Little Balsam Lake Inflow Study

Prepared for

Balsam Lake Protection
and Rehabilitation District

February 2007

Little Balsam Lake Inflow Study

Prepared for

Balsam Lake Protection and Rehabilitation District

February 2007

BARR

4700 West 77th Street
Minneapolis, MN 55435-4803
Phone: (952) 832-2600
Fax: (952) 832-2601

Acknowledgements

This project could not have been completed nor would it have been such a success without the assistance of the following individuals:

Taylor Larson: Taylor performed an absolutely outstanding job collecting the data necessary for this study. She was responsible for setting up the flow and water quality monitoring equipment, maintaining the equipment, taking stream flow measurements, getting the samples to the laboratory on time and in appropriate order, and other tasks such as organizing much of the data. We expect that she will have a prosperous career in whatever field she chooses.

Kari Larson: We also give a special thanks to Kari for making the effort to provide transportation to Taylor especially at those times that were not very convenient.

Table of Contents

List of Tables

List of Figures

List of Appendicies

1.0 Executive Summary

Stream flow and water quality measurements were taken from April through August, 2006 at two locations in the Rice Creek watershed and at the terminus of the Otter Creek watershed. Stream flows were measured continuously while samples were taken for phosphorus and sediment (total suspended solids) on a storm event basis. In addition, GPS measurements were taken in Little Balsam Lake to calculate detailed bathymetry of the sediment delta in Little Balsam Lake and to define the extent of the delta. Conclusions that can be drawn from this study are as follows:

- Annual phosphorus loading from the Rice Creek and Otter Creek watersheds to Little Balsam Lake was low in 2006. For the entire Rice Creek watershed (includes Otter Creek, see Figure 1), annual phosphorus loading was approximately 79 kg. Phosphorus export from this watershed was only 0.009 kg/ac. This loading rate is on the low end of expected phosphorus export rate for watersheds in Wisconsin with similar land uses. It is unlikely that low phosphorus concentrations in the stream and phosphorus loading was simply a function of lower than normal stream flows in the monitored watersheds.

- Annual sediment loading (TSS) from the Rice Creek and Otter Creek watersheds to Little Balsam Lake was low in 2006. For the entire Rice Creek watershed (includes Otter Creek, see Figure 1), annual TSS loading was approximately 9988 kg. TSS export from this watershed was only 1.1 kg/ac. This loading rate is on the low end of expected TSS export rate for watersheds in Wisconsin with similar land uses.

- It is clear that Rice Lake and the constructed pond have the effect of significantly reducing both sediment and phosphorus loading to Little Balsam. Based upon the land use of the Rice Creek watershed, sediment and phosphorus loading would be much higher without their capacity to trap and remove sediment. The wetland that lies approximately a mile north of the confluence of the Otter Creek and Rice Creek is also clearly having the effect of reducing sediment and phosphorus loads to Little Balsam Lake.

- From the data collected in 2006, it is estimated that approximately 0.08 feet of sediment over one acre of lake area (0.08 acre-feet) is contributed to Little Balsam Lake from Rice Creek for one year. Over a 30 year period, approximately 2.4 feet of sediment would be expected to accumulate over one acre of lake area. This volume of sediment, although it does contribute to the observed sediment delta, can not explain the observed changes in the sediment delta in

the last few years. An examination of historic aerial photographs and in-field GPS measurements suggest that changes in the delta are likely the result of changes in the creek channel as it enters Little Balsam Lake and subsequent changes in sediment and aquatic plant movements within the delta area.

- If it is desired to reduce the volume of sediment that is transported to Little Balsam Lake from the inflows with the use of additional ponding, ponds would be most effective if constructed at the terminus of the Otter Creek watershed or near the monitoring site for the Lower Rice Creek watershed. However, the benefit with additional ponding is not expected to be noticeable. The cost of pond construction should be evaluated against the cost of dredging in the area of Little Balsam where sediment accumulation has been greatest.

- An evaluation of the results from the stream flow measurements indicate that they were taken accurately and can be used be used to develop calibrated watershed models that can then be used in future studies of Balsam Lake. The stream flow measurements give a runoff yield of 0.15 inches per inch of rainfall for the entire Rice Creek watershed. For an average year (approximately 32 inches), runoff would be 4.8 inches. With the consideration that 2006 was a dry year, this yield is within the range of average yields of US Geological Society gauged streams in western Wisconsin.

- Given the results of this study which indicate that phosphorus and sediment loading from the Rice Creek watershed are low (although 2006 was a dry year and notwithstanding loads from other tributary watersheds), and the general tendency of the water clarity of Balsam Lake to decline throughout the year (spring through late summer), it is recommended that if there is a need to gain a further understanding of the causes of observed Balsam Lake water clarity, internal lake processes should be examined. These processes include phosphorus release from the sediment, measurements of zooplankton and possibly phytoplankton populations, and also fisheries.

2.0 Background

Concern about sediment and phosphorus inflows to Little Balsam Lake (the northern reach of Balsam Lake) prompted a study to determine the potential for Otter and Rice Creek inflows to cause sediment accumulation in the lake. A number of concerns arise with decreased water depth due to sediment accumulation, including: (1) limited boating activity, (2) reduced recreational uses, and (3) increased aquatic plant coverage and accumulation of organic material. In addition to decreased water depth, concerns also arose about nutrient inputs from Otter and Rice Creeks that may lead to increased fertility in Balsam Lake.

In recognition of the value of Balsam Lake and the current sedimentation problems that have been experienced, the Balsam Lake Protection and Rehabilitation District initiated a project to determine the impacts from flow entering Little Balsam Lake via Rice Creek (with contribution from Otter Creek). There were three initial phases to this project including:

1. Otter Creek sediment evaluation
2. Upper Rice Creek sediment evaluation
3. Lower Rice Creek sediment evaluation

This report represents Phase 4, the data summary and discussion of phases 1 through 3. Methods used for stream flow and water quality measurement are described in Section 3 below.

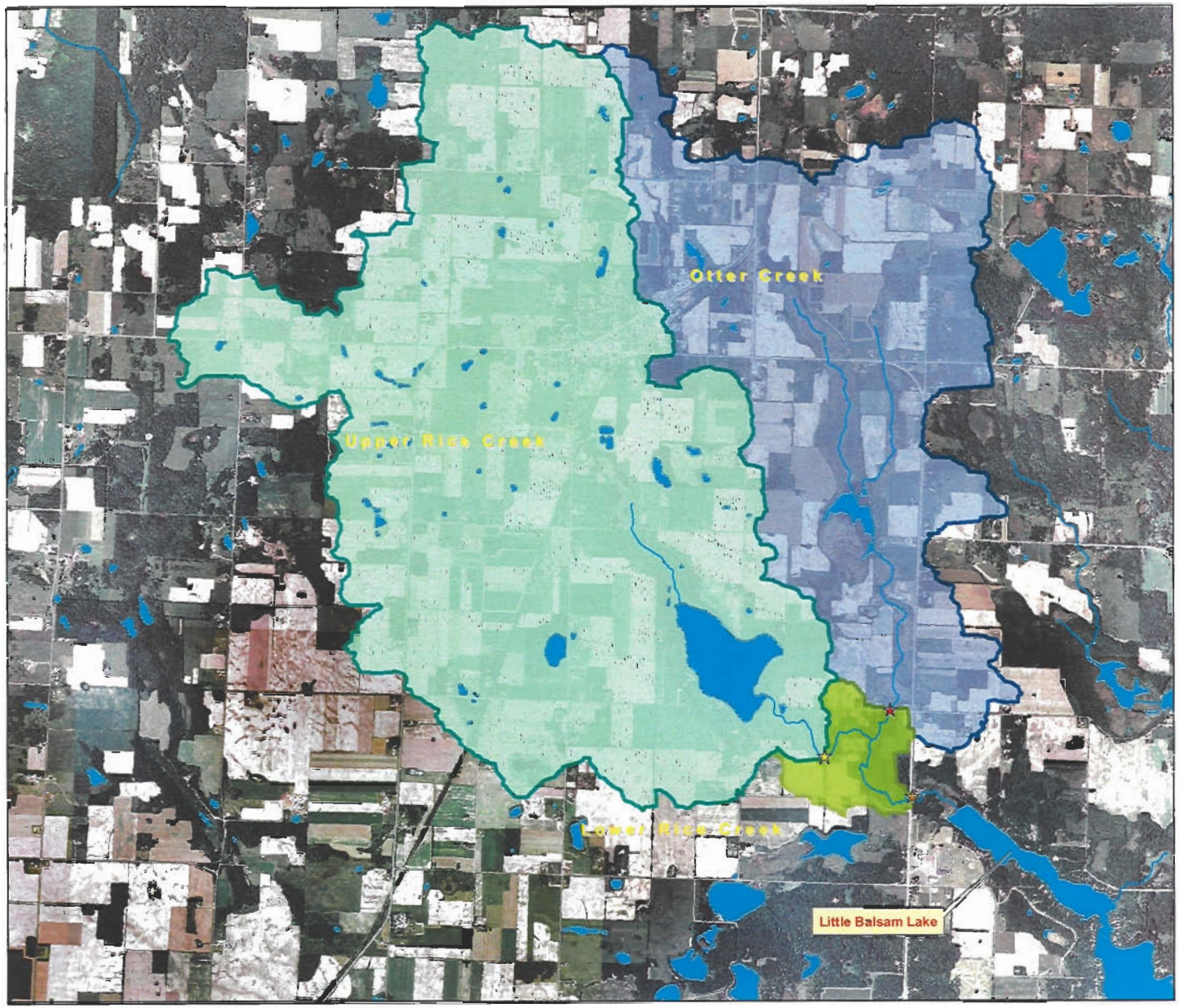


Figure 1. Watersheds and Stream Flow and Water Quality Sampling Locations

3.0 Stream Flow and Water Quality Measurement

Phases 1 through 3 determined the quantity of flow, sediment and phosphorus transported to Little Balsam Lake via both Otter and Rice Creeks during the spring and summer of 2006. Prior to the five month monitoring period, continuous flow loggers and automatic samplers were installed at three locations (Figure 1) including:

- Upstream Rice Creek Station
- Downstream Rice Creek Station
- Otter Creek Station

Sigma water samplers were placed downstream of culverts at the intersection of 155th Street and Upper Rice Creek (Figure 2), County Road 46 and Lower Rice Creek (Figure 3), and 200th Avenue and Otter Creek (Figure 4). Staff gages were installed at the same location as the water samplers. Flow in the stream was determined by establishing a relationship between stream height (as measured with the staff gage) and stream flow. Stream flow was measured by taking stream velocity and depth measurements along a line from one stream bank to the opposite stream bank (see Figure 4). A bubbler system was used to measure stream height at 5 minute intervals.

Figure 2. Equipment installation in Upper Rice Creek.

The water sampler took composite samples over the course of a storm event. Sampling was triggered when the depth in the stream rose by one inch greater than the height at which the bubbler unit was installed in each stream.

Figure 3. Lower Rice Creek monitoring location.

Figure 4. Flow gauging at Otter Creek.

With the data collected at the monitoring locations (Figure 1), the amount of sediment accumulation and phosphorus input to the lake were estimated. Volunteers from the Balsam Lake Protection and Rehabilitation District measured precipitation and intended to measure lake levels during the study period (lake levels could not be measured because residents were not available throughout the monitoring period to perform this task). The collected data are summarized and a discussion of the results follows below.

4.0 Results

4.1 Precipitation, Flow, and Water Quality Measurements

Precipitation data was gathered at the three monitoring locations by the Balsam Lake Protection and Rehabilitation District (Table 1). For comparison purposes, precipitation data collected in Eau Claire is included as well. It can be seen that the total inches of precipitation measured in this study were

Table 1. Precipitation from April 22 through August 25, 2006.

Date	Precipitation (Inches)			
	Lower Rice	Upper Rice	Otter	Eau Claire
4/22/2006	0.07	0.02	0.01	0.03
4/26/2006	0.02	0.03	0	0.00
4/30/2006	(1)	(1)	0.82	0.91
5/1/2006	(1)	(1)	0.49	0.38
5/6/2006	0.8	0.06	0.06	0.00
5/10/2006	0.47	0.49	0.48	0.08
5/13/2006	0.06	0.56	0.61	0.48
5/14/2006	0.45	0.16	0.14	0.25
5/20/2006	0.58	0.05	0.05	0.00
6/5/2006	0.15	0.06	0.06	0.23
6/7/2006	0.09	0.81	0.82	0.00
6/11/2006	0.06	0.32	0.31	0.00
6/18/2006	0.85	1.10	0.95	0.00
6/21/2006	0.3	0.03	0.03	0.00
6/25/2006	1	0.15	0.17	1.19
6/30/2006	0.17	0.29	0.55	0.00
7/4/2006	0.18	0.21	0.25	0.00
7/20/2006	0.09	0.09	0.08	0.00
7/21/2006	0.06	0.09	0.09	0.00
7/26/2006	1.5	1.79	1.5	0.00
7/31/2006	0.13	0.12	0.12	0.00
8/1/2006	2.5	2.65	2.65	4.27
8/2/2006	1.11	0.80	1.1	4.34
8/5/2006	0.01	0.01	0.01	0.00
8/10/2006	0.01	0.64	0.01	0.00
8/14/2006	0.35	0.32	0.34	0.00
8/19/2006	0.14	0.16	0.14	0.00
8/23/2006	1.17	1.05	1.2	1.30
8/25/2006	0.85	1.02	0.92	0.00
Sum	13.17	13.08	13.96	13.46

(1) No data.

similar to the total precipitation at Eau Claire.

Water level was continuously monitored during the 5-month study period. Using the water level data and measured flow at different levels of water height at the sampling locations, a rating curve was developed and used to estimate flow throughout the sampling period. The resulting flow estimates are presented in Figure 5 and Table 2.

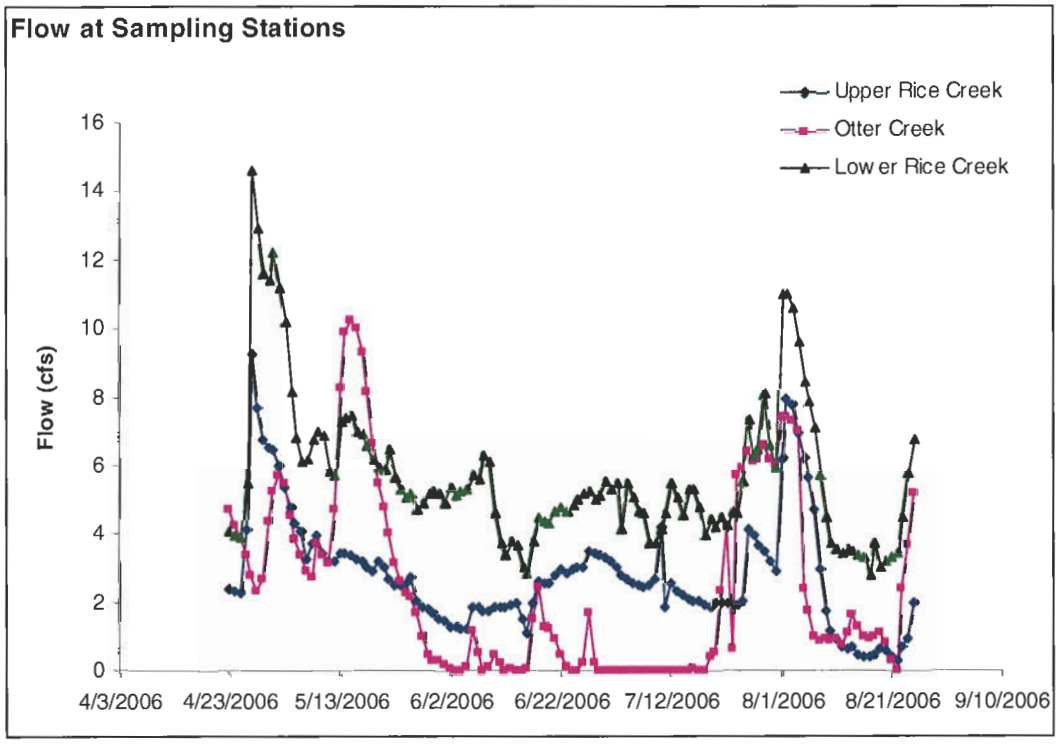


Figure 5. Flow (cfs) at the three monitoring stations located upstream of Little Balsam Lake.

It can be seen that the flow rate in the Upper and Lower Rice Creek was very well regulated and was not readily affected by storm events, while flows in Otter Creek were more affected by storm events. In both watersheds the retention of water by upstream water bodies (Rice Lake and an unnamed wetland in the Otter Creek watershed) have a regulating effect on stream flow. The regulating effect of these two water bodies also can be seen for the water quality results.

Table 2. Daily average flows (cfs) at Upper Rice, Lower Rice, and Otter Creek.

Date	Monitoring Location		
	Upper	Otter	Lower
4/23/2006	2.39	4.69	4.05
4/24/2006	2.33	4.28	3.96
4/25/2006	2.24	3.90	3.89
4/26/2006	4.16	3.35	5.45
4/27/2006	9.27	2.79	14.63
4/28/2006	7.67	2.30	12.94
4/29/2006	6.74	2.65	11.60
4/30/2006	6.49	4.35	11.42
5/1/2006	6.44	5.21	12.24
5/2/2006	6.01	5.69	11.19
5/3/2006	5.33	5.45	10.20
5/4/2006	4.75	4.55	8.15
5/5/2006	4.28	3.85	6.78
5/6/2006	4.05	3.35	6.11
5/7/2006	3.23	2.93	6.15
5/8/2006	3.73	2.75	6.73
5/9/2006	3.97	3.72	6.99
5/10/2006	3.46	3.40	6.88
5/11/2006	3.20	3.15	5.82
5/12/2006	3.23	4.70	5.69
5/13/2006	3.46	8.24	7.25
5/14/2006	3.46	9.91	7.40
5/15/2006	3.40	10.23	7.46
5/16/2006	3.26	10.04	7.00
5/17/2006	3.22	9.33	6.93
5/18/2006	3.04	8.13	6.58
5/19/2006	2.92	6.61	6.15
5/20/2006	3.18	5.45	5.93
5/21/2006	3.03	4.77	5.89
5/22/2006	2.69	4.01	6.47
5/23/2006	2.50	3.16	5.64
5/24/2006	2.49	2.60	5.30
5/25/2006	2.58	2.29	5.07
5/26/2006	2.72	2.13	5.16
5/27/2006	2.06	1.69	4.73
5/28/2006	1.85	1.01	4.89
5/29/2006	1.80	0.45	5.17
5/30/2006	1.71	0.31	5.21
5/31/2006	1.53	0.30	5.18
6/1/2006	1.47	0.16	4.88
6/2/2006	1.30	0.03	5.36
6/3/2006	1.25	0.00	5.12
6/4/2006	1.21	0.00	5.22
6/5/2006	1.21	0.11	5.30
6/6/2006	1.87	1.19	5.71
6/7/2006	1.87	0.52	5.57
6/8/2006	1.77	0.00	6.27
6/9/2006	1.77	0.12	6.09
6/10/2006	1.86	0.48	4.58
6/11/2006	1.84	0.25	3.71
6/12/2006	1.85	0.01	3.40
6/13/2006	1.91	0.06	3.78
6/14/2006	1.95	0.02	3.69
6/15/2006	1.52	0.00	3.05
6/16/2006	1.11	0.07	2.82
6/17/2006	1.96	1.49	3.76
6/18/2006	2.62	2.47	4.49
6/19/2006	2.54	1.26	4.33
6/19/2006	2.54	1.26	4.33
6/20/2006	2.58	1.20	4.30
6/21/2006	2.81	0.91	4.66
6/22/2006	2.95	0.46	4.76
6/23/2006	2.83	0.09	4.63
6/24/2006	2.95	0.00	4.84
6/25/2006	3.05	0.00	4.98
6/26/2006	3.02	0.24	5.17
6/27/2006	3.50	1.69	5.22
6/28/2006	3.46	0.23	4.99
6/29/2006	3.40	0.00	5.11
6/30/2006	3.29	0.00	5.55
7/1/2006	3.20	0.00	5.31
7/2/2006	3.00	0.00	5.46
7/3/2006	2.80	0.00	4.13
7/4/2006	2.66	0.00	5.47
7/5/2006	2.58	0.00	5.04
7/6/2006	2.52	0.00	4.65
7/7/2006	2.42	0.00	4.61
7/8/2006	2.51	0.00	3.73
7/9/2006	2.66	0.00	3.72
7/10/2006	4.21	0.00	4.11
7/11/2006	1.89	0.00	4.60
7/12/2006	2.57	0.00	5.48
7/13/2006	2.31	0.00	5.04
7/14/2006	2.21	0.00	4.51
7/15/2006	2.07	0.01	5.27
7/16/2006	2.01	0.07	5.28
7/17/2006	2.05	0.02	4.78
7/18/2006	1.90	0.00	3.95
7/19/2006	1.88	0.40	4.44
7/20/2006	2.00	0.50	4.22
7/21/2006	1.99	2.32	4.50
7/22/2006	1.98	4.16	4.25
7/23/2006	1.93	0.66	4.67
7/24/2006	1.90	5.68	4.58
7/25/2006	2.04	5.94	5.54
7/26/2006	4.12	6.43	7.32
7/27/2006	3.97	6.16	6.34
7/28/2006	3.64	6.22	6.53
7/29/2006	3.47	6.64	8.08
7/30/2006	3.22	6.24	6.63
7/31/2006	2.93	6.06	5.97
8/1/2006	6.25	7.44	10.99
8/2/2006	7.98	7.45	11.02
8/3/2006	7.82	7.33	10.58
8/4/2006	6.98	7.05	9.58
8/5/2006	6.20	2.36	8.46
8/6/2006	5.67	1.74	7.86
8/7/2006	4.69	0.97	7.10
8/8/2006	2.98	0.85	5.73
8/9/2006	1.74	0.91	4.50
8/10/2006	1.14	0.89	3.70
8/11/2006	0.90	0.92	3.57
8/12/2006	0.69	0.78	3.42
8/13/2006	0.61	1.11	3.54
8/14/2006	0.67	1.61	3.49
8/15/2006	0.49	1.29	3.39
8/16/2006	0.39	0.99	3.29
8/17/2006	0.43	0.92	2.81
8/18/2006	0.44	0.98	3.69
8/19/2006	0.63	1.09	3.01
8/20/2006	0.56	0.79	3.23
8/21/2006	0.38	0.32	3.29
8/22/2006	0.28	0.00	3.44
8/23/2006	0.71	2.39	4.46
8/24/2006	0.95	3.64	5.74
8/25/2006	1.99	5.19	6.77

Phosphorus concentrations are typically high in the spring for streams that are influenced by agricultural runoff. However, phosphorus was low in the spring for both Lower and Upper Rice Creek as well as Otter Creek. It can be assumed that Rice Lake and the constructed pond and the wetland in Otter Creek have the effect of removing phosphorus as well as sediment in the spring and early summer. It can be seen that by late summer, phosphorus levels have remained low in Upper Rice but have begun to increase in Lower Rice and Otter Creek (Table 3, data sheets in Appendix A). By looking at the difference in phosphorus concentrations in Upper and Lower Rice in August, it can be inferred that the higher phosphorus concentrations observed in Lower Rice were caused by the large Otter Creek inflows in August. Hence, it appears that the water quality of Otter Creek is more influenced by storm events. This suggests additional ponding in Otter Creek has the potential to reduce TSS and possibly phosphorus loading (see discussion below) to Little Balsam Lake.

Table 3. Total phosphorus, sediment (TSS), and volatile suspended solids in Lower and Upper Rice Creek and Otter Creek.

Sample Date	Lower Rice			Otter			Upper Rice		
	TP (mg/L)	TSS (mg/L)	VSS (mg/L)	TP (mg/L)	TSS (mg/L)	VSS (mg/L)	TP (mg/L)	TSS (mg/L)	VSS (mg/L)
5/10/2006	0.045	6	3	(1)	(1)	(1)	0.051	2.8	(1)
5/13/2006	0.044	7	4	0.051	(1)	0	(1)	(1)	(1)
5/14/2006	(1)	(1)	(1)	0.056	4	2	(1)	(1)	(1)
5/23/2006	0.041	6	3	(1)	(1)	(1)	(1)	(1)	(1)
6/7/2006	0.08	15	6	(1)	(1)	(1)	(1)	(1)	(1)
6/18/2006	0.037	5	2	(1)	(1)	(1)	(1)	(1)	(1)
6/19/2006	(1)	(1)	(1)	(1)	(1)	(1)	0.03	(1)	(1)
7/6/2006	0.037	5	2	(1)	(1)	(1)	(1)	(1)	(1)
7/12/2006	0.05	6	3	(1)	(1)	(1)	(1)	(1)	(1)
7/25/2006	0.036	4	(1)	(1)	(1)	(1)	0.038	2.5	(1)
7/28/2006	0.04	4	2	(1)	(1)	(1)	(1)	(1)	(1)
7/31/2006	0.082	18	7	(1)	(1)	(1)	0.032	(1)	(1)
8/1/2006	0.069	8	3	0.214	3	2	0.032	2	(1)
8/13/2006	0.035	4	3	(1)	(1)	(1)	0.05	7	6
8/18/2006	(1)	(1)	(1)	(1)	(1)	(1)	0.034	5	4
8/23/2006	0.219	53	20	(1)	(1)	(1)	0.035	2	(1)
8/24/2006	0.067	12	4	(1)	(1)	(1)	(1)	(1)	(1)
Average	0.06	10.9	4.8	0.11	3.5	1.3	0.04	3.6	5.0

(1) No data

TP=total phosphorus

TSS=total suspended solids

VSS=volatile suspended soids, approximately equivalent to the organic content of solids

It is possible, however, that much of the phosphorus that is being contributed by Otter Creek is not settleable. It is a well-known phenomenon that wetland systems can capture phosphorus in the spring and early summer, but by mid-summer they can begin to release dissolved phosphorus from the sediments. Given the low solids content but high phosphorus content of the water collected in Otter Creek on August 1, 2006, it can be assumed that much of the phosphorus is in a dissolved form (i.e., unsettleable). If most of the high levels of phosphorus observed in Otter Creek were dissolved, then ponding would be ineffective for phosphorus removal.

Overall, phosphorus and sediment levels were low in Rice and Otter Creek. The lower phosphorus levels may have been influenced somewhat by dry conditions in 2006. Even with the effect of lower than normal precipitation during the monitoring period, phosphorus and sediment levels in the monitored creeks are significantly lower that urban streams as well as streams that receive runoff from agricultural lands (see land use in Table 3 and Figure 6). Rice Lake, the constructed ponds, the wetland in Otter Creek, and the well-preserved riparian zone in Rice and Otter Creek, appear to be having the effect of minimizing sediment and nutrient transport to Little Balsam and Balsam Lake.

Table 4. Land use of the Upper Rice, Lower Rice, and Otter Creek watersheds.

Land Use Category	Upper Rice		Lower Rice		Otter		Total	
	Area (ac)	%	Area (ac)	%	Area (ac)	%	Area (ac)	%
Urban	246	4.4	0	0.0	30	1.0	239	2.7
Agriculture	2,252	40.3	101	45.5	1,044	35.1	3,482	39.7
Grassland	2,022	36.2	65	29.2	1,166	39.2	3,156	35.9
Forest	709	12.7	34	15.4	435	14.6	1,201	13.7
Open	125	2.2	0	0.2	26	0.9	133	1.5
Wetland	202	3.6	20	8.8	265	8.9	525	6.0
Barren	15	0.3	2	0.8	8	0.3	31	0.4
Shrubland	14	0.2	0	0.1	0	0.0	14	0.2
Total	5,584	100	222	100	2,975	100	8,781	100

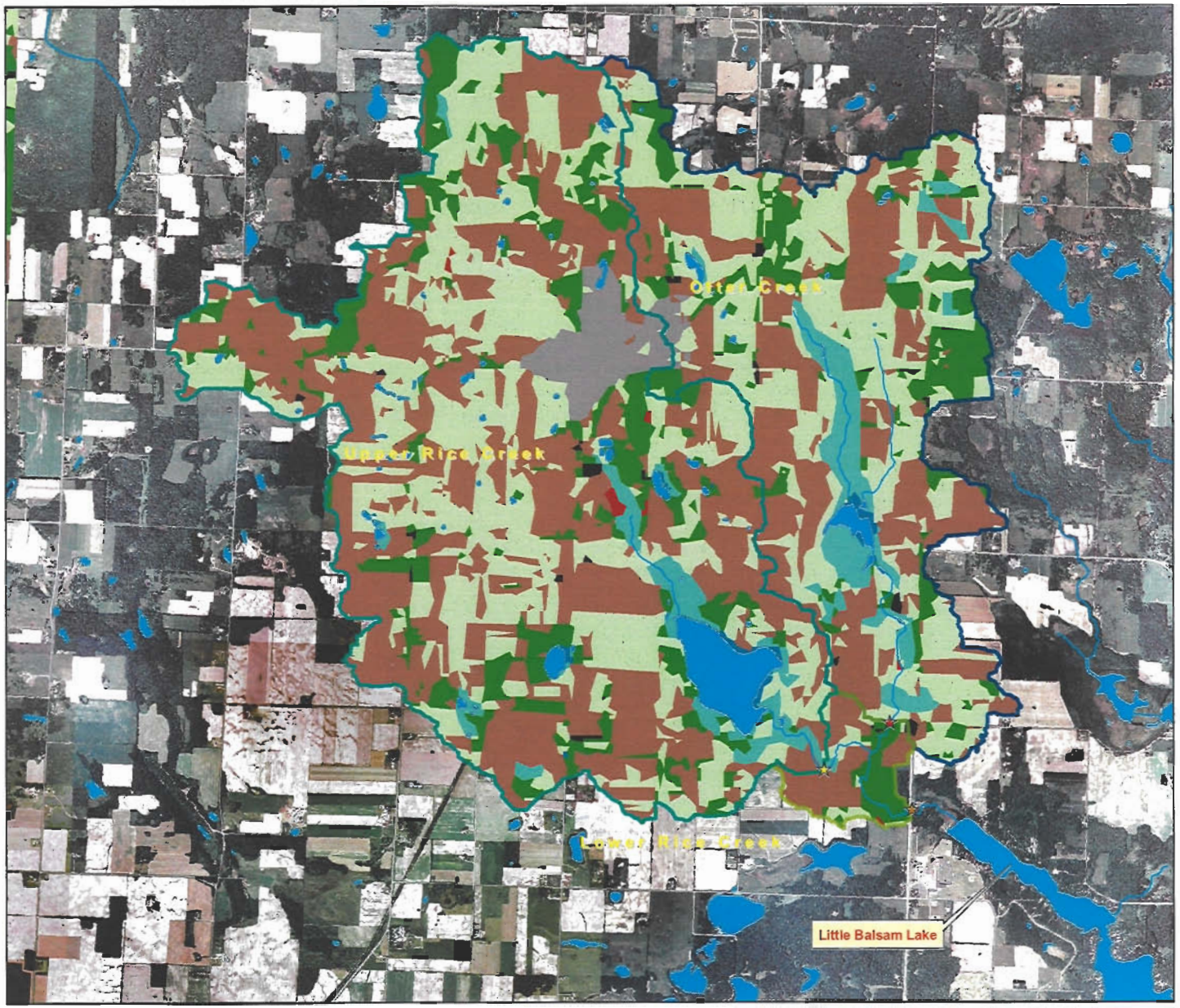


Figure 6.
Landuse of Rice and Otter Creek

4.2 Water Yield, Sediment, and Phosphorus Loading

Using the precipitation, flow, and water quality data, calculations were performed to further understand the water, sediment, and phosphorus yields in the monitored watersheds (Table 4). Yield is a term that is typically used to describe flow and water quality data on a per acre of watershed area basis. The use of "yield" assists in the interpretation of data and allows for comparisons between different watershed systems. Using the flow monitoring data, the inches of runoff (water yield) that were generated during the monitoring period are given in Table 4. Using the water yield generated from this study, the water yield for the entire Rice Creek watershed for an average year is approximately 4.8 inches. Given the type of soils found in the Rice Creek watershed (Table 5), this yield is reasonable. Phosphorus and TSS loading for the entire Rice Creek watershed during the monitoring period was 79 and 9,988 kg, respectively. For the entire watershed, each acre exported 0.009 kg of phosphorus and 1.1 kg of sediment (TSS).

The loading data calculated for the 2006 monitoring period (April through August, 2006) were also used to estimate yields for an entire year (for an average precipitation year of approximately 32 inches). For the entire watershed, each acre exports approximately 0.024 kg of phosphorus each year. This is very low and compares to the expected rate of phosphorus export from heavily forested watersheds (Panuska, 1995, Wisconsin Department of Natural Resources, Findings Number 38). Although 2006 was a dry year, it is reasonable to conclude that phosphorus export is low for the Rice Creek watershed. Annual sediment export of 3 kg per acre of watershed area is also low.

Similar to the conclusion in the previous section, Rice Lake, the constructed ponds, the wetland in Otter Creek, and the well-preserved riparian zone in Rice and Otter Creek, appear to be having the effect of minimizing sediment and nutrient transport to Little Balsam and Balsam Lake.

Table 5. Water, sediment (TSS), and phosphorus yields from the Upper Rice, Lower Rice, and Otter Creek Watersheds.

Watershed	**Water Yield** *Inches Over Watershed*[1]	For 2006 Monitoring Period			
		Total TP Loading (kg)	Total TSS Loading (kg)	Aerial TP Loads (kg/ac)	Aerial TSS Loads (kg/ac)
Upper Rice	1.5	33	3085	0.006	0.6
Otter Creek[2]	2.4	46	6903	0.016	2.3
Lower Rice (entire Rice Creek watershed)	1.9	79	9988	0.009	1.1

(1)Calculated as the total volume of runoff during the monitoring period divided by the total watershed contributing area.

(2)Because of limited sample data, total phosphorus and total suspended solids loading for Otter Creek estimated as the difference in loading for the entire Rice Creek watershed minus the loading for the Upper Rice Creek watershed.

Watershed	Average Annual[1]			
	Total TP Loading (kg)[2]	Total TSS Loading (kg)[2]	Aerial TP Loads (kg/ac)	Aerial TSS Loads (kg/ac)
Upper Rice	87	8197	0.016	1.5
Otter Creek	116	17307	0.039	5.8
Lower Rice (entire Rice Creek watershed)	210	26543	0.024	3.0

(1)Estimated using the average annual precipitation (32 inches/year) for a 30 year record.

Table 6. The type of soils in the Rice and Otter Creek watersheds.

Hydrologic Soil Group	Upper Rice		Lower Rice		Otter		Total Watershed	
	Area (ac)	%	Area (ac)[1]	%	Area (ac)	%	Area (ac)	%
A	246	4.4	0	0.0	30	1.0	239	2.7
A/D	2252	40.3	101	45.5	1044	35.1	3482	39.7
B	2022	36.2	65	29.2	1166	39.2	3156	35.9
B/D	709	12.7	34	15.4	435	14.6	1201	13.7
C	125	2.2	0	0.2	26	0.9	133	1.5
Total	5584	100	222	90	2975	91	8781	94

(1)Includes watershed area between the Lower Rice Creek monitoring point and the Upper Rice and Otter Creek monitoring location.

A=Sandy soil, high infiltration rates

A/D=Sandy/silty soil, high infiltration rates

B=Sandy/loam, medium infiltration rates

B/D=Sandy/clay/loam, low infiltration rates

C=Shallow soils, clayey, medium to low infiltration.

D=Silty/clay, clay, very low infiltration rates

4.3 Evaluation of Sediment Accumulation in Little Balsam Lake

The flow and sediment monitoring data collected in 2006 suggest that inflows from Rice and Otter Creek are not likely responsible for the observed accumulation of sediment in localized areas of Little Balsam Lake. Because 2006 was a dry year, an additional field investigation was performed to "ground truth" the monitoring data. This was performed by developing a bathymetric map of water depth in Little Balsam Lake and to map the extent of the sediment delta using GPS. The purpose of mapping the lake water depth was to provide a baseline with which to evaluate future observed changes in the delta. Mapping of the extent of the sediment delta was performed to see how today's observations compare with the historic conditions of the delta. Historic conditions were evaluated with the use of aerial photos dating back to the late 1930s.

The bathymetric map and the historic sediment delta maps are provided in Appendix B. The bathymetric map was developed by using a GPS device and a depth finder to simultaneously measure lake depth and position. Measurements were made by driving a boat from shore to shore. Measurements were taken as far in to the sediment delta as physically possible. The red line represents the maximum extent that measurements were taken in the north end of the lake. This line is also the extent of the emergent macrophyte growth (cattails) in 2006. Beyond this line (to the west and north), there was almost no open water (see photograph in Appendix B). A staff gage was placed near the shore in front of Al Dornfeld's property. The gage and water height were measured at the time of the bathymetric mapping such that future bathymetric measurements could be related back to the measurements in 2006. Lake depth measurements then can be used to judge any changes in the delta.

The edge of the cattail bed that was defined during the bathymetric survey (red line in the aerial photographs) is also useful as a reference point to judge historic changes in the delta area of Little Balsam Lake. Looking at aerial photographs from 1938 through 2005, it can be seen that the macrophyte bed, the stream channel, and by inference the sediment delta, has been variable. In 1938, aquatic plants extended further out into the lake than in 2006. It appears, however, that the plant bed was composed of submerged aquatic plants rather than emergent plants such as cattails. Also noticeable is that the Rice Creek channel was not well defined. The aquatic plant bed in 1938 was similar to 1951. This aerial photograph shows however that the plants adjacent to the red line were submerged and the cattails were west of the current (2006) cattail extent. Also note that the channel was more visible in this photograph. The 1965 photograph clearly shows a more defined stream channel. The extent of the emergent vegetation (cattails) is similar to the extent observed in the 1951

photograph. In 1973, it appears that the stream channel has migrated north. Likely because of the season in which the photo was taken, it looks like the plant bed is more open compared to 1965. In 1988, the stream channel is clearly larger and more defined. In 2000, the stream channel is clearly changing and is migrating north. Coincident with this change appears to be change in the open area that is on the north side of the lake but west of the red line. In 2005 and in the south and west end of the lake, the extent of the cattails was about the same as in 2006 (the red line). By 2005, the channel had fully migrated north and there was further evidence that the area west of the red line (on the north end) was filling in with aquatic plants and possibly sediment. By 2006, the area west of the red line was not navigable by boat.

The movement of the Rice Creek channel bed from the south end to the north end of the delta area clearly coincided with the increase in the dense growth of cattails and the potential filling in of sediment in this region. From the sediment data collected in 2006, it does not appear feasible that the observed changes are due to new sediment deposits. It is more likely that changes in the stream channel had the effect of transporting already deposited sediment in the upper reaches of the delta downstream. It is possible that this then allowed greater cattail growth in 2006.

5.0 Conclusions

It can be concluded that phosphorus and sediment loading to Little Balsam Lake from Rice Creek and Otter Creek are low. Rice Lake, the constructed pond, and the open water wetland that is in Otter Creek are clearly regulating (i.e., reducing) the transport of sediment and phosphorus from the Rice Creek and Otter Creek watersheds to Balsam Lake. It is unlikely that the observed changes in the sediment delta/aquatic plant bed in the west and north end of Little Balsam Lake are the result of new sediment deposits. From the aerial photographs (1938 through 2005) it is clear that there have been significant movements in the aquatic plant community, the Rice Creek stream bed, and the sediment delta. However, it is hypothesized that the changes observed are due to movements of sediment within the delta which have given cattails the opportunity to invade these previously open areas. Observations of the types of sediment in the newly filled in areas suggest that they are high in organic carbon content. This suggests that much of the accumulated sediment is from within the delta region rather than from the stream sediment.

It is estimated that phosphorus and sediment loading from Otter Creek are greater than from Rice Creek. However, overall phosphorus and sediment loading from Otter Creek is low. Although it is always worthwhile to try to reduce external sediment and phosphorus loads, the benefit of providing additional ponding for Otter Creek may not be justified by the costs. Based upon the results of this study, monies would better spend on in-lake management activities. If there is a need to provide lake residents that are affected by the sediment delta with better access to the lake, localized dredging activities would be more effective than additional upstream ponding.

6.0 Recommendations

As a result of this study, several recommendations are provided below. They include:

- The construction of a sedimentation pond either in the Otter Creek or Rice Creek watershed is not recommended at this time. If the District is seriously considering the construction of a sedimentation pond in either of these watersheds, a few grab samples should be taken and analyzed for dissolved and total phosphorus. If most of the phosphorus in the samples is dissolved, then this indicates that much of the phosphorus in Rice or Otter Creek is not settleable.

- If there is a need to provide lake residents that are affected by the sediment delta with better access to the lake, localized dredging activities would be more effective than additional upstream ponding.

- Given the results of this study which indicate that phosphorus and sediment loading from the Rice Creek watershed are low (although 2006 was a dry year and notwithstanding loads from other tributary watersheds), and the general tendency of the water clarity of Balsam Lake to decline throughout the year (spring through late summer), it is recommended that if there is a need to gain a further understanding of the causes of observed Balsam Lake water clarity, internal lake processes should be examined. These processes include phosphorus release from the sediment, measurements of zooplankton and possibly phytoplankton populations, and also fisheries.

- If a complete water and phosphorus budget of Balsam Lake is developed, the data collected as part of this study can be used to develop a hydrologic and water quality model. This model could save time and money in the development of a hydrologic and phosphorus budget for Balsam Lake.

Appendix A

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IQ022195
Collection Start:	05/10/2006 06:00 pm	Collection End:	05/10/2006 08:00 pm
Collected by:	LARSON	Waterbody/Outfall Id:	2621200
ID #:	493217	ID Point #:	
County:	Polk	Account #:	LM012
Sample Location:	RICE CREEK @ 155TH STREET		
Sample Description:	STREAM WATER SAMPLE		
Sample Source:	NP	Sample Depth:	
Date Reported:	06/02/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	05/17/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.031	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
TOTAL SOLIDS (SM 2540B)	05/17/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
500	RESIDUE TOTAL	130.	MG/L	50		167

Analysis Method	Analysis Date	Lab Comment
TOTAL VOLATILE SOLIDS (SM 2540E-17TH ED)	05/17/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
505	RESIDUE TOTAL VOL	ND	MG/L	50		167

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	05/15/2006	MATRIX DUPLICATE QC EXCEEDED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*2.8	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	05/12/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IQ022196
Collection Start:	05/10/2006 08:00 pm	Collection End:	
Collected by:	TAYLOR LARSON	Waterbody/Outfall Id:	2621200
ID #:	493052	ID Point #:	
County:	Polk	Account #:	PP009
Sample Location:	RICE CREEK - DOWNSTREAM		
Sample Description:	STREAM WATER SAMPLE		
Sample Source:	NP	Sample Depth:	
Date Reported:	06/02/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	05/17/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.045	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	05/15/2006	MATRIX DUPLICATE QC EXCEEDED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*6	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	05/15/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	3.	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	05/12/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621300	Sample #:	IQ022322
Collection Start:	05/14/2006 12:00 am	Collection End:	
Collected by:	TAYLOR LARSON	Waterbody/Outfall Id:	2621300
ID #:	493216	ID Point #:	
County:	Polk	Account #:	LM012
Sample Location:	OTTER CREEK AT 200TH AVE		
Sample Description:	STREAM WATER		
Sample Source:	NP	Sample Depth:	
Date Reported:	06/02/2006	Sample Status:	COMPLETE
Project No:	LPL1045		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	05/22/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.056	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	05/18/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*4	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	05/18/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*2	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT	05/16/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	13.	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IQ022320
Collection Start:	05/13/2006 12:00 am	Collection End:	
Collected by:	TAYLOR LARSON	Waterbody/Outfall Id:	2621200
ID #:	493052	ID Point #:	
County:	Polk	Account #:	PP009
Sample Location:	RICE CREEK - DOWNSTREAM		
Sample Description:			
Sample Source:	NP	Sample Depth:	
Date Reported:	06/02/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	05/22/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.044	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	05/18/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*7	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	05/18/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*4	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT	05/16/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	13.	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

DNR ID 113133790

Sample:

Field #:	2621300	Sample #:	IQ022321
Collection Start:	05/13/2006 12:00 am	Collection End:	
Collected by:	TAYLOR LARSON	Waterbody/Outfall Id:	2621300
ID #:	493216	ID Point #:	
County:	Polk	Account #:	LM012
Sample Location:	OTTER CREEK AT 200TH AVE		
Sample Description:	STREAM WATER		
Sample Source:	NP	Sample Depth:	
Date Reported:	06/02/2006	Sample Status:	COMPLETE
Project No:	LPL1045		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	05/22/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.051	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	05/18/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*2	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	05/18/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT	05/16/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	13.	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IQ023390
Collection Start:	05/23/2006 12:00 am	Collection End:	
Collected by:	TAYLOR LARSON	Waterbody/Outfall Id:	2621200
ID #:	493052	ID Point #:	
County:	Polk	Account #:	PP009
Sample Location:	RICE CREEK		
Sample Description:	DOWNSTREAM		
Sample Source:	NP	Sample Depth:	
Date Reported:	06/15/2006	Sample Status:	COMPLETE
Project No:			

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	06/02/2006	MATRIX DUPLICATE QC EXCEEDED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.041	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	05/30/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	6.	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	05/30/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	3.	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	05/25/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IQ024784
Collection Start:	06/07/2006 12:00 am	Collection End:	
Collected by:	TAYLOR	Waterbody/Outfall Id:	2621200
ID #:	493052	ID Point #:	
County:	Polk	Account #:	PP009
Sample Location:	RICE CREEK - DOWNSTREAM		
Sample Description:			
Sample Source:	NP	Sample Depth:	
Date Reported:	06/26/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	06/13/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.080	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	06/13/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*15	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	06/13/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*6	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT	06/09/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	18.	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IQ025687
Collection Start:	06/18/2006 12:00 am	Collection End:	06/18/2006 02:00 am
Collected by:	LARSON	Waterbody/Outfall Id:	2621200
ID #:	493052	ID Point #:	
County:	Polk	Account #:	PP009
Sample Location:	RICE CREEK - DOWNSTREAM		
Sample Description:			
Sample Source:	NP	Sample Depth:	
Date Reported:	06/30/2006	Sample Status:	COMPLETE
Project No:			

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	06/23/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.037	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	06/21/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*5	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	06/21/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*2	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT	06/20/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	16.	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IQ025686
Collection Start:	06/19/2006 12:00 am	Collection End:	
Collected by:	LARSON	Waterbody/Outfall Id:	2621200
ID #:	493217	ID Point #:	
County:	Polk	Account #:	LM012
Sample Location:	RICE CREEK @ 155TH STREET		
Sample Description:	STREAM WATER SAMPLE		
Sample Source:	NP	Sample Depth:	
Date Reported:	06/30/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	06/23/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.030	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	06/21/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	06/21/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT	06/20/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	16.	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: **Wisconsin State Laboratory of Hygiene** *DNR ID* **113133790**
2601 Agriculture Dr
Madison **WI** **537077996**
Phone : **800-442-4618** *Fax Phone :* **608-224-6276**

Sample:

Field #:	**2621200**	*Sample #:*	**IR000376**
Collection Start:	**07/06/2006 12:00 am**	*Collection End:*	
Collected by:	**LARSON**	*Waterbody/Outfall Id:*	**2621200**
ID #:	**493217**	*ID Point #:*	
County:	**Polk**	*Account #:*	**LM013**
Sample Location:	**RICE CREEK @ 155TH STREET**		
Sample Description:	**STREAM WATER SAMPLE**		
Sample Source:	**SU**	*Sample Depth:*	
Date Reported:	**08/09/2006**	*Sample Status:*	**CORRECTED**
Project No:	**LPL1046**		

Analyses and Results:

Analysis Method	*Analysis Date*	*Lab Comment*
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	**07/31/2006**	**MATRIX DUP QC EXCEEDED**

Code	*Description*	*Result*	*Units*	*LOD*	*Report Limit*	*LOQ*
665	**PHOSPHORUS TOTAL**	***0.032**	MG/L	0.005		0.016

Analysis Method	*Analysis Date*	*Lab Comment*
SUSPENDED SOLIDS (EPA METHOD 160.2)	**07/12/2006**	**SAMPLE RECEIVED WITH ICE MELTED**

Code	*Description*	*Result*	*Units*	*LOD*	*Report Limit*	*LOQ*
530	**RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)**	***2**	MG/L	2		7

Analysis Method	*Analysis Date*	*Lab Comment*
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	**07/12/2006**	**SAMPLE RECEIVED WITH ICE MELTED**

Code	*Description*	*Result*	*Units*	*LOD*	*Report Limit*	*LOQ*
535	**RESIDUE VOL NFLT**	***2**	MG/L	2		7

Analysis Method	*Analysis Date*	*Lab Comment*
TEMPERATURE ON RECEIPT	**07/07/2006**	

Code	*Description*	*Result*	*Units*	*LOD*	*Report Limit*	*LOQ*
136	**TEMPERATURE AT LAB**	**15.**	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: **Wisconsin State Laboratory of Hygiene** *DNR ID* **113133790**
2601 Agriculture Dr
Madison **WI** **537077996**
Phone : **800-442-4618** *Fax Phone :* **608-224-6276**

Sample:

Field #: **2621200** *Sample #:* **IR001355**
Collection Start: **07/12/2006 12:00 am** *Collection End:* **07/14/2006 12:00 am**
Collected by: **LARSON** *Waterbody/Outfall Id:* **2621200**
ID #: **493217** *ID Point #:*
County: **Polk** *Account #:* **LM013**
Sample Location: **RICE CREEK @ 155TH STREET**
Sample Description: **STREAM WATER**
Sample Source: **NP** *Sample Depth:*
Date Reported: **08/04/2006** *Sample Status:* **COMPLETE**
Project No: **LPL1046**

Analyses and Results:

Analysis Method	*Analysis Date*	*Lab Comment*
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	**07/19/2006**	**SAMPLE RECEIVED WITH ICE MELTED**

Code	*Description*	*Result*	*Units*	*LOD*	*Report Limit*	*LOQ*
665	**PHOSPHORUS TOTAL**	***0.044**	MG/L	0.005		0.016

Analysis Method	*Analysis Date*	*Lab Comment*
SUSPENDED SOLIDS (EPA METHOD 160.2)	**07/17/2006**	**SAMPLE RECEIVED WITH ICE MELTED**

Code	*Description*	*Result*	*Units*	*LOD*	*Report Limit*	*LOQ*
530	**RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)**	***2**	MG/L	2		7

Analysis Method	*Analysis Date*	*Lab Comment*
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	**07/17/2006**	**SAMPLE RECEIVED WITH ICE MELTED**

Code	*Description*	*Result*	*Units*	*LOD*	*Report Limit*	*LOQ*
535	**RESIDUE VOL NFLT**	***ND**	MG/L	2		7

Analysis Method	*Analysis Date*	*Lab Comment*
TEMPERATURE ON RECEIPT	**07/17/2006**	

Code	*Description*	*Result*	*Units*	*LOD*	*Report Limit*	*LOQ*
136	**TEMPERATURE AT LAB**	**28.**	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #	2621200	Sample #	IR002520
Collection Start	07/25/2006 12:00 am	Collection End	07/26/2006 12:00 am
Collected by	LARSON	Waterbody/Outfall Id	2621200
ID #	493217	ID Point #	
County	Polk	Account #	LM013
Sample Location	RICE CREEK @ 155TH STREET		
Sample Description	STREAM WATER SAMPLE		
Sample Source	NP	Sample Depth	
Date Reported	08/11/2006	Sample Status	COMPLETE
Project No.	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	07/31/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.038	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	07/31/2006	SAMPLE RECEIVED WITH ICE MELTED, LOW SAMPLE VOLUME

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*<2.5	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	07/31/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT	07/27/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	18.	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #	2621200	Sample #:	IR002519
Collection Start	07/25/2006 12:00 am	Collection End	07/26/2006 12:00 am
Collected by	LARSON	Waterbody/Outfall Id	2621200
ID #	493052	ID Point #	
County	Polk	Account #	PP009
Sample Location	RICE CREEK		
Sample Description	DOWNSTREAM		
Sample Source	NP	Sample Depth	
Date Reported	08/11/2006	Sample Status	COMPLETE
Project No			

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	07/31/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	*0.036	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	07/31/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*4	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	07/31/2006	SAMPLE RECEIVED WITH ICE MELTED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT	07/27/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	18.	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #	2621200	Sample #	IR002981
Collection Start	07/28/2006 12:00 am	Collection End	07/29/2006 12:00 am
Collected by	TAYLOR LARSON	Waterbody/Outfall Id	2621200
ID #	493052	ID Point #	
County	Polk	Account #	PP009
Sample Location	RICE CREEK		
Sample Description	DOWNSTREAM		
Sample Source	NP	Sample Depth	
Date Reported	08/22/2006	Sample Status	COMPLETE
Project No			

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/07/2006	HOLDING TIME EXCEEDED BY 3 DAYS

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*2.	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/02/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/07/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.040	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	4.	MG/L	2		7

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #:	2621200	Sample #:	IR003192
Collection Start:	07/31/2006 12:00 am	Collection End	08/01/2006 12:00 am
Collected by:	TAYLOR LARSON	Waterbody/Outfall Id	2621200
ID #	493217	ID Point #	
County:	Polk	Account #	LM013
Sample Location:	RICE CREEK @ 155TH STREET		
Sample Description:	STREAM WATER SAMPLE		
Sample Source	NP	Sample Depth:	
Date Reported	08/24/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/10/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.032	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/07/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #	2621200	Sample #	IR003194
Collection Start	07/31/2006 12:00 am	Collection End	08/01/2006 12:00 am
Collected by	LARSON	Waterbody/Outfall Id	2621200
ID #	493052	ID Point #	
County	Polk	Account #	PP009
Sample Location	RICE CREEK		
Sample Description	DOWNSTREAM		
Sample Source	NP	Sample Depth	
Date Reported	08/24/2006	Sample Status	COMPLETE
Project No			

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/10/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.082	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/04/2006	IMPROPER SLH BOTTLES USED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*18	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/07/2006	IMPROPER SLH BOTTLES USED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*7	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #:	2621300	Sample #:	IR003193
Collection Start:	08/01/2006 12:00 am	Collection End:	08/02/2006 12:00 am
Collected by:	TAYLOR LARSON	Waterbody/Outfall Id:	2621300
ID #:	493216	ID Point #:	
County:	Polk	Account #:	LM013
Sample Location:	OTTER CREEK AT 200TH AVENUE		
Sample Description:	STREAM WATER SAMPLE		
Sample Source:	NP	Sample Depth:	
Date Reported:	08/24/2006	Sample Status:	COMPLETE
Project No:	LPL1045		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/10/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.214	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	3.	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/07/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	2.	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #:	2621200	Sample #:	IR003191
Collection Start	08/01/2006 12:00 am	Collection End	08/02/2006 12:00 am
Collected by	TAYLOR LARSON	Waterbody/Outfall Id	2621200
ID #	493217	ID Point #	
County:	Polk	Account #:	LM013
Sample Location:	RICE CREEK @ 155TH STREET		
Sample Description:	STREAM WATER SAMPLE		
Sample Source:	NP	Sample Depth	
Date Reported	08/24/2006	Sample Status:	COMPLETE
Project No	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/10/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.032	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	2.	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/07/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #	2621200	Sample #	IR003195
Collection Start	08/01/2006 12:00 am	Collection End	08/02/2006 12:00 am
Collected by	LARSON	Waterbody/Outfall Id	2621200
ID #	493052	ID Point #	
County	Polk	Account #	PP009
Sample Location	RICE CREEK		
Sample Description	DOWNSTREAM		
Sample Source	NP	Sample Depth	
Date Reported	08/24/2006	Sample Status	COMPLETE
Project No			

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/10/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.069	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/04/2006	IMPROPER SLH BOTTLES USED

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*8	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/07/2006	IMPROPER SLH BOTTLES USED

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*3	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/04/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #		Sample #	IR004073
Collection Start	08/13/2006 12:00 am	Collection End	08/14/2006 12:00 am
Collected by	TAYLOR LARSON	Waterbody/Outfall Id	2621200
ID #	493052	ID Point #	
County	Polk	Account #	PP009
Sample Location	RICE CREEK - DOWNSTREAM		
Sample Description			
Sample Source	NP	Sample Depth	
Date Reported	08/25/2006	Sample Status	COMPLETE
Project No			

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/18/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.035	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/17/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*4	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/17/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*3	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/16/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone 800-442-4618 Fax Phone 608-224-6276

Sample:

Field #		Sample #	IR004074
Collection Start	08/13/2006 12:00 am	Collection End	08/14/2006 12:00 am
Collected by	TAYLOR LARSON	Waterbody/Outfall Id	2621200
ID #:	493217	ID Point #:	
County	Polk	Account #	LM013
Sample Location:	RICE CREEK - AT 155TH STREET		
Sample Description	STREAM WATER SAMPLE		
Sample Source	NP	Sample Depth:	
Date Reported	08/25/2006	Sample Status	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/18/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.050	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/17/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*7	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/17/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*6	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/16/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone: 800-442-4618 Fax Phone: 608-224-6276

Sample:

Field #:	2621200	Sample #:	IR005065
Collection Start:	08/23/2006 12:00 am	Collection End:	
Collected by:	LARSON	Waterbody/Outfall Id:	2621200
ID #:	493217	ID Point #:	
County:	Polk	Account #:	LM013
Sample Location:	RICE CREEK @ 155TH STREET		
Sample Description:	STREAM WATER SAMPLE		
Sample Source:	NP	Sample Depth:	
Date Reported:	09/06/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/28/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.035	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/28/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*2	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/28/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*ND	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/25/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #: 2621200 Sample #: IR005066
Collection Start: 08/23/2006 12:00 am Collection End:
Collected by: LARSON Waterbody/Outfall Id: 2621200
ID #: 493052 ID Point #:
County: Polk Account #: PP009
Sample Location: RICE CREEK - DOWNSTREAM
Sample Description:
Sample Source: NP Sample Depth:
Date Reported: 09/06/2006 Sample Status: COMPLETE
Project No:

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/28/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.219	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/28/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*53	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/28/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*20	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/25/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IR004573
Collection Start:	08/18/2006 12:00 am	Collection End:	08/19/2006 12:00 am
Collected by:	LARSON	Waterbody/Outfall Id:	2621200
ID #:	493217	ID Point #:	
County:	Polk	Account #:	LM013
Sample Location:	RICE CREEK @ 155TH STREET		
Sample Description:	STREAM WATER SAMPLE		
Sample Source:	NP	Sample Depth:	
Date Reported:	09/11/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	08/25/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.034	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/23/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*5	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (SM 2540E-1	08/23/2006	NON-SLH BOTTLES USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*4	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/22/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Wisconsin Department of Natural Resources
Laboratory Report

Laboratory: Wisconsin State Laboratory of Hygiene DNR ID 113133790
2601 Agriculture Dr
Madison WI 537077996
Phone : 800-442-4618 Fax Phone : 608-224-6276

Sample:

Field #:	2621200	Sample #:	IR005331
Collection Start:	08/24/2006 12:00 am	Collection End:	08/25/2006 12:00 am
Collected by:	LARSON	Waterbody/Outfall Id:	2621200
ID #:	493217	ID Point #:	
County:	Polk	Account #:	LM013
Sample Location:	LOWER RICE - HWY 46		
Sample Description:	STREAM WATER		
Sample Source:	NP	Sample Depth:	
Date Reported:	09/13/2006	Sample Status:	COMPLETE
Project No:	LPL1046		

Analyses and Results:

Analysis Method	Analysis Date	Lab Comment
TOTAL PHOSPHORUS (AS P) (EPA 365.1)	09/01/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
665	PHOSPHORUS TOTAL	0.067	MG/L	0.005		0.016

Analysis Method	Analysis Date	Lab Comment
SUSPENDED SOLIDS (EPA METHOD 160.2)	08/31/2006	NON-SLH BOTTLE USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
530	RESIDUE TOTAL NFLT (TOTAL SUSPENDED SOLIDS)	*12	MG/L	2		7

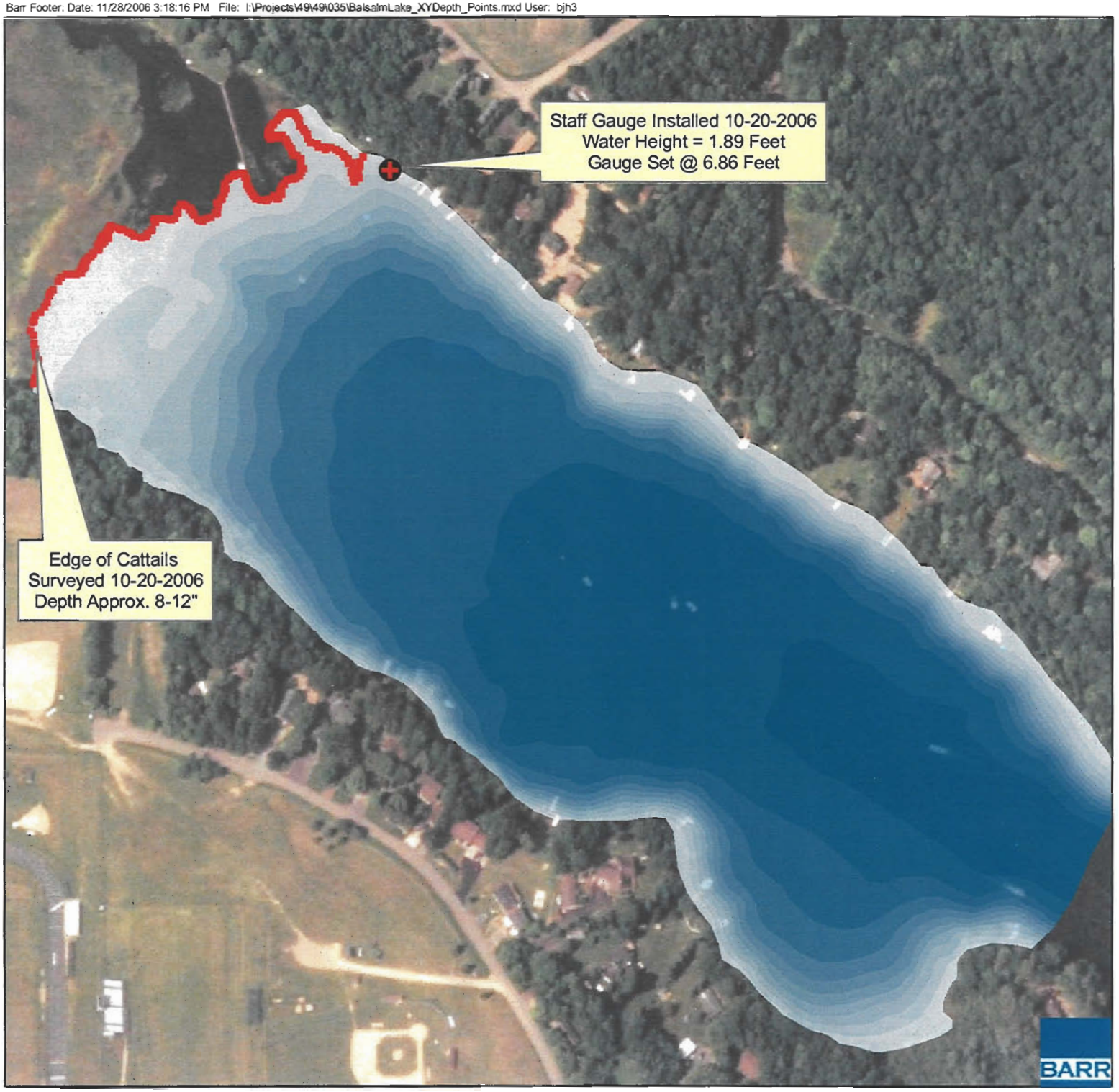
Analysis Method	Analysis Date	Lab Comment
VOLATILE SUSPENDED SOLIDS (EPA 160.4)	08/31/2006	NON-SLH BOTTLE USED, RESULT APPROXIMATE

Code	Description	Result	Units	LOD	Report Limit	LOQ
535	RESIDUE VOL NFLT	*4	MG/L	2		7

Analysis Method	Analysis Date	Lab Comment
TEMPERATURE ON RECEIPT-ICED	08/30/2006	

Code	Description	Result	Units	LOD	Report Limit	LOQ
136	TEMPERATURE AT LAB	ICED	C		0	

Appendix B



Depth Contours

Feet

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 14
- 14 - 16
- 16 - 18
- 18 - 20
- 20 - 22
- Depth Gauge
- Edge of Cattails

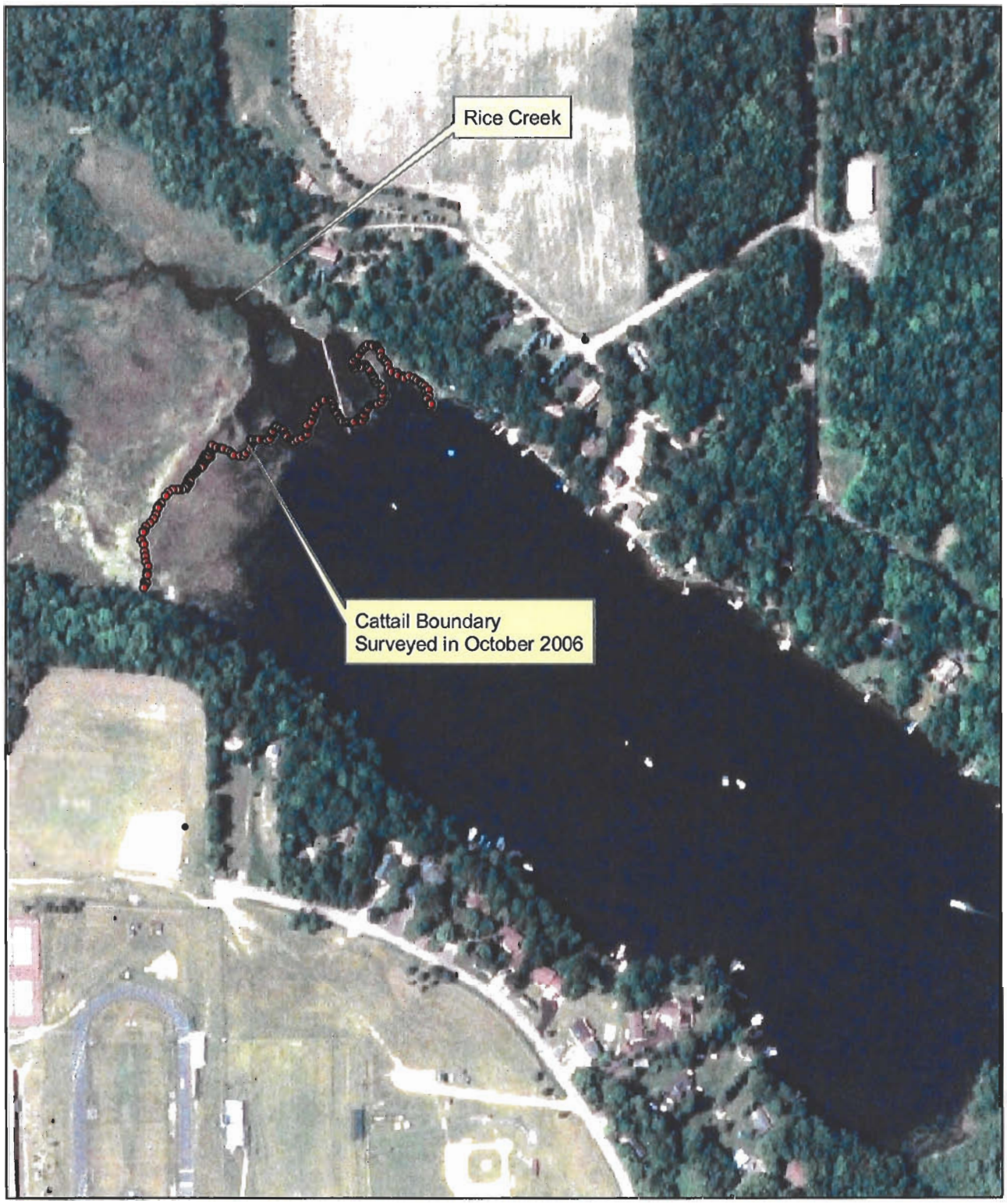
N
W E
S

0 65 130 260 390 520
Feet

Little Balsam Lake 2006
Bathymetric Survey

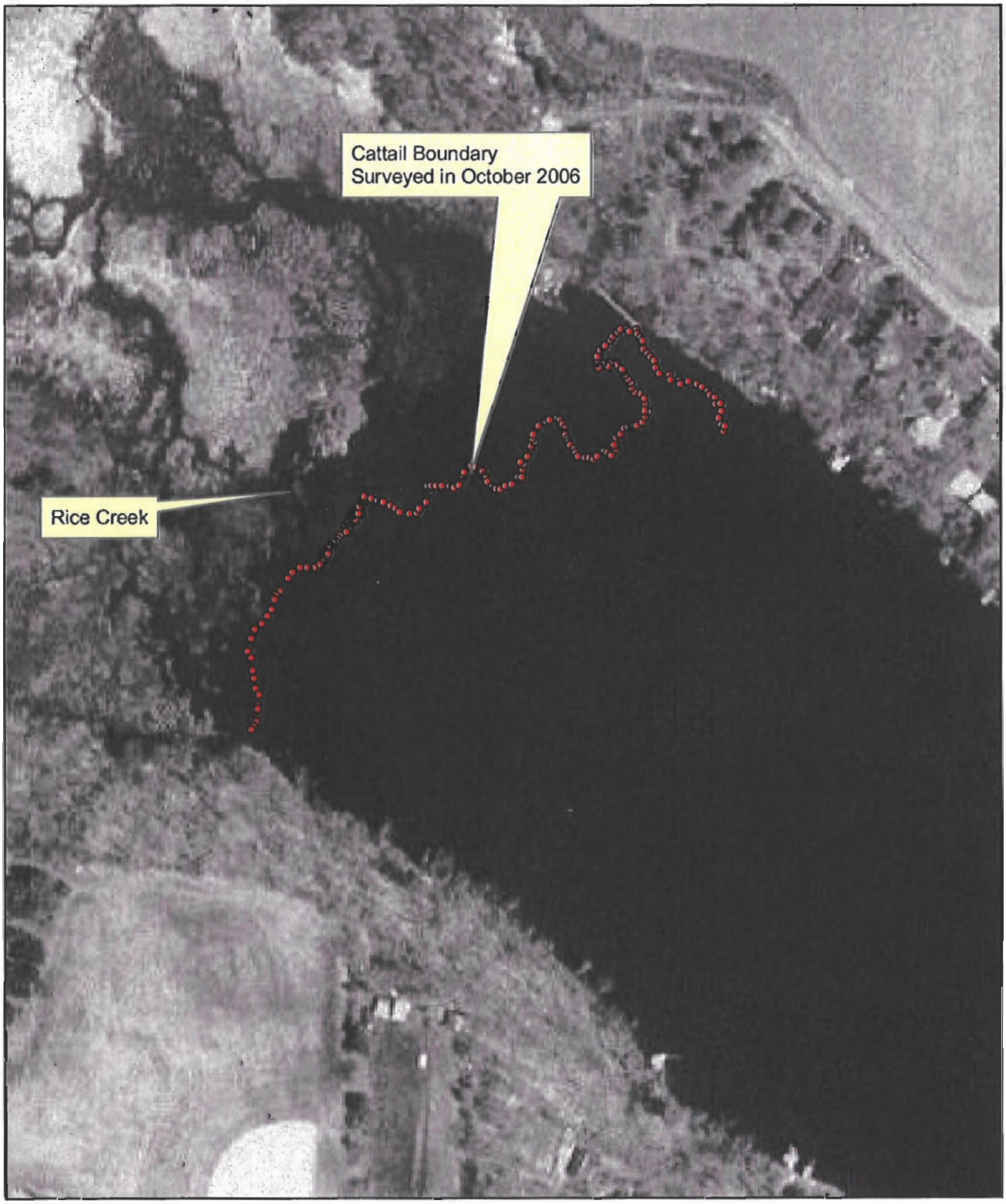
Western Edge of Plant Bed, Looking North

Western Edge of Plant Bed. Mouth of Rice Creek is at the Right Edge of the Photograph



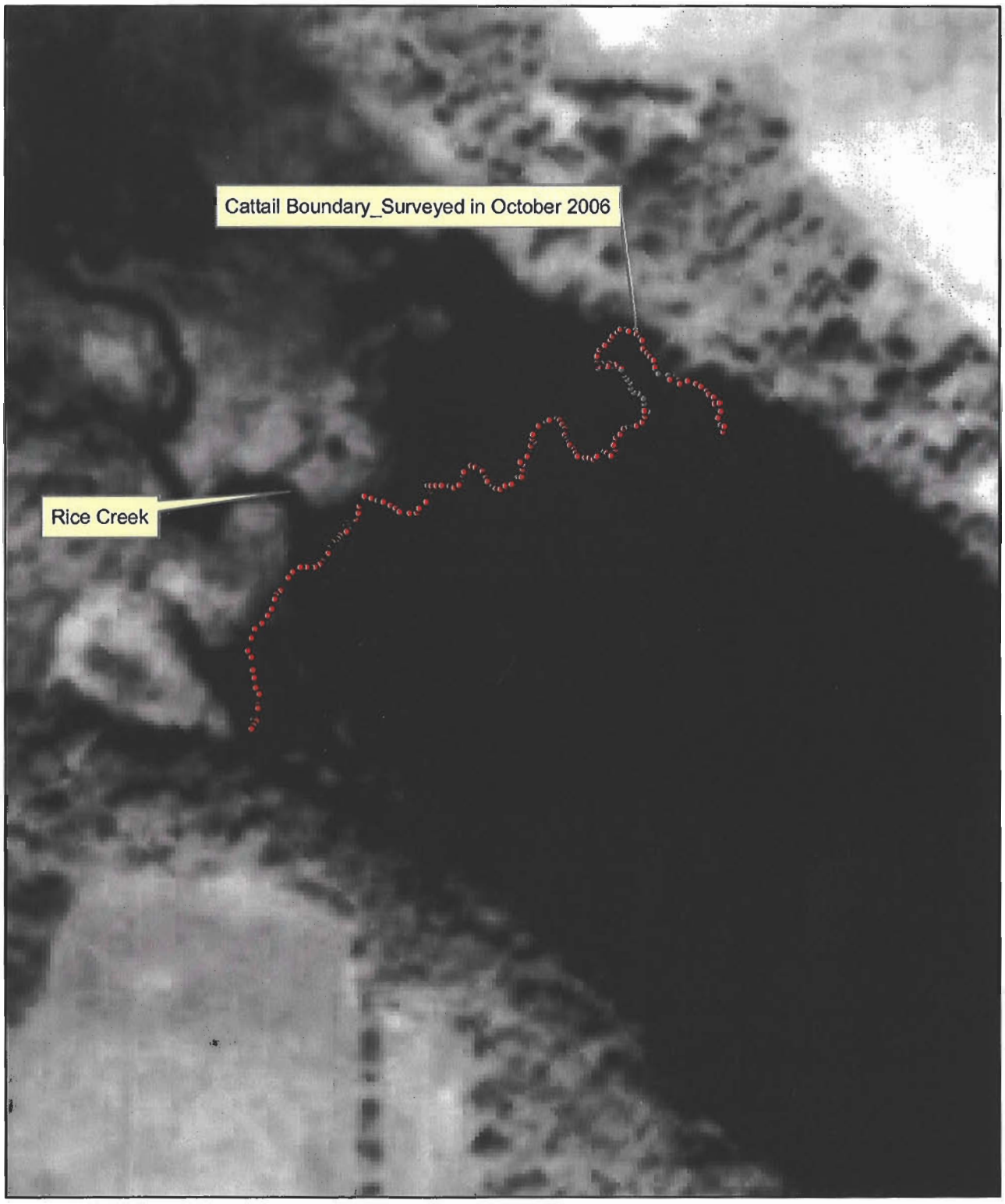
N

Balsam Lake
Edge of Plant Bed in 2005



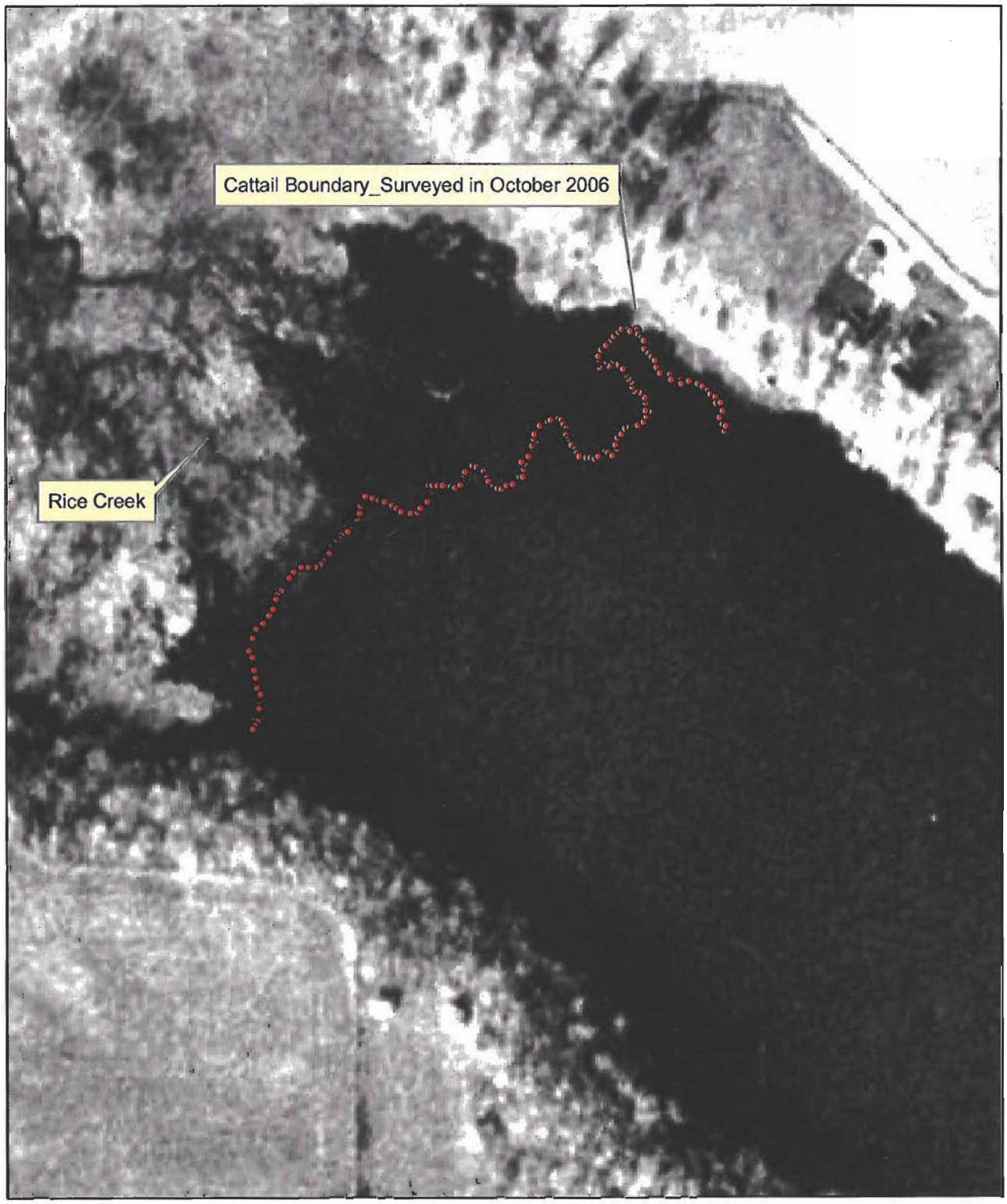
N

Balsam Lake
Edge of Plant Bed in 2000



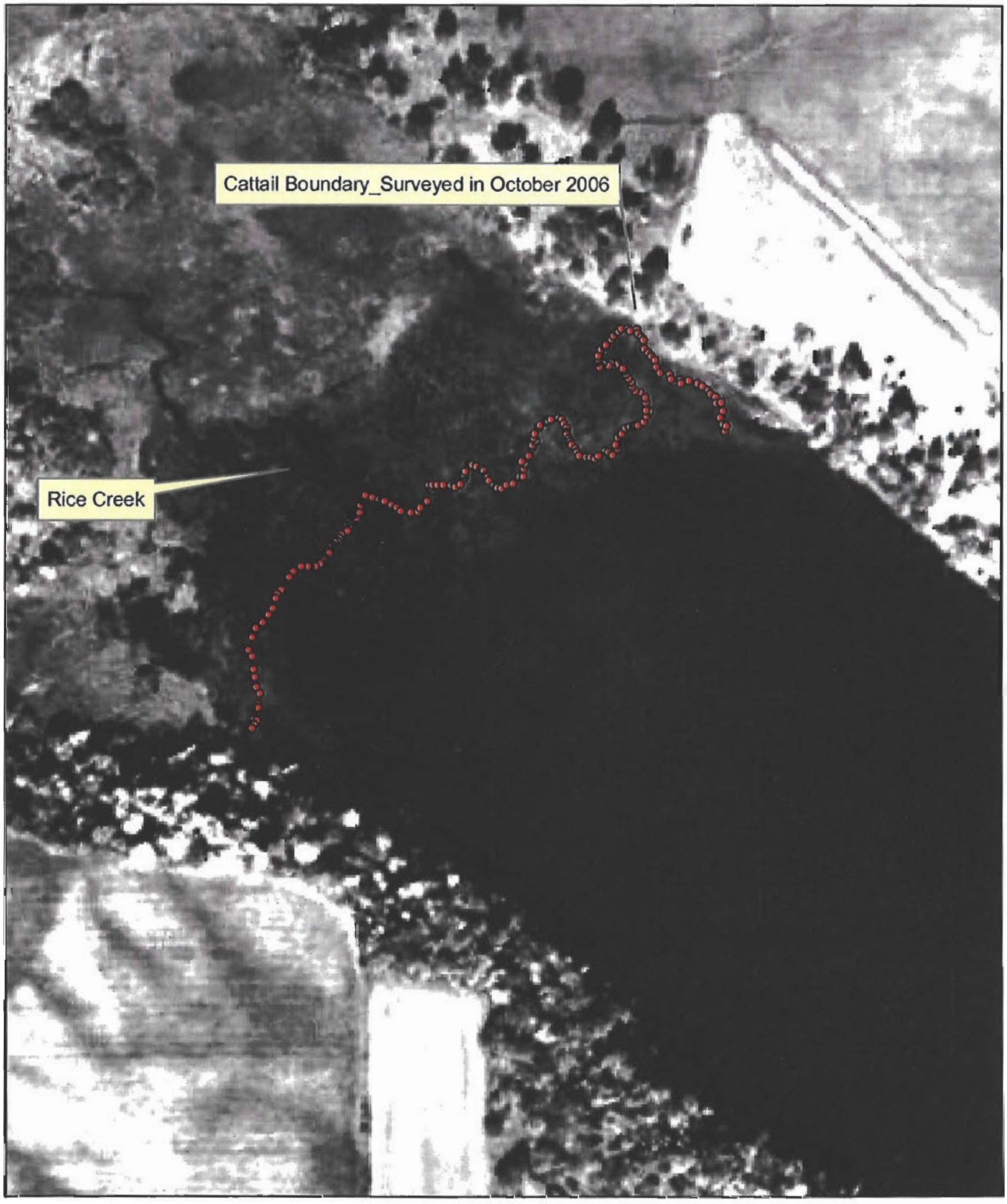
N

Balsam Lake
Edge of Plant Bed in 1988



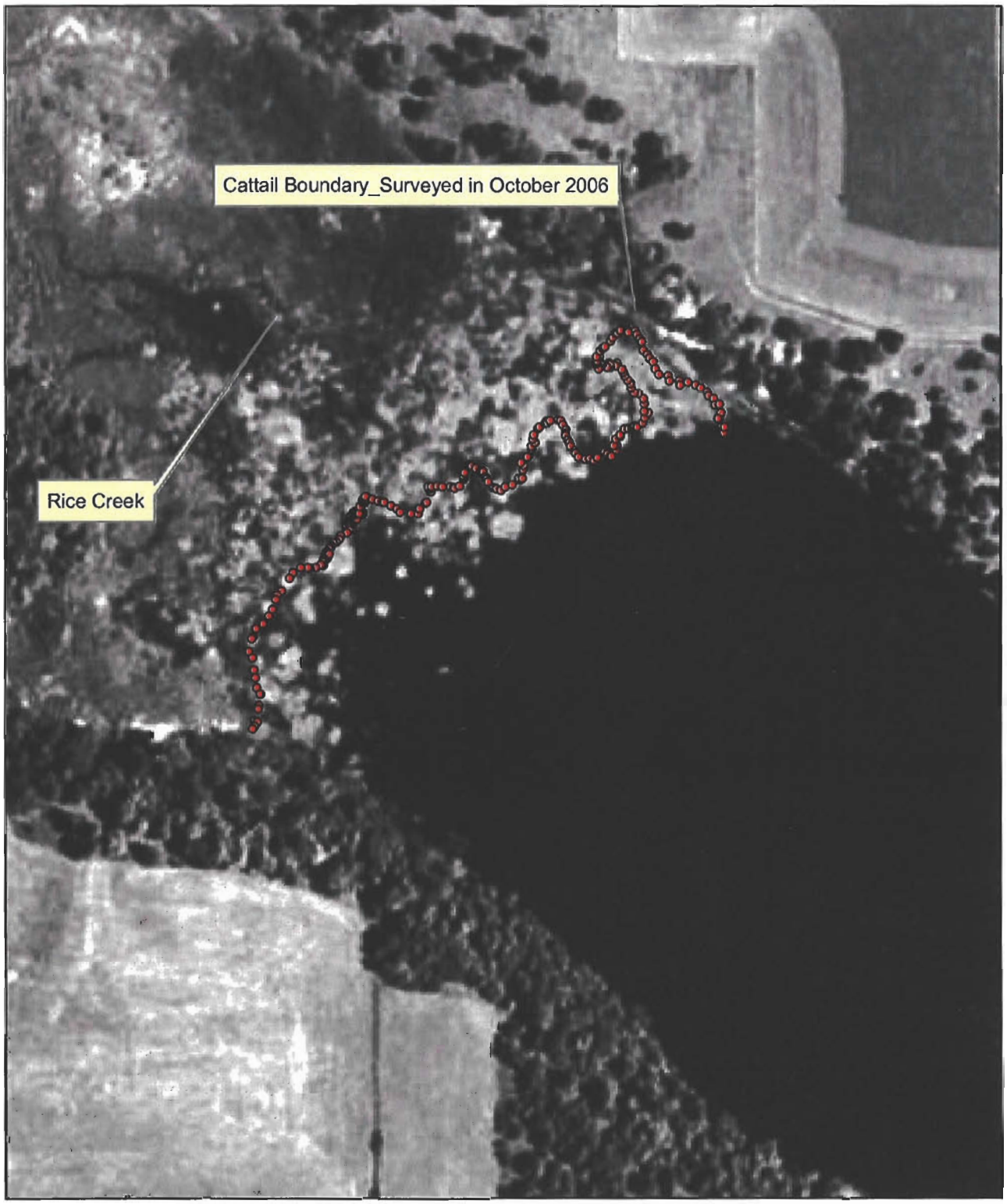
N

Balsam Lake
Edge of Plant Bed in 1973



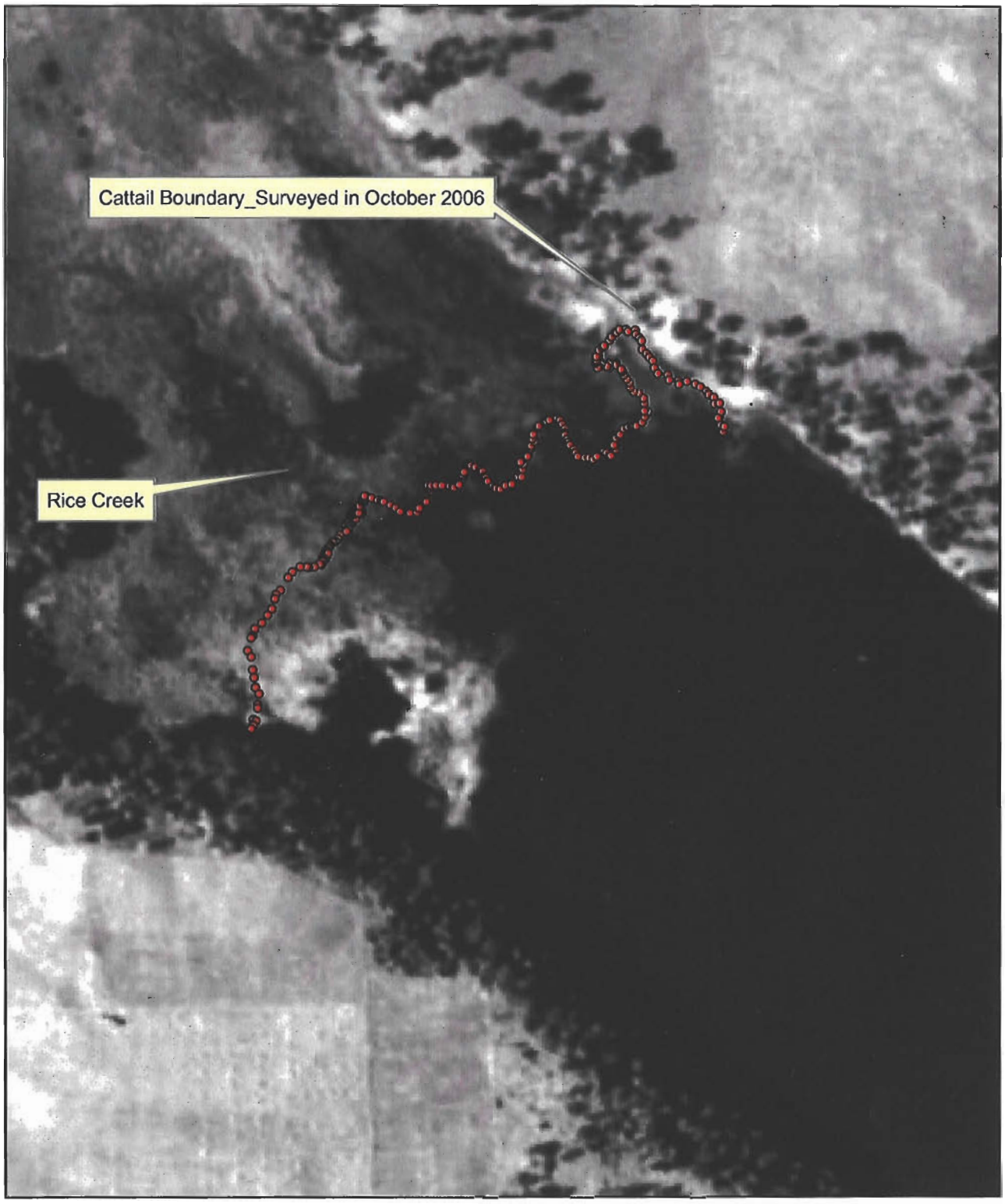
N

Balsam Lake
Edge of Plant Bed in 1965



N

Balsam Lake
Edge of Plant Bed in 1951



N

Balsam Lake
Edge of Plant Bed in 1938