



# Mavis Consulting, Ltd Articles

Turf & Soil Specialist

March 2016

## Incoming Nitrate and Phosphorus levels vs. Outgoing

Water samples were collected from incoming and outgoing surface water (creek, stream, river, drainage ditch, etc.) locations on 26 golf courses located throughout Ohio, Indiana and Michigan. Samples were analyzed for Nitrate Nitrogen and Total Phosphorus.

### Purpose of Study:

To determine if there is an increase or decrease in Nitrate and Total Phosphorus content in the surface waters that leave golf courses.



### Procedure:

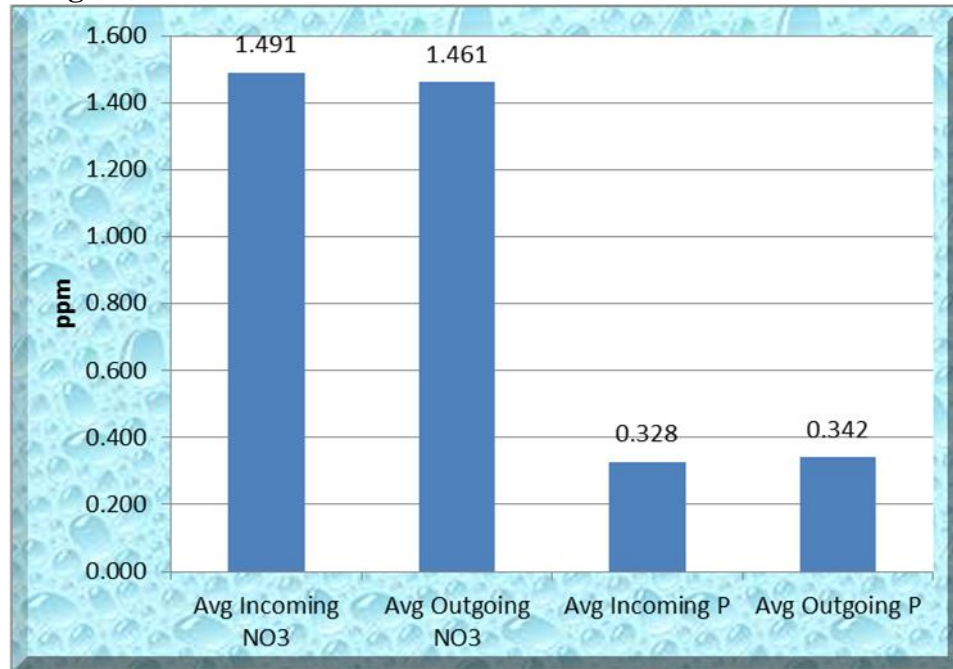
#### Sample Collection

1. Collect water samples from surface water that enters a golf course property and where it leaves a golf course property
2. Samples are collected and then acid preservative bottles are filled and submitted to the Brookside Laboratories, Inc. for Nitrate Nitrogen (MDL = <0.1 ppm) and Total Phosphorus (MDL = <0.2 ppm)
  - a. EPA method 200.7 for Phosphorus
  - b. EPA method 353.2 for Nitrates

### Results:

1. There were 154 total samples collected (84 incoming & 70 outgoing)
2. For NO<sub>3</sub> there were 5 Incoming samples BDL (Below detection level) and 2 Outgoing samples BDL
3. For total Phosphorus there were 12 Incoming samples not BDL and 6 Outgoing samples not BDL

**Chart 1. Average NO<sub>3</sub> and Total P results**



**Discussion:**

In the future a lower detection level test will be utilized for the Phosphorus content. The study should also be limited to surface water sources where there is one incoming and one outgoing point unless also determining flow rates. The study should also be limited to surface water sources where there is no contribution/ drainage from sources other than the golf course (homes, roadways, industry, etc.). More frequent testing (monthly) may prove to be useful to help determine if there are seasonal variations in surface water Nitrate and Phosphorus content on golf courses.

Initial results indicate that there is little to no difference in the average Nitrate and average total Phosphorus content for incoming and outgoing surface water samples.

Thank you to the Brookside Consultants of Ohio for helping to fund the majority of the analytical cost, Brookside Labs for their excellent customer service, and especially to all of the golf courses and their staff for allowing me to collect samples and conduct this study.

02475 Rosedale Rd.

*Mavis Consulting, Ltd.*

Brian Mavis

Edgerton, OH 43517

*Surface Water Monitoring*

Phone: (419) 212-1639

e-mail: [Brian@mavisconsulting.com](mailto:Brian@mavisconsulting.com)[www.mavisconsulting.com](http://www.mavisconsulting.com)

Date Reported	Site	Sample Description #2	NO3-N (ppm)	Total P (ppm)
11/3/2015	1	A-1	BDL	BDL
11/3/2015	1	A-2	0.12	BDL
11/3/2015	1	B	0.11	BDL
7/20/2015	1	A-1	0.61	BDL
7/20/2015	1	A-2	0.13	BDL
7/20/2015	1	B	0.12	BDL
3/24/2015	1	A-1	0.48	BDL
3/24/2015	1	A-2	0.55	BDL
3/24/2015	1	B	0.47	BDL
11/3/2015	2	A	0.31	BDL
11/3/2015	2	B	0.23	BDL
3/20/2015	2	A	2.27	0.31
3/20/2015	2	B	2.3	BDL
10/26/2015	3	A	1.13	0.62
10/26/2015	3	B	1.92	BDL
9/9/2015	3	A	1.21	BDL
9/9/2015	3	B	1.22	BDL
5/11/2015	3	A	0.93	BDL
5/11/2015	3	B	0.96	BDL
7/27/2015	4	A	1.77	BDL
7/27/2015	4	B	1.71	BDL
4/13/2015	4	A	4.27	BDL
4/13/2015	4	B	4.41	BDL
10/19/2015	5	A	0.51	BDL
10/19/2015	5	B	0.43	BDL
7/27/2015	5	A-1	4.78	BDL
7/27/2015	5	A-2	1.03	0.39
7/27/2015	5	B	4.72	BDL
4/27/2015	5	A-1	10.98	BDL
4/27/2015	5	A-2	4.22	0.29
4/27/2015	5	B	11.06	BDL
4/13/2015	5	A	6.65	BDL
4/13/2015	5	B	6.17	BDL
10/19/2015	6	A	0.33	BDL
10/19/2015	6	B	0.41	BDL
8/3/2015	6	A	0.11	BDL
8/3/2015	6	B	0.15	BDL
5/26/2015	6	A	BDL	BDL
5/26/2015	6	B	BDL	BDL
10/19/2015	7	A	0.29	BDL
10/19/2015	7	B	0.26	BDL
8/13/2015	7	A	0.36	BDL
8/13/2015	7	B	0.34	BDL
4/13/2015	7	A	0.45	BDL
4/13/2015	7	B	0.45	BDL
7/27/2015	8	A	2.73	BDL
7/27/2015	8	B	2.61	BDL
4/27/2015	8	A	2.66	BDL
4/27/2015	8	B	2.65	BDL

**BDL= Below Detection Level****MDL NO3 = <.1****MDL P = >.2**

"A" Incoming Sample

"B" Outgoing Sample

Date Reported	Site	Sample Description #2	NO3-N (ppm)	Total P (ppm)		
10/12/2015	9	A	0.24	BDL	<b>BDL= Below Detection Level</b> <b>MDL NO3 = &lt;.1</b> <b>MDL P = &gt;.2</b>	
10/12/2015	9	B	0.26	BDL		
7/27/2015	9	A	0.68	BDL		
7/27/2015	9	B	0.69	BDL		
4/13/2015	9	A	1.87	BDL		"A" Incoming Sample
4/13/2015	9	B	1.53	BDL		"B" Outgoing Sample
10/12/2015	10	A	0.4	BDL		
10/12/2015	10	B	0.38	BDL		
7/27/2015	10	A	4.31	0.24		
7/27/2015	10	B	4.24	BDL		
4/13/2015	10	A	6.14	BDL		
4/13/2015	10	B	6.26	BDL		
10/9/2015	11	A	1.32	BDL		
10/9/2015	11	B	1.31	BDL		
7/31/2015	11	A	0.95	BDL		
7/31/2015	11	B	0.94	BDL		
3/20/2015	11	A	1.82	BDL		
3/20/2015	11	B	1.78	BDL		
10/2/2015	12	A	0.29	BDL		
10/2/2015	12	B	0.31	BDL		
7/16/2015	12	A	BDL	0.011		
7/16/2015	12	B	BDL	0.013		
3/31/2015	12	A	0.49	BDL		
3/31/2015	12	A-2	0.24	BDL		
3/31/2015	12	B	0.5	BDL		
9/29/2015	13	A	0.57	BDL		
9/29/2015	13	A	0.26	BDL		
9/29/2015	13	A	0.45	BDL		
9/29/2015	13	B	0.46	BDL		
7/20/2015	13	A	0.94	BDL		
7/20/2015	13	A	0.24	BDL		
7/20/2015	13	A	3.94	0.22		
7/20/2015	13	A	0.81	0.24		
7/20/2015	13	B	3.89	0.26		
4/21/2015	13	A	2.69	BDL		
4/21/2015	13	A	1.39	BDL		
4/21/2015	13	A	0.41	BDL		
4/21/2015	13	A	0.82	BDL		
4/21/2015	13	B	2.39	BDL		
9/21/2015	14	A	0.78	BDL		
9/21/2015	14	B	1.66	BDL		
7/20/2015	14	A	0.59	BDL		
7/20/2015	14	B	0.33	BDL		
4/27/2015	14	A	0.64	BDL		
4/27/2015	14	B	0.66	BDL		
9/9/2015	15	A-1	0.24	BDL		
9/9/2015	15	A-2	3.11	BDL		
9/9/2015	15	B-1	0.27	BDL		
9/9/2015	15	B-2	2.1	BDL		
4/21/2015	15	A-1	0.31	BDL		
4/21/2015	15	A-2	3.43	BDL		
4/21/2015	15	B-1	0.5	BDL		
4/21/2015	15	B-2	1.14	BDL		

Date Reported	Site	Sample Description #2	NO3-N (ppm)	Total P (ppm)	
8/24/2015	16	A-1	1.02	BDL	<b>BDL= Below Detection Level</b>
8/24/2015	16	A-2	0.53	BDL	
8/24/2015	16	B-1	0.79	BDL	<b>MDL NO3 = &lt;.1</b>
8/24/2015	16	B-2	0.25	BDL	<b>MDL P = &gt;.2</b>
5/18/2015	16	A-1	0.37	BDL	"A" Incoming Sample
5/18/2015	16	A-2	0.1	0.42	"B" Outgoing Sample
5/18/2015	16	B-1	0.62	BDL	
5/18/2015	16	B-2	0.1	0.29	
7/27/2015	17	A-1	1.13	BDL	
7/27/2015	17	A-2	1.13	BDL	
7/27/2015	17	B-1	1.11	BDL	
7/27/2015	17	B-2	1.11	BDL	
4/13/2015	17	A-1	1.14	BDL	
4/13/2015	17	A-2	0.95	BDL	
4/13/2015	17	B-1	1.11	BDL	
4/13/2015	17	B-2	0.96	BDL	
7/27/2015	18	A	6.67	BDL	
7/27/2015	18	B	6.59	BDL	
4/13/2015	18	A	5.1	BDL	
4/13/2015	18	B	4.96	BDL	
7/27/2015	19	A	1.22	BDL	
7/27/2015	19	B	0.8	BDL	
4/13/2015	19	A	0.69	BDL	
4/13/2015	19	B	0.65	BDL	
7/27/2015	20	A	0.29	BDL	
7/27/2015	20	B	0.39	BDL	
6/1/2015	20	A	0.28	BDL	
6/1/2015	20	B	0.49	BDL	
5/18/2015	21	A	0.94	BDL	
5/18/2015	21	B	0.93	BDL	
8/21/2015	22	A	0.23	BDL	
8/21/2015	22	B	0.2	BDL	
5/4/2015	22	A	0.34	BDL	
5/4/2015	22	B	0.31	BDL	
5/4/2015	23	A	0.36	BDL	
5/4/2015	23	B-1	0.21	BDL	
5/4/2015	23	B-2	0.14	BDL	
7/14/2015	24	A-1	BDL	BDL	
7/14/2015	24	A-2	BDL	0.48	
7/14/2015	24	B-1	0.2	0.24	
7/14/2015	24	B-2	0.16	0.43	
4/13/2015	24	A-1	1.24	0.42	
4/13/2015	24	A-2	0.17	BDL	
4/13/2015	24	B-1	0.21	0.82	
4/13/2015	24	B-2	0.27	BDL	
10/9/2015	26	A	0.42	BDL	
10/9/2015	26	B	0.43	BDL	
4/27/2015	26	A	0.28	BDL	
4/27/2015	26	B	0.27	BDL	
4/21/2015	27	A	1.84	0.3	
4/21/2015	27	A	2.09	BDL	
4/21/2015	27	B	1.82	BDL	