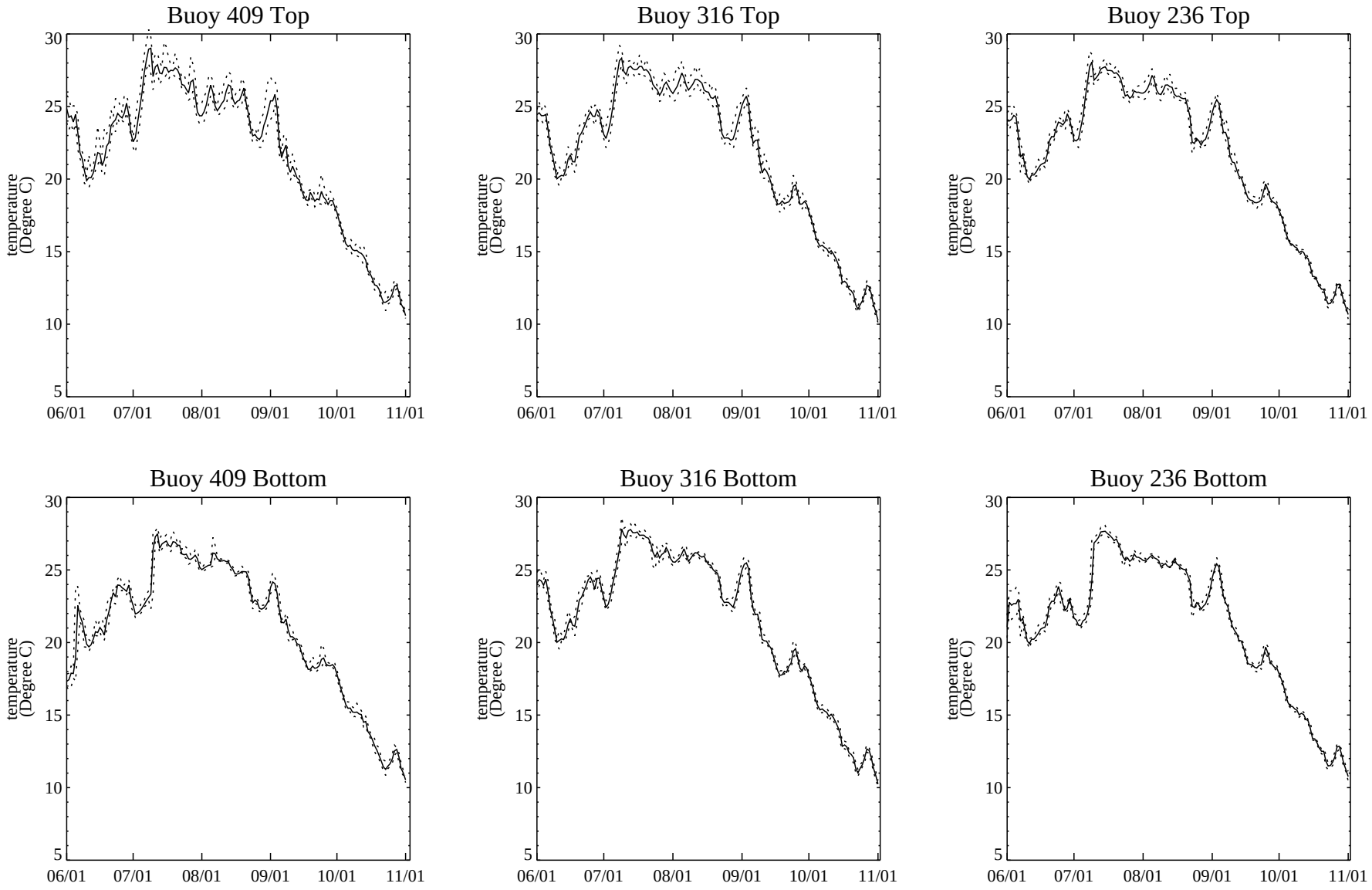

Figure 4. Temporal Profiles of YSI Sonde

Temporal profiles of daily average and variations of temperature recorded by YSI sondes at Buoys 409, 316, and 236 during 2010

Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.

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Wed Jun 01 13:05:04 2011

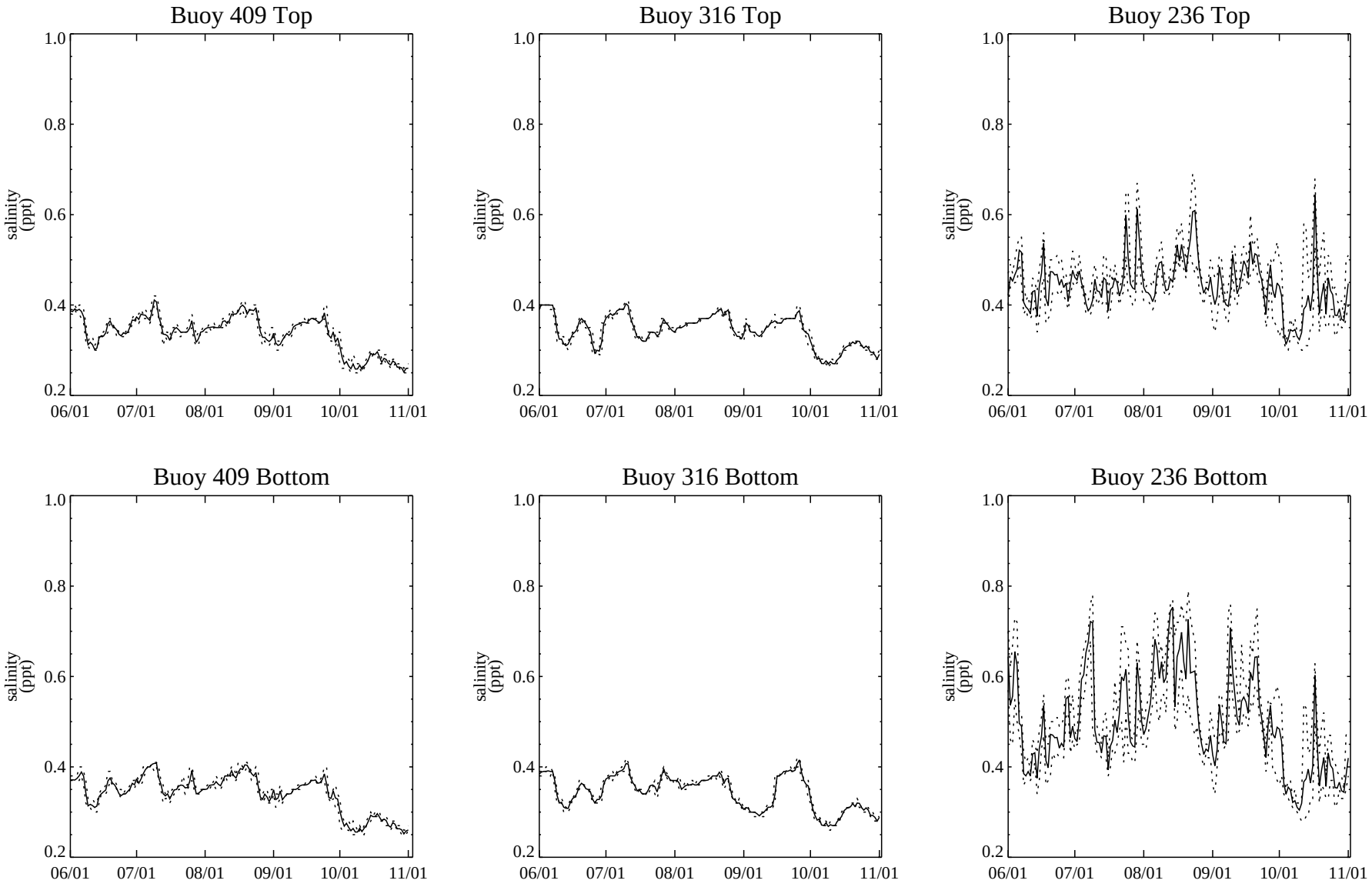

Figure 4. Temporal Profiles of YSI Sonde

Temporal profiles of daily average and variations of salinity recorded by YSI sondes at Buoys 409, 316, and 236 during 2010

Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.

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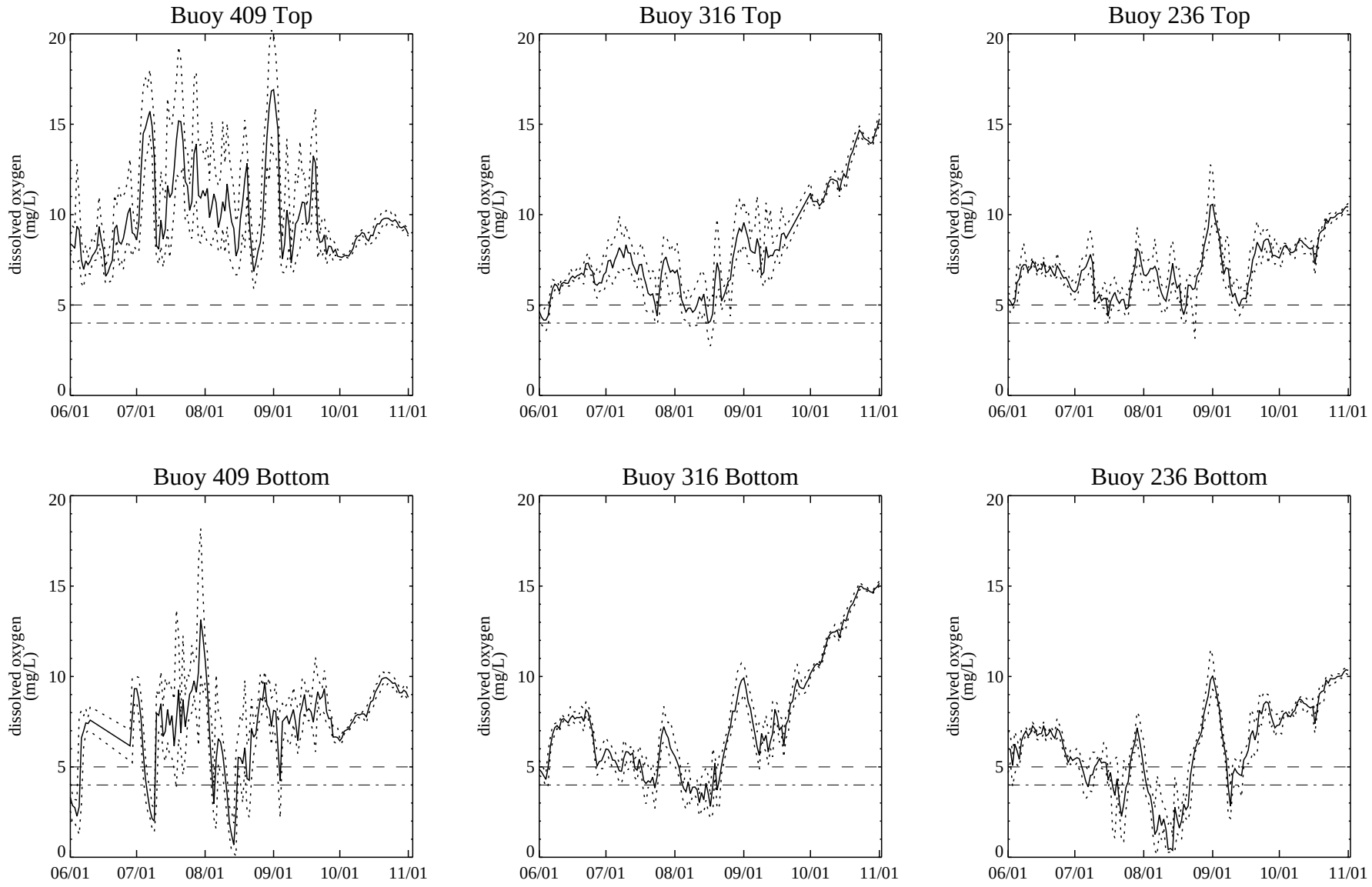

Figure 4. Temporal Profiles of YSI Sonde

Temporal profiles of daily average and variations of dissolved oxygen recorded by YSI sondes at Buoys 409, 316, and 236 during 2010

Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.

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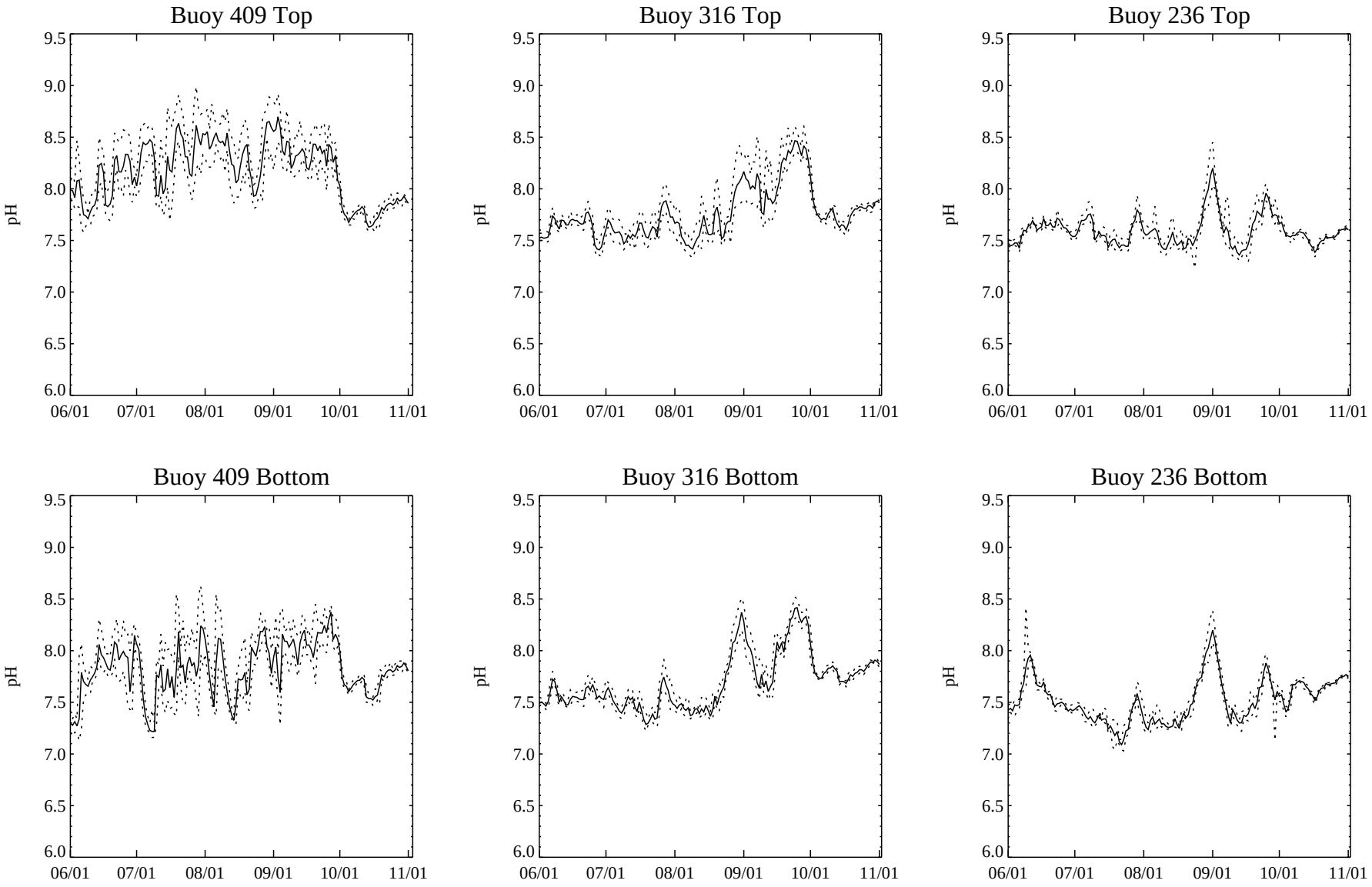

Figure 4. Temporal Profiles of YSI Sonde

Temporal profiles of daily average and variations of pH recorded by YSI sondes at Buoys 409, 316, and 236 during 2010

Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.

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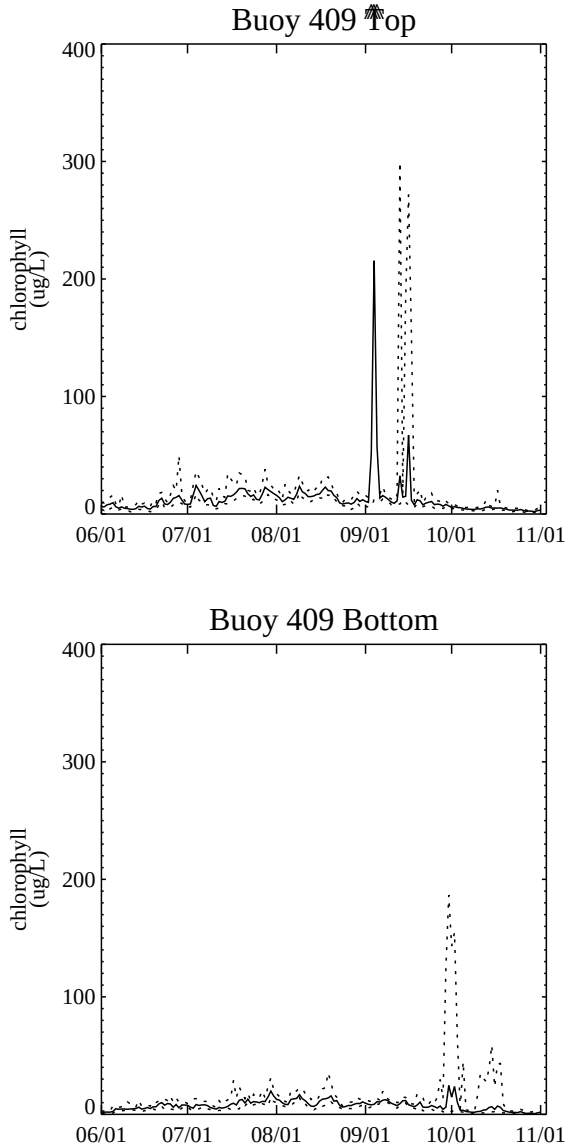

Figure 4. Temporal Profiles of YSI Sonde

Temporal profiles of daily average and variations of chlorophyll recorded by YSI sondes at Buoy 409 during 2010

Notes: Results are only shown for days that at least half of the 15-minute instantaneous data were available.

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Table 1. Summary of AMP river sampling locations and total numbers of samples[1] collected in 2010.

Buoy	Buoy 412	Buoy 409	Buoy 397	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	Oneida	Oneida	Oneida	Oswego	Lake Outlet	Lake Outlet	Lake Outlet
Kilometer[2]	-36.5	-35.4	-33.3	-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	9	6	6	6	6	6	6	6	6	6	6	6
Chlorophyll-a	6	6	6	6	12	6	6	6	6	6	6	6	6	6	6	6	6	6
Pheophytin-a	6	6	6	6	12	6	6	6	6	6	6	6	6	6	6	6	6	6
TOC	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
TOC-F	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
NH3-N	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
NO2	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
NO3	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
ORG-N	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
TKN	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
TKN-F	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
TP	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
SRP	6	6	6	6	12	6	7	6	6	6	6	6	6	6	6	6	6	6
TDP	6	6	6	5	12	6	7	6	6	6	6	6	6	6	6	6	6	6
Chloride	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	3
COND-field	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	9	6	6	6	6	6	6	6	6	6	6	6
Temp-field	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	9	6	6	6	6	6	6	6	6	6	6	6
Turbidity	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6
TSS	6	6	6	6	12	6	9	6	6	6	6	6	6	6	6	6	6	6

Note:

[1] *Sample counts doesnet include samples with result_flat=2*

[2] *River kilometers measured from Three Rivers Junction, upstream (-) for Seneca and Oneida / downstream (+) for Oswego.*

Table 2. Summary of Seneca River flow conditions between 2001 and 2010.

This indicates that the summer flow conditions in 2010 were a little bit high compared to past years.

Year	Average summer flow rate (cfs)	Days below 7Q10
2001	800	0
2002	842	7
2003	2,028	0
2004	4,518	0
2005	1,052	8
2006	4,607	3
2007	774	4
2008	1,497	0
2009	1,606	2
2010	2,410	0

Notes:

Summer season starts on July 1st and ends on September 31st.

Table 3. Summary of non-compliances dissolved oxygen, nitrite and total ammonia in Three Rivers System during 2010.

Parameter	Sampling Date	Location	Depth	Value (mg/L)
Dissolved Oxygen (Instantaneous Compliance Criteria = 4 mg/L)	8/17/2010	BUOY-10	BOTTOM	3.52
	8/17/2010	BUOY-222	BOTTOM	3.28
	8/17/2010	BUOY-240	BOTTOM	1.54
	8/17/2010	BUOY-255	BOTTOM	3.16
	8/17/2010	BUOY-260	BOTTOM	2.32
	8/17/2010	BUOY-269	BOTTOM	3.18
	8/17/2010	BUOY-294	TOP	3.97
	8/17/2010	BUOY-294	BOTTOM	1.79
	8/17/2010	BUOY-316	TOP	2.99
	8/17/2010	BUOY-316	BOTTOM	2.78
	8/17/2010	BUOY-334	TOP	3.69
	8/17/2010	BUOY-334	BOTTOM	3.19
Parameter	**Sampling Date**	**Location**	**Depth**	**Value (mgN/L)**
NO2-N (Compliance Criteria = 0.1 mgN/L)	None	None	None	--
Total NH3-N (NYSDEC Criteria Calculated from pH and Temperature)	None	None	None	--

Note:
The median value for Total NH3-N criteria in 2010 was approximately 1.2 mgN/L, ranged from 0.25 mgN/L to 1.8 mgN/L.

Table 4. Summary of 15-minute dissolved oxygen (DO) data[1] collected by the YSI sondes in 2010.

Sonde Location	Deployment Dates[2]		Operation (days)[3]	DO < 5 mg/L (days)[4]	DO < 4 mg/L (days)[5]
	Start	End			
Buoy 409 (Top)	5/28/2010	11/3/2010	160	0	0
Buoy 409 (Bottom)			143	23	29
Buoy 409 (Top or Bottom)			160	23	29
Buoy 316 (Top)	5/26/2010	11/3/2010	151	17	12
Buoy 316 (Bottom)			161	35	26
Buoy 316 (Top or Bottom)			161	36	28
Buoy 236 (Top)	5/27/2010	11/2/2010	160	8	2
Buoy 236 (Bottom)			160	44	43
Buoy 236 (Top or Bottom)			160	44	45

Notes:

[1] *Blank and negative DO values were excluded from analysis.*

[2] *Not all parameters may have been measured during the deployment dates.*

[3] *DO measured at least half of the time within one day.*

[4] *NYSDEC minimum daily average DO standard. Reported value represents number of days in which the daily average calculated from the 15-minute data was below the standard.*

[5] *NYSDEC instantaneous minimum DO standard. Reported value represents the number of days in which one or more of the 15-minute readings was below the standard.*