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Henderson Harbor Jefferson County, New York

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Henderson Harbor is located on the eastern end of Lake Ontario and is home to most of Jefferson County's charter boat fishing industry. The bay is 4 miles long, bordered by waterfront housing and a watershed dominated by rural agriculture. Much of the area's economy is driven by seasonal tourism, making water quality in the harbor a major concern. The New York State



Henderson Harbor

Department of Environmental Conservation has acknowledged that inadequately treated sewage has been discharged into the bay from the Hamlet of Henderson Harbor. Additionally, failure of sewer systems around the bay has also contributed to excessive aquatic growth. The New York State Department of Health has designated the bay as stressed for drinking water and swimming use in large part due to this contamination (Makarewicz 2000). This short report provides a synopsis of data collected

monthly from May through September (2005 to 2009) on the water quality of Henderson Harbor and the lakeside (swimmable depth) of Lake Ontario near the harbor.

Phosphorus is of concern as it stimulates the growth of plants, causing blooms of algae such as *Cladophora*. The average Henderson Harbor total phosphorus (TP) levels ($15.4 \pm 2.8 \mu\text{g P/L}$) were below the NYSDEC ambient guideline of $20 \mu\text{g P/L}$, as were the lakeside site concentrations ($11.5 \pm 1.8 \mu\text{g P/L}$). Both harbor and lakeside concentrations were higher than the concentrations in the open ($9.5 \pm 0.7 \mu\text{g P/L}$) offshore waters of Lake Ontario (Table 1). Harbor soluble reactive phosphorus (SRP) levels ($4.7 \pm 1.6 \mu\text{g P/L}$) were twice those measured at the lakeside site ($2.1 \pm 0.3 \mu\text{g P/L}$) and comparable to SRP levels in the offshore waters of Lake Ontario ($3.1\text{--}5.2 \mu\text{g P/L}$, Table 1). In comparison to TP concentrations in other Lake Ontario bays ($129.7 \pm 59.6 \mu\text{g P/L}$), average TP concentrations in Henderson Harbor ($15.4 \pm 2.8 \mu\text{g P/L}$) were significantly lower. Algae levels, as indicated by chlorophyll levels, in Henderson Harbor ($2.06 \pm 0.48 \mu\text{g/L}$) were comparable to concentrations in the offshore waters of Lake Ontario ($2.0\text{--}2.6 \mu\text{g/L}$, Table 1) and significantly lower than in other bays ($20.0 \pm 2.4 \mu\text{g/L}$) of Lake Ontario (Table 1). No annual trends in chlorophyll (Fig. 1c), total suspended solids (Fig. 1e), nitrate (Fig. 1f), nor total Kjeldahl nitrogen (Fig. 1g) were observed at the lakeside or harbor site although levels of phycocyanin, an indicator of blue green algae, were much lower in 2007 and 2008 than in 2005 and 2006 at Henderson Harbor (Fig. 1d). Also, phycocyanin levels (Fig. 1d) were consistently higher within Henderson Harbor than at the lakeside site. Seasonally, average monthly lakeside concentrations were very variable (Fig. 2). Nitrate (Fig. 2f) showed the clearest trend, decreasing between May and September. Soluble reactive phosphorus was high in May, decreased in May, and then increased into September (Fig. 2b). Harbor waters were

different. Phosphorus (TP and SRP) (Figs. 3a, b), suspended sediment (TSS, Fig. 3e), nitrate (Fig. 3f), and chlorophyll trended downward from May to September.

References:

Henderson Harbor. Available at: http://www.lakeontariosailing.com/henderson_harbor_yc.htm

Jefferson Soil and Water Conservation District. 2009. Available at:

<http://www.jeffersonswcd.org/>

Makarewicz, J.C. 2000. New York's North Coast: A Troubled Coastline: Lake Ontario Coastal Initiative. SUNY Brockport. Available from The Center for Environmental Information. Rochester, NY.

Table 1. Average concentrations (2003 to 2009, May through September) and standard errors (S.E.) of total phosphorus (TP), soluble reactive phosphorus (SRP), nitrate, Chlorophyll a (Chl a), phycocyanin, total suspended solids (TSS), total Kjeldahl nitrogen (TKN), sodium, and silica.

	TP ($\mu\text{g P/L}$)		SRP ($\mu\text{g P/L}$)		Nitrate (mg/L)		Chlorophyll ($\mu\text{g/L}$)		Phycocyanin ($\mu\text{g/L}$)		TSS (mg/L)		TKN ($\mu\text{g/L}$)		Sodium (mg/L)		Silica (mg/L)	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
Lakeside	62.0	7.4	7.0	0.9	0.27	0.01	19.1	4.1	17.8	2.2	33.5	4.8	795	96	13.78	0.19	0.56	0.06
Rivers	83.8	7.0	44.8	5.4	0.57	0.03	6.5	0.8	13.2	3.0	10.5	1.9	559	25	26.65	1.28	1.42	0.15
Embayments	129.7	59.6	15.5	2.0	0.14	0.01	20.0	2.4	237.5	207.6	17.0	5.70	923	70	27.47	1.49	1.29	0.11
Lake Ontario 30m	9.9	0.7	3.1	0.5	0.31	0.02	2.0	0.17	5.5	1.2	0.7	0.14	253.3	21.0	11.46	0.23	0.35	0.05
Lake Ontario 100m	9.5	0.7	5.2	2.1	0.31	0.01	2.6	0.26	6.1	1.3	0.8	0.12	343.4	50.9	11.45	0.24	0.40	0.07

Map of the “North Coast” of New York showing sampling locations for the Lake Ontario Coastal Initiative. The Henderson Harbor watershed is shown in the insert.

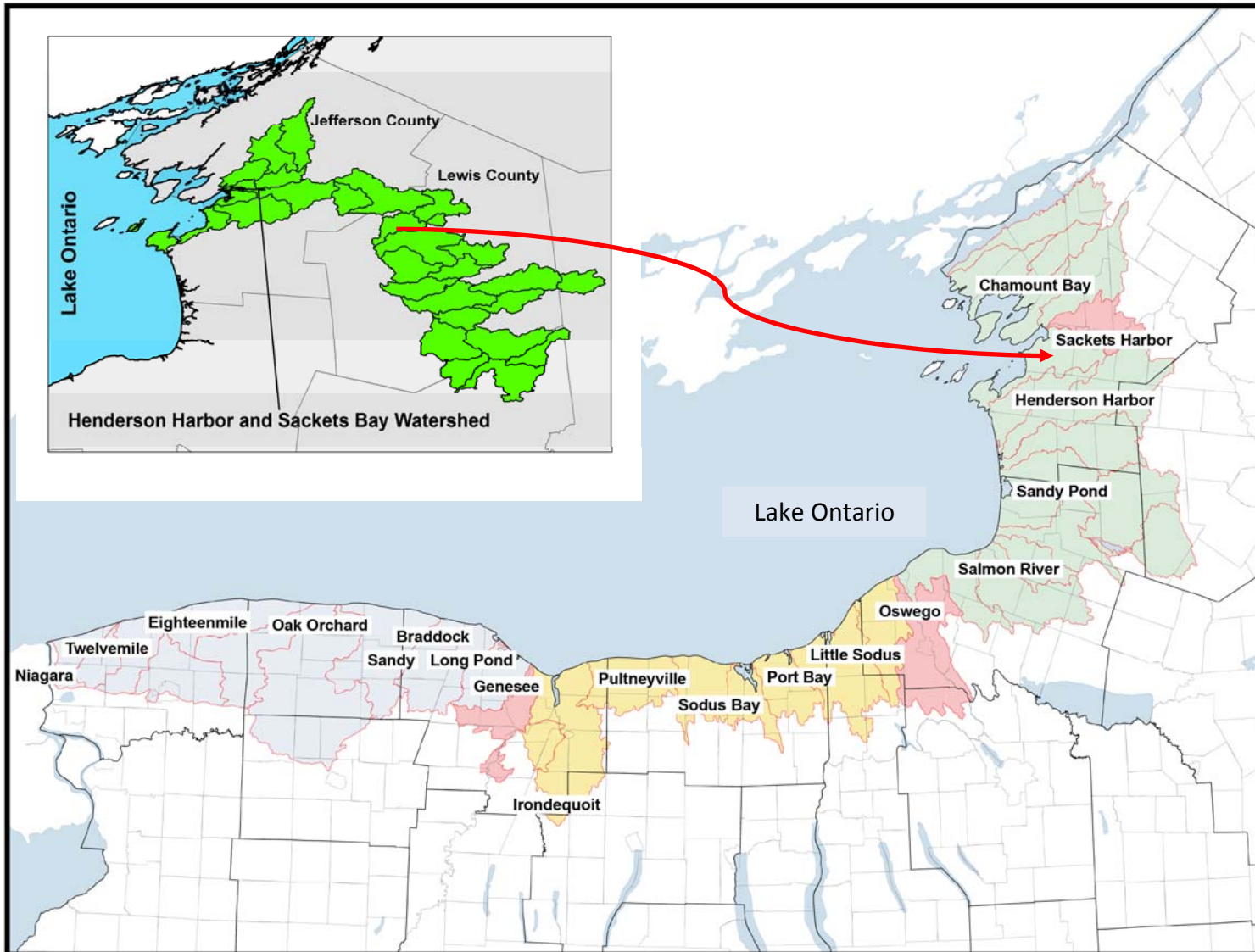


Figure 1. Average (\pm S.E) summer total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, and total Kjeldahl nitrogen concentrations at the lakeside of Lake Ontario near Henderson Harbor and at Henderson Harbor. Surface water samples were taken monthly (May-September) at a 1-meter depth.

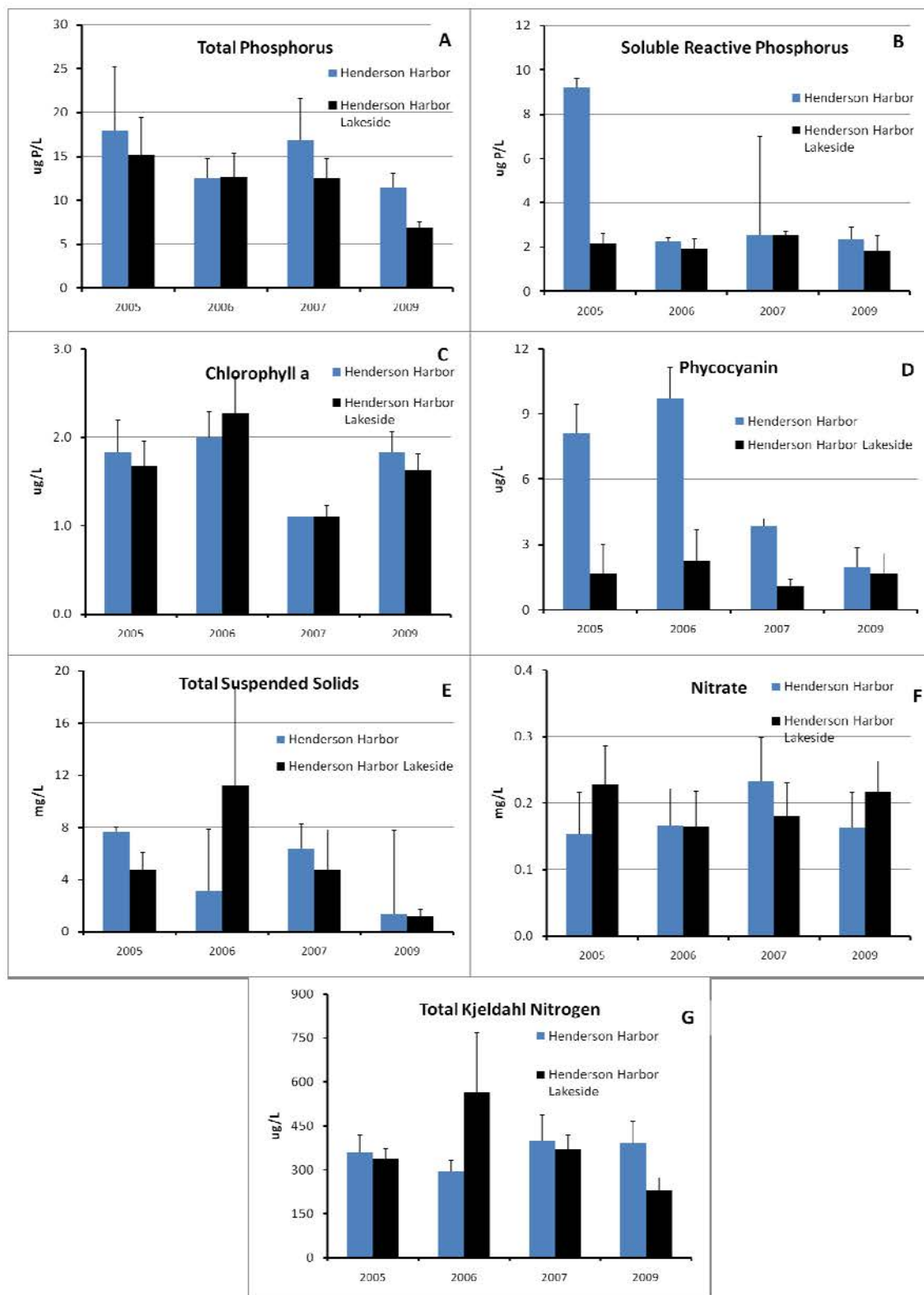


Figure 2. Average (\pm S.E) seasonal concentrations of total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, and total Kjeldahl nitrogen at the lakeside of Lake Ontario near Henderson Harbor.

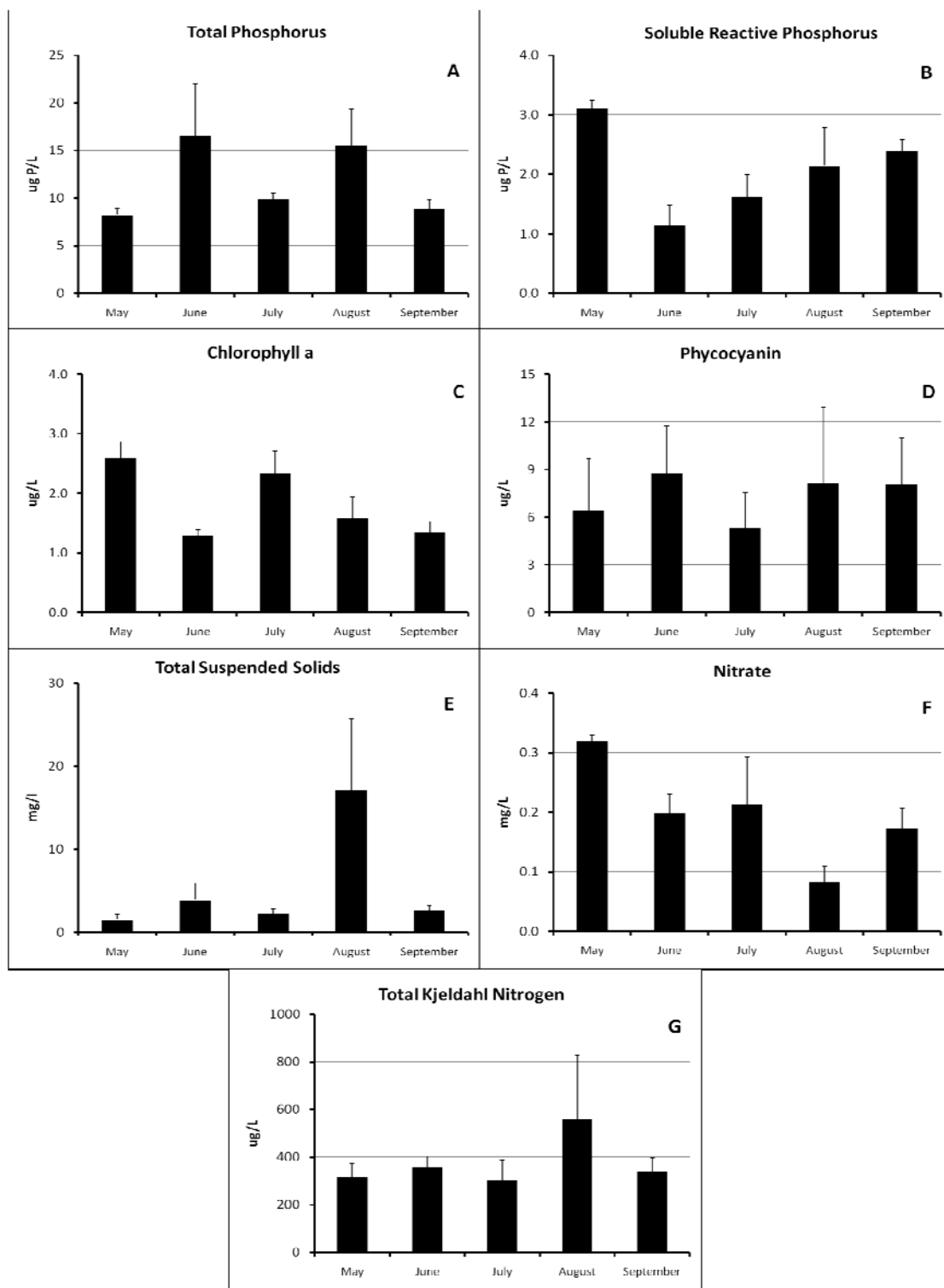


Figure 3. Average (\pm S.E) seasonal concentrations of total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, and total Kjeldahl nitrogen in Henderson Harbor.

