



Water Quality Monitoring at Saratoga National Historical Park

Northeast Temperate Network 2011 Summary Report

Natural Resource Data Series NPS/NETN/NRDS—2012/348



ON THE COVER

Measuring stream flow (discharge) at Mill Creek confluence, September 2011

Photograph by: Brian Schuetz

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William G. Gawley
National Park Service
Acadia National Park
PO Box 177
Bar Harbor, Maine 04609

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Introduction

This report on the water quality of Saratoga National Historical Park (SARA) generated by the Northeast Temperate Network (NETN) Water Quality Monitoring Program includes data gathered in the 2011 monitoring season and displays these results in graphic form, accompanied by a brief interpretation. Appendix A contains data collected from 2006 through 2011.

The vital signs for freshwater bodies included in the NETN Freshwater Monitoring Protocol (Lombard et al. 2006) are water chemistry, nutrient enrichment, water quantity, and the detection of invasive plant species. These metrics were chosen to address the NPS Inventory and Monitoring Program objective to detect change in the status of physical, chemical, or biological attributes of the ecosystem.

The NETN Freshwater Monitoring Protocol calls for a total of four park streams to be sampled monthly from May through October. A cooperator from the University of Vermont or a NETN hydrologic technician measured physical and in-situ water chemistry parameters each month and periodically collected water samples for analysis at the University of Maine's Sawyer Environmental Chemistry Research Laboratory. All monitoring data are incorporated into a series of comprehensive databases that ultimately feed the U.S. Environmental Protection Agency's "STORET" data system, the repository for all NPS water quality and quantity data.

Sampling Sites

There are 8 miles of perennial streams divided between four watersheds in SARA that all flow into the Hudson River (Figure 1). These watersheds are the Kroma Kill, Mill Creek, American's Creek and Great Falls Creek. In addition, the historic ruins of the old Champlain Canal cut across the downstream end of the major drainages of park, and water from the Hudson River can back up into the park. Since there are no major ponds or impoundments in Saratoga, NETN monitoring is designed to characterize only the streams in the park (Lombard et al 2006).

One monitoring site has been identified in each major watershed in the park where water quality samples can be taken and streamflow measured (Table 1). In addition, there are major tributaries in the Mill Creek watershed within park boundaries, and thus an additional site has been identified on the North Fork of Mill Creek. The three park streams monitored by the NETN are considered warm water fisheries, capable of supporting bass, perch, sunfish, and similar species (Vana-Miller et al 2001). Kroma Kill (SARASA) is a third order stream in the park and is monitored upstream of the first bridge crossing along the Park Entrance Road from Route 4. The bridge provides an adequate staff gage site, a constricted area for hydraulic control, and a platform for sampling during high flows.

The sample site established for American's Creek (SARASB) is below Bemis Point at the end of the American River Fortifications. Here the stream flows through a narrow channel incised to bedrock. Flow proves difficult to measure in very dry years.

Mill Creek enters the Hudson River as a second order stream. The Upper Mill Creek site (SARASC) is located near where the stream enters the park, just downstream of the park tour

road. The stream is very small at this location but appears to be perennial and the box culvert can be used for accurate discharge measurements when flows are elevated.

The Lower Mill Creek site (SARASD) is approximately 200 m downstream of the confluence of the North and South Forks (historic site SARA0053). This site provides an integrated sample for the watersheds of the North and South Forks. The South Fork can have low flow and would not be a reliable year round sampling site that meets sampling site criteria.

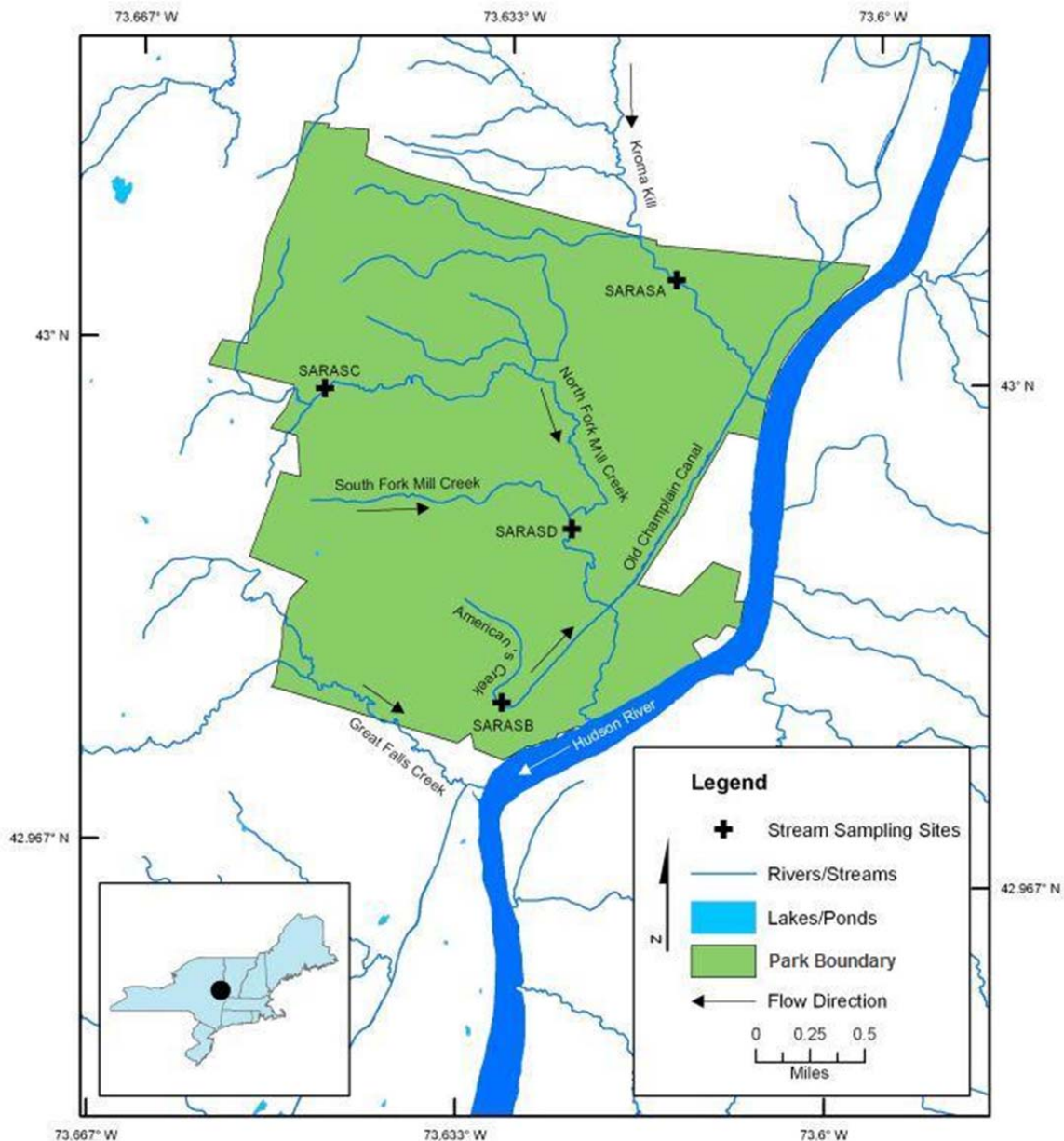


Figure 1. NETN water monitoring sites at Saratoga NHP.

Table 1. Water quality monitoring sites at Saratoga NHP

Water Body	NETN Site Code	Latitude	Longitude
Kroma Kill (Stream A)	SARASA	43.0058333	-73.61730
American's Creek (Stream B)	SARASB	42.9771667	-73.63100
Upper Mill Creek (Stream C)	SARASC	42.9973833	-73.64855
Mill Creek Confluence (Stream D)	SARASD	42.9889500	-73.62555

Methods

Detailed descriptions of all monitoring methods are found in the protocol (Lombard et al 2006). Monthly sampling parameters included in-situ water quality measures (pH, specific conductance, temperature, and dissolved oxygen) determined with a YSI 600XL sonde, weather, stream flow (discharge), and stream stage (water level). Water samples obtained in May and August were analyzed for acid neutralizing capacity (ANC), color, and nutrients. Nutrient chemistry parameters were analyzed from a grab sample.

Stream discharge was measured using U.S. Geological Survey protocols (Rantz et al 1982), employing a measuring tape, wading rod, and SonTek FlowTracker current meter or a Price Pygmy current meter to measure a particular cross-sectional area of the stream and the velocity of the water at that cross section.

In-situ stream water chemical and physical measurements and water samples were collected within 5 meters from the location of the discharge measurement. Sonde measurements were taken in the main stream flow with care taken that the sonde was not resting directly on the stream bottom. Grab samples were obtained by submerging the sample bottle directly in the stream with a gloved hand. A peristaltic pump and Tygon tubing were used to collect samples if water levels were too low to completely submerge a bottle.

Water Quality Standards

New York's Surface-Water Quality Standards (New York State Department of Environmental Conservation 1999) designates Class AA as the most restrictive stream classification for water quality. "Class AA waters shall have no change in color that will cause a substantial visible contrast to natural conditions, and shall have no phosphorus and nitrogen that will result in algae, weed, and slime growth that will impair the waters for their best usages. The pH shall range from 6.5 to 8.5. DO [Dissolved Oxygen] concentrations shall not be less than 7.0 mg/L for other than natural conditions in cold waters suitable for trout spawning. The minimum average daily DO concentration for trout waters shall not be less than 6.0 mg/L and at no time shall the concentration be less than 5.0 mg/L. The minimum average daily DO concentration for non-trout waters shall not be less than 5.0 mg/L, and at no time shall the DO concentration be less than 4.0 mg/L" (New York State Department of Environmental Conservation 1999).

EPA Ecoregion 7 water quality criteria (Table 2; U.S. Environmental Protection Agency 2000) are also used as a benchmark in this report. EPA water quality criteria for nutrients help translate narrative criteria within State or Tribal water quality standards by establishing values for causal variables (e.g., total nitrogen and total phosphorus) and response variables (e.g., turbidity and chlorophyll *a*). Causal variables are necessary to provide sufficient protection of designated uses before impairment occurs and to maintain downstream uses. Early response variables are necessary to provide warning signs of possible impairment and to integrate the effects of variable and potentially unmeasured nutrient loads (U.S. Environmental Protection Agency 2002).

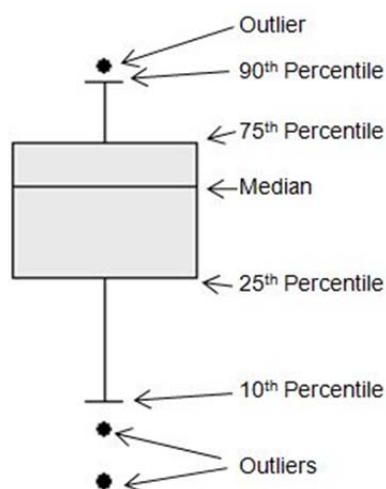
Table 2. EPA Ecoregion 7 nutrient criteria for streams.

Nutrient Criteria	Value
Total Phosphorus	33 µg/L
Total Nitrogen	0.54 mg/L

These criteria were developed specifically for Ecoregion 7 (which includes both NETN parks in New York) and are designed to represent conditions of surface waters that are minimally impacted by human activities and thus protect against the adverse effects of nutrient over-enrichment from cultural eutrophication. The values are EPA’s scientific recommendations regarding ambient concentrations of nutrients that protect aquatic resource quality. They do not have any regulatory impact or meaning.

The criteria were established based on the lower 25th percentile of streams for which the EPA found data. This percentile of all streams is expected to approximately correspond to the 75th percentile of reference (undisturbed) streams. In other words, 75% of streams in the ecoregion do not meet the criteria, nor do roughly 25% of reference streams. (U.S. Environmental Protection Agency 2000).

Results



Monitoring results for 2011 are displayed in scatter-plot graphs showing all data for each site for a given parameter. The scatter plots of 2011 data are overlaid on box plots representing the overall range and distribution of data values collected from 2006 through 2011 for the specified parameter and site (Appendix A contains all data in tabular form). A box plot (Figure 2) is a summary plot that graphs data as a box representing statistical values. The boundary of the box closest to zero indicates the 25th percentile, a line within the box marks the median, and the boundary of the box farthest from zero indicates the 75th percentile. Whiskers (error bars) above and below the box indicate the 90th and 10th percentiles respectively. Outliers are displayed as black filled circles. If EPA or other water quality criteria exist for a particular parameter they are displayed on the graphs as specification lines.

Figure 2. Explanation of box plot graph

Water Quality

Measures of water quality include specific conductance, pH, water temperature, dissolved oxygen (DO), acid neutralizing capacity (ANC), and apparent color. Assessment of water quality data aids in the interpretation of the biotic condition and ecological processes of surface water resources.

Specific Conductance

Specific conductance (Figure 3) is a measure of the ability of water to carry an electrical current, and is directly related to the level of dissolved ions in the water. An increase in specific conductance can be an indicator of pollutants in the water. Naturally occurring values range from less than 20 to more than 1,000 microsiemens per centimeter ($\mu\text{S}/\text{cm}$). Specific conductance values from 2011 were within the appropriate range for moderate to high ionic strength waters, and were generally within the range of values shown on the box plot.

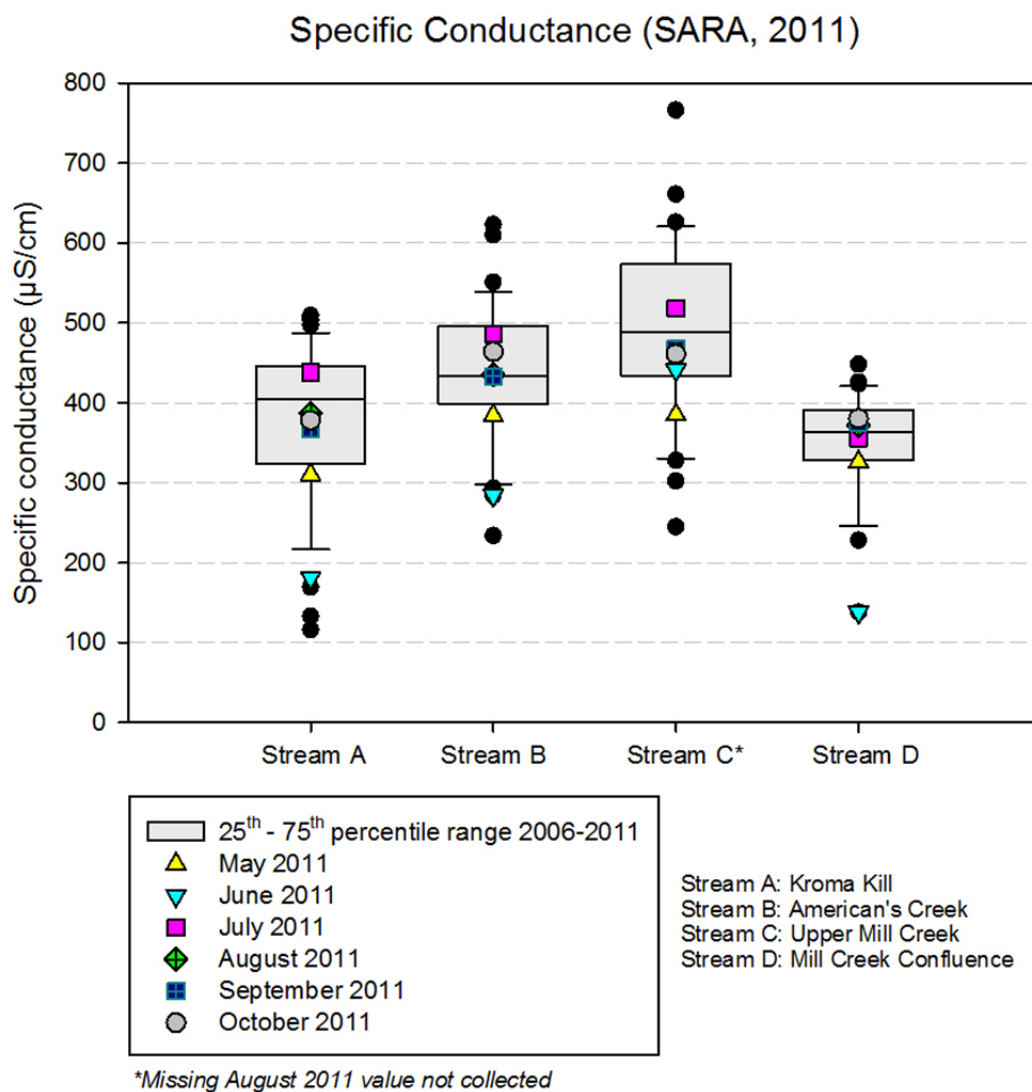


Figure 3. Specific conductance from 2011 YSI sonde in-situ measurements overlaid on a box plot of measurements taken from 2006-2011.

pH Level

The pH of a water body reflects how acidic or basic the water is, measured on a scale of 1 to 14, with 7 being neutral. Acid waters are below 7, and alkaline waters are above 7. A one unit change in pH represents a 10-fold change in acidity or alkalinity. New York standards, like those of most northeast states, indicate that a pH between 6.5 and 8.5 is within the acceptable range. pH values from the 2011 monitoring season (Figure 4) were basic, and were all between the upper and lower New York water quality standards.

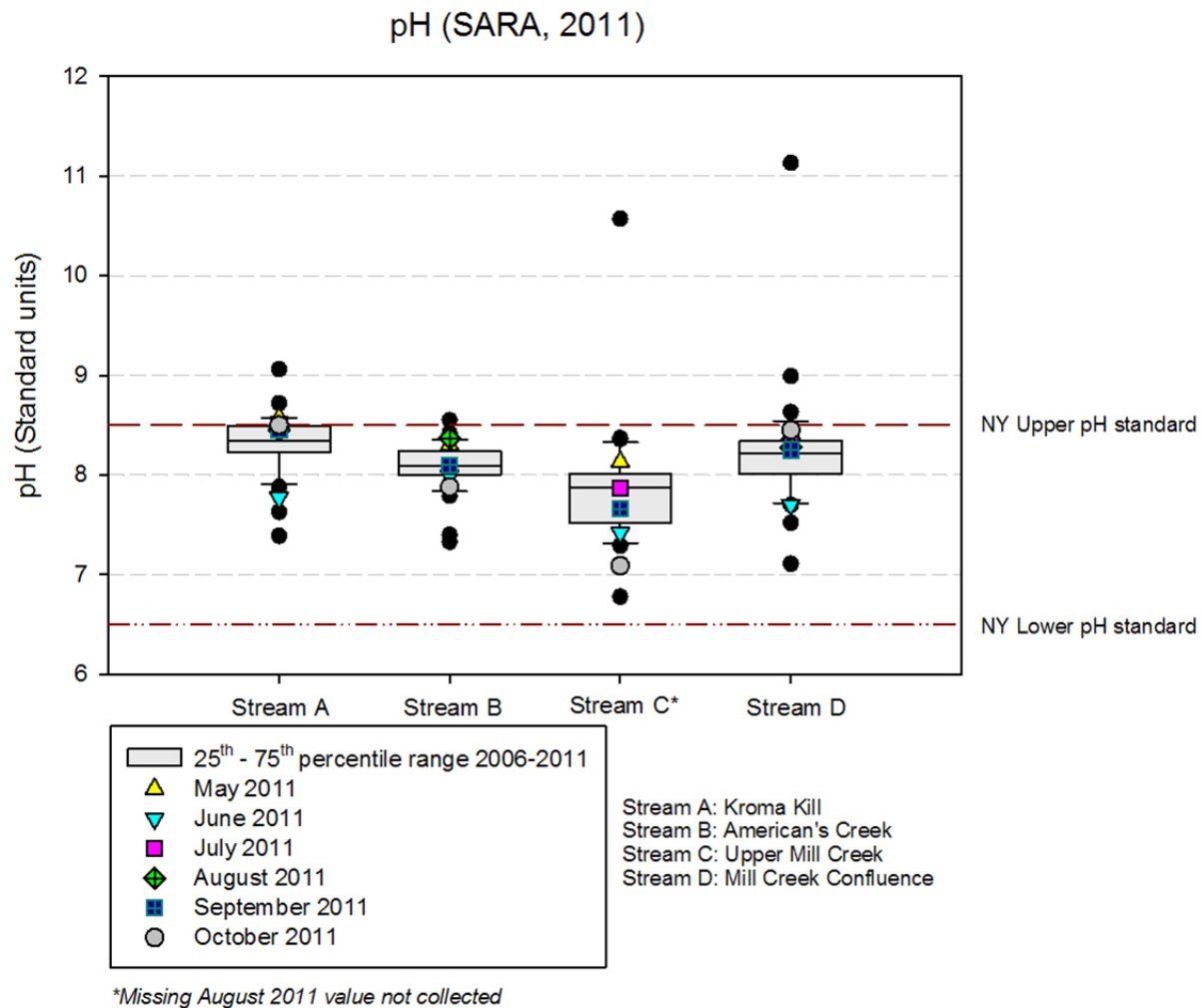
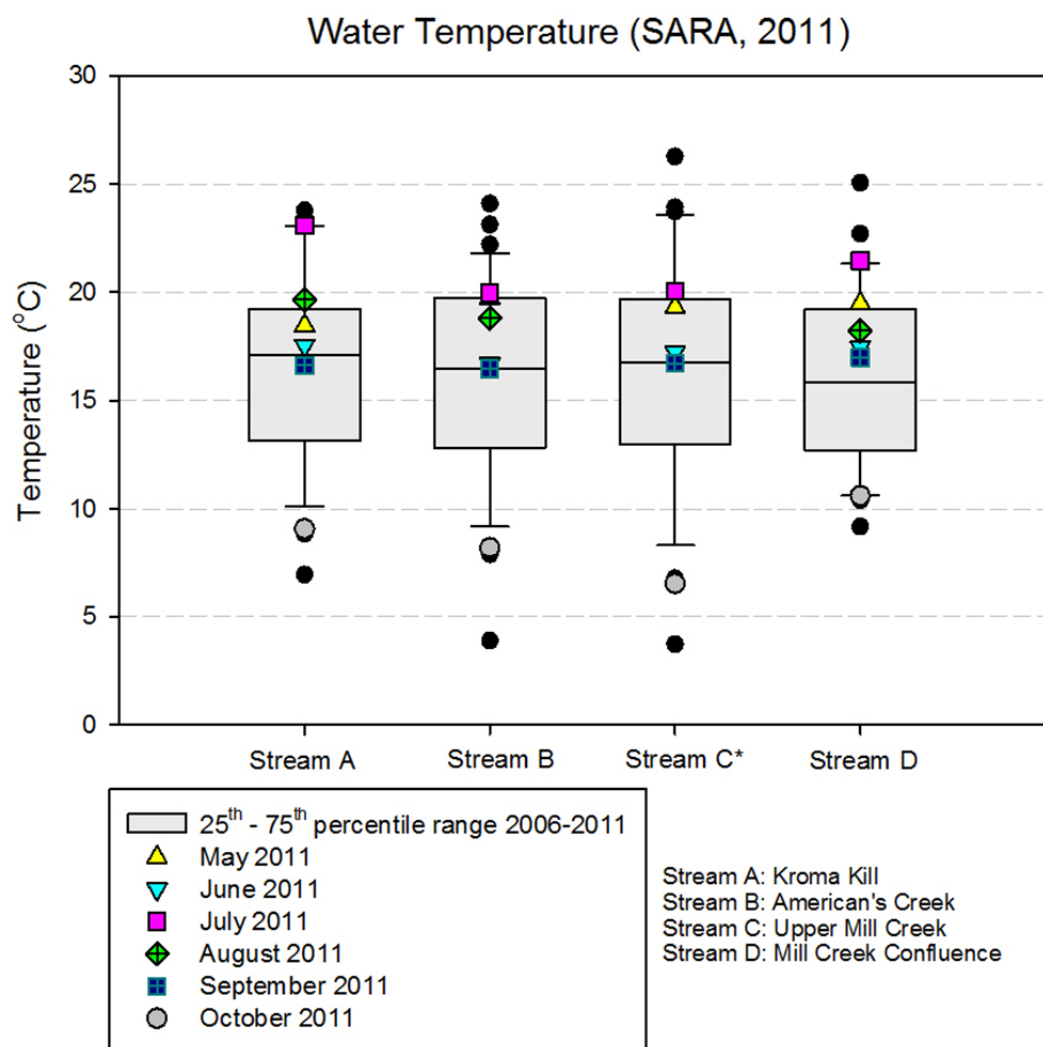


Figure 4. pH from 2011 YSI sonde in-situ measurements overlaid on a box plot of measurements taken from 2006-2011.

Water Temperature

Temperature can affect water chemistry and biology. For example, the amount of oxygen that water can hold is directly related to the temperature of the water. The higher the temperature, the less oxygen water can hold, which can be observed in both diel (day and night) and seasonal shifts. Oxygen will naturally decline during the summer months as water temperatures rise. Temperature can also determine the kinds of plants and animals found in the lake or pond. Certain species of fish, insects, and algae will predominate during the cooler temperatures of the spring and fall, yet be less apparent during the warmer temperatures of summer. Surface water temperatures (Figure 5) appeared to be within the normal range of variability in 2011, though the July values reflected the contributions of high air temperature and solar radiation.



**Missing August 2011 value not collected*

Figure 5. Water temperature (surface) from 2011 YSI sonde in-situ measurements overlaid on a box plot of measurements taken from 2006-2011.

Dissolved Oxygen

Dissolved oxygen (DO) is a critical indicator of water quality because aquatic life generally needs DO concentrations at or above 5 mg/L to thrive. Low oxygen can directly kill or stress organisms such that they will not be able to successfully reproduce or grow. Water with less than 1 part per million (ppm) of oxygen is considered anoxic (no oxygen present). All SARA sites were well oxygenated in 2011 (Figure 6), except for the Upper Mill Creek (Stream C) June measurement of 3.81 mg/L. The July measurements from American's Creek (Stream B) and Upper Mill Creek (Stream C) were only slightly below the most stringent (7 mg/L) state DO standard. All other 2011 DO measurements were above the standard.

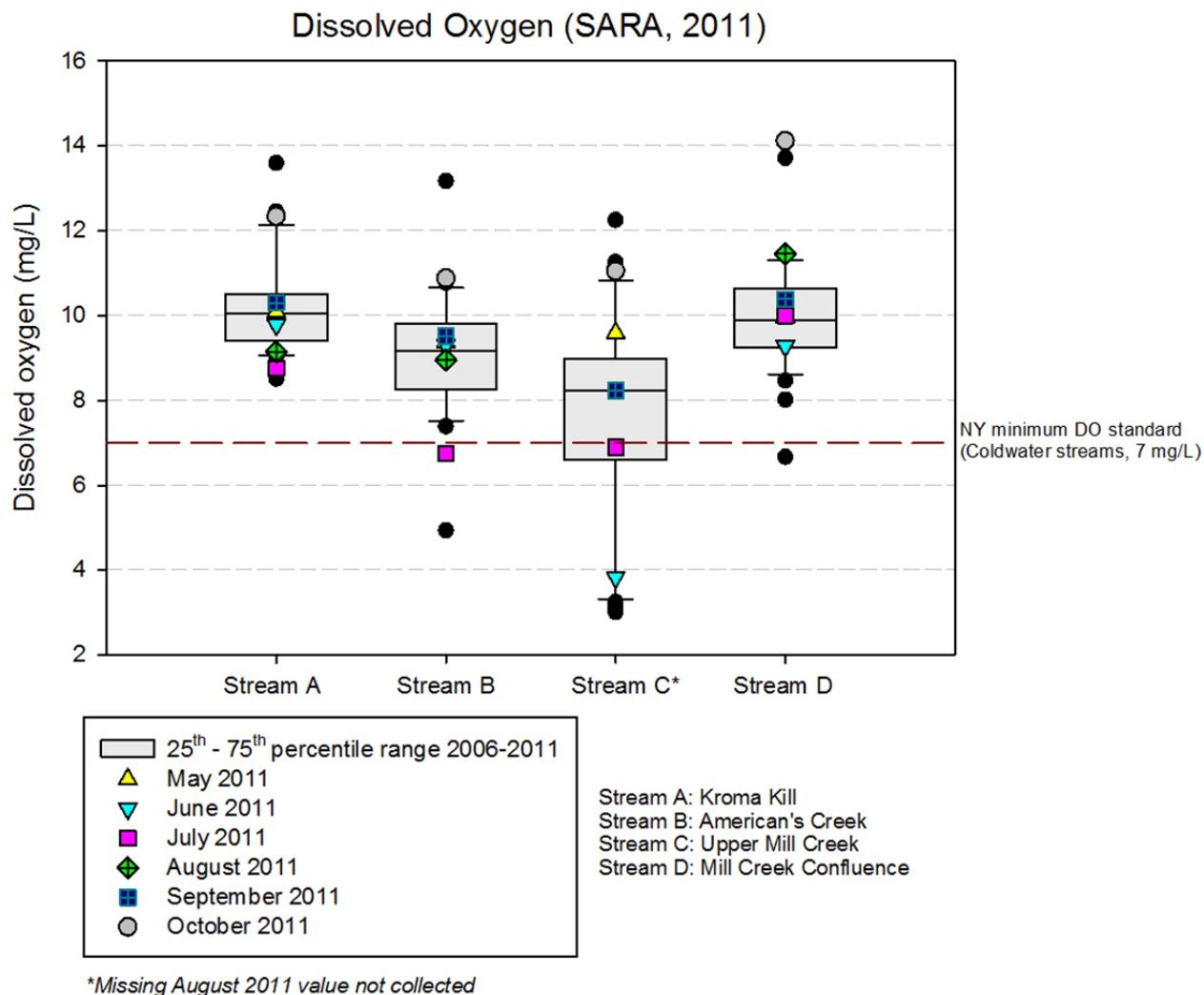


Figure 6. Dissolved oxygen (surface) from 2011 YSI sonde in-situ measurements overlaid on a box plot of measurements taken from 2006-2011.

Acid Neutralizing Capacity

Acid neutralizing capacity (ANC) is also known as alkalinity, or buffering capacity. It is due primarily to the presence of naturally available bicarbonate, carbonate, and hydroxide ions, with bicarbonate being the major form. Most states do not have numerical criteria for ANC in their water-quality standards. ANC values greater than 100 $\mu\text{eq/L}$ are considered well-buffered, while values less than zero typify acidic waters (Stoddard et al. 2003). Acid neutralizing capacity measured in the 2011 samples (Figure 7) illustrates that SARA streams were extremely well-buffered, likely due to the underlying geology. May (Spring) 2011 ANC measurements follow the typical seasonal pattern of being lower than August (Summer) values. This effect is likely due to the contribution of episodic acidification from spring snowmelt and runoff (and also illustrates the ability of the robust ANC to counteract the acidification pulses).

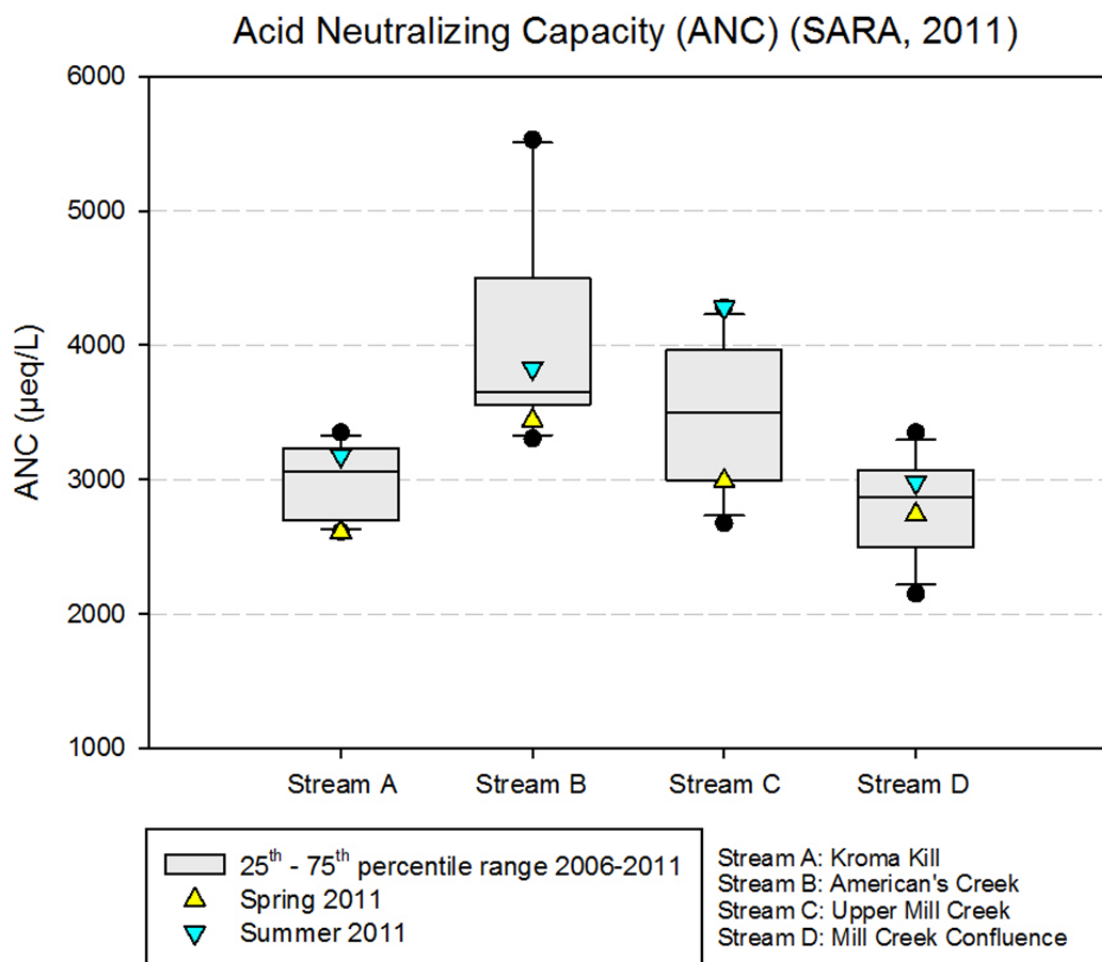


Figure 7. Acid neutralizing capacity from 2011 spring and summer water samples overlaid on a box plot of measurements taken from 2006-2011.

Apparent Color

Color in pond and stream water is caused by natural metallic ions, humus and peat materials, plankton, weeds, and industrial wastes. Color is reported in Pt-Co units (PCU). True color is the color measurement of water from which suspended particles have been removed by filtration. Apparent color (the measurement method utilized by NETN) is determined on original samples without filtration. Color can be a rough indicator for organic acidity.

Water bodies with apparent color values of greater than 25 PCU are considered to be highly colored, and often exhibit reduced water clarity and high phosphorus concentrations. Values of color are usually not included in water quality standards, except to note that they should be as naturally occurs.

Color measurements from 2011 monitoring were near or above median color values from 2006 to 2011 monitoring (Figure 8), and show SARA streams to be highly colored. Much of the color is likely due to runoff and sediment input to the streams, rather than dissolved constituents, since the samples were not filtered before analysis. Monthly turbidity measurements, which will begin in 2012, may provide additional information on the impacts to SARA streams from episodic runoff events.

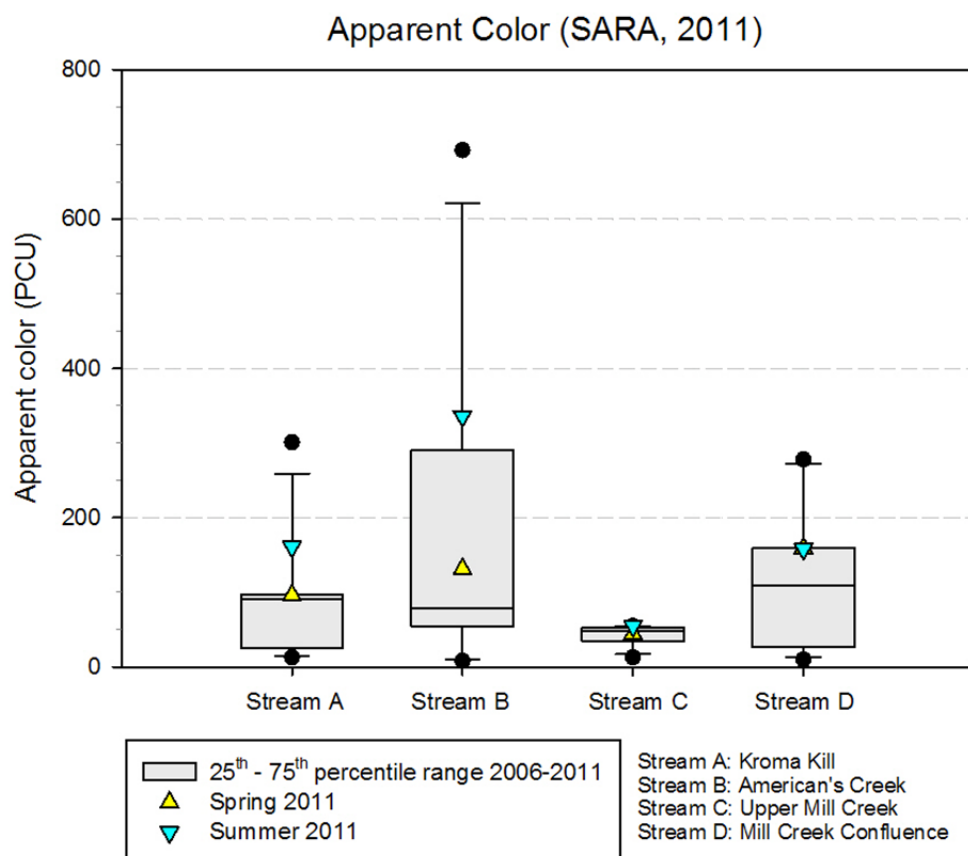


Figure 8. Apparent color from 2011 spring and summer water samples overlaid on a box plot of measurements taken from 2006-2011.

Nutrient Enrichment

Nutrient enrichment and the acceleration of eutrophication have been identified in most NETN parks as one of the stressors of greatest concern. Several forms of total and dissolved phosphorus and nitrogen are measured to give managers information regarding the trophic status and productivity of freshwater systems.

Phosphorus

Phosphorus (P) is one of the major nutrients needed for plant growth. It is generally present in small amounts and limits the plant growth in streams and ponds. Several forms of phosphorus were tested individually. Total phosphorus (TP) is a measure of both inorganic and organic forms of phosphorus, and is the common water quality standard or criteria metric. Phosphorus can be present as dissolved or particulate matter, and filtered samples were analyzed for total dissolved phosphorus (TDP). Soluble reactive phosphorus (SRP, or “orthophosphate”) is a measure of the inorganic oxidized form of soluble phosphorus. This form of phosphorus is the most readily available for uptake during photosynthesis. High concentrations of SRP generally occur in conjunction with algal blooms.

In 2011, most phosphorus concentrations (Figure 9) were in the moderate range, and generally showed the expected seasonal variation of lower spring (May) values. Spring TP values were near or below the EPA Ecoregion 7 criterion of 33 $\mu\text{g/L}$ and all summer (August) measurements were slightly above the criterion. As described above (“Water Quality Standards”), the EPA criteria do not have any regulatory meaning.

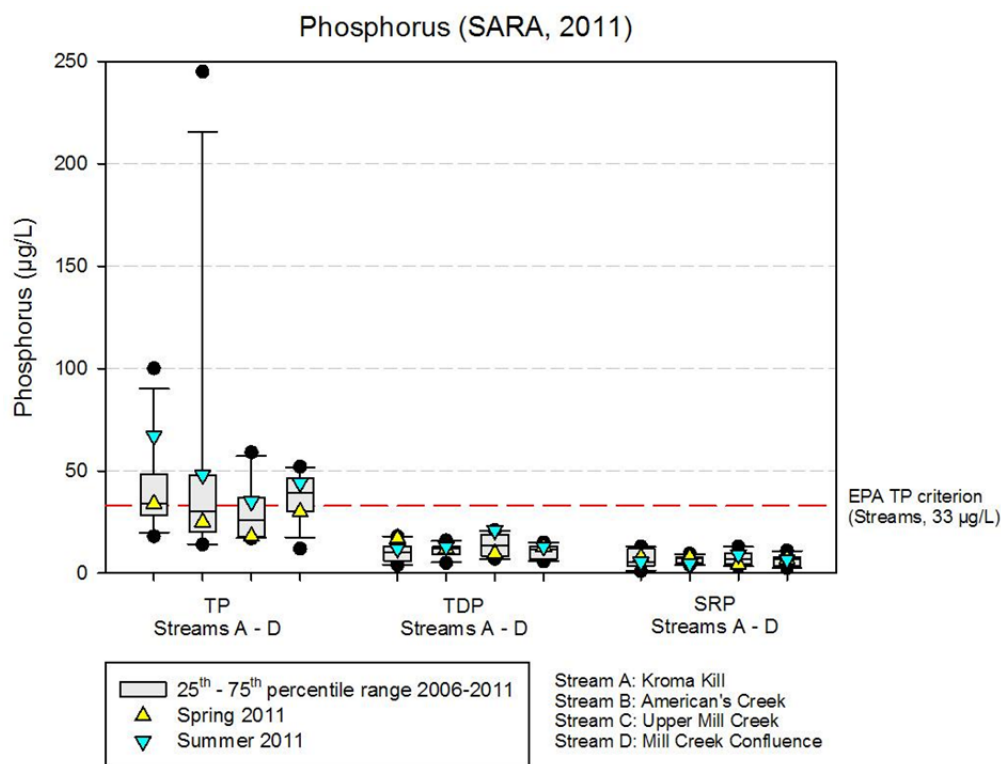


Figure 9. Total phosphorus (TP), total dissolved phosphorus (TDP), and soluble reactive phosphorus (SRP) from spring and summer water samples. The data are overlaid on a box plot of measurements taken from 2006-2011. There is no numeric New York state water quality TP standard.

Total Nitrogen

Total nitrogen (TN) is a measure of all forms of nitrogen (organic and inorganic). Nitrogen is an essential plant element and is often the limiting nutrient in marine waters, and it can also limit some freshwater systems. Filtered samples were analyzed for total dissolved nitrogen (TDN). The importance of nitrogen in the aquatic environment varies according to the relative amounts of the forms of nitrogen present, including nitrate, nitrite, and ammonia.

Test results for several forms of nitrogen are shown in Figure 10. The majority of the 2011 TN and TDN results for Streams A and D (Kroma Kill and Mill Creek Confluence) were above 2.0 mg/L, the value used as a TN standard in several northeast states (New York has no numeric TN standard). Total nitrogen values in Streams B and C were significantly lower, and were at or below the EPA Region 7 criterion of 0.54 mg/L, although as with TP this criterion does not have regulatory meaning. Nitrate (NO_3) is the most oxidized and stable form of nitrogen in a water body, and is the primary form of nitrogen used by plants as a nutrient. Nitrite (NO_2) is an unstable form of nitrogen that is either rapidly oxidized to nitrate (nitrification) or reduced to nitrogen gas (de-nitrification). This form of nitrogen can also be used as a source of nutrients for plants. NETN water samples were analyzed with a combined test for nitrate and nitrite, with elevated concentrations in Streams A and D. Most of this was in the form of nitrate, since individual nitrite test results in all streams were very low, with several below the method reporting limit of 0.005 mg/L. All 2011 ammonia (NH_3 , another inorganic, bioavailable form of concern) test results were below the method reporting limit of 0.08 mg/L.

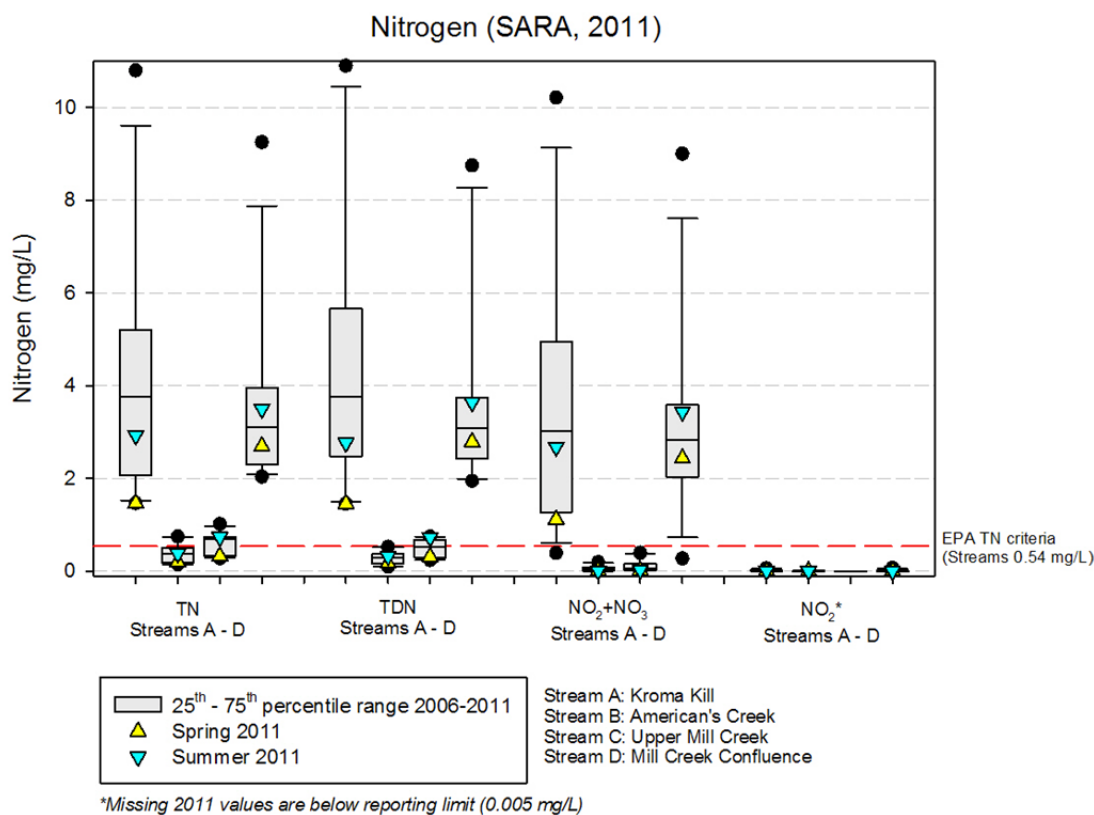


Figure 10. Total nitrogen (TN), total dissolved nitrogen (TDN), nitrite + nitrate ($\text{NO}_2 + \text{NO}_3$), and nitrite (NO_2) from 2011 spring and summer water samples. The data are overlaid on a box plot of measurements taken from 2006-2011.

Water Quantity

Monthly stream discharge measurements, taken with a current meter and wading rod, can be used to calculate loading of nutrient chemical constituents (flow times concentration), and also provide a record of variations in stream flow. Stream stage (height of water) measurements can be paired with discharge values and over time a stage to discharge relationship can be calculated. Once this relationship is established, investigators can interpolate the stream discharge from the stage measurement alone. Numerous discharge measurements at all ranges of streamflow are required to establish and maintain an accurate stage to discharge relationship. Stream stage measurements from 2011 are graphed in Figure 11. Discharge and stage measurements from 2006 to 2011 are listed in Table A3 in Appendix A.

Streamflow followed the expected seasonal sequence of high discharge in May to minimal flow in July and August, with gradual recovery in September and October. NETN staff are currently reviewing discharge and stage measurement methodology and quality assurance/quality control procedures in order to enhance the quality and utility of the water quantity data. A stage to discharge relationship graph will be produced once sufficient data are collected.

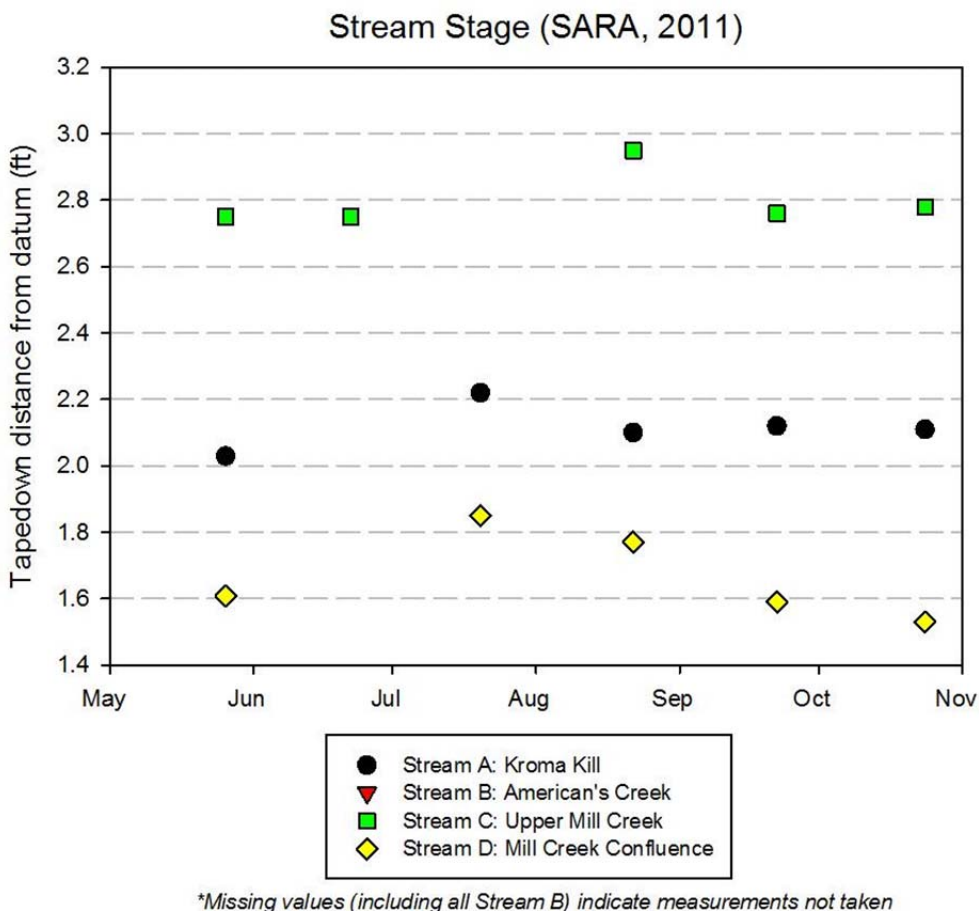


Figure 11. Stream stage obtained in 2011 by measuring from a permanent datum point down to the water surface. *Note: Larger tapedown distances indicate LOWER water levels.*

Invasive Aquatic Plants

Invasive aquatic plant monitoring was not conducted at SARA during the 2011 monitoring season, since the protocol specifies that targeted invasive aquatic plant monitoring is only conducted at pond and lake sites. However, during future visits to all NETN parks, monitoring crews will be increasingly attentive for the presence of Didymo (*Didymosphenia geminata*), also known as “rock snot”, a highly invasive alga that has recently invaded the northern reaches of the Connecticut River in New Hampshire and in the White River and Battenkill River in Vermont. This species has a great potential to alter habitats and displace native species, and is of great concern to officials in regions where infestations have been established.

Didymo is easily spread by even just one cell of the alga breaking off and drifting downstream in infested reaches. It is also very easily spread by waders, and potentially, water monitoring equipment and other gear that touches the bottoms of streams in infested areas. Enhanced equipment cleaning and decontamination procedures are being included in the latest NETN monitoring protocol revision.

The early detection of an invasive plant infestation can make eradication or control more feasible, and it can lead to efforts that reduce the spread of the plant to neighboring water bodies. Designating the early detection of these plants as a NETN vital sign and the ongoing partnership with state and local monitoring and eradication efforts are highly effective prevention strategies.

Summary

Most water quality parameters for the streams monitored in Saratoga National Historical Park are within state standards, and are generally within the range of EPA criteria, where applicable. The majority of values are within the ranges of the historic NETN monitoring data from SARA. ANC measurements showed that all streams had sufficient buffering to avoid severely depressed pH values from spring snowmelt and runoff that can contribute acidity and sediment to the stream water.

Test results for TN, TDN, and NO₃ were moderately high in most 2011 samples, especially in Kroma Kill and the Mill Creek Confluence site. Results for NO₂ were low at all sites. All NH₃ test results were below the method reporting limit of 0.08 mg/L. Most total phosphorus results for 2011 were near or below the EPA Ecoregion 7 criterion of 33 µg/L, and TDP and SRP values were low in all streams.

Monitoring under the NETN protocol builds on the historic water quality monitoring by park staff and other agencies to provide critical baseline information on the chemical and physical status of the water resources Saratoga National Historical Park. Several changes will be implemented in the 2012 monitoring season, including taking monthly stream turbidity measurements, and the addition of sulfate, chloride, and dissolved organic carbon (DOC) analyses to the spring and summer water chemistry testing. These changes will expand the scope and usefulness of the monitoring data. As more data are collected, the ability to detect changes outside this natural range of variability will increase, which in turn will more clearly indicate the status of the vital signs of water quality, nutrient enrichment, water quantity, and the detection of invasive plant species.

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Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011.

Table A1. YSI sonde in-situ water quality measurements collected at SARA. *Missing values indicate data are unavailable.*

Site	Date	Depth (m)	Temp (C)	DO (mg/L)	pH	Specific Conductance (µS/cm)
Kroma Kill (Stream A)	5/17/2006	0.5	12.75	10.49	8.34	284
Kroma Kill (Stream A)	6/14/2006	0.6	18.85	9.39	8.50	321
Kroma Kill (Stream A)	7/19/2006	0.3	23.77	9.07	8.53	325
Kroma Kill (Stream A)	7/20/2006	-0.2	18.50	9.06	8.14	116
Kroma Kill (Stream A)	8/22/2006	0.0	19.51	10.01	8.37	222
Kroma Kill (Stream A)	9/27/2006	0.3	11.91	11.25	8.33	458
Kroma Kill (Stream A)	10/12/2006	0.3	13.12	10.55	8.32	433
Kroma Kill (Stream A)	4/3/2007	0.2	6.93	12.45	7.96	281
Kroma Kill (Stream A)	5/9/2007	0.4	18.76	10.02	8.72	355
Kroma Kill (Stream A)	6/14/2007	0.3	14.49	10.31	8.40	427
Kroma Kill (Stream A)	7/12/2007	0.3	19.23	9.13	8.18	286
Kroma Kill (Stream A)	8/8/2007	0.1	23.06	8.51	8.41	475
Kroma Kill (Stream A)	9/6/2007	0.2	18.13	9.92	8.29	497
Kroma Kill (Stream A)	10/3/2007	0.0	16.73	10.06	8.27	509
Kroma Kill (Stream A)	5/15/2008	0.4	13.25	10.37	8.32	362
Kroma Kill (Stream A)	6/17/2008	0.5	17.89	9.66	8.51	444
Kroma Kill (Stream A)	7/23/2008	0.5	18.84	9.16	8.23	429
Kroma Kill (Stream A)	8/21/2008	0.6	14.86	10.17	8.25	390
Kroma Kill (Stream A)	9/23/2008	0.4	10.22	11.09	8.22	486
Kroma Kill (Stream A)	10/14/2008	0.1	13.54	12.11	8.44	482
Kroma Kill (Stream A)	5/14/2009	0.4	12.23	10.82	8.32	418
Kroma Kill (Stream A)	6/24/2009	0.4	21.55	9.40	8.49	376
Kroma Kill (Stream A)	7/31/2009	0.1	18.35	9.04	7.88	133
Kroma Kill (Stream A)	8/31/2009	0.5	16.60	10.03	8.33	364
Kroma Kill (Stream A)	10/2/2009	0.5	11.02	11.66	8.45	432
Kroma Kill (Stream A)	10/21/2009	0.3	8.87	13.59	9.06	437
Kroma Kill (Stream A)	5/27/2010	0.4	19.28	9.40	7.39	444
Kroma Kill (Stream A)	6/16/2010	0.4	15.75	10.38	8.57	438
Kroma Kill (Stream A)	7/7/2010	0.4	23.39	9.85		466
Kroma Kill (Stream A)	8/12/2010	0.5	19.87	10.04	7.63	449
Kroma Kill (Stream A)	9/9/2010	0.1	16.03	10.11	8.46	504
Kroma Kill (Stream A)	10/6/2010	0.4	13.17	10.49	8.10	350
Kroma Kill (Stream A)	5/26/2011	0.5	18.48	10.09	8.57	310
Kroma Kill (Stream A)	6/23/2011	0.4	17.47	9.56	7.92	169
Kroma Kill (Stream A)	6/23/2011	0.6	17.54	9.78	7.77	181
Kroma Kill (Stream A)	7/20/2011	0.4	23.09	8.76	8.51	438
Kroma Kill (Stream A)	8/22/2011	0.3	19.67	9.15	8.45	387

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A1. YSI sonde in-situ water quality measurements collected at SARA (continued).

Site	Date	Depth (m)	Temp (C)	DO (mg/L)	pH	Specific Conductance (µS/cm)
Kroma Kill (Stream A)	9/22/2011	0.4	16.62	10.30	8.45	368
Kroma Kill (Stream A)	10/24/2011	0.4	9.09	12.34	8.50	378
American's Creek (Stream B)	5/17/2006	0.4	13.31	9.99	8.20	234
American's Creek (Stream B)	6/14/2006	0.4	17.11	9.13	8.34	382
American's Creek (Stream B)	7/19/2006	0.3	21.38	8.25	8.17	425
American's Creek (Stream B)	8/22/2006	0.1	17.87	8.44	8.04	418
American's Creek (Stream B)	9/27/2006	0.2	12.90	9.10	8.08	487
American's Creek (Stream B)	10/12/2006	0.2	12.54	9.18	8.00	469
American's Creek (Stream B)	4/3/2007	0.2	3.88	13.17	7.89	293
American's Creek (Stream B)	5/9/2007	0.4	16.36	10.52	8.26	457
American's Creek (Stream B)	6/14/2007	0.3	15.45	9.67	8.33	495
American's Creek (Stream B)	7/12/2007	0.2	19.88	8.84	8.20	415
American's Creek (Stream B)	8/8/2007	0.1	23.13	7.39	8.08	403
American's Creek (Stream B)	5/15/2008	0.3	12.62	9.86	8.18	377
American's Creek (Stream B)	6/17/2008	0.4	17.29	8.23	8.08	346
American's Creek (Stream B)	7/22/2008	0.4	21.21	7.81	8.15	498
American's Creek (Stream B)	8/21/2008	0.5	17.72	8.63	8.03	406
American's Creek (Stream B)	9/22/2008	0.3	13.31	9.82	8.12	427
American's Creek (Stream B)	10/14/2008	0.0	14.40	7.68	7.92	490
American's Creek (Stream B)	5/14/2009	0.2	12.61	9.80	8.23	551
American's Creek (Stream B)	7/30/2009	0.2	22.21	8.16	8.07	302
American's Creek (Stream B)	8/31/2009	0.5	16.51	9.47	8.27	405
American's Creek (Stream B)	10/1/2009	0.4	10.16	9.68	8.08	481
American's Creek (Stream B)	10/21/2009	0.3	7.87	10.78	8.55	526
American's Creek (Stream B)	5/27/2010	0.3	19.46	8.15	8.01	624
American's Creek (Stream B)	5/27/2010	0.3	19.42	8.40	8.00	623
American's Creek (Stream B)	6/16/2010	0.4	15.34	9.78	8.42	610
American's Creek (Stream B)	7/7/2010	0.3	24.08	8.05	7.40	510
American's Creek (Stream B)	7/7/2010	0.4	24.10	7.65	7.33	511
American's Creek (Stream B)	8/12/2010	0.4	19.72	8.33	7.40	524
American's Creek (Stream B)	9/10/2010	0.2	15.22	4.92	8.04	527
American's Creek (Stream B)	10/6/2010	0.3	12.66	10.15	7.79	404
American's Creek (Stream B)	5/26/2011	0.5	19.74	9.38	8.30	384
American's Creek (Stream B)	6/22/2011	0.4	16.70	9.30	7.99	284
American's Creek (Stream B)	7/20/2011	0.4	19.97	6.75	8.09	486
American's Creek (Stream B)	8/22/2011	0.3	18.81	8.95	8.37	435
American's Creek (Stream B)	9/22/2011	0.3	16.49	9.52	8.10	433
American's Creek (Stream B)	10/24/2011	0.4	8.22	10.88	7.88	464
Upper Mill Creek (Stream C)	5/17/2006	0.4	14.06	10.28	8.28	245
Upper Mill Creek (Stream C)	6/14/2006	0.4	15.43	9.82	8.24	334
Upper Mill Creek (Stream C)	7/19/2006	0.3	23.92	7.43	8.01	482

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A1. YSI sonde in-situ water quality measurements collected at SARA (continued).

Site	Date	Depth (m)	Temp (C)	DO (mg/L)	pH	Specific Conductance (µS/cm)
Upper Mill Creek (Stream C)	8/22/2006	0.0	17.58	7.78	7.87	484
Upper Mill Creek (Stream C)	9/27/2006	0.2	12.36	8.81	8.00	626
Upper Mill Creek (Stream C)	10/12/2006	0.2	12.90	8.71	7.93	526
Upper Mill Creek (Stream C)	4/3/2007	0.1	3.72	12.25	7.47	302
Upper Mill Creek (Stream C)	5/9/2007	0.3	17.49	11.26	8.36	371
Upper Mill Creek (Stream C)	6/14/2007	0.2	17.08	8.57	8.01	521
Upper Mill Creek (Stream C)	7/12/2007	0.1	20.42	7.96	7.78	347
Upper Mill Creek (Stream C)	8/8/2007	0.1	23.73	8.16	7.94	486
Upper Mill Creek (Stream C)	5/14/2008	0.2	17.22	8.49	8.01	427
Upper Mill Creek (Stream C)	6/18/2008	0.4	17.60	3.14	7.39	604
Upper Mill Creek (Stream C)	8/21/2008	0.5	15.04	8.63	7.91	551
Upper Mill Creek (Stream C)	9/22/2008	0.4	13.29	6.07	7.55	592
Upper Mill Creek (Stream C)	10/14/2008	0.0	12.24	4.60	7.64	766
Upper Mill Creek (Stream C)	5/14/2009	0.3	12.95	8.41	7.83	489
Upper Mill Creek (Stream C)	6/24/2009	0.3	20.12	8.39	7.90	516
Upper Mill Creek (Stream C)	7/30/2009	0.3	23.31	3.23	7.36	328
Upper Mill Creek (Stream C)	8/31/2009	0.6	16.75	7.40	7.72	465
Upper Mill Creek (Stream C)	10/1/2009	0.4	10.66	9.17	7.80	579
Upper Mill Creek (Stream C)	10/21/2009	0.2	6.77	10.48	8.37	613
Upper Mill Creek (Stream C)	5/26/2010	0.3	18.96	3.40	7.29	527
Upper Mill Creek (Stream C)	6/16/2010	0.4	15.71	6.84	7.83	606
Upper Mill Creek (Stream C)	7/7/2010	0.3	26.27	6.35	10.57	518
Upper Mill Creek (Stream C)	8/12/2010	0.4	20.44	3.00	6.78	568
Upper Mill Creek (Stream C)	9/10/2010	0.1	16.60	8.48	7.97	661
Upper Mill Creek (Stream C)	10/6/2010	0.4	13.01	7.42	7.49	470
Upper Mill Creek (Stream C)	5/26/2011	0.5	19.31	9.59	8.13	385
Upper Mill Creek (Stream C)	6/22/2011	0.5	17.23	3.81	7.42	441
Upper Mill Creek (Stream C)	7/20/2011	0.3	20.05	6.90	7.87	518
Upper Mill Creek (Stream C)	9/22/2011	0.4	16.74	8.24	7.66	468
Upper Mill Creek (Stream C)	10/24/2011	0.5	6.52	11.05	7.09	461
Mill Creek Confluence (Stream D)	5/17/2006	0.5	14.27	10.23	8.35	246
Mill Creek Confluence (Stream D)	6/14/2006	0.5	15.80	9.91	8.30	335
Mill Creek Confluence (Stream D)	7/19/2006	0.3	20.75	8.77	8.29	382
Mill Creek Confluence (Stream D)	8/22/2006	0.1	19.77	9.83	8.23	363
Mill Creek Confluence (Stream D)	9/27/2006	0.3	11.02	9.86	8.09	448
Mill Creek Confluence (Stream D)	10/12/2006	0.3	12.78	10.05	8.17	424
Mill Creek Confluence (Stream D)	5/9/2007	0.5	12.22	11.06	8.21	329
Mill Creek Confluence (Stream D)	6/14/2007	0.3	14.77	9.73	8.20	363
Mill Creek Confluence (Stream D)	7/12/2007	0.2	18.82	9.09	8.13	246
Mill Creek Confluence (Stream D)	8/9/2007	0.2	19.13	8.02	8.18	390
Mill Creek Confluence (Stream D)	9/7/2007	0.2	17.42	9.12	8.42	395

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A1. YSI sonde in-situ water quality measurements collected at SARA (continued).

Site	Date	Depth (m)	Temp (C)	DO (mg/L)	pH	Specific Conductance (μS/cm)
Mill Creek Confluence (Stream D)	10/4/2007	0.1	15.87	6.67	7.73	400
Mill Creek Confluence (Stream D)	5/14/2008	0.4	15.63	11.14	8.63	308
Mill Creek Confluence (Stream D)	6/18/2008	0.5	14.87	9.46	7.97	315
Mill Creek Confluence (Stream D)	8/21/2008	0.5	17.59	9.89	8.22	376
Mill Creek Confluence (Stream D)	9/23/2008	0.3	10.62	10.67	7.83	357
Mill Creek Confluence (Stream D)	10/14/2008	0.1	12.07	10.64	7.93	426
Mill Creek Confluence (Stream D)	5/14/2009	0.2	12.50	10.86	8.23	372
Mill Creek Confluence (Stream D)	6/24/2009	0.4	20.04	9.40	8.29	364
Mill Creek Confluence (Stream D)	9/1/2009	0.5	14.07	10.02	8.16	355
Mill Creek Confluence (Stream D)	10/2/2009	0.5	10.42	11.02	8.14	398
Mill Creek Confluence (Stream D)	10/21/2009	0.2	9.19	13.71	8.99	413
Mill Creek Confluence (Stream D)	5/26/2010	0.3	22.70	8.47	7.11	388
Mill Creek Confluence (Stream D)	6/16/2010	0.4	15.54	10.17	8.36	419
Mill Creek Confluence (Stream D)	6/16/2010	0.4	15.54	9.84	8.36	418
Mill Creek Confluence (Stream D)	7/7/2010	0.4	25.06	8.97	11.13	228
Mill Creek Confluence (Stream D)	8/12/2010	0.4	21.19	9.87	7.52	325
Mill Creek Confluence (Stream D)	9/9/2010	0.1	16.76	9.00	7.93	353
Mill Creek Confluence (Stream D)	10/6/2010	0.4	13.26	10.16	8.02	338
Mill Creek Confluence (Stream D)	5/26/2011	0.4	19.50	9.95	8.41	326
Mill Creek Confluence (Stream D)	6/23/2011	0.4	17.46	9.28	7.70	138
Mill Creek Confluence (Stream D)	7/20/2011	0.4	21.45	9.99	8.34	356
Mill Creek Confluence (Stream D)	8/22/2011	0.3	18.23	11.45	8.28	372
Mill Creek Confluence (Stream D)	9/22/2011	0.4	16.98	10.38	8.25	376
Mill Creek Confluence (Stream D)	10/24/2011	0.3	10.62	14.11	8.45	380

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A2. Laboratory nutrient chemistry data for SARA. “<MRL” indicates the result was below the method reporting limit (provided after the abbreviation). *Missing values indicate data are unavailable.*

Site	Date	ANC (µeq/L)	Apparent Color (PCU)	TP (µg/L)	TDP (µg/L)	SRP (µg/L)	TN (mg/L)	TDN (mg/L)	NO ₂ +NO ₃ (mg/L)	NO ₂ (mg/L)	NH ₃ (mg/L)
Kroma Kill (Stream A)	8/22/2006	3060.0	25	30		12.0	4.730		4.660	0.010	0.013
Kroma Kill (Stream A)	6/14/2006	2720.0	25	40		13.0	1.680		1.170	0.005	0.007
Kroma Kill (Stream A)	8/8/2007	3247.5	18	50	9.0	4.0	10.800	10.900	10.212	0.024	<MRL 0.02
Kroma Kill (Stream A)	5/9/2007	2687.7	13	18	4.0	<MRL 6	4.020	4.050	3.710	0.012	<MRL 0.02
Kroma Kill (Stream A)	8/21/2008	3060.0	98	34	8.9	3.4	2.430	2.690	2.400	0.006	<MRL 0.08
Kroma Kill (Stream A)	5/15/2008	2686.0	91	28	5.3	2.5	3.600	3.460	3.370	0.018	
Kroma Kill (Stream A)	5/14/2009	3170.0	94	24	6.1	1.0	3.910	4.110	0.393	0.022	<MRL 0.08
Kroma Kill (Stream A)	8/31/2009	2990.0	301	100	18.0	12.0	1.950	1.860	1.607	0.011	<MRL 0.08
Kroma Kill (Stream A)	5/27/2010	3350.0	66	44	12.0	5.3	5.350	5.420	5.050	0.066	0.150
Kroma Kill (Stream A)	8/12/2010	3280.0	90	34	11.0	4.5	6.840	6.370	6.600	0.021	<MRL 0.08
Kroma Kill (Stream A)	8/22/2011	3180.0	161	67	12.0	5.4	2.930	2.770	2.680	0.009	<MRL 0.08
Kroma Kill (Stream A)	5/26/2011	2610.0	96	34	17.0	7.8	1.470	1.460	1.120	0.006	<MRL 0.08
American's Creek (Stream B)	8/22/2006	3560.0	18	20		8.0	0.750		0.082	0.001	0.035
American's Creek (Stream B)	5/9/2007	3652.8	8	14	5.0	4.0	0.150	0.100	<MRL 0.016	<MRL 0.002	<MRL 0.02
American's Creek (Stream B)	8/8/2007	3687.9	60	98	16.0	8.0	0.670	0.530	0.195	0.004	<MRL 0.02
American's Creek (Stream B)	5/15/2008	3304.0	55	15	9.5	6.5	<MRL 0.1	0.122	0.005	<MRL 0.005	
American's Creek (Stream B)	8/21/2008	3650.0	290	38	13.0	7.6	0.379	0.306	0.051	<MRL 0.005	<MRL 0.08
American's Creek (Stream B)	5/14/2009	4500.0	193	41	7.6	7.5	0.162	0.183	0.018	0.007	<MRL 0.08
American's Creek (Stream B)	8/31/2009	3650.0	79	30	12.0	9.5	0.302	0.290	0.050	<MRL 0.005	<MRL 0.08
American's Creek (Stream B)	8/12/2010	5530.0	54	27	11.0	4.9	0.452	0.408	0.124	<MRL 0.005	<MRL 0.08
American's Creek (Stream B)	5/27/2010	5410.0	692	245	13.0	5.5	0.387	0.364	0.032	0.012	<MRL 0.08
American's Creek (Stream B)	8/22/2011	3830.0	336	48	13.0	4.6	0.380	0.322	0.013	0.007	<MRL 0.08
American's Creek (Stream B)	5/26/2011	3440.0	131	25	12.0	7.8	0.199	0.170	0.011	0.005	<MRL 0.08
Upper Mill Creek (Stream C)	8/22/2006	3240.0	35	50		13.0	0.780		0.171	0.001	0.013
Upper Mill Creek (Stream C)	5/9/2007	2958.1	13	18	7.0	<MRL 6	0.700	0.650	0.404	0.003	<MRL 0.02
Upper Mill Creek (Stream C)	8/8/2007	3587.1	35	59	19.0	9.0	0.740	0.530	0.095	0.002	0.013
Upper Mill Creek (Stream C)	8/21/2008	3970.0	52	22	13.0	4.8	0.491	0.482	0.059	<MRL 0.005	<MRL 0.08
Upper Mill Creek (Stream C)	5/14/2008	2673.0	49	17	7.6	3.2	0.281	0.244	0.030	<MRL 0.005	

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A2. Laboratory nutrient chemistry data for SARA (continued).

Site	Date	ANC (µeq/L)	Apparent Color (PCU)	TP (µg/L)	TDP (µg/L)	SRP (µg/L)	TN (mg/L)	TDN (mg/L)	NO ₂ +NO ₃ (mg/L)	NO ₂ (mg/L)	NH ₃ (mg/L)
Upper Mill Creek (Stream C)	5/14/2009	3500.0	51	26	8.5	4.3	0.327	0.269	0.038	<MRL 0.005	<MRL 0.08
Upper Mill Creek (Stream C)	8/31/2009	3400.0	48	25	16.0	11.0	0.449	0.541	0.039	<MRL 0.005	<MRL 0.08
Upper Mill Creek (Stream C)	8/12/2010	4020.0	44	34	19.0	8.3	0.692	0.607	0.067	<MRL 0.005	<MRL 0.08
Upper Mill Creek (Stream C)	5/26/2010	3760.0	54	37	14.0	5.6	1.020	0.748	0.254	0.008	<MRL 0.08
Upper Mill Creek (Stream C)	5/26/2011	2990.0	44	18	9.6	4.4	0.329	0.316	0.021	<MRL 0.005	<MRL 0.08
Upper Mill Creek (Stream C)	8/22/2011	4280.0	55	35	21.0	9.1	0.735	0.734	0.028	<MRL 0.005	<MRL 0.08
Mill Creek Confluence (Stream D)	6/14/2006	2860.0	20	40		8.0	2.400		1.990	0.003	0.011
Mill Creek Confluence (Stream D)	8/22/2006	2460.0	30	40		11.0	4.680		4.360	0.004	0.009
Mill Creek Confluence (Stream D)	8/9/2007	3103.8	25	52	15.0	8.0	4.020	4.000	3.640	0.010	0.013
Mill Creek Confluence (Stream D)	5/9/2007	2600.9	10	30	7.0	<MRL 6	3.310	3.310	3.210	0.009	<MRL 0.02
Mill Creek Confluence (Stream D)	8/21/2008	2880.0	278	39	11.0	3.5	2.220	2.440	2.290	0.007	<MRL 0.08
Mill Creek Confluence (Stream D)	5/14/2008	2372.0	59	12	5.7	2.5	2.040	1.950	1.780	0.005	
Mill Creek Confluence (Stream D)	9/1/2009	2940.0	259	51	14.0	10.0	2.270	2.410	2.180	0.008	<MRL 0.08
Mill Creek Confluence (Stream D)	5/14/2009	3160.0	154	34	6.0	3.0	2.910	2.880	0.278	0.013	<MRL 0.08
Mill Creek Confluence (Stream D)	8/12/2010	2150.0	121	31	11.0	6.8	9.250	8.750	9.000	0.018	<MRL 0.08
Mill Creek Confluence (Stream D)	5/26/2010	3350.0	97	47	12.0	5.0	3.780	3.650	3.210	0.073	0.120
Mill Creek Confluence (Stream D)	8/22/2011	2980.0	158	44	13.0	6.7	3.500	3.640	3.440	0.007	<MRL 0.08
Mill Creek Confluence (Stream D)	5/26/2011	2740.0	159	30	13.0	6.9	2.700	2.790	2.440	0.008	<MRL 0.08

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A3. Stream stage and discharge data for SARA. *Missing values indicate data are unavailable.*

Site	Date	Tapedown from datum (ft)	Total cross section area (sqft)	Average velocity (f/s)	Discharge (cfs)
Kroma Kill (Stream A)	6/14/2006		3.93	2.90	11.27
Kroma Kill (Stream A)	7/19/2006	2.18	5.51	0.55	3.09
Kroma Kill (Stream A)	7/20/2006	0.66	0.68	0.55	0.35
Kroma Kill (Stream A)	8/22/2006	2.25	5.17	0.43	2.21
Kroma Kill (Stream A)	9/27/2006	2.25	1.27	0.93	1.12
Kroma Kill (Stream A)	10/12/2006	2.17	1.77	1.76	3.19
Kroma Kill (Stream A)	4/3/2007	2.00	11.95	1.37	15.19
Kroma Kill (Stream A)	5/9/2007	2.19	2.00	1.55	3.07
Kroma Kill (Stream A)	6/14/2007		1.32	0.97	1.32
Kroma Kill (Stream A)	7/12/2007	1.21	10.38	1.44	15.39
Kroma Kill (Stream A)	8/8/2007	2.23	1.05	1.02	1.04
Kroma Kill (Stream A)	9/6/2007		1.23	0.47	0.53
Kroma Kill (Stream A)	10/3/2007	2.31	1.14	0.50	0.56
Kroma Kill (Stream A)	5/15/2008	2.19	1.62	2.06	3.04
Kroma Kill (Stream A)	6/17/2008	2.25	1.73	0.63	1.05
Kroma Kill (Stream A)	7/23/2008	2.21			
Kroma Kill (Stream A)	8/21/2008	2.19			
Kroma Kill (Stream A)	9/23/2008	2.25		0.65	
Kroma Kill (Stream A)	10/14/2008	2.21	1.71	0.58	0.93
Kroma Kill (Stream A)	5/14/2009	2.20	1.64	0.93	1.53
Kroma Kill (Stream A)	6/24/2009	2.25	1.71	2.76	4.72
Kroma Kill (Stream A)	7/31/2009				
Kroma Kill (Stream A)	8/31/2009	2.10	1.81	2.11	4.25
Kroma Kill (Stream A)	10/2/2009		1.98	0.72	1.42
Kroma Kill (Stream A)	10/21/2009	2.21	2.71	0.59	1.60
Kroma Kill (Stream A)	5/27/2010	2.25	1.27	0.98	1.25
Kroma Kill (Stream A)	6/16/2010	2.20	1.00	1.09	1.09
Kroma Kill (Stream A)	7/7/2010	2.20	0.77	0.53	0.41
Kroma Kill (Stream A)	8/12/2010	2.25	0.89	0.95	0.84
Kroma Kill (Stream A)	9/9/2010	2.25	0.47	0.70	0.32
Kroma Kill (Stream A)	10/6/2010	2.10	2.57	2.14	5.52
Kroma Kill (Stream A)	5/26/2011	2.03	4.04	1.84	7.42
Kroma Kill (Stream A)	7/20/2011	2.22	0.93	0.95	0.89
Kroma Kill (Stream A)	8/22/2011	2.10	4.08	1.03	4.19
Kroma Kill (Stream A)	9/22/2011	2.12	2.44	1.86	4.54
Kroma Kill (Stream A)	10/24/2011	2.11	2.73	2.06	5.62
American's Creek (Stream B)	6/14/2006		0.34	0.29	0.10
American's Creek (Stream B)	7/19/2006	2.42	0.12	0.23	0.03
American's Creek (Stream B)	8/22/2006	2.56	0.12	0.21	0.03

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A3. Stream stage and discharge data for SARA (continued).

Site	Date	Tapedown from datum (ft)	Total cross section area (sqft)	Average velocity (f/s)	Discharge (cfs)
American's Creek (Stream B)	10/12/2006	2.50	0.52	0.58	0.19
American's Creek (Stream B)	4/3/2007	2.75	0.72	1.01	0.79
American's Creek (Stream B)	5/9/2007	2.73	0.57	0.09	0.05
American's Creek (Stream B)	6/14/2007	2.67	0.32	0.19	0.05
American's Creek (Stream B)	7/12/2007	2.83	0.29	0.32	0.10
American's Creek (Stream B)	8/8/2007	Too dry			
American's Creek (Stream B)	5/15/2008		0.32	0.12	0.03
American's Creek (Stream B)	6/17/2008	Too dry			
American's Creek (Stream B)	7/8/2008	Too dry			
American's Creek (Stream B)	7/22/2008	Too dry			
American's Creek (Stream B)	8/21/2008	Too dry			
American's Creek (Stream B)	9/22/2008	Too dry			
American's Creek (Stream B)	10/14/2008	Too dry			
American's Creek (Stream B)	5/14/2009		0.37	0.14	0.05
American's Creek (Stream B)	6/24/2009		0.27	0.13	0.04
American's Creek (Stream B)	7/30/2009		0.38	0.55	0.21
American's Creek (Stream B)	8/31/2009		0.21	0.29	0.07
American's Creek (Stream B)	10/1/2009		0.17	0.05	0.01
American's Creek (Stream B)	10/21/2009				
American's Creek (Stream B)	10/6/2010		5.21	0.25	1.30
American's Creek (Stream B)	6/22/2011		0.07	0.36	0.03
American's Creek (Stream B)	8/22/2011		0.00	0.00	0.00
American's Creek (Stream B)	9/22/2011		0.14	0.65	0.09
American's Creek (Stream B)	10/24/2011		0.38	0.18	0.07
Upper Mill Creek (Stream C)	6/14/2006		3.85	0.36	1.57
Upper Mill Creek (Stream C)	7/19/2006	2.75	1.24	0.14	0.20
Upper Mill Creek (Stream C)	8/22/2006	2.71			
Upper Mill Creek (Stream C)	9/27/2006	2.80			
Upper Mill Creek (Stream C)	10/12/2006	2.75	0.72	0.67	0.48
Upper Mill Creek (Stream C)	4/3/2007	2.77	1.16	1.57	1.83
Upper Mill Creek (Stream C)	5/9/2007	2.79	0.30	0.36	0.11
Upper Mill Creek (Stream C)	6/14/2007	2.79	0.13	0.23	0.03
Upper Mill Creek (Stream C)	7/12/2007	2.75	0.56	0.79	0.46
Upper Mill Creek (Stream C)	8/8/2007		0.13	0.23	0.02
Upper Mill Creek (Stream C)	5/14/2008	2.79	0.16	0.47	0.07
Upper Mill Creek (Stream C)	6/18/2008	2.77			
Upper Mill Creek (Stream C)	7/22/2008				
Upper Mill Creek (Stream C)	8/18/2008	2.77			
Upper Mill Creek (Stream C)	8/21/2008	2.79			
Upper Mill Creek (Stream C)	9/22/2008				
Upper Mill Creek (Stream C)	10/14/2008				

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A3. Stream stage and discharge data for SARA (continued).

Site	Date	Tapedown from datum (ft)	Total cross section area (sqft)	Average velocity (f/s)	Discharge (cfs)
Upper Mill Creek (Stream C)	5/14/2009	2.75			
Upper Mill Creek (Stream C)	6/24/2009	2.74	0.39	0.31	0.12
Upper Mill Creek (Stream C)	7/30/2009	2.73	1.29	1.07	1.38
Upper Mill Creek (Stream C)	8/31/2009	2.76	0.39	0.44	0.18
Upper Mill Creek (Stream C)	10/1/2009	2.77	0.32	0.24	0.08
Upper Mill Creek (Stream C)	10/21/2009	2.77	0.48	0.24	0.11
Upper Mill Creek (Stream C)	6/16/2010		0.11	0.11	0.01
Upper Mill Creek (Stream C)	10/6/2010	2.75	0.51	0.77	0.39
Upper Mill Creek (Stream C)	5/26/2011	2.75	0.56	0.78	0.44
Upper Mill Creek (Stream C)	6/22/2011	2.75	0.72	0.76	0.55
Upper Mill Creek (Stream C)	8/22/2011	2.95	0.24	0.68	0.21
Upper Mill Creek (Stream C)	9/22/2011	2.76	0.83	0.71	0.59
Upper Mill Creek (Stream C)	10/24/2011	2.78	1.62	0.16	0.26
Mill Creek Confluence (Stream D)	6/14/2006		4.53	0.43	2.19
Mill Creek Confluence (Stream D)	7/19/2006	2.21	2.42	0.21	0.59
Mill Creek Confluence (Stream D)	8/22/2006	2.29	1.71	0.19	0.37
Mill Creek Confluence (Stream D)	9/27/2006	2.30	1.87	0.14	0.25
Mill Creek Confluence (Stream D)	10/12/2006	2.00	3.42	0.64	2.26
Mill Creek Confluence (Stream D)	5/9/2007	2.19	2.41	0.39	0.72
Mill Creek Confluence (Stream D)	6/14/2007	2.23	1.87	0.19	0.32
Mill Creek Confluence (Stream D)	7/12/2007	1.79	4.87	0.81	4.06
Mill Creek Confluence (Stream D)	8/9/2007	2.31	0.75	0.18	0.13
Mill Creek Confluence (Stream D)	9/7/2007				
Mill Creek Confluence (Stream D)	10/4/2007	2.35			
Mill Creek Confluence (Stream D)	5/14/2008	2.08	1.38	0.41	0.53
Mill Creek Confluence (Stream D)	6/18/2008	2.21	0.56	0.19	0.09
Mill Creek Confluence (Stream D)	7/22/2008	1.93			
Mill Creek Confluence (Stream D)	8/21/2008	2.01			
Mill Creek Confluence (Stream D)	9/23/2008	2.19	1.69	0.13	0.20
Mill Creek Confluence (Stream D)	10/14/2008	2.13	0.97	0.19	0.14
Mill Creek Confluence (Stream D)	5/14/2009		2.52	0.18	0.44
Mill Creek Confluence (Stream D)	6/24/2009	2.00	1.88	0.30	0.57
Mill Creek Confluence (Stream D)	9/1/2009	1.92	1.48	0.53	0.69
Mill Creek Confluence (Stream D)	10/2/2009	1.98	0.32	0.24	0.08
Mill Creek Confluence (Stream D)	10/21/2009	2.00			
Mill Creek Confluence (Stream D)	5/26/2010	1.95	1.11	0.15	0.17
Mill Creek Confluence (Stream D)	6/16/2010	1.92	0.72	0.36	0.26
Mill Creek Confluence (Stream D)	7/7/2010	1.95	0.95	0.09	0.09
Mill Creek Confluence (Stream D)	8/12/2010	1.89	0.92	0.15	0.14
Mill Creek Confluence (Stream D)	9/9/2010	1.87	0.74	0.09	0.07
Mill Creek Confluence (Stream D)	10/6/2010	1.70	1.83	0.60	1.11

Appendix A. Saratoga National Historical Park (SARA) Water Monitoring Data, 2006-2011 (continued).

Table A3. Stream stage and discharge data for SARA (continued).

Site	Date	Tapedown from datum (ft)	Total cross section area (sqft)	Average velocity (f/s)	Discharge (cfs)
Mill Creek Confluence (Stream D)	5/26/2011	1.61	0.19	0.28	0.05
Mill Creek Confluence (Stream D)	7/20/2011	1.85	0.62	0.27	0.17
Mill Creek Confluence (Stream D)	8/22/2011	1.77	0.14	0.15	0.02
Mill Creek Confluence (Stream D)	9/22/2011	1.59	3.66	0.32	1.19
Mill Creek Confluence (Stream D)	10/24/2011	1.53	3.64	0.32	1.16

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Natural Resource Stewardship and Science

1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov