The background of the cover page is a photograph of Lopez Pond. The water is dark blue with gentle ripples. In the foreground, a large, weathered log lies partially submerged in the water on the right side. The shoreline is lined with tall green grasses and reeds. In the distance, a dense forest of tall, thin trees stretches across the horizon under a light blue sky with some clouds.

**Lopez Pond**  
**2008 Trophic Status Index Study**  
**Loyalsock Creek Watershed**  
**Laporte Township, Sullivan County**

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Water Management

## Introduction

There are numerous lakes, impoundments, and wetland systems scattered across the landscape in the northern portions of Sullivan County. The abundance of lakes and impoundments in the area is attributed to the glaciated topography of the region. Prior to 2007, the Department had conducted few lake assessments in this part of the region. However, six lakes have been surveyed within the past two years and Lopez Pond is one of those lakes.

Lopez Pond is a small natural lake located at the headwaters of Lopez Creek on State Gameland 13 in Laporte Township, Sullivan County. A small amount of earthen fill combined with beaver activity has modified the natural condition and increased the original surface elevation at the outlet by several feet. The lake supports a PA threatened species *Potamogeton confervoides* (Tuckerman Pondweed) and has a floating bog mat on the south end of the lake. The lake is open to the public for hunting and fishing, but access is limited to a 0.4 mile walk from a state game land road that is only open to vehicle traffic during the hunting seasons. There are no records that indicate the Department has ever conducted any water quality surveys on Lopez Pond, but the Environmental Protection Agency (EPA) collected a water sample on November 12, 1984, as part of the National Acid Precipitation Assessment Program (Kanciruk et al. 1986). Fisheries surveys were conducted by the PA Fish and Boat Commission in 1931 and 1989 and records indicate the lake was stocked with “catfish”, “sunfish”, and yellow perch in 1931, 1932, and 1933 (Hollender 1990).

The Department is obligated by the Clean Water Act and Clean Streams Law to assess all lakes and impoundments in the state to determine whether their conditions are attaining designated uses for aquatic life, recreation, and public health. Aquatic life use is assessed by conducting trophic status index (TSI) studies, evaluating Chapter 93 water quality standards, and conducting fisheries surveys where recent fisheries data are not available. Recreational use is assessed by conducting aquatic macrophyte surveys, fisheries surveys, and sometimes bacteria collections in lakes that permit swimming. In lakes where no boating or swimming is permitted, a fisheries assessment is used to assess recreation. Human health assessments are conducted by evaluating fish tissue for contaminants, water quality for bacteria, and any other use that the lake may be designated (e.g. public water supply).

During the spring, summer, and fall of 2008, I conducted a lake assessment on Lopez Pond with assistance from John Ryder, Martin Friday, and Harry Vitolins. The purpose of the survey was to assess the water quality and fish population conditions to determine aquatic life, recreation, and human health use attainment. We did not conduct an aquatic macrophyte survey, but we conducted a qualitative assessment of the plant community to evaluate the percent coverage and used information from a previous survey by the PA Department of Conservation and Natural Resources (DCNR; 1987) to document species diversity. Thorough sampling of aquatic plants for cataloging purposes may occur in future years as time permits.

## Drainage Basin Description

Lopez Pond is an 8 hectare (20 acre) modified natural lake located at the headwaters of Lopez Creek in Laporte Township, Sullivan County (Figure 1). The drainage area is 1.89 km<sup>2</sup> (0.73 mi<sup>2</sup>) and 94% of the impoundment's watershed is forested. The mean annual precipitation is 120 cm (47.6 inches) and the mean basin elevation is 701 meters (2300ft.; USGS stream stats). Lopez Creek is part of the Lower West Branch Susquehanna River (HUC 02050206) drainage and is located in the Mountainous High Plateau Section of the Ridge and Valley province. The topography in the Mountainous High Plateau Section is described as broad flat-topped mountains with steep slopes and deep angular valleys (Shultz 1999).

Lopez pond is a mountaintop impoundment that is located on a plateau that separates the Muncy Creek and Loyalsock Creek drainages. Soil associations in the lake's drainage basin are Wellsboro, Norwich, Medisapristis, and Morris in level areas and Oquaga on slopes. All of the soils in the watershed range from very to moderately acidic ((USDA 1986; Table 1). The bedrock geology that underlies the entire watershed is Burgoon Sandstone.

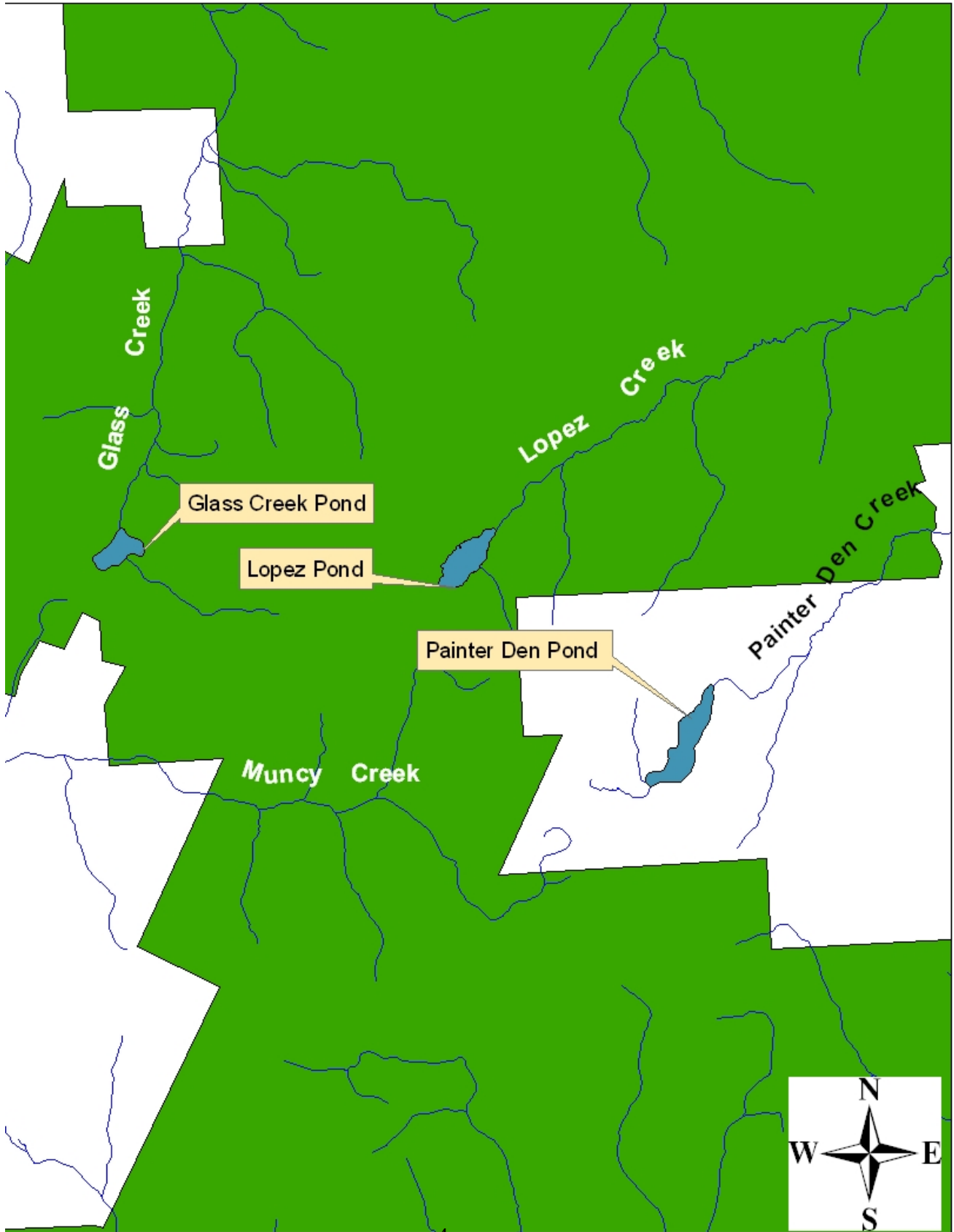
## Methods

Water samples were collected at two stations on April 21, July 22, and October 21, 2008 to capture spring, summer, and fall conditions and gill nets were set overnight on October 7-8, 2008 to identify species composition and collect a fish tissue sample. Water collection points were established at the midpoint of the lake and near the dam (Figure 2). Water samples were only collected 1-meter below the surface at both stations because the maximum depth of water was less than 3-meters. All water samples were collected with a Kemmerer bottle and plankton samples were collected with a Wisconsin plankton net (80 µm mesh size). Lake profile field measurements were collected for dissolved oxygen, pH, specific conductance, and temperature at half-meter intervals from surface to bottom using a Hydrolab Quanta. A secchi disc measurement was also taken at each station.

Water samples were tested for total nitrogen (TN), nitrites (NO<sub>2</sub>), nitrates (NO<sub>3</sub>), ammonia (NH<sub>4</sub>), total phosphorous (TP), ortho phosphorous (OP), total organic carbon (TOC), total suspended solids (TSS), total dissolved solids (TDS), specific conductance (SPC), pH, alkalinity (ALK), total aluminum (Al), total manganese (Mn), total magnesium (Mg), total iron (Fe), total calcium (Ca), total sulfate (Su), and color. Filtered samples were analyzed for chlorophyll-*a* and plankton samples were identified and quantified. All samples were processed by the DEP Bureau of Labs and were analyzed according to American Public Health Association (1992) methods.

The trophic condition of the reservoir was determined using a Carlson trophic status index (TSI; Carlson 1977) for total phosphorous (TSI-TP), chlorophyll-*a* (TSI-CHL), and secchi depth (TSI-SD). Chemical results were also evaluated for specific water quality criteria in Chapter 93 for the lake's designated use.

**Figure 1** – Location of Lopez Pond on State Gameland 13 in Laporte Township, Sullivan County.





**Table 1** – The soil types mapped in the Lopez Pond watershed and their characteristics in respect to landscape (i.e. slope), drainage, depth to water table, amount of rocks exposed on the surface, and soil acidity (USDA 1986).

<b>Soil Type</b>	<b>Slope</b>	<b>Drainage</b>	<b>Water Table (inches)</b>	<b>Surface Rocks</b>	<b>Acidity</b>
Norwich (NoB)	0-8% slope	Poorly Drained	High - (0-6 in) during wet periods	3-15% of surface	Strong-Moderate
Quaga Extremely Stony	OsB 3-8% OsD: 8-25%	Well Drained	Very Low	15-50%	Very Strong to Moderate
Norwich (NoB)	0-8% slope	Poorly Drained	High - (0-6 in) during wet periods	3-15% of surface	Strong-Moderate
Medisaprists	0%	Poorly Drained	High - at or above the surface	0%	High
Wellsboro Very Stony	WgB: 3-8% slope WgD: 15-25% slope	Poorly Drained	Seasonally High (12-36 in.)	3-15% of Surface	Very Strong to Moderate
Morris Very Stony	MsB: 3-8% slope	Somewhat Poorly Drained	6-12 in. during wet periods	3-15% of Surface	Very Strong to Moderate

**Figure 2** – Lopez Pond sampling stations located in Laporte Township, Sullivan County.



We set two experimental gill nets near each end of the lake. Each gill net measured 48 meters (150 ft.) in length and had 6 panels that were 1.8 meters (6 ft.) in height. The individual panels had a bar mesh size of 13, 25, 38, 50, 63, and 75 millimeters. All species were measured to the nearest millimeter and weighed to the nearest gram. We collected a yellow perch (*Perca flavescens*) and creek chubsucker (*Erimyzon oblongus*) sample for tissue analysis and followed processing procedures according to Pennsylvania's Surface Water Quality Monitoring Network document (PA DEP 2005; <http://www.depweb.state.pa.us/watersupply/cwp>).

## Results

### *Lake Information*

Major Basin: West Branch Susquehanna River  
Minor Basin: Lopez Creek  
Subbasin: 10B  
HUC: 02050206  
Location: Laporte Township, Sullivan County  
Latitude 41<sup>o</sup> 23' 56" Longitude: 76<sup>o</sup> 23' 19"  
PA Quad: Laporte  
Chapter 93: CWF  
Lake Use: Recreation

### *Morphology at Normal Pool*

Surface Area (normal pool):	8.0 hectares	(20 acres)
Shoreline Length:	2.28 kilometers	(1.42 miles)
Shoreline Development:	2.3	
Mean Depth:	0.89 meters	(2.9 ft.)
Drainage Area:	1.89 square kilometers	(0.73 mi <sup>2</sup> )
Elevation:	679 meters	(2228 ft.)
Volume:	71,591 m <sup>3</sup>	58 acre-feet
Retention time:		25.5 days

### *Water Quality*

The maximum depth of water measured at Station 1 and 2 was 2.2 and 2.3 meters, respectively. The field pH ranged from 4.4 to 5.1 units with lowest values occurring in the spring. The lake remained mixed throughout the year and dissolved oxygen levels were adequate to support fish (> 4.0 ppm) throughout the water column. Specific conductance averaged 12 µmhos and temperatures did not vary from surface to bottom (Table 2).

Nutrient concentrations were low and total phosphorous (P) concentrations were not above the reporting limit (0.01 mg/L). The average estimated value below the reporting limit and

**Table 2** – The temperature (<sup>0</sup>C), dissolved oxygen (ppm), specific conductance (umhos), and pH (units) profiles for Lopez Pond located in Laporte Township, Sullivan County.

	Temperature		Dissolved Oxygen		Specific Conductance		pH	
	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
<b>21-Apr-08</b>								
Surface	15.3	15.0	10.8	11	14	14	4.6	4.6
0.5 M	15.3	15.0	10.7	10.8	14	14	4.5	4.5
1.0 M	15.2	15.0	10.6	10.8	14	14	4.5	4.4
1.5 M	15.0	14.8	10.6	10.6	14	14	4.4	4.4
2.0 M		14.8		10.6		14		4.4
<b>22-Jul-08</b>								
Surface	25.7	26.0	8.4	8	11	10	5	5
0.5 M	25.7	26.0	7.9	7.9	11	11	5	4.8
1.0 M	25.7	25.6	7.8	7.9	10	11	4.9	4.8
1.5 M	25.6	25.6	7.8	7.9	11	11	4.8	4.6
2.0 M	25.6	25.6	8.1	8.3	11	11	4.7	4.6
<b>21-Oct-08</b>								
Surface	10	9.9	11.9	10	14	12	5.1	4.7
0.5 M	10	9.9	10.6	9.9	13	12	4.9	4.8
1.0 M	10	9.9	10.2	9.9	12	11	4.8	4.6
1.5 M	10	9.9	10.2	9.9	12	11	4.8	4.6
2.0 M	10	9.9	10.1	9.1	11	11	4.8	4.8



above the method detection limit for summer and fall samples was 0.007 mg/L. (Note: Reporting procedures were changed in May 2008. The lab reports values > 0.01 mg/L for Total P, but estimated values < 0.01 are reported for lake samples if concentrations are above the method detection limit.) The total nitrogen (N) concentrations were similar at both stations with a mean of 0.3 mg/L. The N:P ratio for samples ranged from 26 to 49 indicating a phosphorous limited system. Total nitrite (NO<sub>2</sub>) was not detected in the samples and total nitrate (NO<sub>3</sub>) was only detected at both stations in the spring.

Total alkalinity was very poor and ranged from 0 – 1.4 mg/L (endpoint 4.5), at both stations. Lab pH was similar between stations and ranged from 4.9 to 5.9 with a median of 5.5 units. Total suspended solids concentrations were below the detection limit of 5 mg/L in the spring and summer and were 8 mg/L in the fall. The mean concentration of total dissolved solids was 15 mg/L and the mean concentration of total organic carbon was 3.6 mg/L. Color was 5 and 10 PT/C in the spring and 10 PT/C in the summer.

Chlorophyll-*a* samples represented low production and were only reported above the detection limit (1.0 ug/L) at Station 2 in the spring and both stations in the summer. Secchi disc measurements confirmed low amounts of suspended solids and chlorophyll-*a* with readings completely to the bottom throughout the year. The seasonal results of all lab samples are listed in Table 3.

**Table 3** – The seasonal water quality results for Lopez Pond located in Laporte Township, Sullivan County. Values with < were below the detection limit, and \* = not analyzed.

Variable	Spring		Summer		Fall	
	Station 1	Station 2	Station 1	Station 2	Station 1	Station 2
Maximum Depth (m)	1.8	2.0	2.0	2.2	2.3	2.2
Secchi Depth (m)	1.8	2.0	2.0	2.2	2.3	2.2
Lab pH (units)	5.6	4.9	5.4	5.4	5.9	5.6
Alkalinity (mg/L)	0.4	0	0.0	0.0	1.4	1.2
Specific Conductance (mg/L)	16.9	17.0	14.2	14.1	*	*
Total Nitrogen (mg/L)	0.26	0.33	0.23	0.20	0.39	0.39
Nitrite - N (mg/L)	< 0.01	< 0.01	< 0.01	< 0.01	*	*
Nitrate - N (mg/L)	0.13	0.14	< 0.04	< 0.04	*	*
Ammonia - N (mg/L)	< 0.02	< 0.02	< 0.02	0.08	0.03	< 0.02
Total Phosphorous (mg/L)	< 0.01	< 0.01	0.005	0.006	0.009	0.008
Ortho Phosphorous (mg/L)	< 0.01	< 0.01	< 0.01	< 0.01	*	*
Total Dissolved Solids (mg/L)	10	8	24	12	14	20
Total Suspended Solids (mg/L)	< 5	< 5	< 5	< 5	8	8
Total Aluminum (ug/L)	< 200	< 200	< 200	< 200	112	109
Total Sulfate (mg/L)	< 15	< 15	< 15	< 15	2.9	2.9
Total Iron (ug/L)	58	54	118	117	142	142
Total Manganese (ug/L)	68	72	39	40	73	76
Total Magnesium (mg/L)	0.34	0.36	0.31	0.31	0.35	0.35
Total Calcium (mg/L)	0.81	0.86	*	*	0.9	0.9
Total Hardness (mg/L)	*	*	*	*	4.0	4.0
Total Organic Carbon (mg/L)	2.3	2.4	3.4	3.5	5	5.1
Chlorophyll-a (ug/L)	< 1.0	1.9	1.8	1.7	< 1.0	< 1.0
Color (PT/C)	10	5	10	10	*	*

### *Metals and total sulfate*

Total aluminum concentrations were less than 200 ug/L at all stations. The mean total iron concentration was 105 ug/L and concentrations were highest in the summer at 142 ug/L. The mean total manganese concentration was 61 ug/L and the mean total magnesium concentration was 0.34 mg/L. Total sulfate was not detected (>15 mg/L) in the sample (Table 3).

### *Plankton Results*

There were 26 different genera identified in the plankton samples, but there were only 14 genera that were quantified in a 1 ml sub-sample. Flagellates were the most abundant in the spring and fall with *Dinobryon* dominant in the spring and *Synura* dominant in the fall. Green algae were the most abundant in the summer with *Mougeotia* the dominant taxa (Table 4).

### *Trophic Status Index*

The Carlson TSI results using phosphorous and chlorophyll-*a* were similar and secchi depth was not usable. Annual TSI results for phosphorous and chlorophyll-*a* indicated the impoundment was oligotrophic, and results for secchi depth indicated the lake was mesotrophic.

The TSI scores for total phosphorous (TSI-TP) in the spring could not be calculated because values < 0.01 mg/L were not reported. The summer and fall TSI-TP ranged from 27-36 with a mean of 32 indicating an oligotrophic condition.

The TSI scores for chlorophyll-*a* (TSI-CHL) could only be calculated for the Station 2 spring sample and both stations in the summer because the remaining samples were below the detection limit of 1 ug/L. Therefore, the mean TSI score for chlorophyll-*a* was determined from a range of expected values to account for concentrations between 0 and 1 ug/L. The TSI-CHL varied from < 30 to 37 and indicated an oligotrophic condition.

The TSI scores for secchi depth (TSI-SD) were similar throughout the year with a mean score of 49. The TSI-SD score indicated that the lake was mesotrophic. However, there is not much utility in using the TSI-SD score in shallow lakes because calculations are dependent upon depth. The lake was too shallow to get a score less than 48, even though visibility was 100% throughout the entire year.

### *Fisheries and fish tissue*

We only collected 3 creek chubsucker and 8 yellow perch in two overnight gill net sets and kept a sample of each species for tissue analysis. The average length and weight of creek chubsucker was 350 mm (14 in.) and 777g (27 oz.) and the average length and weight of yellow perch was 204 mm (8.2 in.) and 88g (3.1 oz.). The creek chubsucker fish tissue sample had 0.14 ppm of mercury, 0.49 ppm of copper, < 0.025 ppm of lead, 0.17 ppm of

**Table 4** –Results of plankton samples collected in Lopez Pond located in Laporte Township, Sullivan County. An \* indicates present in taxa scan, but not quantified in 1-ml sub-sample.

	Organisms per Liter (L)			
	Spring	Summer	Fall (Station 1)	Fall (Station 2)
<b>Blue Green Algae</b>				
<i>Aphanizominon</i>				*
<i>Oscillatoria</i>			*	*
<b>Green Algae</b>				
<i>Mougeotia</i>	224	5,412		
<i>Oocystis</i>		*		*
<i>Staurastrum</i>		60		
<i>Closterium</i>		*		
<i>Botryococcus</i>	56	1,584		
<b>Diatoms</b>				
<i>Asterionella</i>	*	60	*	
<i>Fragilaria</i>	*		*	
<i>Melosira</i>	*		*	
<i>Surirella</i>	56			
<i>Navicula</i>		264	*	
<i>Tabellaria</i>	224	792		
<b>Rotifers</b>				
<i>Asplanchna</i>		*		
<i>Keratella</i>	*	396	*	*
<i>Polyartha</i>			120	*
<i>Monostyla</i>		60		
<i>Trichocerca</i>				*
<b>Crustaceans</b>				
<i>Copepod</i>	*	*	*	*
Nauplius of <i>Copepod</i>	112	*	*	*
<i>Daphnia</i>		*		
<b>Flagellates</b>				
<i>Chryptomonas</i>	*		*	*
<i>Ceratium</i>		264	*	*
<i>Dinobryon</i>	896	60		
<i>Synura (colonies)</i>			1,800	14,630
<i>Synura (cells)</i>			832,000	608,300
<i>Codonella</i>				*
<i>Vorticella</i>	*			

Chromium, 0.006 ppm of cadmium and < 1 ppm of selenium. The yellow perch sample had 0.3 ppm of mercury, 2.8 ppm of copper, 0.20 ppm of lead, 0.26 ppm of chromium, 0.005 ppm of cadmium, and < 1 ppm of selenium (Table 7). Mercury concentrations measured in yellow perch exceeded the statewide fish consumption advisory of one meal per week (< 0.2 ppm) and were at an action level of one meal per month (0.2 – 1.0 ppm).

**Table 7** – Results of creek chubsucker and yellow perch fish tissue samples analyzed for heavy metals. The results are from scaled fillets with the skin attached. All values are reported in parts per million (ppm). Values highlighted in red indicate the sample is at an action level for consumption of one meal per month.

Variable	Creek Chubsucker	Yellow Perch
Cadmium (Cd)	0.006	0.005
Chromium (Cr)	0.17	0.26
Copper (Cu)	0.49	2.8
Mercury (Hg)	0.14	0.30
Lead (Pb)	< 0.025	0.20
Selenium (Se)	< 1	< 1

### Discussion

Lopez Pond is basically a flooded bog. The lakes location, chemistry, and fish community limits fishing opportunities, but its remote location and setting are attractive for getting off the beaten path to fish, kayak, or observe wildlife.

#### *Aquatic Life and Chapter 93*

Lopez Pond is required to meet the Chapter 93 water quality criteria for CWF in order to meet the attainment threshold for aquatic life use. This requires compliance with the statewide list plus dissolved oxygen specific for CWF (DO<sub>1</sub>). Specific criteria outlined in Chapter 93 require a pH from 6 to 9 inclusive and minimum dissolved oxygen concentrations of 5 mg/L throughout the water column under unstratified conditions. Based upon the specified criteria, all stations were in violation of §93.7 of the Chapter 93 water quality standards for pH but were in compliance with DO criteria.

The pH violation of the Chapter 93 criteria will be reported on the integrated list as an impairment. However, I could not determine if source of low pH was natural or anthropogenic. Additional water quality sampling and analysis following the DEP acid deposition protocol will be necessary to separate the source of low pH.

Acidic conditions in Lopez Pond limited uptake of nutrients into the system and resulted in an oligotrophic condition. Although the N:P ratio suggested phosphorous was the limiting nutrient, low concentrations of alkalinity, chlorophyll-*a*, and conductivity were all indicators of a carbon-limited system. Therefore, the limiting factor for lake production was dissolved carbon which was limited by the problems associated with acidic conditions.



## *Recreation*

The PA Game Commission manages Lopez Pond for wildlife, so the vegetation criterion for boating was not applicable. Nonetheless, we did not observe any excessive vegetation in the lake. Lopez Pond supports a number of acid tolerant plant species and a 1987 DCNR plant survey documented a PA threatened pondweed *Potamogeton confervoides* (Tuckerman's Pondweed). A floating bog mat on the south end of the lake also supported a unique plant community and surveys (DCNR 1987) described the bog mat plant community as a ring of dwarf leatherleaf *Chamaedaphne calyculata* around the perimeter and sphagnum moss in the center. Although I did not collect plant specimens, I noted and photographed a number of plant species on the bog mat and within open waters. These species included: pitcher plant *Sarracenia purpurea*; sundew *Drosera* spp.; yellow bartonia *Bartonia virginica*, tawny cotton-grass *Eriophorum virginicum*; Spatterdock *Nuphar* spp., and watershield *Brasenia schreberi*. We also observed several wood ducks, white tailed deer, and a Canada goose nesting on an abandoned beaver lodge at the northwest tip of the floating matt (Appendix A).

There is not much to say about the fish community in Lopez Pond and our gill net catch was low in abundance and diversity. However, the catch was sufficient to indicate there was a limited fishery that was supported by natural reproduction. This was the first time we used gill nets for lake assessment work, but our catch was similar to PFBC data (Hollender 1990). The yellow perch in the lake were a harvestable size, but densities were low and reflective of the water quality conditions. The Department typically uses results from bacteria samples and plant assessments, with supplemental information from the fisheries assessment support use attainment decisions for recreation. Although the designated use of the lake is for wildlife management and vegetation criteria do not apply, plant density was not at a nuisance level for boating, hunting, or other recreational activities. Therefore, Lopez Pond is meeting the designated use for recreation.

## *Human Health*

A complete lake assessment requires collection of fish tissue to determine if contaminants are present above the statewide consumption advisory of one meal per week. We typically target the dominant gamefish and panfish in a lake for tissue analysis, but we did not capture any gamefish. Therefore, we resorted to creek chubsucker to replace the gamefish sample. Although creek chubsucker samples did not have high contaminant levels, the yellow perch sample exceeded statewide fish consumption criteria. It has been my experience that some fish species are better indicators of contamination and this is probably associated with diet and biomagnification rather than direct exposure. Creek chubsucker may not be a good species for contaminant testing because they are lower on the food chain and this is the second time we have tested creek chubsucker where the potential for mercury contamination was high and tissue results were low.

The Department usually collects another fish tissue sample when it exceeds the statewide consumption advisory level. However, due to low abundance of yellow perch and risk of exposure combined with the difficulty in access and labor needed to set gill nets, it will be recommended to issue an advisory without another sample for verification.

## Conclusion

Lopez Pond is an acidified lake that has low nutrients and an acid tolerant fish community. Although Lopez Pond would not be expected to be productive, based upon limitations in lake morphology, underlying geology, and land-use in the watershed, the absence of any buffering capacity in the reservoir increases the vulnerability to atmospheric deposition. Water quality conditions in Lopez Pond were conducive to mercury uptake in the food chain. However, there was a limited risk of mercury exposure for fish consumption because fishing access is limited and abundance was low.

Based upon the findings in this report, Lopez Pond is attaining designated use for recreation and should be placed on List 2 (at least one use attained) of the Pennsylvania Integrated and Monitoring Assessment Report. The lake is impaired for human health and should be placed on List 5 of the Pennsylvania Integrated and Monitoring Assessment Report for atmospheric deposition / mercury. Violation of the Chapter 93 criteria for pH will result in an impairment listing. However, the source of the impairment is currently unknown and additional water samples are necessary to determine if the impairment is attributed to anthropogenic influences and requires a total maximum daily load (TMDL) or if it is a natural condition that does not require a TMDL.

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## **Appendix**



**Appendix A.** - The length and weight of creek chubsucker and yellow perch that were tested for contaminants.

	<b>Total Length (inches)</b>	<b>Weight (lbs. Oz.)</b>
Creek Chubsucker	13.5	1 lb. 6 oz.
	14	1 lb. 13 oz.
	14.5	1 lb. 14 oz.
Yellow Perch	7.8	3.2
	8.1	3.4
	8.2	2.3
	8.3	3.3
	8.4	3.3

**Appendix B** - The individual values and Trophic Status Index (TSI) of chlorophyll-a, secchi depth, and phosphorous for samples collected in Lopez Pond located in Laporte Township, Sullivan County.

LAKE NAME	Item	Value	Date	Time	Station	Sample #	Secchi (m)	TN	TP	CHL-a	N:P	TSI on TP	TSI on Chl a	TSI on secchi
Lopez Pond	Dam No.													
	Detention time		04/21/08	10:25	Sta 1	456768	1.80	0.26	0.01		26	<b>37.37</b>		<b>51.52</b>
	Depth @ dam	2	04/21/08	10:10	Sta 2	456771	2	0.33	0.01		33	<b>37.37</b>		<b>50.00</b>
	Depth @ mid	2.2	04/21/08	10:30	CHL (1)	456769				0.001			<b>30.57</b>	
	Stream		04/21/08	10:15	CHL (2)	456772				0.0019			<b>36.87</b>	
	River Miles													
	SWP	10B	07/22/08	10:00	Sta 1	456792	2.00	0.23	0.005	0.0018	46	<b>27.37</b>	<b>36.34</b>	<b>50.00</b>
	Use	CWF	07/22/08	10:15	Sta 2	456795	2.2	0.2	0.006	0.0017	33	<b>30.00</b>	<b>35.77</b>	<b>48.62</b>
	County	Sullivan	10/15/07	10:20	STA 1	456809	2.20	0.39	0.009	0.001	43	<b>35.85</b>	<b>30.57</b>	<b>48.62</b>
			10/15/07	10:25	STA 2	459813	2.30	0.39	0.008	0.001	49	<b>34.15</b>	<b>30.57</b>	<b>47.98</b>
												<b>34</b>	<b>33</b>	<b>49</b>

**Photo 1** – Canada goose nesting on an abandoned beaver lodge at the northeastern tip of the bog mat.



**Photo 2** – View looking west from the lakes midpoint.



**Photo 3** – Photograph of vegetation observed on the floating bog mat. Vegetation includes pitcher plant, sundew, sphagnum moss, leatherleaf, and a sedge spp..



**Photo 4** – Photograph of Spatterdock (*Nuphar spp.* ) mixed with watershield (*Brasenia schreberi*) growing in the channel between the floating mat and the Northern shoreline.





**Photo 5** – View looking east towards the outlet.

