



Monitoring Matters

Nutrient Enrichment of Surface Waters at Saratoga NHP

Background

Nutrients, such as phosphorus and nitrogen, are generally present in small amounts in freshwater systems and are an important component of healthy lakes, rivers, and streams. However, excessive nutrients can lead to eutrophication, or the overabundance of algae and plants, which deteriorates water quality by depleting dissolved oxygen within the system. While a variety of human activities and sources

are known to cause nutrient enrichment in water bodies, eutrophication of upland streams located in NY is mostly associated with runoff from agricultural applications of fertilizer or manure

KEY POINTS

- All Kroma Kill and Mill Creek, and over half of Upper Mill Creek water samples show Total Nitrogen concentrations above the EPA's poor water quality threshold.
- About half of the samples from all sites are above Total Phosphorous EPA threshold.

(USGS 2019). The purpose of this update is to provide Saratoga National Historical Park (SARA) with a summary of the persistently high nitrogen and phosphorus measurements in park streams, dating to the late 1980s (Lynch 1987) and monitored each year since 2006 by the Northeast Temperate Network's (NETN) Water Monitoring program (Gawley et al. 2016ab).

Water Quality Standards – Ecoregional Nutrient Criteria

Although NY state does not provide numerical values for water quality standards, the U.S. Environmental Protection Agency (USEPA) has established ecoregional nutrient criteria, which are used as a benchmark by NETN for assessing water quality at SARA. These criteria were developed specifically for individual ecoregions and are designed to represent conditions of surface waters that are minimally impacted by human activities. These 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 (Gawley et al. 2016a).

Nutrient Enrichment at SARA

Nutrient enrichment, in the forms of nitrate and total phosphorus, were initially measured at SARA by Lynch (1987) in Kroma Kill, Mill Creek, and American's Creek. Since 2006, NETN has consistently monitored water quality, nutrient enrichment, and water quantity at Kroma Kill, Upper Mill Creek, and Mill Creek Confluence (Fig. 1) and the pattern of enrichment has continued. Water samples at Kroma Kill, a third order stream, are collected upstream of the first bridge crossing along the Park Entrance Road from Route 4. The Upper Mill Creek site is sampled where the stream enters the park, downstream of the park tour road. The Mill Creek Confluence site is 200 meters downstream of the confluence of the North and South Forks.

Since 2006, NETN has recorded consistently high concentrations of total nitrogen (TN) and total phosphorus

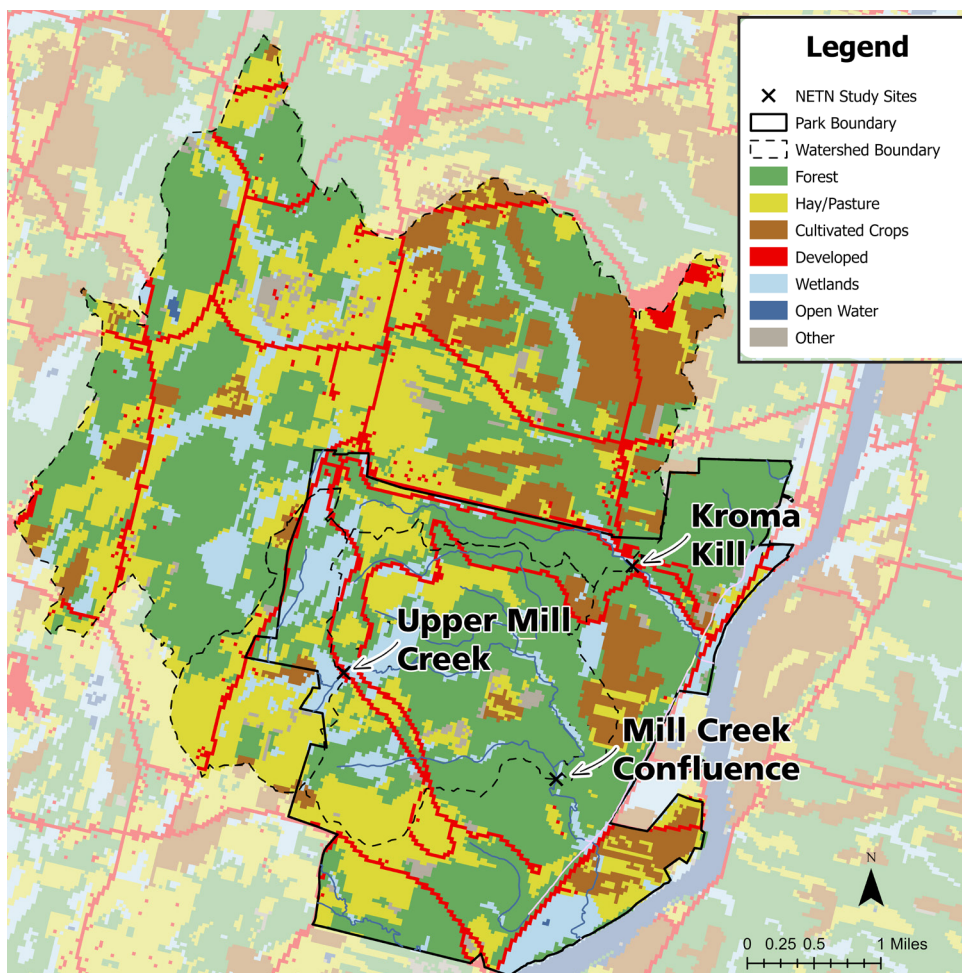
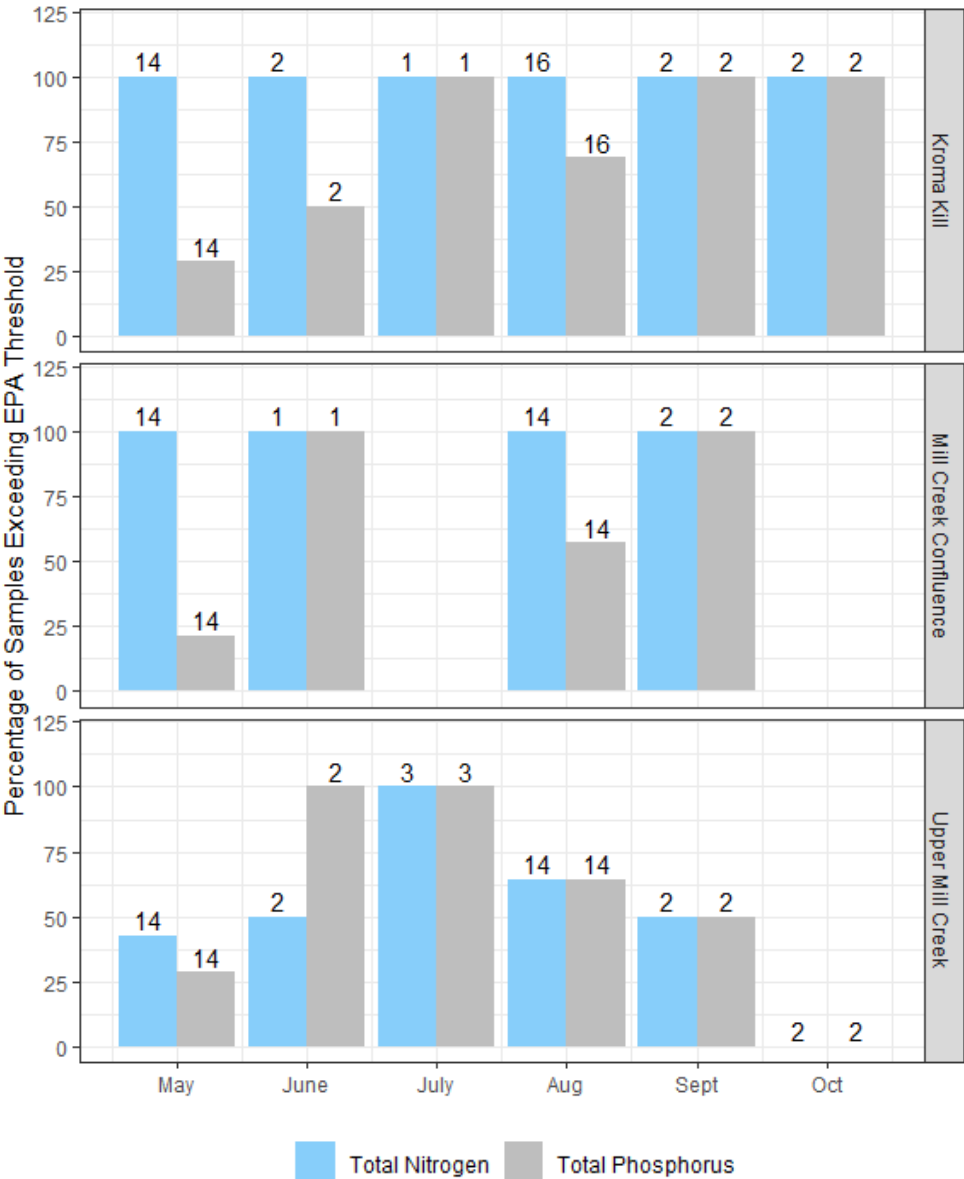


Figure 1. 2021 land use (Dewitz 2023) in Saratoga National Historical Park and surrounding watersheds associated with NETN's long term monitoring sites.

Table 1. 2021 land use within each watershed derived from Dewitz (2023).

Land Use Type	Kroma Kill (%)	Upper Mill Creek (%)	Mill Creek Confluence (%)
Forest	41.6	22.3	44.2
Hay/Pasture	28.6	42.7	29.0
Cultivated Crops	13.3	4.0	4.4
Developed	6.9	6.7	5.5
Wetlands	7.8	22.7	15.3
Open Water	0.1	0	0
Other	1.8	1.5	1.6



(TP) in the park’s freshwater systems from May through October (Fig. 2). At Kroma Kill and Mill Creek Confluence, all 68 water samples collected since 2006 have TN concentrations above the “poor” EPA benchmark for total nitrogen (0.484 mg/L) (Fig. 2). At Upper Mill Creek, 54% of 37 water samples collected were above this threshold for TN. Similarly, nearly half (47) of all samples (105) collected at all three sites were above the “poor” EPA benchmark for TP (32.6 ug/L): 57% of samples at Kroma Kill; 49% at Upper Mill Creek and 45% at Mill Creek Confluence (Fig. 2). Exceedances in TN and TP at Kroma Kill and Mill Creek Confluence were persistent from May through October sampling, although exceedances of TP occurred less frequently in May and August based on the few samples collected so far in the other months (Fig. 2).

Examining land use within the watersheds that drain into these streams provides context on the potential sources of nutrient inputs into the streams. Within the study site watersheds at SARA, a significant percentage of land use is agricultural (Kroma Kill, 41.9%; Upper Mill Creek, 46.7%; and Mill Creek Confluence, 33.4%) (Table 1), which we suspect is likely the source of nutrient enrichment in SARA streams.

For More Information

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References and Resources

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- Gawley, W. G., B. R. Mitchell, and E. A. Arsenault. 2016b. Northeast Temperate Network lakes, ponds, and streams monitoring protocol: 2015 revision. Natural Resource Report NPS/NETN/NRR—2016/1225. National Park Service, Fort Collins, Colorado.
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- Lynch P. 1987. Saratoga NHP Water Resource Management Program - 'baseline inventory' - annual review and summary, 1987. Saratoga National Historical Park. Stillwater, NY.
<https://irma.nps.gov/DataStore/DownloadFile/430866>
- [National Rivers and Streams Assessment 2018-19 Results | US EPA](#)
- [Nutrients and Eutrophication | U.S. Geological Survey \(usgs.gov\)](#)
- [NYS Section 303\(d\) List Of Impaired/TMDL Waters - NYDEC](#)
- [Water Quality Standards And Classifications - NYDEC](#)

