



January 31, 2014

Minnesota Pollution Control Agency  
Attn: WQ Submittals Center  
520 Lafayette Road North  
St. Paul, Minnesota 55155-4194

**Re: 2013 Wild Rice Survey and Water Quality Monitoring Report**

Dear WQ Submittals Center:

On behalf of Mesabi Nugget, please find attached/enclosed *2013 Wild Rice Survey and Water Quality Monitoring report* prepared for Mesabi Nugget Delaware, LLC.

Please contact Brandy Long of Mesabi Nugget if you have any questions.

Sincerely,

A handwritten signature in black ink that reads "Rachel Walker". The signature is written in a cursive, flowing style.

Rachel Walker, Ph.D.  
Senior Environmental Scientist

Enclosures:  
2013 Wild Rice Survey and Water Quality Monitoring report

c: Richard Clark, Minnesota Pollution Control Agency  
Brandy Long, Mesabi Nugget  
Mike Hansel, Barr Engineering Co.  
Keith Hanson, Barr Engineering Co.

# **2013 Wild Rice Survey and Water Quality Monitoring**

## ***Partridge River and Second Creek***

### ***Prepared for***

Mesabi Nugget Delaware, LLC



January 2014



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Mesabi Nugget

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## 1.0 Introduction

As a condition of NPDES/SDS Permit No. MN0067687, Chapter 5, 1.11, Mesabi Nugget Delaware, LLC, is required to prepare a *Wild Rice Impact Study*. The Permit requires that an annual progress report on the status of the study, including a preliminary evaluation of information and data collected to date, be submitted (Chapter 5, 1.12). To comply with this condition, Mesabi Nugget Delaware, LLC, retained Barr Engineering Co. (Barr) to monitor wild rice (*Zizania palustris*) and water quality in surface waters downstream of the discharge SD-001 and the confluence of the Partridge River with the St. Louis River. The study will continue per the approved work plan (Chapter 5, 1.10).

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## 2.0 Purpose

Previous wild rice studies conducted by Barr on behalf of Mesabi Nugget have identified water bodies in the project area that contain wild rice. The purpose of this study is to provide information on wild rice stands, water quality within or proximate to the stands, and wild rice habitat (including a description of co-occurring macrophytes) in those identified water bodies in 2013. The water bodies surveyed (study area) in 2013 are:

- Second Creek (from SD001 to its confluence with the Partridge River).
- Partridge River (from its confluence with Second Creek to its confluence with the St. Louis River).

Figure 1 shows the portions of these water bodies surveyed for wild rice in 2013.

## 3.0 Methods

### 3.1 Wild Rice Survey Methods

Wild rice field survey methods are similar to those used by the 1854 Treaty Authority, *Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998–2008)* (reference (1)) and other vegetation plot data surveys designed to quantify *in situ* plant species (e.g., *A Handbook for Collecting Vegetation Plot Data in Minnesota: The Relevé Method* (Reference (2))). These methods include qualitative (shoreline surveys) and quantitative (grid sampling) density measurements of wild rice stands and *in situ* and *ex situ* wild rice plant measurements and statistical analyses. Only qualitative surveys were completed in 2013. Second Creek has historically had many beaver dams, making surveys by kayak or on foot difficult. In 2013, in accordance with Minnesota Department of Natural Resources (MnDNR) permits and approvals, several beaver dams were mechanically removed along Second Creek. As a result, it was possible to directly survey a majority of Second Creek by kayak and on foot.

A wild rice density-rating system, from 1 to 5, is used by the 1854 Treaty Authority. The rating system was applied to each observation of wild rice. A density rating was used to qualitatively assess the density of wild rice over a given area and indicates approximate cover (in percentage) of wild rice (Table 1).

**Table 1 Wild Rice Density Scale**

Wild Rice Density Rating	Description
1	<10% Wild Rice Cover
2	10–25% Wild Rice Cover
3	25–50% Wild Rice Cover
4	50–75% Wild Rice Cover
5	>75% Wild Rice Cover

### 3.2 Macrophyte Sampling Methods

While not required by the NPDES permit, other aquatic macrophytes growing in or near the wild rice stands were identified as part of the 2013 wild rice surveys. Identifying and describing the frequency and abundance of co-occurring macrophytes may be helpful in assessing a range of factors that affect wild rice growth and production. Occurrences in areas where wild rice was not found were also periodically recorded for context. Qualitative density methods, similar to those used for wild rice, were used to determine macrophyte abundance. Sampling efforts included collection of plant specimens to verify field identification.

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### 3.3 Water Quality Monitoring Methods

Water samples were analyzed for sulfate using EPA method 300.0. These are consistent with Barr's standard operating procedures (SOP): *Collection of Surface Water Samples* (Reference (3)). At the time of the wild rice surveys, water samples were collected at or near wild rice stands located in Second Creek and the Partridge River. Upon collection, these unfiltered samples were placed in a cooler with ice and submitted to Pace Analytical (Pace) for analysis. While not required by the NPDES permit, Barr collected some additional water quality data. Concentrations of major cations and anions from the water samples collected in August 2013 are listed in Large Table 2.

## 4.0 Results

### 4.1 Wild Rice Survey Results

The locations of wild rice stands were identified and plant densities were measured during field surveys conducted on August 8 and August 30, 2013 (Partridge River), and August 22, 2013 (Second Creek). The survey included approximately 8.5 miles of Second Creek, upstream of its confluence with the Partridge River and a little more than 4 miles of the Partridge River, starting at the confluence with Second Creek and ending at the St. Louis River (Figure 1 through Figure 8). Figure 2 shows stream characteristics of the Partridge River and Figure 6 shows stream characteristics of Second Creek. Results of the wild rice surveys are summarized below; all were completed by kayak or on foot. Figure 3 through Figure 5 and Figure 7 and Figure 8 show wild rice density results from field surveys. Photographs of study locations (with and without wild rice) are included in Exhibit A. Additional detail regarding water quality sampling is provided in Section 4.3, "Water Quality Monitoring Results."

#### 4.1.1 Partridge River Survey Results

The Partridge River (from its confluence with Second Creek to the St. Louis River) comprised a wide, fairly straight channel with open water and aquatic macrophytes growing near the shore up to River Mile 3.5. Wild rice stands (densities 1–5) were identified along a majority of shoreline up to River Mile 3.5. Thereafter, the channel narrowed and meandered, marked by intermittent riffles, pools, and open water. Intermittent wild rice stands (densities 1–5) were identified along the channel up to the St. Louis River.

- **Reach 1:** The width of the river in this 0.2-mile section ranged from 80 to 120 feet. Open water was seen in the middle of the river, while wild rice (density between 1 and 4) and other vegetation were found growing in shallow areas near shore. The substrate was composed of muck, sand, and cobble. Floating leaf pondweed (*Potamogeton* spp.), emergent arrowhead (*Sagittaria* spp.), white water-lily (*Nymphaea odorata*), spike rush (*Eleocharis* spp.), and emergent bur-reed (*Sparganium* spp.) were common forms of in-stream vegetation. Riparian habitat adjacent to the river comprised tall grasses and brush.
- **Reach 2:** In this small section (0.05 mile), the river was between 25 and 100 feet wide. A stretch of boulder rapids was found downstream of the County Road 110 Bridge. Tall grasses and brush were seen adjacent to the river. No wild rice was found in this stretch.
- **Reach 3:** A 0.3-mile-long stretch of wild rice (density rating of 2–5) was found along both shorelines at the start of this reach, growing in water less than 3 feet deep. Water in the middle of the channel was deeper, with no vegetation. The width of the river ranged from 100 to 160 feet. Varied substrates included sand, muck, cobble, and boulders. Tall grasses and brush were found adjacent to the river. Common in-stream vegetation included arrowhead and white water-lily.
- **Reach 4:** This 0.6-mile reach was composed of shallow rocky riffles/rapids and intermittent pools. The width was between 60 and 100 feet. Wild rice (density 2) was found near Mile 3.5. Substrate materials were cobble, boulders, sand, gravel, and muck. Riparian habitat adjacent to the river was

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composed of tall grasses and brush. Small floating manna grass (*Glyceria borealis*) and emergent burr-reed were common forms of in-stream vegetation.

- **Reach 5:** This small reach of river (less than 0.05 mile), ranged between 60 and 80 feet in width. A bend in the river revealed a deep pool, with shallow backwater connected to the river channel. Wild rice (density rating of 1) was found in the area connecting the backwater to the river channel. Riparian habitat adjacent to the stream consisted of tall grasses and brush. Common forms of in-stream vegetation were arrowhead, burr-reed, and spike rush.
- **Reach 6:** The width of this reach ranged between 40 and 100 feet. Although wild rice was found on the upstream and downstream borders of this reach, no rice was found in this 0.3-mile stretch. Sand, gravel, and shallow riffles were common substrates. Arrowhead was noted in the stream, while tall grasses and brush grew adjacent to it.
- **Reach 7:** This 0.6-mile reach ranged from 60 to 120 feet in width. Wild rice of varying density (between 1 and 4) was found growing in shallow areas near both shores. In-stream vegetation consisted primarily of arrowhead, white water-lily, yellow pond-lily (*Nuphar variegata*), and spike rush. Substrates noted were sand, muck, gravel, and silt. Tall grasses and brush were seen adjacent to the stream.
- **Reach 8:** The stream characteristics and riparian habitat of this 0.5-mile reach were almost identical to Reach 7. The exception was the river's width, which expanded to about 200 feet in some sections. Wild rice of varying densities (between 1 and 4) was found on both sides of the river.
- **Reach 9:** Again, the stream characteristics and riparian habitat of this 0.6-mile reach were nearly identical to Reach 7 and 8. The width of the river here, however, was much less varied, with a maximum of 100 feet. Other differences included some hard-bottom substrate and, in one area, mowed grass adjacent to the river. Wild rice (density ratings 1 and 2) was found along both shorelines.
- **Reach 10:** This small reach (less than 0.2 mile), ranged from 40 to 100 feet in width and was characterized by shallow, rocky riffle. The substrate comprised cobble and boulder. Wild rice (density rating 1) was observed along the west shore. Mixed coniferous and deciduous forest was found immediately adjacent to the stream. No one species of in-stream vegetation dominated.
- **Reach 11:** This small reach (0.04 mile) was about 140 feet wide. The most commonly observed in-stream vegetation was dense wild rice (rating of 5) found along the west shore. Mixed coniferous and deciduous forest was seen immediately adjacent to the stream.
- **Reach 12:** This small section of river (approximately 0.4 mile), immediately adjacent to the St. Louis River, was fairly consistent in width (60–80 feet). There were a few occurrences of sparse wild rice (density rating of 1). Shallow, rocky riffles were present 800–1000 feet upstream of the confluence with the St. Louis River. Habitat adjacent to and away from the river was dominated by

mixed coniferous and deciduous forest. The substrate was composed of cobble, boulder, and gravel.

#### 4.1.2 Second Creek Survey Results

The Second Creek survey was primarily conducted through direct observation via kayak. In portions of the creek too shallow and rocky to traverse by kayak, observations were made while carrying the kayaks over rocks or beaver dams. Second Creek comprised a narrow, meandering channel marked by intermittent open water and pools. Wild rice was identified in Reaches 5–7 (densities 1–3) (Figure 6 through Figure 8).

- **Reach 1:** No wild rice was observed in this 1.1-mile portion of the stream—which widened to approximately 500 feet wide with a maximum depth of 2 feet and provided habitat for trumpeter swans. Sago pondweed and flat-leaf bladderwort (*Utricularia intermedia*) were the dominant vegetation.
- **Reach 2:** The average width of this 0.7-mile reach, which includes a man-made channel, was 30 feet; the maximum depth was 3 feet. The substrate was composed of rocks and muck. Common in-stream vegetation included sago pondweed, water milfoil, flat-leaf bladderwort, American eelgrass (*Valisneria americana*), and burr-reed. Riparian habitat adjacent to the stream consisted of rattlesnake manna grass (*Glyceria canadensis*), woolgrass (*Scirpus cyperinus*), bluejoint (*Calamagrostis canadensis*), and cattail (*Typha spp.*). Birch (*Betula spp.*), black spruce (*Picea mariana*), and tamarack (*Larix laricina*) were seen in the forested area away from the stream. No wild rice was found.
- **Reach 3:** Wild rice was not seen in this 2.6-mile reach. A few beaver dams were observed in the first mile as the reach returned to a natural channel. The average width of the stream in this section was 10 feet; depth ranged from 1 to 3 feet. The substrate was composed of muck and sand. Many portions of this segment were too shallow and rocky to traverse by kayak. Instead, observations were made while carrying kayaks over rocks. Flooding was observed just upstream of a beaver dam and culvert under County Road 380. Riparian habitat adjacent to the stream included cattail marsh, wet meadow dominated by reed canarygrass, and alder thicket with speckled alder (*Alnus incana*) and bluejoint. Sago pondweed, burr-reed, floating pondweed (*Potamogeton natans*), and coontail (*Ceratophyllum spp.*) were common forms of in-stream vegetation.
- **Reach 4:** No wild rice was found in this 2.3-mile stream segment. The width of the creek here varied from 5 to 20 feet, while depths ranged from 0.5 to 3 feet. The substrate consisted of rock. Flooding, caused by beaver dams, was frequently observed. Yellow pond-lily, flat-stem pondweed (*Potamogeton zosteriformis*), burr-reed, and narrow-leaved pondweed were the most common forms of in-stream vegetation. Cedar swamp and shallow marsh, dominated by cattail, were found adjacent to the stream.
- **Reach 5:** Sparse amounts of wild rice (density less than 1) were observed in this 2.1-mile reach which averaged 10 feet in width and 3 feet in depth. Common in-stream vegetation was burr-reed, yellow pond-lily, and narrow-leaved pondweed. Riparian habitat adjacent to the stream

consisted of wet meadow dominated by bluejoint, manna grass, and reed canarygrass. Alder, cedar (*Thuja occidentalis*), and birch were observed away from the stream.

- **Reach 6:** This 0.1-mile stretch was about 10 feet wide and 3 feet deep. The observed substrate was sand. Wild rice, with density ratings from 1 to 3, was found just downstream from a rocky area. Wet meadow dominated by reed canarygrass grew adjacent to the stream. Yellow pond-lily was the most common in-stream vegetation.
- **Reach 7:** Wild rice (density 3) was found in this area near the confluence with the Partridge River. The width of this last section of stream was 20 feet; the depth was 4 feet. Cattail marsh and wet meadow were observed adjacent to the stream; yellow pond-lily grew in the stream.

## 4.2 Other Macrophyte Results

Approximately 16 taxa of aquatic macrophytes were observed in water bodies surveyed (Large Table 1). In the Partridge River, macrophyte presence or absence and species composition were documented at 59 discrete points where wild rice was found and at two points where wild rice was absent. In Second Creek, macrophyte presence was documented at 15 sites with wild rice and seven sites without. Because documenting wild rice occurrence was the primary focus of field surveys, macrophyte documentation occurred at more wild rice locations than locations lacking wild rice. Complete documentation of macrophytes was not made at each sample point, but the results from sample points provide a realistic description of macrophyte species present and their relative abundance.

Macrophyte abundance varied greatly among survey locations. The most common macrophytes found in the Partridge River were wild rice, yellow pond-lily, white water-lily, and arrowheads. The most common species in Second Creek were wild rice, yellow pond-lily, bur-reed, and sago pondweed. Macrophytes occurred frequently where wild rice was both present and absent.

## 4.3 Water Quality Monitoring Results

A total of four water samples were collected near wild rice stands in Second Creek and Partridge River during the 2013 wild rice survey (Figure 3, Figure 4, and Figure 7). Water quality results are presented in Large Table 2. Sulfate concentrations by water body are presented in Table 2.

**Table 2 Sulfate Concentrations (mg/L) in 2013**

Water Body	Sample Name	Sulfate, as SO <sub>4</sub> (mg/l)
Partridge River	PM-MN-KDM-03	114
Partridge River	PM-MN-KMS2-26	159
Partridge River	PM-MN-KMS2-27	190
Second Creek	PM-MN-GTZ-01	1040

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A quality-assurance and quality-control (QA/QC) review was completed to assess the validity of the analytical surface water results. This review was performed in accordance with Barr's SOPs for routine data evaluation, based on *The National Functional Guidelines for Inorganic Data Review* (Reference (4)). Data evaluation included a review of technical holding times, preservation, laboratory control samples, matrix spike samples, and data package completeness. No field duplicates or blanks were collected. All reported data have been determined to be acceptable and usable as presented in the data summary tables.

#### 4.4 Field Survey Summary

The Mesabi Nugget wild rice survey consisted of documenting the presence or absence of wild rice in the following water bodies (Figure 1):

- Second Creek (from SD001 to its confluence with the Partridge River)
- Partridge River (from its confluence with Second Creek to its confluence with the St. Louis River)

Fieldwork consisted of evaluating approximately 8.5 miles of Second Creek and a little more than 4 miles of the Partridge River (as listed above) in August 2013.

Intermittent stands of wild rice with a density rating of 1 to 5 (on a scale of 1 to 5) were identified in the Partridge River (Figure 3 through Figure 5) and density ratings of 1 to 3 were identified on Second Creek (Figure 7 and Figure 8).

Barr collected surface water samples near wild rice stands in three locations of the Partridge River and one location of Second Creek. Laboratory results indicate that sulfate concentrations at all stands are greater than 10 mg/L.

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## 5.0 References

1. **1854 Treaty Authority.** Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998-2008). 2008.
2. **Minnesota Department of Natural Resources.** *A Handbook for Collecting Vegetation Plot Data in Minnesota: The Relevé Method.* 2007.
3. **Barr Engineering Co.** Standard Operating Procedure Collection of Surface Water Samples, Revision 5. April 2011.
4. **U.S. Environmental Protection Agency.** USEPA Contract Laboratory Program, National Functional Guidelines for Inorganic Superfund Data Review. *United States Environmental Protection Agency.* [Online] OSWER 9240.1-51. USEPA-540-R-10-011, January 2010.  
<http://epa.gov/superfund/programs/clp/download/ism/ism1nfg.pdf>.

## Large Tables

**Large Table 1 Overview of Macrophyte Monitoring Results for 2013<sup>(1)</sup>**

Scientific Name(2)	Common Name	Second Creek		Partridge River	
		Wild Rice Present	Wild Rice Absent	Wild Rice Present	Wild Rice Absent
		(n = 15)	(n = 7)	(n = 59)	(n = 2)
Ceratophyllum spp.	Coontail		3		
Eleocharis spp.	Spikerush			4	
Equisetum fluviatile	River horsetail			1	
Glyceria borealis	Northern manna grass			1	1
Lemna minor	Common duckweed		1		
Myriophyllum spp.	Water milfoil		2		
Nuphar variegata	Yellow pond-lily	15	5	8	
Nymphaea odorata	White water-lily			15	
Potamogeton natans	Floating pondweed		2	2	
Potamogeton spp.	A narrow-leaved pondweed	7			
Potamogeton zosteriformis	Flat-stem pondweed		1		
Sagittaria rigida	Sessile-fruit arrowhead			15	1
Sparganium spp.	Bur-reed	8	4	3	2
Stuckenia pectinata	Sago pondweed		4		
Utricularia intermedia	Flat-leaf bladderwort		2		
Vallisneria americana	American eel-grass		1		

(1) Occurrences of individual species based on number of sample locations at which the species was observed. The number of sample points (n) is indicated for each water body, categorized as whether wild rice was present or not.

(2) When a plant could only be identified confidently to genus, it is designated "Genus spp." When a likely species identification could be made, but without complete confidence, it is indicated with "cf."

**Large Table 2 Water Quality Data Collected During the 2013 Wild Rice Survey**

Water Body	Parameter			Alkalinity, bicarbonate, as CaCO <sub>3</sub> NA mg/l	Chloride NA mg/l	Sulfate, as SO <sub>4</sub> <sup>2-</sup> NA mg/l	Calcium Total mg/l	Magnesium Total mg/l	Potassium Total mg/l	Sodium Total mg/l
	Total or Dissolved									
	Sample Name	Date	Sample Type							
Partridge River	PM-MN-KDM-03	8/8/2013	N	91.9	4.7	114	26.2	39.1	2.5	9.8
Partridge River	PM-MN-KMS2-26	8/30/2013	N	117	6.2	159	26.9	52.4	3.4	12.4
Partridge River	PM-MN-KMS2-27	8/30/2013	N	132	6.0	190	28.1	62.7	3.9	13.6
Second Creek	PM-MN-GTZ-01	8/22/2013	N	440	8.3	1040	49.7	323	14.1	44.4

## Figures



- Surface Discharge Location
- ~ Surveyed Rivers & Streams
- ~ Streams
- - - Stream Channel

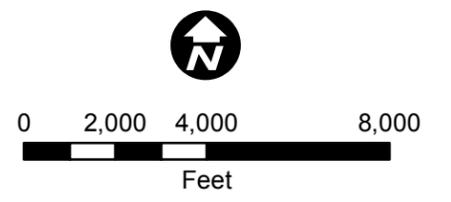


Figure 1  
 2013 WILD RICE FIELD SURVEY  
 WATER BODIES  
 Mesabi Mining, LLC  
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.2.1, 2014-01-31 09:10 File: I:\Client\Mesabi Nugget\Out of Scope\Wild Rice\Mapa\Report\Maps\2013\Figure 1 2013 Wild Rice Survey Areas.mxd User: am2  
 Image Source: St. Louis County, May, 2013.



- River Mile
- | Reach Division
- ~ Direct Shoreline Observation

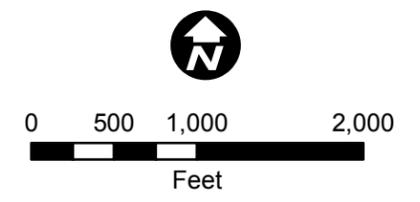


Figure 2  
 2013 WILD RICE FIELD SURVEY  
 PARTRIDGE RIVER REACHES  
 Mesabi Mining, LLC  
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.2.1, 2014-01-31 09:22 File: I:\Client\Mesabi\_Nugnet\Out\_of\_Scope\Wild\_Rice\Mapa\Report\Maps\2013\Figure 2 Stream Reach Sections of the Partridge River Wild Rice Survey.mxd User: arm2  
 Image Source: St. Louis County; May, 2013.

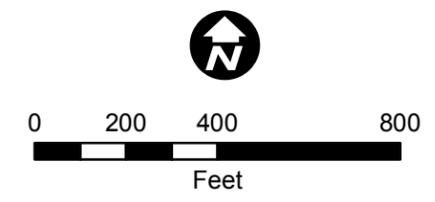
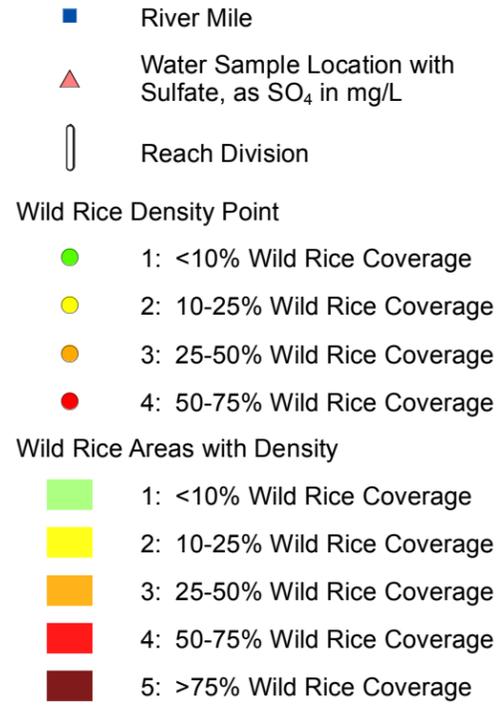
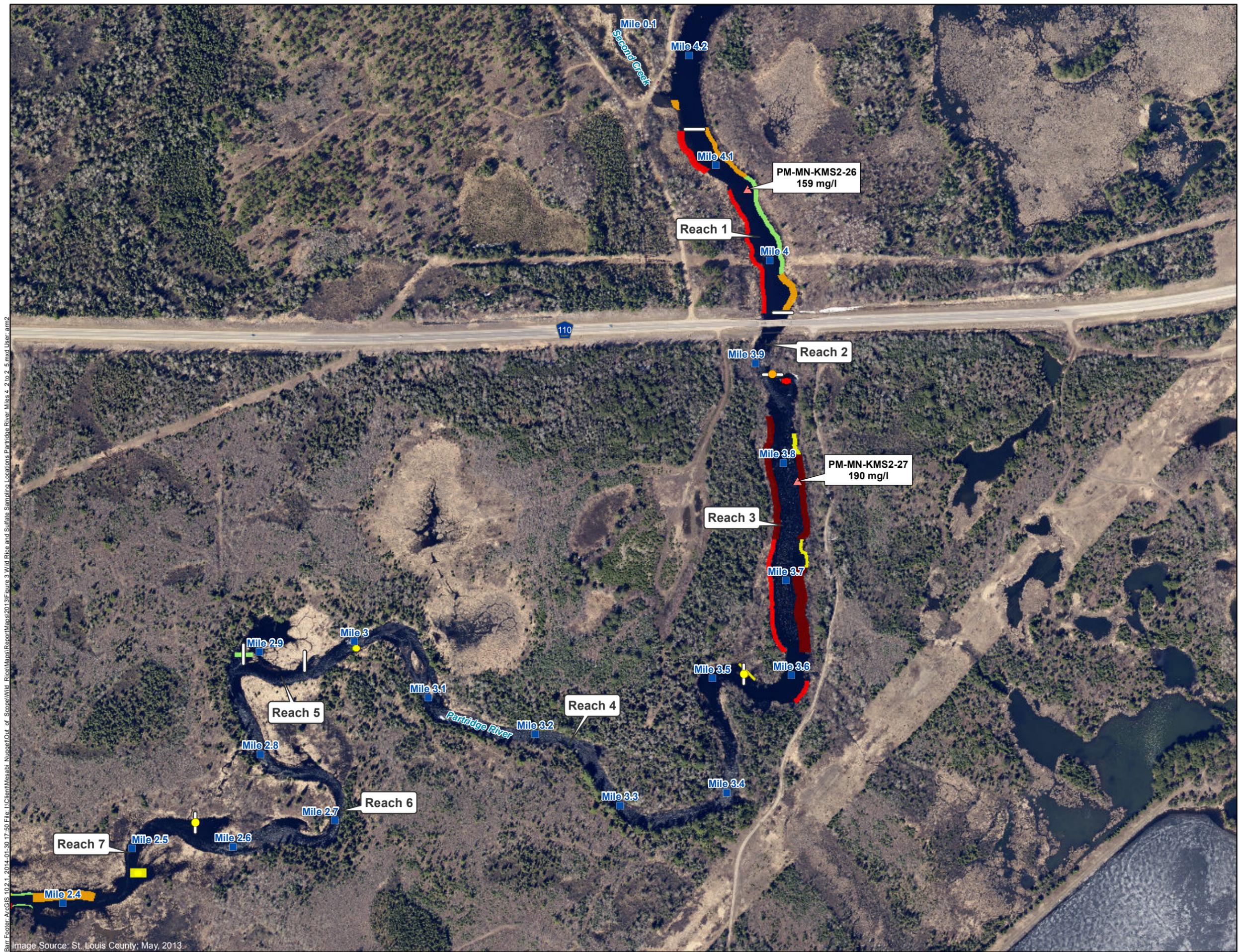
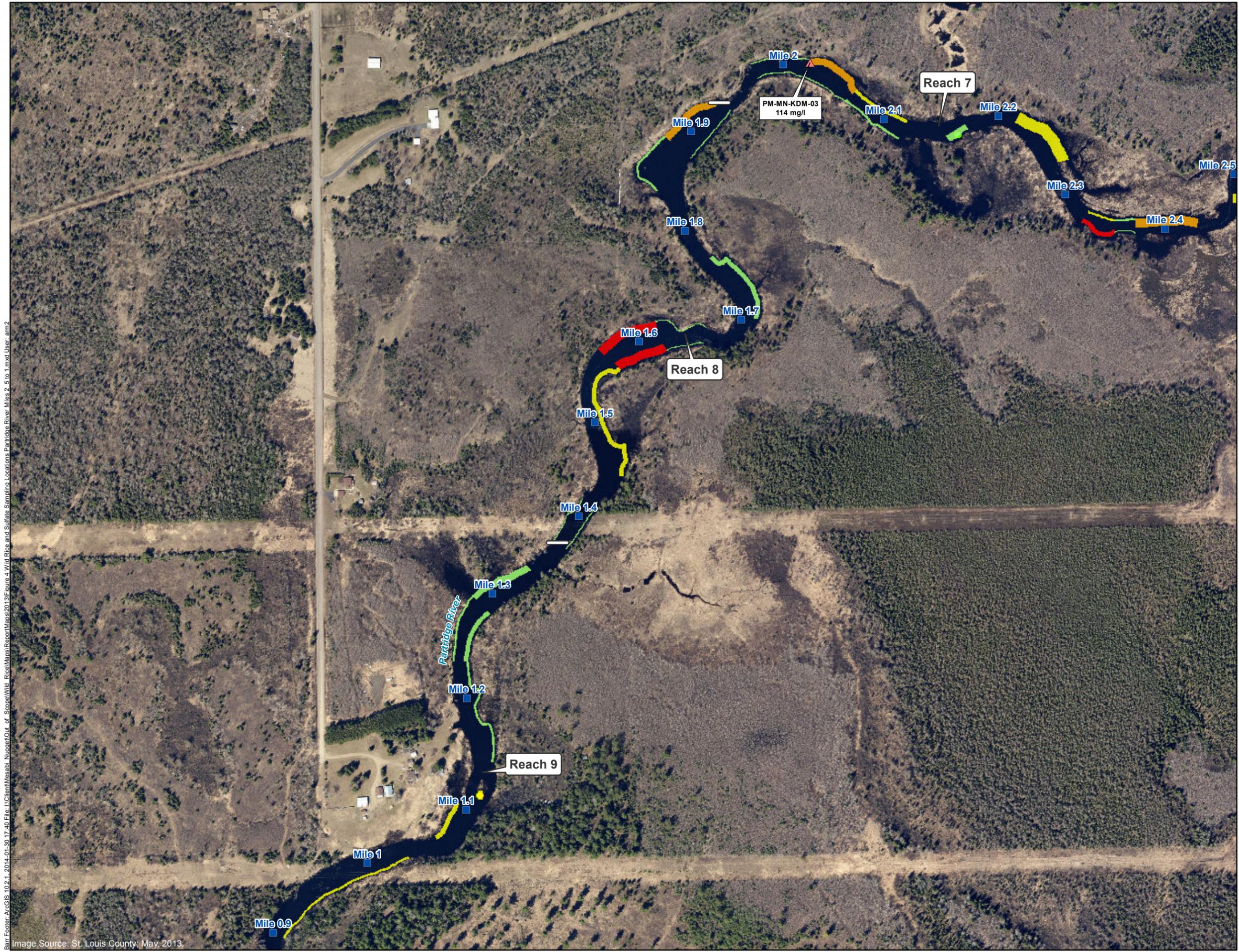


Figure 3  
 2013 WILD RICE  
 FIELD SURVEY RESULTS  
 PARTRIDGE RIVER  
 MILE 4.2 TO MILE 2.5  
 Mesabi Mining, LLC  
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.2.1, 2014-01-30 17:50 File: I:\Client\Mesabi\_Nugget\Out\_of\_Scope\Wild\_Rice\Map\Report\Map\2013\Figure 3 Wild Rice and Sulfate Sampling Locations Partridge River Miles 4.2 to 2.5.mxd User: am2  
 Image Source: St. Louis County; May, 2013.



- River Mile
- ▲ Water Sample Location with Sulfate, as SO<sub>4</sub> in mg/L
- ⏏ Reach Division
- Wild Rice Density Point
  - 1: <10% Wild Rice Coverage
  - 2: 10-25% Wild Rice Coverage
- Wild Rice Areas with Density
  - 1: <10% Wild Rice Coverage
  - 2: 10-25% Wild Rice Coverage
  - 3: 25-50% Wild Rice Coverage
  - 4: 50-75% Wild Rice Coverage
  - 5: >75% Wild Rice Coverage

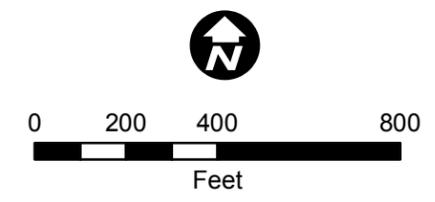


Figure 4  
 2013 WILD RICE  
 FIELD SURVEY RESULTS  
 PARTRIDGE RIVER MILE 2.5 to MILE 1  
 Mesabi Mining, LLC  
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.2.1, 2014-01-30 17:40 File: I:\Client\Mesabi\_Nugget\Out\_of\_Scope\Wild\_Rice\Map\Report\Maps\2013\Figure 4 Wild Rice and Sulfate Sampling Locations Partridge River Miles 2.5 to 1.mxd User: arm2  
 Image Source: St. Louis County; May, 2013.



- River Mile
- ⏏ Reach Division
- Wild Rice Density Point
- 1: <10% Wild Rice Coverage
- Wild Rice Areas with Density
- 1: <10% Wild Rice Coverage
- 2: 10-25% Wild Rice Coverage
- 3: 25-50% Wild Rice Coverage
- 4: 50-75% Wild Rice Coverage
- 5: >75% Wild Rice Coverage

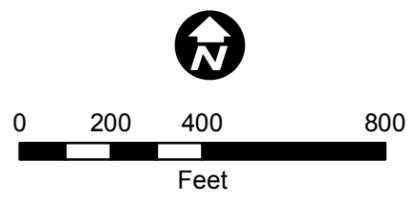


Figure 5  
 2013 WILD RICE  
 FIELD SURVEY RESULTS  
 PARTRIDGE RIVER MILE 1.0 TO MILE 0  
 Mesabi Mining, LLC  
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.2.1, 2014-01-30 17:18 File: I:\Client\Mesabi\_Nugget\Out\_of\_Scope\Wild\_Rice\Mapa\Report\Maps\2013\Figure 5 Wild Rice and Sulfate Sampling Locations Partridge River Miles 1 to 0.mxd User: am2  
 Image Source: St. Louis County; May, 2013.



- Surface Discharge Location
- River Mile
- | Reach Division
- ~ Direct Shoreline Observation

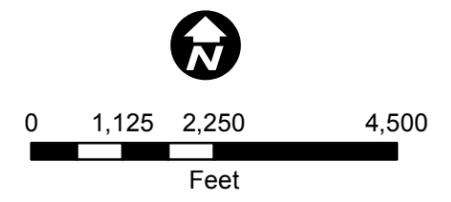


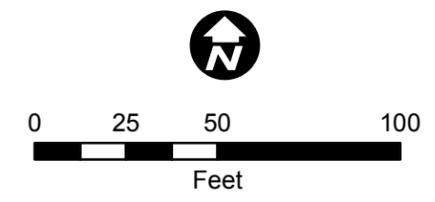
Figure 6  
 2013 WILD RICE FIELD SURVEY  
 SECOND CREEK REACHES  
 Mesabi Mining, LLC  
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.2.1, 2014-01-31 09:42 File: I:\Client\Mesabi Nugget\Out of Scope\Wild Rice\Map\Report\Maps\2013\Figure 6 Stream Reach Sections of the Second Creek Wild Rice Survey.mxd User: am2  
 Image Source: St. Louis County; May, 2013



- River Mile
- ▲ Water Sample Location with Sulfate, as SO<sub>4</sub> in mg/L
- Wild Rice Point Observation
- ▭ Reach Division

- Wild Rice Areas with Density
- 1: <10% Wild Rice Coverage
  - 2: 10-25% Wild Rice Coverage
  - 3: 25-50% Wild Rice Coverage
  - 4: 50-75% Wild Rice Coverage
  - 5: >75% Wild Rice Coverage



Barr Footer: ArcGIS 10.2.1, 2014-01-31 09:50 File: I:\Client\Mesabi Nugnet\Out\_of\_Scope\Wild\_Rice\Map\Report\Maps\2013\Figure 7 Wild Rice and Sulfate Sampling Locations Second Creek Near River Mile 2.2.mxd User: arm2

Image Source: St. Louis County; May, 2013.

Figure 7  
 2013 WILD RICE  
 FIELD SURVEY RESULTS  
 SECOND CREEK NEAR MILE 2.2  
 Mesabi Mining, LLC  
 Hoyt Lakes, Minnesota

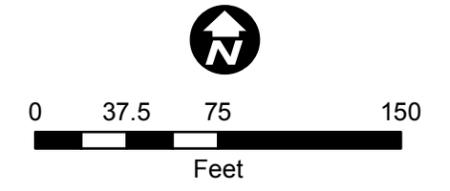
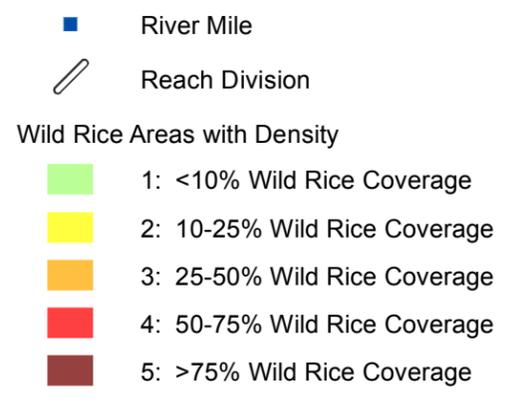


Figure 8  
 2013 WILD RICE FIELD SURVEY  
 RESULTS FOR SECOND CREEK  
 NEAR MILE 0.1  
 Mesabi Mining, LLC  
 Hoyt Lakes, Minnesota

Barr Footer: ArcGIS 10.2.1, 2014-01-31 09:55 File: I:\Client\Mesabi\_Nugget\Out\_of\_Scope\Wild\_Rice\Map\Report\Map\2013\Figure 8 Wild Rice and Sulfate Sampling Location Second Creek Near River Mile 0.1.mxd User: arm2  
 Image Source: St. Louis County; May, 2013.

## Exhibits

## **Exhibit A**

### **2013 Wild Rice Study Area Photographs**



Second Creek, Reach 4, approximately 2.2 miles upstream of confluence with Partridge River



Second Creek, Reach 6, upstream of the confluence with Partridge River



Second Creek, Reach 7, near the confluence with Partridge River



Partridge River, Reach 1, approximately 0.25 miles downstream of Second Creek



Partridge River, Reach 2, wild rice present along shore near the Highway 110 bridge



Partridge River, Reach 3, wild rice growing on both sides of river with open water in middle of the channel



Partridge River, Reach 7, wild rice and lily pads in shallow water near shoreline



Partridge River, Reach 9, sparse wild rice and lily pads in shallow water near shoreline



Partridge River, Reach 11, dense wild rice in pool along west shoreline; pool is at downstream end of approximately 0.25 mile of rocky riffles



Partridge River, Reach 12, sparse wild rice along edge of shallow rocky riffles