Little Sodus Bay
Cayuga County, New York

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Little Sodus Bay is a 728-acre embayment on the southern Lake Ontario shoreline, located in the Town of Fair Haven, New York. The bay has a mean depth of 22 feet, a maximum depth of 37 feet, and is not fed by any major tributaries. Little Sodus Bay connects to Lake Ontario through a narrow channel located in the northwest corner of the bay. The watershed surrounding the bay is composed of land roughly 20% agricultural, 18% developed land (mostly limited development), 61% forest, 1% wetlands, and 0.1% quarry (The Camdus Group 2007). Little Sodus Bay has nuisance algae and weed problems that impact water recreation. Northern and Eurasian Milfoil are a particular problem and are so dense in some shallow areas of the bay that boat navigation is hindered. Diquat dibromide was applied to control aquatic growth in the 1980s, and in the 1990s the Cayuga Soil and Water District started a weed harvesting program. Fish spawning in the bay has been identified as stressed, the result of benthic anoxia caused by cultural addition of nutrients (Makarewicz 2000). This short report provides a synopsis of data collected monthly from May through September (2003 to 2009) on the water quality of Little Sodus Bay and the lakeside (swimmable depth) of Lake Ontario near the bay.

Little Sodus Bay: Fair Haven, NY

Phosphorus is of concern as it stimulates the growth of plants, causing blooms of algae such as *Cladophora*. Both lakeside and bay total phosphorus (TP) levels exceeded the NYSDEC ambient guideline of 20 µg P/L for phosphorus concentration. Average lakeside TP (31.0±7.1 µg P/L) and soluble reactive phosphorus (SRP) (5.3±1.2 µg P/L) levels (Figs. 1a, b) were similar to Little Sodus Bay concentrations (TP=32.6±3.5 µg P/L, SRP=7.4±1.7 µg P/L). In comparison to concentrations in other Lake Ontario bays (129.7±59.6 µg P/L, Table 1), average TP concentrations in Little Sodus Bay (32.6±3.5 µg P/L) were significantly lower but still much higher than in the open (9.5±0.7 µg P/L) offshore waters of Lake Ontario. Bay (5.0±0.9 µg/L) and lakeside (4.4±1.2 µg/L) chlorophyll concentrations were significantly lower than average chlorophyll for other Lake Ontario embayments (20.0±2.4 µg/L) and lakeside sites (19.1±4.1 µg/L) (Table 1). Annual summer concentrations of algae (indicated by *chlorophyll a*, Fig. 1c) and total Kjeldahl nitrogen (TKN) levels (Fig. 1g) showed no clear annual trends throughout the study period. Concentrations of phycocyanin (Fig. 1d), an indicator of the nuisance species of blue-green algae, peaked in Little Sodus Bay in 2009 at 95 µg/L (Fig. 1d), while suspended

sediment (TSS, Fig. 1e) and nitrate levels (Fig. 1f) were consistently higher in lakeshore waters than within the bay. Seasonally, lakeside TP (Fig. 2a), SRP (Fig. 2b), chlorophyll (Fig. 2c), phycocyanin (Fig. 2d), TSS (Fig. 2e), and TKN (Fig. 2g) generally increased, while nitrate (Fig. 2f) decreased from May through September. Similar trends were not observed in Little Sodus Bay (Fig. 3). In the bay TP, SRP, and phycocyanin reached a peak in July.

References:

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

The Camdus Group. 2007. Total Maximum Daily Load (TMDL) for Phosphorus in Little Sodus Bay. Available at: http://www.dec.ny.gov/docs/water_pdf/tmdlphoslsod.pdf.

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 (µg P/L)		SRP (µg P/L)		Nitrate (mg/L)		Chlorophyll (µg/L)		Phycocyanin (µg/L)		TSS (mg/L)		TKN (µg/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. Little Sodus Bay watershed is shown in the insert.

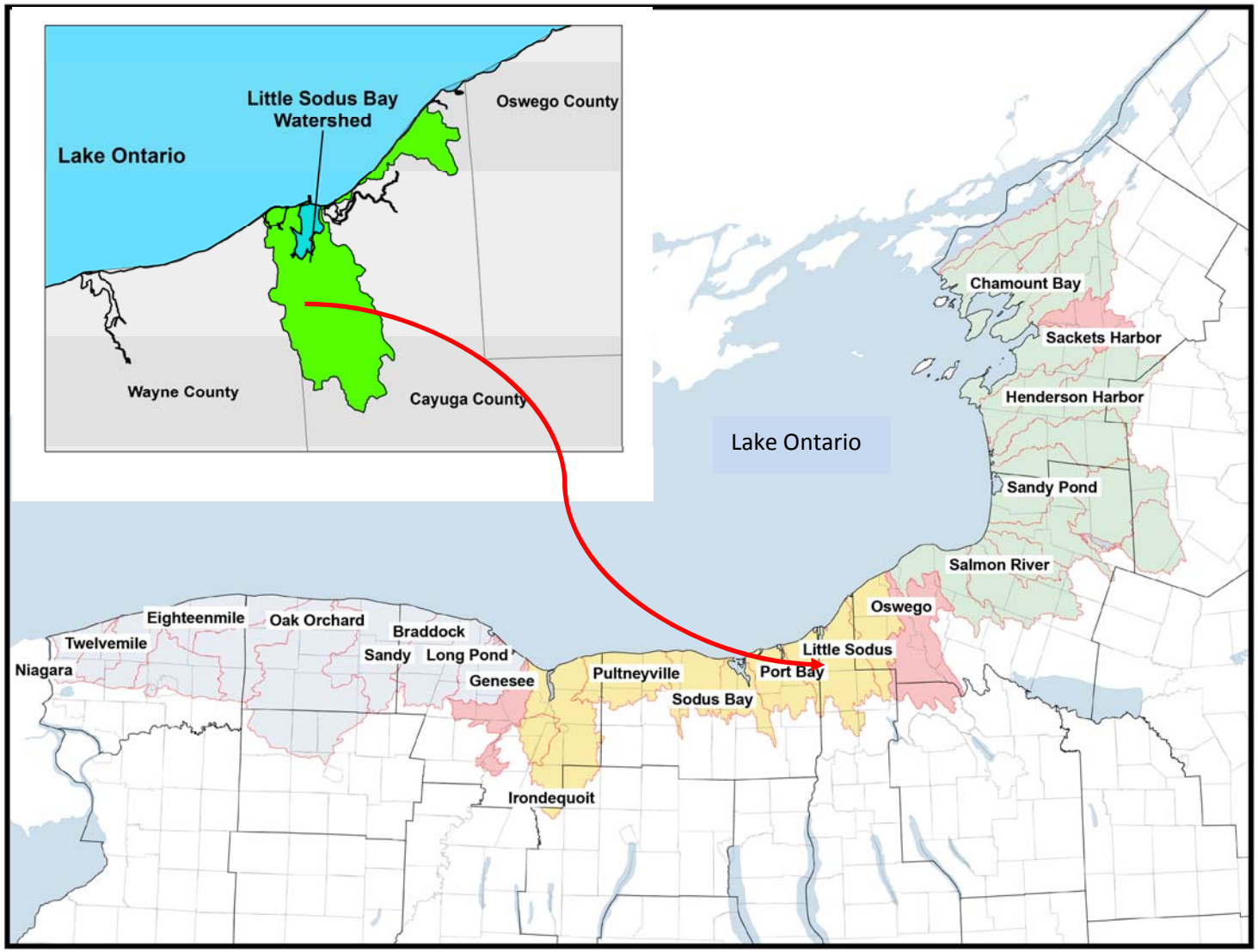

Figure 1. Average (±S.E) summer total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, and total Kjeldahl nitrogen (TKN) concentrations at the lakeside of Lake Ontario near Little Sodus Bay and at Little Sodus Bay. Surface water samples were taken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

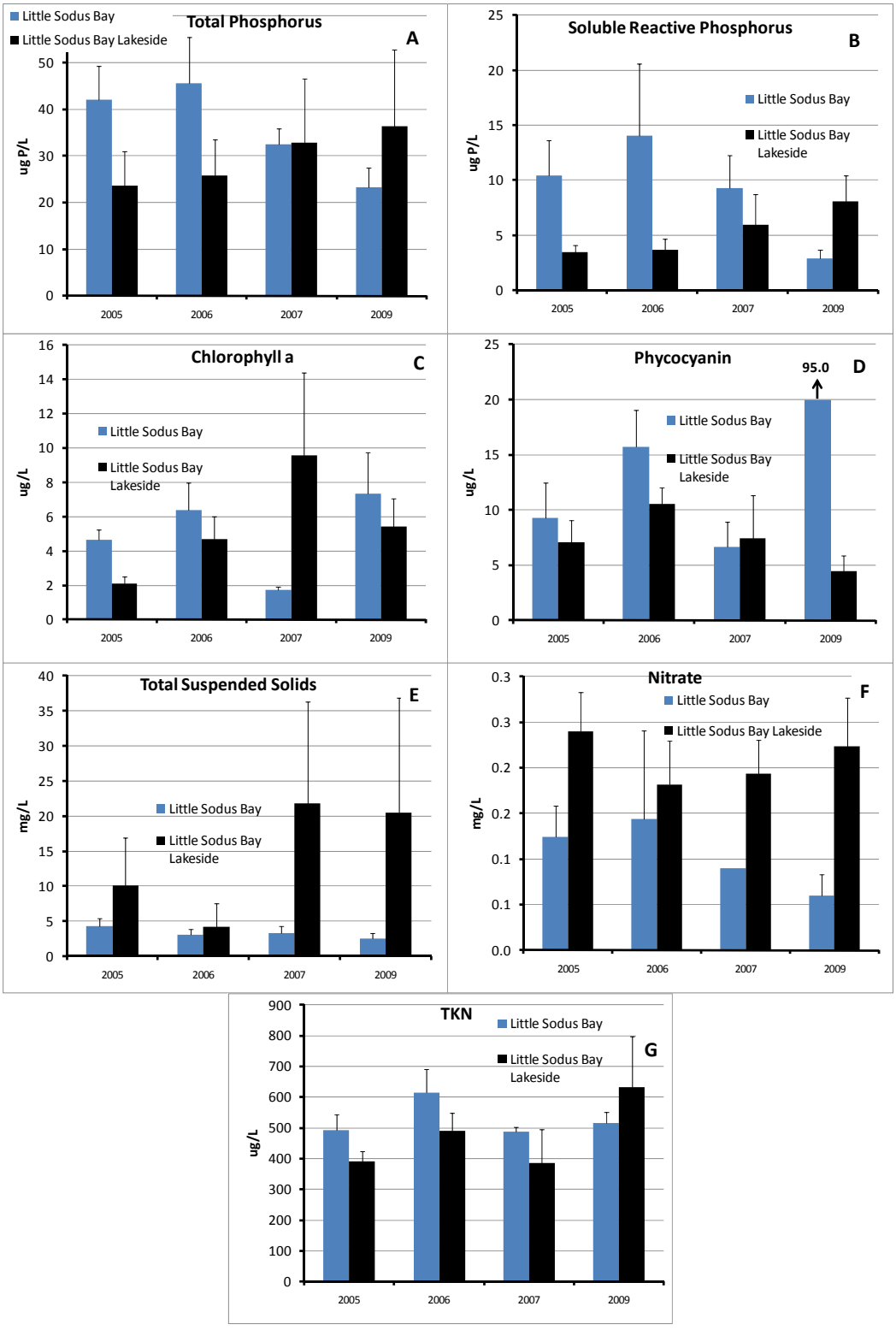

Figure 2. Average (±S.E) seasonal concentration of total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, total Kjeldahl nitrogen (TKN) and nitrate concentration at the lakeside of Lake Ontario near Little Sodus Bay.

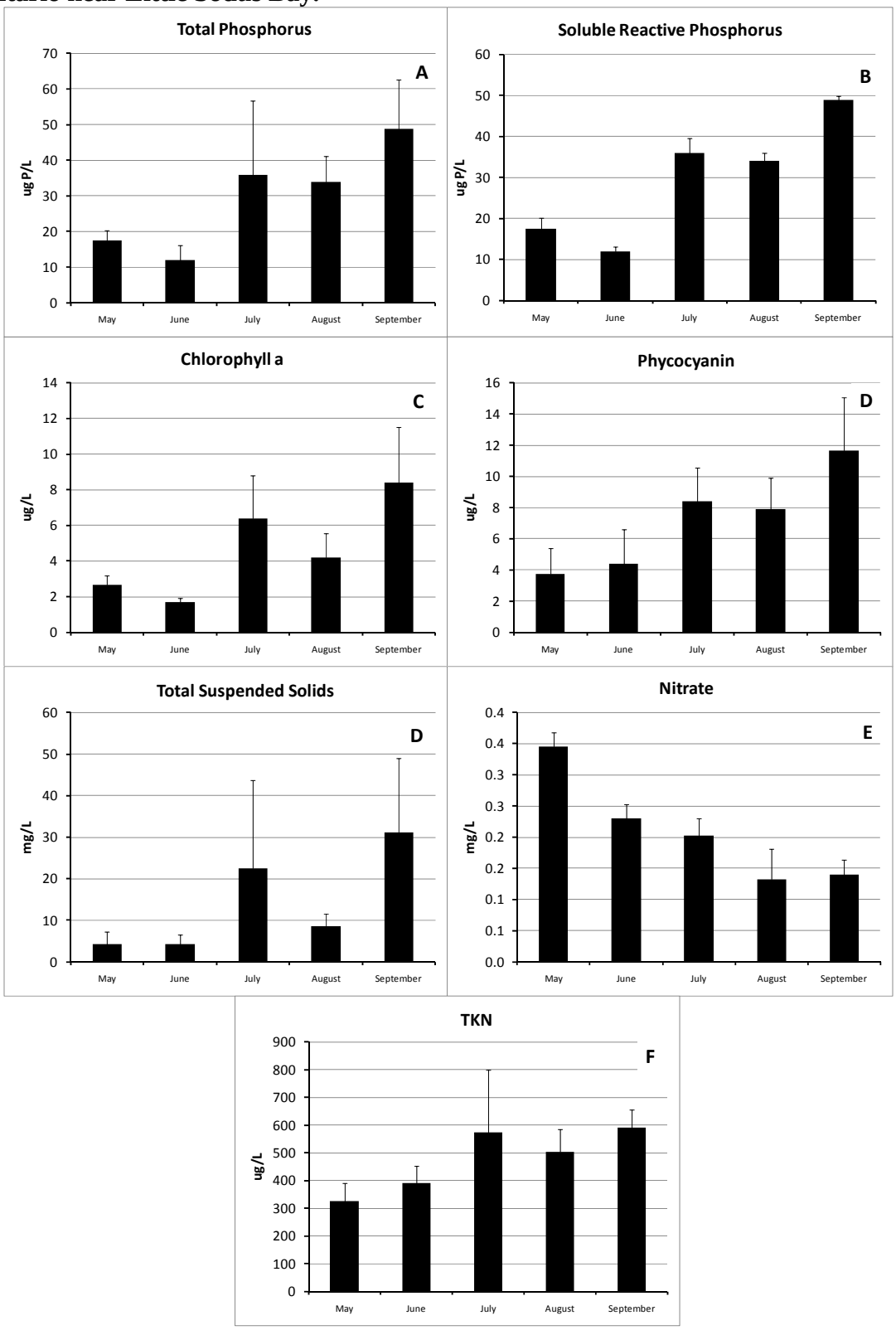

Figure 3. Average (±S.E) seasonal concentration of total phosphorus, soluble reactive phosphorus, chlorophyll a, phycocyanin, total suspended solids, nitrate, total Kjeldahl nitrogen concentrations in Little Sodus Bay.