Watershed 1 Pond Monitoring Report SSLP-468-11

Deer Lake Conservancy

Project scope/description

Deer Lake is an 812-acre lake in Polk County. Its watersheds, primarily on the north side of the lake, total over 5800 acres. The outflow of the watershed 1 pond on the northeast side of Deer Lake was identified as a significant contributor of phosphorus to the lake in 2011 when this project began. High P concentrations in runoff came from a barnyard and crop fields to the east of the pond. Flow and grab sample testing of total and dissolved P concentrations (from 1998 – 2002) showed dissolved phosphorus ranging from 73% to 90% of total phosphorus above the pond and from 57% to 100% below the pond.

This project collected monitoring data for the watershed 1 tributary in anticipation of the installation of a sand-iron filing stormwater treatment system. This treatment system was not installed because cattle were removed from the area in 2013, and early 2014 sampling results indicated much lower phosphorus and fecal coliform levels.

The watershed 1 pond project was altered to include dredging accumulated sediment and reconfiguring the outlet with a riser pipe to allow settling of sediment and removal of associated phosphorus.

Samples were collected both prior to removal of cattle from the area, after removal of cattle, and after the pond outlet was reconfigured. Sampling sites include the following:

W1-2 (BY) = flow from barnyard via road ditch
W1-4 (NP) = flow from pond north of 140th Avenue
W1-1 (P) = flow from culvert which drains pond
W1-Lake = flow to lake from int. stream

In most instances, sampling occurred only when all sample sites had running water. This generally required at least 1" of precipitation in the preceding 24 hours or a snow melt condition. During dry periods, the pond water level was still well below the pond outlet, and it didn't run at all. Sampling was also limited by the need to get samples to the lab for analysis Monday – Thursday.

Parameters analyzed included:

- Fecal coliform
- BOD
- Total Phosphorus
- Ortho Phosphorus
- Total Suspended Solids

Sampling results illustrate significant improvement for all parameters following cattle removal and pond reconfiguration.

The flow from the barnyard and cropfield area to the W1 pond still show significantly higher phosphorus and total suspended solids content when compared to the flow from the pond north of the road to the W1 pond.

	Fecal Coliform Results/ 100 ml				SM9222 D										
	W1-2 (BY)	W1-4 (NP)	W1-1 (P)	W1-Lake											
2005			400 - >800												
4/6/2011	NA	NA	27,000	700											
6/22/2011	>80,000	100	>80,000	600											
8/2/2011	>80000	>8,000	>8,000	>8,000											
8/30/2011	NA	6,500	15,000	200											
5/13/2014		<100	400												
4/25/2016	860	10	10	270											
	BOD				SM5210B										
8/30/2011	NA	10	45	4											
5/13/2014		2	6												
7/6/2015	7	NA	5	4											
	Phosphorus, mg/L				365.4		Cattle removed from barnyard in pond drainage area: 2013 (not sure exactly)								
	W1-2 (BY)	W1-4 (NP)	W1-1 (P)	W1-Lake			W1 pond construction summer 2014								
98-2002			0.6-12.29												
2005			5.8-15												
4/6/2011	NA	NA	5.8	4.4			*average total P in Deer Lake July and August = .017 mg/L*								
6/22/2011	24	0.1	6.7	2.8											
8/2/2011	33	0.1	11	8.5											
8/30/2011	NA	0.1	11	0.8											
5/13/2014		0.07	0.21												
7/6/2015	7.88	na	1.02	0.754											
7/20/2015	NA	0.123	0.278	0.372											
4/25/2016	9.39	0.09	0.326	0.415											
	Ortho Phosphorus, mg/L				365.1										
98-2002			0.6-8.43												
2005			2.7-3.4			Date	lab sheet notes				*AHPS Precip NOAA web site for date*				
4/6/2011	NA	NA	4.6	3.5		4/6/2011	*spring collection*				.25 - .50"				
6/22/2011	23	<0.1	3.7	1.6		6/22/2011	*just following 1.25" rain event*				*1 - 1.5"*				
8/2/2011	26	<0.1	7.8	6.2		8/2/2011	no rainfall info				*1 - 1.5"*				
8/30/2011	NA	<0.1	5.5	0.4		8/30/2011	*end of summer collection*								
5/13/2014		<.05	0.12			5/13/2014	*spring collection*				.25 - .50"				
7/6/2015	7.25	na	0.764	0.474		7/6/2015					*.65" in 24 hours, 1.12 in 30 hours (NWS)*				
7/20/2015	NA	0.055	0.182	0.263		7/20/2015					*2.5 - 3"*				
4/25/2016	8.38	0.038	0.116	0.117		4/25/2016					1-1.5"				
	Total Suspended Solids, mg/L				SM2540D										
98-2002			9-526												
2005			366-546												
4/6/2011	NA	NA	39	23											
6/22/2011	32	7	58	17											
8/2/2011	180	11	122	74											
8/30/2011	NA	25	356	21											
5/13/2014		3	6												
7/6/2015	5	na	5	8											
7/20/2015	NA	<2	6	5											
4/25/2016	74	ND	8	23											
	W1-2 (BY) = flow from barnyard via road ditch														
	W1-4 (NP) = flow from pond north of 140th Avenue														
	W1-1 (P) = flow from culvert which drains pond														
	W1-Lake = flow to lake from int. stream														

Deer Lake Watershed 1 Pond
Water Sampling Procedures

When to sample
After rain events that reach 1 inch. You do not have to go out when it is raining, but water needs to be running in the ditch and below the pond. Keep a rain gauge and record approximate duration of storm and rainfall in inches on the comment section of the lab slip.

Sample only on days when lab can receive within 24 hours. This includes Sunday afternoon/evening and Monday – Thursday. Tuesday and Wednesday are ideal because we can ship free from the wastewater treatment plant in Amery.
Call Cheryl's cell (715-225-0690) if there is a storm event you are unable to sample.

Preparation
Record sample locations on the bottles and the lab sheets prior to sampling. Sample bottles must be labeled according to the map provided.

Sample 4 locations for each rain event if possible.

- W1-2: water from barnyard
- W1-4: water from pond across the road, sample from the culvert
- W1 -1 OR W1-Pond: sample from the culvert if it is flowing, if water is not flowing, use the pole sampler to collect a sample from 3 locations in the pond, and pour into a composite bottle then mix and pour into sample bottle to send to the lab. A single sterile bottle must be used for the fecal coliform sample.
- W1- Lake: sample near the lake

Fill out lab sheets according to example lab slip provided.

General sampling tips

- Use hand-sanitizer both before and after sampling. Gloves are recommended for sampling. (We are not sure of current bacteria levels in the pond.)
- Do not touch the insides of bottles or lids. Place cap top down to avoid contamination.
- Fecal coliform bottle is sterile. Samples must be collected directly into the bottle.
- Total phosphorus bottle has acid in it. Use a collection bottle, then pour the water into the lab bottle and mix.
- Grab the sample in the cleanest part of the flow.
- Avoid stirring up water. Approach sample location from downstream. Allow water to settle if stirred up.

Preparing samples for shipping

- Place sample bottles and lab slips in cooler with ice.
- Use zip block bags for ice, lab slips, and sample bottles if ice pack not available.
- Deliver to Jim Miller's house – place in shade behind the garage.
- Call Cheryl's cell to let us know samples are there (715-225-0690)

Keep a log of when you collected and delivered samples and your time and expenses.