

***2012 Wild Rice and Water Quality Monitoring
Summary***

***Prepared for
Poly Met Mining Inc.***

January 2013



2012 Wild Rice and Water Quality Monitoring Summary

***Spring Mine Creek, Trimble Creek, Unnamed Creek,
Hay Lake (1), Embarrass River, Sabin Lake, Wynne Lake,
Embarrass Lake, Lower Embarrass Lake, Unnamed Lake,
Cedar Island Lake, Fourth Lake, Little Rice Lake,
Hay Lake (2), Partridge River, St. Louis River***

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1.0 Background

Poly Met Mining Inc. (PolyMet) has retained Barr Engineering Company (Barr) to complete baseline studies in response to the Minnesota Pollution Control Agency's (MPCA) "Wild Rice Information Request" on May 28, 2009 with regard to the PolyMet NorthMet Project (Project). 2012 was the fourth year of data collection to fulfill that request. This report, the 2012 Wild Rice and Water Quality Monitoring Summary (2012 summary), highlights the results of the wild rice and water quality monitoring conducted in 2012.

1.1 Purpose

MPCA takes the position that waters that contain, or have the potential to contain wild rice, may be regulated under Minnesota Rules, part 7050.0224, subpart 2. Based on this, the purpose of this work is to collect information about the potential presence of wild rice in water bodies located downstream of any potential discharges that could be part of the Project. The scope of the work includes:

- On site verification of the presence and density of select wild rice stands.
- Plant collection as well as measurement and basic statistical analyses of plant growth parameters including: total plant biomass, root biomass, stem biomass, seed biomass and seed number.
- Chemical analysis of water samples collected in or next to wild rice stands; analyses include sulfate (SO_4^{2-}), major cations (Mg^{2+} , Ca^{2+} , K^+ , and Na^+) and major anions (HCO_3^- and Cl^-).

The 2012 summary provides information regarding wild rice stands, water quality within or proximate to those stands, and the presence of other macrophytes in water bodies near the proposed project. These water bodies were recommended for survey by the MPCA and have been surveyed all or in part since 2009. They include all or portions of Spring Mine Creek, Trimble Creek, Unnamed Creek, Hay Lake (1), Embarrass River, Sabin Lake, Wynne Lake, Embarrass Lake, Lower Embarrass Lake, Unnamed Lake, Cedar Island Lake, Fourth Lake, Little Rice Lake, Hay Lake (2), Partridge River, St. Louis River (Study Area). Figure 1 indicates the portions of these water bodies surveyed for wild rice in 2012. Additional information regarding aquatic plants (macrophytes) growing near wild rice was also collected in 2012 as part of Barr's quality control and quality assurance measures for wild rice surveys.

It is difficult to determine the health and history of wild rice in the Study Area without a multi-year combined analysis of ground surveys, as wild rice populations oscillate over an approximate 4- to 6-year period (Reference (1) and Reference (2)). Delays in plant nutrient uptake and wild rice tissue chemistry influence wild rice growth and production from year-to-year (Reference (1) and Reference (2)). Other factors such as water level, parasites, herbivory and weather conditions may also play a role (Reference (3), Reference (4) and Reference (5)). If water levels fluctuate in early summer during the floating leaf stage, wild rice stands may be affected. In particular, the MDNR and Great Lakes Indian Fish and Wildlife Commission resource managers have documented that extreme fluctuations in water level during the floating leaf stage may result in crop loss (Reference (3) and Reference (4)). Given that wild rice populations fluctuate over a multiple-year time period, studies carried out over a shorter time period may not provide sufficient information regarding the growth and production of wild rice.

2.0 Methods

2.1 Wild Rice Survey Methods

The survey methods are similar to those presented in the 1854 Treaty Authority, *Wild Rice Monitoring and Abundance in the 1854 Ceded Territory (1998–2008)* 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 (6))). A wild rice density rating scale of 1 to 5, presented in the 1854 Treaty Authority, is applied to each observation of wild rice. The density rating is used to qualitatively assess the density of wild rice. The rating references approximate percent coverage of wild rice in a water body or defined section of a water body. Table 2-1 relates wild rice density scale ratings to the approximate percent coverage of wild rice (Table 2-1).

As in previous years, prior to conducting field work, the most recently available aerial photographs and maps (GIS maps developed by Barr) of the Study Area water bodies were examined by Barr field staff. Staff examined GIS maps: 1) to determine whether they would potentially encounter difficulty in accessing and surveying these water bodies; and 2) to identify whether water bodies in the Study Area had flowing streams with open water, which would potentially support wild rice populations.

Where possible, water bodies in the Study Area were surveyed by direct observation by kayak or on foot. Stream stretches that were not accessible by kayak or on foot were surveyed by indirect observation from road crossings or nearby shore. In summary, these methods include qualitative (shoreline surveys) and quantitative (grid sampling) wild rice stand density measurements and *in situ* and *ex situ* wild rice plant measurements and statistical analyses.

Table 2-1 Wild Rice Density Scale

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

Total plant, shoot, root, and seed weight (dry weight) and total seed number were calculated for plants collected from the Embarrass River (including the chain of lakes), the Pike River (including

Little Rice Lake), the Partridge River, and the St. Louis River. Mean, median and standard deviation of each parameter was also calculated. To assure accuracy of plant weight calculations, total plant biomass of intact plants were compared to the sum of individual roots, shoots, and seed biomass calculations.

2.2 Macrophyte Sampling Methods

In 2012, as part its quality control and quality assurance measures for wild rice surveys, Barr conducted plant identification training facilitated by in-house botanists and ecologists. The objectives of the 2012 training were to: 1) ensure accurate identification, with staff able to distinguish wild rice from other macrophytes commonly growing in similar habitats in northern Minnesota, and 2) accurately assess wild rice habitat characteristics (including the presence and abundance of other macrophytes). As part of the 2012 wild rice surveys, staff also conducted identification and qualitative macrophyte-abundance estimation in habitats and potential habitats of wild rice. These methods are similar to the qualitative wild rice density method (Reference (6)). A subset of macrophyte observations included collection of plant specimens to verify field identification. The staff effort to identify and sample macrophytes totaled about 10 to 20 percent of the wild rice qualitative surveys effort.

2.3 Water Quality Monitoring Methods

The same methods described in the *2011 Wild Rice and Water Quality Monitoring Report* (Reference (7)) for PolyMet were followed in 2012, which are consistent with Barr's standard operating procedure (SOP), *Collection of Surface Water Samples* (Reference (8)). At the time of the wild rice surveys, water samples were collected at or near wild rice stands located in 11 water bodies (Embarrass River, Partridge River, Second Creek, St. Louis River, Cedar Island Lake, Lower Embarrass Lake, Hay Lake (2), Little Rice Lake, Sabin Lake, Wynne Lake, and Unnamed Lake). Upon collection, unfiltered samples were placed in a cooler with ice and submitted to Pace Analytical (Pace) for analysis.

Water samples were analyzed for concentrations of SO_4^{2-} , major cations (Mg^{2+} , Ca^{2+} , K^+ , and Na^+) and major anions (HCO_3^- and Cl^-). The major cations were analyzed using EPA method 6010; sulfate and chloride were analyzed using EPA method 300.0; and bicarbonate was measured as bicarbonate alkalinity and reported as CaCO_3 using SM 2320B.

3.0 Results

3.1 Wild Rice Survey Results

Barr identified the locations of wild rice stands and measured plant densities during field surveys conducted between August 6 and September 12, 2012. Due to safety and/or access reasons, some water body sections were surveyed indirectly from bridge crossings, stream banks, or lakeshores, or through the interpretation of aerial photographs. Results of the wild rice surveys are summarized in Large Table 1. Large Table 1 also includes a summary of sulfate concentrations found in water samples collected at or near the wild rice stands. Figure 2 through Figure 13 show qualitative and quantitative wild rice density results from field surveys and grid counts. Generally, fewer and less dense stands were observed in 2012 compared with 2009 through 2011. Five out of nine grid locations on the Embarrass River and Partridge River did not have wild rice in 2012; all grids had some rice in 2009 through 2011. Qualitative results are discussed below and are loosely grouped from north to south by watershed and water body. Figure 14 through Figure 23 include mean, standard deviation, and mean plant weight and seed number from 2010 to 2011. Photographs of select wild rice locations within the study area are included in Exhibit A.

3.1.1 Qualitative Wild Rice Survey Results – Upper Embarrass River, Trimble Creek, Unnamed Creek and Wyman Creek

Density factor 1 wild rice was documented in only two locations where it was previously documented between 2009 and 2011 along the Upper Embarrass River between Spring Mine Creek and Sabin Lake. Density factor 1 wild rice was also documented on Hay Lake (1) adjacent to the Embarrass River in densities comparable to those from 2009 to 2011. As in past years, no wild rice was documented on Trimble Creek, Unnamed Creek or Wyman Creek.

3.1.2 Embarrass River Chain of Lakes

Density factors 1- 2 wild rice was documented in Lower Embarrass Lake, Unnamed Lake, Cedar Island Lake and Fourth Lake. One of the grids on Cedar Island Lake had no wild rice and very little was counted within the other grid locations.

3.1.3 Pike River

No wild rice was documented on Little Rice Lake and very sparse stands (density 1) were documented on Hay Lake (2) along the north and south shorelines.

3.1.4 Partridge River and Second Creek

As in years 2009 to 2011, no wild rice was identified from approximately Colvin Creek at Mile 14 to just upstream of the railroad crossing at Mile 23. In 2012, only one density factor 1 wild rice stand was documented downstream from Mile 23. In 2011, density factor 2 stands were identified in that location. In 2011, density factor 1 wild rice was also identified upstream and downstream from the railroad crossing at Mile 23. In 2012, however, no wild rice was documented in those locations.

As in previous years, wild rice was documented on the Lower Partridge River from Mile 29 to the St. Louis River confluence. In 2011, mostly density factor 4-5 wild rice was documented at approximately Mile 29 and between Mile 30 and Mile 31. In 2012 from Mile 29 to Mile 31, wild rice stands were fewer and less dense with density factors ranging from 1 to 3. One density factor 4 stand was documented on the Partridge River at the confluence with Second Creek. As in previous years, wild rice was documented along the downstream 500 feet of Second Creek in densities ranging from 1 to 4.

3.2 Other Macrophyte Results

Macrophyte species were documented at various locations along stream reaches. The plants observed include submergent, floating and emergent macrophytes in the water, and in many cases, plants growing along the immediate shoreline. Large Table 2 lists the species observed and their occurrence in each surveyed water body. The most observation points were on the Embarrass River, the Partridge River and the St. Louis River. Approximately 70 taxa of vascular plants were identified.

The most common submerged species include coontail (*Ceratophyllum demersum* and *C. echinatum*), water milfoil (*Myriophyllum* spp.), nodding water nymph (*Najas flexilis*), various pondweeds (*Potamogeton* spp.), bladderwort (*Utricularia macrorhiza*), and water-celery (*Vallisneria americana*). Frequently observed floating species include water-shield (*Brasenia shreberi*), yellow pond-lily (*Nuphar variegata*), white water-lily (*Nymphaea odorata*), water knotweed (*Polygonum amphibium*), floating pondweed (*Potamogeton natans*), and bur-reed (*Sparganium* spp.; often not identifiable to species, but when possible, typically *S. fluctuans*). Common emergent species include spikerush (*Eleocharis* spp.; often not identifiable to species, but when possible, typically *E. palustris*), river horsetail (*Equisetum fluviatile*), northern mannagrass (*Glyceria borealis*), bur-reed (*Sparganium* spp.; often not identifiable to species, but when possible, typically *S. emersum*), arrowheads (*Sagittaria* spp.; often not identifiable to species, but when possible, three species were found, *S. cuneata*, *S. latifolia*, and *S. rigida*), cattails (*Typha* spp.), and bulrushes (*Scirpus* spp. and *Schoenoplectus* spp.). Several species were common on shorelines and occasionally emergent near

shorelines including bluejoint (*Calamagrostis canadensis*), sedges (*Carex* spp., particularly, but not exclusively, yellow lake sedge, *C. utriculata*), reed canarygrass (*Phalaris arundinacea*), and woolgrass (*Scirpus cyperinus*).

The occurrence of one macrophyte species, northern mannagrass, in the Upper Partridge River warrants discussion. As reported in previous documents, northern mannagrass was mistakenly identified as wild rice on the Upper Partridge River in the 2009 Wild Rice and Sulfate Monitoring report. Barr staff who re-surveyed the Upper Partridge River every year since 2009 have found no wild rice from near the Longnose Creek confluence to approximately 200 m upstream of the railroad crossing at Mile 23. Northern mannagrass, however, was found throughout the entire surveyed reach of the Upper Partridge. In 2012, its occurrence was documented in 16 locations where no wild rice grew (GPS points documented). The 2012 survey confirms that northern mannagrass is very common throughout the Upper Partridge River in reaches where no wild rice occurs.

3.3 Water Quality Monitoring Results

A total of 24 water samples were collected from 11 different water bodies near wild rice stands during the 2012 wild rice survey, including Embarrass River, Partridge River, Second Creek, St. Louis River, Cedar Island Lake, Lower Embarrass Lake, Hay Lake (2), Little Rice Lake, Sabin Lake, Wynne Lake, and Unnamed Lake (Figure 24). Water quality results are presented in Large Table 3. Sulfate concentration ranges by water body are presented in Table 3-1. Other water quality concentration ranges by water body are presented in Large Table 4. Second Creek had the highest levels of all water quality concentrations for all parameters and Hay Lake (2) had the lowest levels (Large Table 4). In general, Partridge River and Embarrass River had comparable concentrations of all water quality parameters with values differing by a few mg/L or less. Similarly, the Embarrass River chain of lakes (Sabin lake, Wynne Lake, Embarrass Lake, Unnamed Lake, Cedar Island Lake and Fourth Lake) all had comparable concentrations of all water quality parameters, and values differed by a few mg/L or less.

Table 3-1 Maximum, Minimum and Average Sulfate Concentrations (mg/L) in 2012

| Water Body | Sulfate (mg/l) | | |
|----------------------|----------------|---------|---------|
| | Maximum | Minimum | Average |
| Cedar Island Lake | 15.7 | 14.8 | 15.3 |
| Lower Embarrass Lake | 16.8 | 16.7 | 16.8 |
| Embarrass River | 54.7 | 10.6 | 22.6 |
| Hay Lake (2) | 1.8 | 1.8 | 1.8 |

| Water Body | Sulfate (mg/l) | | |
|------------------|----------------|---------|---------|
| | Maximum | Minimum | Average |
| Little Rice Lake | 2.2 | 2.2 | 2.2 |
| Partridge River | 86 | 5.4 | 46.9 |
| Sabin Lake | 14.7 | 14.7 | 14.7 |
| Second Creek | 1100 | 1100 | 1100 |
| St. Louis River | 30.9 | 30.9 | 30.9 |
| Unnamed Lake | 16.4 | 16.3 | 16.4 |
| Wynne Lake | 15.4 | 15.4 | 15.4 |

Field duplicate measurements are not included in these calculations.

In 2012, 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, which are based on *The National Functional Guidelines for Inorganic Data Review* (Reference (9)). Data evaluation included a review of technical holding times, preservation, blanks, laboratory control samples, matrix spike samples, duplicate samples, and data package completeness. All data are acceptable as reported and qualified and are usable as presented in the data summary tables. Barr-defined qualifiers, based on USEPA-defined qualifiers, were assigned for this project in the data summary tables and the associated database during the evaluation process.

Analyte concentration detections in laboratory blank samples were compared to project sample analyte concentrations. Any sample concentration within five times the blank sample detection concentrations was qualified (b) and should be considered a potential false positive concentration.

4.0 Summary

Fewer stands with less dense wild rice were identified in all Study Area water bodies in 2012 compared with previous years. Wild rice was absent from five of nine grid locations for the first time since surveys began in 2009 (Figure 9 through Figure 13). From 2009 to 2011, water bodies with larger denser stands ranging from densities 3 to 5 included Unnamed Lake and Cedar Island Lake on the Embarrass River, and the Partridge River just above and below its confluence with Second Creek. In 2012, more stands with density 1 were identified in those locations. On the Partridge River, wild rice was not dense enough to record stem counts at grid locations. Portions of all Study Area water bodies had conditions that could potentially support wild rice in the future and they should be re-surveyed in 2013. These conditions include some or all of the following: open water, presence of other macrophytes, and water depths of between one and four feet.

5.0 References

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Large Tables

Large Table 1 Overview of Monitoring Results for 2012

| Water Body | Reach | | Wild Rice Monitoring Outcomes |
|----------------------|--|--|--|
| | from | to | 2012 |
| Spring Mine Creek | County Road 615 crossing | Confluence with Embarrass River | No wild rice observed |
| Trimble Creek | At County Road 358 crossing | | No wild rice observed |
| | At County Road 615 crossing | | No wild rice observed |
| Unnamed Creek | At railroad grade | | No wild rice observed |
| Hay Lake (1) | Entire shoreline | | Low density wild rice observed nearly continuously along shoreline (density=1) |
| Embarrass River | Mile 47 | Mile 26 | No wild rice observed |
| | Mile 26 | Sabin Lake | Wild rice observed along two <500 foot stretches near mile 24 and 25.5 (density=1) |
| | Cedar lake outflow | Fourth Lake inflow | Wild rice observed along two ~100 foot stretches (density=1) |
| Sabin Lake | Entire shoreline | | No wild rice observed |
| Wynne Lake | Entire shoreline | | No wild rice observed |
| Embarrass Lake | Entire shoreline | | No wild rice observed |
| Lower Embarrass Lake | Entire shoreline | | Low density rice observed at two <200 foot stretches (density=1) |
| Unnamed Lake | Lower Embarrass lake inflow | Clockwise to outflow to Cedar Island Lake | Wild rice observed along five <200 foot stretches and one ~500 foot stretch (density=1-2) |
| | Outflow to Cedar Island Lake | Clockwise to Lower Embarrass lake inflow | Wild rice observed along two <100 foot stretches and two ~500 foot stretches (density=1) |
| | Shoreline of island in center of lake | Wild rice observed along one <100 foot stretch (density=1) | Wild rice observed along one <100 foot stretch (density=1) |
| Cedar Island Lake | Unnamed lake inflow | Clockwise to outflow to Fourth Lake | Wild rice observed along 17 stretches varying in length from <100 to ~1000 feet in length (density=1-2) |
| | Outflow to Fourth Lake | Clockwise to unnamed lake inflow | Low density wild Rice observed along two ~1000 foot stretches and three <100 foot stretches (density=1) |
| | Shoreline of island in western portion of lake | | Wild rice observed along two <200 foot stretches along northwestern shore (density=1) |
| | Shorelines of two islands in southern portion of lake | | Wild rice observed along <200 foot stretches along west shore of both islands (density=1) |
| Fourth Lake | Entire Shoreline | | Low density wild rice observed nearly continuously along shoreline (density=1) |
| Little Rice Lake | Entire shoreline | | Low density wild rice observed at several points along shoreline (density=1) |
| Hay Lake (2) | Entire Shoreline | | Low density wild rice observed along north and south shorelines (density=1) |
| Wymann Creek | Upstream portions between mile 0 and mile 2 | | No wild rice observed |
| | Downstream portion from mile 3.25 to Partridge River | | No wild rice observed |
| Second Creek | ~500 feet downstream of confluence with First Creek | ~550 feet downstream of confluence with First Creek | No wild rice observed |
| | ~500 feet upstream of confluence with Partridge River. | Confluence with Partridge River | Wild rice observed along entire stretch (density varying from 1-4) |
| Partridge River | Mile 14 | County Road 565 | Wild rice observed along ~1/2 mile stretch from mile 23.5 to County Road 565 (density=1) |
| | Mile 29 | Confluence with Second Creek | Wild rice observed along 9 stretches 100-500 feet (density=1-2) |
| | Confluence with Second Creek | Hwy 110 bridge | Wild rice stand (density 4) immediately downstream of Second Creek, wild rice stand (density 3) immediately upstream of Hwy. 110 bridge. |
| | Hwy 110 bridge | Confluence with St. Louis River | Wild rice observed along 12 stretches, each with length ~200 ft. or less (density ranging from 1-2) |
| St. Louis River | Confluence with Partridge | Co. Hwy. 100 crossing | No wild rice observed |

| Scientific Name ^[2] | Common Name | Cedar Island Lake | | Embarrass Lake | | Embarrass River | | Embarrass River Tributaries ^[3] | | Fourth Lake | | Hay Lake (1) Embarrass River | | Hay Lake (2) - Pike River | | Little Rice Lake | | Lower Embarrass Lake | | Partridge River (Lower) ^[4] | | Partridge River (Upper) | | Pike River | | Sabin Lake | | St. Louis River | | Unnamed Lake | | Wyman Creek | | Wynne Lake | | | |
|---------------------------------------|------------------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|--|------------------|-------------------|------------------|------------------------------|------------------|---------------------------|------------------|-------------------|------------------|----------------------|------------------|--|------------------|-------------------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|-------------------|------------------|------------|---------|---|---|
| | | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | Wild Rice Present | Wild Rice Absent | | | | |
| | | (n = 26) | (n = 3) | (n = 0) | (n = 4) | (n = 2) | (n = 48) | (n = 0) | (n = 8) | (n = 3) | (n = 0) | (n = 3) | (n = 0) | (n = 4) | (n = 0) | (n = 1) | (n = 1) | (n = 3) | (n = 2) | (n = 28) | (n = 6) | (n = 2) | (n = 19) | (n = 1) | (n = 2) | (n = 0) | (n = 11) | (n = 4) | (n = 24) | (n = 14) | (n = 2) | (n = 0) | (n = 21) | (n = 0) | (n = 7) | | |
| <i>Potamogeton gramineus</i> | Grass-leaf pondweed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | |
| <i>Potamogeton natans</i> | Floating pondweed | 2 | 1 | | | | | 2 | | 1 | | | | | 4 | | 1 | | | | | | | | | | | | | | | | | | | | |
| <i>Potamogeton richardsonii</i> | Richardson's pondweed | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Potamogeton robbinsii</i> | Fern pondweed | 1 | 1 | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | |
| <i>Potamogeton spirillus</i> | Northern snail-seed pondweed | | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | |
| <i>Potamogeton spp.</i> (narrow leaf) | Narrow-leaf pondweed | 1 | | | | | | | | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Potamogeton zosteriformis</i> | Flat-stem pondweed | | 1 | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | 1 | | |
| <i>Sagittaria cf. cuneata</i> | Arum-leaf arrowhead | | | | | | | 2 | | | | | | | | | | | | | | 5 | | | | | | | | | | | | | | | |
| <i>Sagittaria cf. latifolia</i> | Broad-leaf arrowhead | | | | | 1 | 8 | | | | | 2 | | | | | | 1 | | | | 18 | 4 | | | | 1 | 1 | 2 | 1 | | | 3 | | 1 | | |
| <i>Sagittaria cf. rigida</i> | Sessile-fruit arrowhead | 1 | 1 | | | 2 | 3 | | | 2 | | | | | | | | 1 | | | | 2 | | | | | 1 | 4 | 2 | | | 1 | | | | | |
| <i>Schoenoplectus acutus</i> | Hard-stem bulrush | 1 | | | 1 | | 1 | | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | | |
| <i>Schoenoplectus tabernaemontani</i> | Soft-stem bulrush | 1 | 1 | | | | | | | 1 | 1 | | | | | | | | | | | | | | | | 1 | | | | | | | | 1 | | |
| <i>Scirpus atrovirens</i> | Green bulrush | | | | | | 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Scirpus cyperinus</i> | Woolgrass | | 1 | | | 1 | 4 | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | | |
| <i>Scirpus pedicellatus</i> | Stalked woolgrass | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Scirpus spp.</i> | Bulrush | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 2 |
| <i>Sium suave</i> | Water-parsnip | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Sparganium cf. emersum</i> | Narrow-leaf bur-reed | | | | | | 1 | | | | | | | | | | | | | | | | 4 | | | | | | | | | | | | | | 1 |
| <i>Sparganium cf. fluctuans</i> | Floating-leaf bur-reed | | 1 | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | | | | | | | | 1 |
| <i>Sparganium spp.</i> | Bur-reed | 1 | 1 | | | | 3 | | | 1 | | | | | | | | | | | | | | | | | | 1 | | | | | | | | | 3 |
| <i>Symphyotrichum lanceolatum</i> | Eastern lined-aster | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <i>Typha spp.</i> | Cattail | | | | 2 | | 1 | | | 2 | 1 | | | | | | | | | | | 1 | 1 | | | | | | | | | | | | | 1 | |
| <i>Utricularia macrorhiza</i> | Common bladderwort | 1 | 2 | | | | 1 | | | 1 | | | | | 2 | | | | | | 1 | | | | | | | | | | | | | | | 3 | |
| <i>Vallisneria americana</i> | Water-celery | 2 | | | | | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 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 waterbody, 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."

[3] Includes five sample points on Spring Mine Creek, two sample points on Trimble Creek, and one sample point on Unnamed Creek, all without wild rice.

[4] Includes one sample point on Second Creek just upstream of Partridge River, where no wild rice was observed.

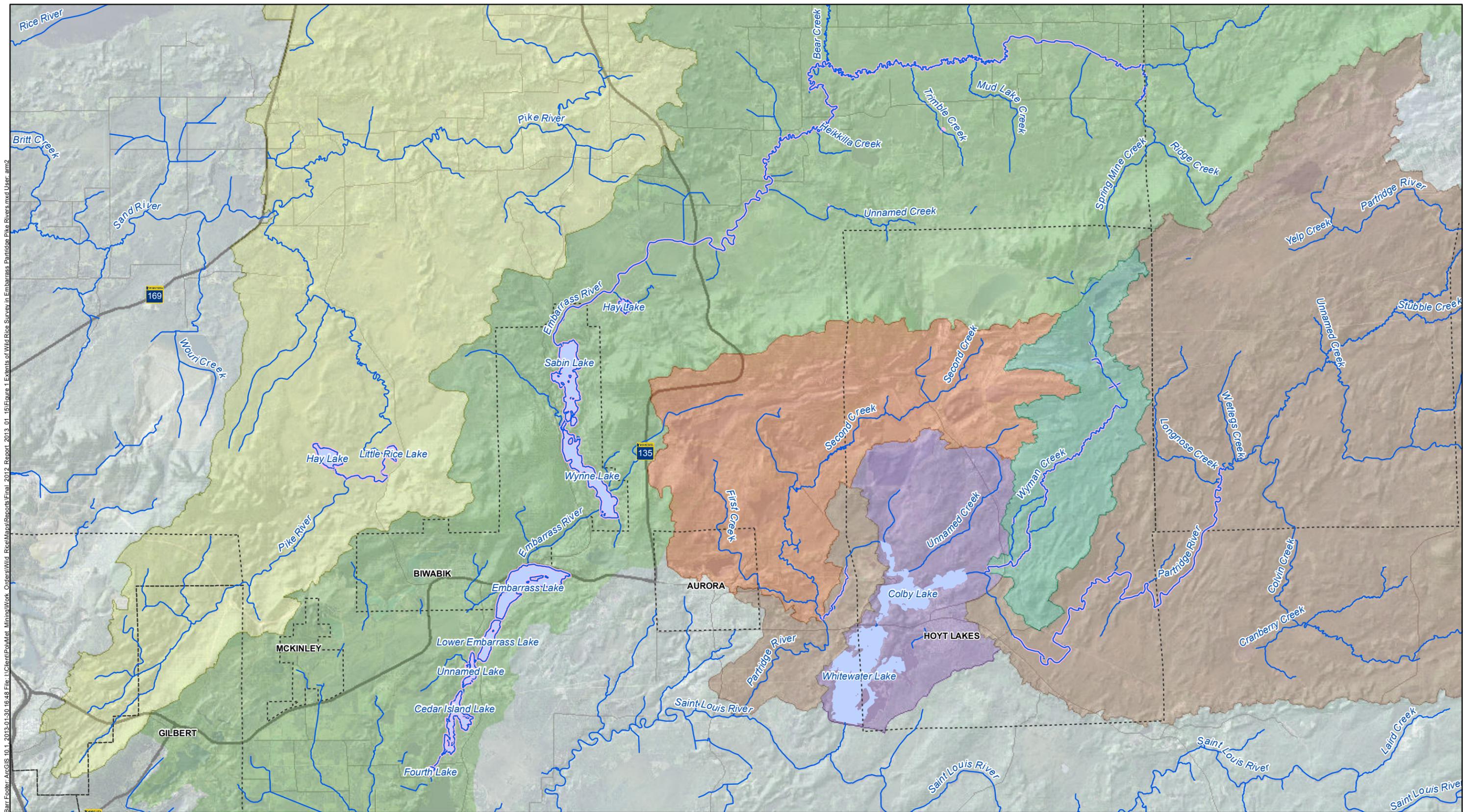
Large Table 3 Water Quality Data Collected During the 2012 Wild Rice Survey

| Water Body | Parameter | | | Alkalinity, bicarbonate, as CaCO3 | Calcium | Chloride | Magnesium | Potassium | Sodium | Sulfate |
|-------------------------------------|--------------------|-----------|-------------|-----------------------------------|---------|----------|-----------|-----------|--------|---------|
| | Total or Dissolved | | | NA | Total | NA | Total | Total | Total | NA |
| | Sample Name | Date | Sample Type | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l | mg/l |
| Cedar Island Lake | PM-KNBB-29-01 | 8/9/2012 | N | 54.3 | 16.4 | 4.3 | 9.5 | 1.8 | 6.0 | 15.7 |
| Cedar Island Lake | PM-KNBB-30-01 | 8/9/2012 | N | 50.8 | 16.8 | 4.4 | 9.3 | 1.8 | 5.9 | 14.8 |
| Cedar Island Lake | PM-KWSATT-01 | 8/23/2012 | N | 59.5 | 17.3 | 4.5 | 10 | 1.7 | 6.1 | 15.4 |
| Lower Embarrass Lake | PM-TTSA-01 | 8/22/2012 | N | 61.7 | 17.4 | 4.4 | 10 | 1.7 | 5.9 | 16.8 |
| Lower Embarrass Lake | PM-KNBB_22_01 | 8/10/2012 | N | 58.4 | 17.8 | 4.3 | 10.0 | 2.0 | 6.4 | 16.7 |
| Embarrass River | PM-KSMB-1 | 8/7/2012 | N | 94.4 | 23.3 | 2.8 | 24.1 | 5.1 | 9.0 | 54.7 |
| Embarrass River | PM-KSMB-2 | 8/7/2012 | N | 64.2 | 19.7 | 1.9 | 8.5 | 1.2 | 3.6 | 11.9 |
| Embarrass River | PM-DTRW-01 | 8/16/2012 | N | 87.7 | 22.5 | 2.3 | 12.6 | 0.80 | 6.2 | 13.3 |
| Embarrass River | PM-DTRW-04 | 8/16/2012 | N | 93.0 | 24.1 | 3.0 | 13.4 | 1.9 | 6.9 | 10.6 |
| Hay Lake (West of Little Rice Lake) | PM-KMTM-01 | 8/22/2012 | N | 11.0 b | 6.5 | 0.63 b | 2.2 | 0.65 | 1.5 | 1.8 b |
| Little Rice Lake | PM_KNBB_19_01 | 8/7/2012 | N | 53.4 | 16.9 | 4.6 | 6.0 | 0.94 | 4.5 | 2.2 |
| Little Rice Lake | PM_KNBB_20_01 | 8/8/2012 | N | 53.0 | 17.0 | 4.9 | 6.1 | 0.95 | 4.6 | 2.2 |
| Partridge River | PM-KMDD-01 | 8/9/2012 | N | 57.3 | 14.5 | 4.0 | 8.7 | 1.2 | 4.9 | 5.4 |
| Partridge River | PMMN-KMTM-01 | 8/7/2012 | N | 71.4 | 21.8 | 4.1 | 27.0 | 2.2 | 7.3 | 69.9 |
| Partridge River | PMMN-KMTM-02 | 8/8/2012 | N | 52.1 | 18.6 | 3.6 | 9.5 | 1.3 | 4.9 | 16.7 |
| Partridge River | PM-MN-KSMB-5 | 8/9/2012 | N | 52.2 | 18.7 | 3.7 | 9.4 | 1.4 | 4.9 | 17.0 |
| Partridge River | PM-MN-KSMB-6 | 8/9/2012 | N | 64.5 | 21.2 | 4.1 | 29.0 | 2.2 | 7.5 | 56.4 |
| Partridge River | PM-MN-KSMB-7 | 8/9/2012 | N | 79.6 | 21.1 | 4.3 | 30.3 | 2.2 | 7.7 | 86.0 |
| Sabin Lake | PM-KSMB-4 | 8/8/2012 | N | 59.9 | 17.6 | 3.0 | 11.0 | 2.0 | 6.4 | 14.7 |
| Second Creek | PM-KNCA-01 | 8/30/2012 | N | 485 | 59.5 | 8.8 | 363 | 16.8 | 52.7 | 1100 |
| St. Louis River | PM-DEJW-03 | 8/8/2012 | N | 49.3 | 14.5 | 2.3 | 14.4 | 1.3 | 4.0 | 30.9 |
| Unnamed Lake | PM-KWTT-02 | 8/23/2012 | N | 61.8 | 17.3 | 4.3 | 10.0 | 1.8 | 6.2 | 16.3 |
| Unnamed Lake | PM-KNBB_21_01 | 8/10/2012 | N | 56.2 | 17.0 | 4.4 | 9.7 | 2.0 | 6.3 | 16.4 |
| Wynne Lake | PM-KSMB-3 | 8/8/2012 | N | 55.0 | 15.7 | 3.3 | 9.7 | 1.7 | 5.8 | 15.4 |

Large Table 4 Maximum, Minimum and Average Bicarbonate, Chloride, and Cations Concentrations (mg/L) in 2012

| Water Body | Alkalinity, bicarbonate, as CaCO ₃ (mg/l) | | | Calcium (mg/l) | | | Chloride (mg/l) | | | Magnesium (mg/l) | | | Potassium (mg/l) | | | Sodium (mg/l) | | |
|----------------------|--|------|------|----------------|------|-------|-----------------|------|------|------------------|------|------|------------------|------|------|---------------|------|------|
| | Max | Min | Avg | Max | Min | Avg | Max | Min | Avg | Max | Min | Avg | Max | Min | Avg | Max | Min | Avg |
| Cedar Island Lake | 59.5 | 50.8 | 54.9 | 17.3 | 16.4 | 16.8 | 4.5 | 4.3 | 4.4 | 10 | 9.3 | 9.6 | 1.8 | 1.7 | 1.8 | 6.1 | 5.9 | 6.0 |
| Lower Embarrass Lake | 61.7 | 58.4 | 60.1 | 17.8 | 17.4 | 17.6 | 4.4 | 4.3 | 4.4 | 10 | 10 | 10 | 2.0 | 1.7 | 1.9 | 6.4 | 5.9 | 6.2 |
| Embarrass River | 94.4 | 64.2 | 84.8 | 24.1 | 19.7 | 22.4 | 3 | 1.9 | 2.5 | 24.1 | 8.5 | 15 | 5.1 | 0.8 | 2.3 | 9 | 3.6 | 6.4 |
| Hay Lake (2) | 11.0 | 11.0 | 11.0 | 6.5 | 6.5 | 6.5 | 0.63 | 0.63 | 0.63 | 2.2 | 2.2 | 2.2 | 0.65 | 0.65 | 0.65 | 1.5 | 1.5 | 1.5 |
| Little Rice Lake | 53.4 | 53.0 | 53.2 | 17.0 | 16.9 | 17.0 | 4.9 | 4.6 | 4.8 | 6.1 | 6.0 | 6.1 | 0.95 | 0.94 | 0.95 | 4.6 | 4.5 | 4.6 |
| Partridge River | 79.6 | 52.1 | 62.9 | 21.8 | 14.5 | 19.32 | 4.3 | 3.6 | 3.97 | 30.3 | 8.7 | 19 | 2.2 | 1.2 | 1.8 | 7.7 | 4.9 | 6.2 |
| Sabin Lake | 59.9 | 59.9 | 59.9 | 17.6 | 17.6 | 17.6 | 3.0 | 3.0 | 3.0 | 11 | 11 | 11 | 2.0 | 2.0 | 2.0 | 6.4 | 6.4 | 6.4 |
| Second Creek | 485 | 485 | 485 | 59.5 | 59.5 | 59.5 | 8.8 | 8.8 | 8.8 | 363 | 363 | 363 | 16.8 | 16.8 | 16.8 | 52.7 | 52.7 | 52.7 |
| St. Louis River | 49.3 | 49.3 | 49.3 | 14.5 | 14.5 | 14.5 | 2.3 | 2.3 | 2.3 | 14.4 | 14.4 | 14.4 | 1.3 | 1.3 | 1.3 | 4.0 | 4.0 | 4.0 |
| Unnamed Lake | 61.8 | 56.2 | 59 | 17.3 | 17 | 17.2 | 4.4 | 4.3 | 4.4 | 10 | 9.7 | 9.9 | 2 | 1.8 | 1.9 | 6.2 | 6.2 | 6.3 |
| Wynne Lake | 55.0 | 55.0 | 55.0 | 15.7 | 15.7 | 15.7 | 3.3 | 3.3 | 3.3 | 9.7 | 9.7 | 9.7 | 1.7 | 1.7 | 1.7 | 5.8 | 5.8 | 5.8 |

Figures



- Stream Segments Surveyed in 2012
- Lake Shoreline Surveyed in 2012
- Other Lakes
- City Boundaries
- Embarrass River Watershed
- Pike River Watershed
- Colby-Whitewater Watershed
- Partridge River Watershed
- Second Creek Watershed
- Wyman Creek Watershed

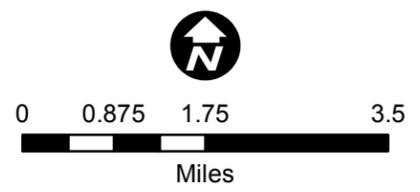


Figure 1
 EXTENTS OF 2012 WILD RICE SURVEYS IN
 THE EMBARRASS RIVER, PARTRIDGE RIVER
 AND PIKE RIVER WATERSHEDS
 NorthMet Project
 Poly Met Mining, Inc.
 Hoyt Lakes, Minnesota

Bar Footer: ArcGIS 10.1, 2013-01-30 16:48 File: I:\Client\Polymet_Minima\Work_Orders\Wild_Rice\Map\Reports\Final_2012_Report_2013_01_15\Figure_1_Extents_of_Wild_Rice_Survey_in_Embarrass_Partridge_Pike_Rivers.mxd User: am2

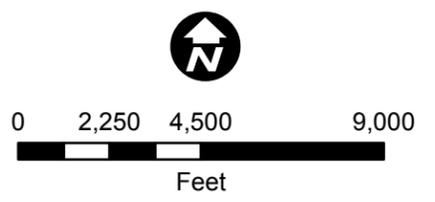
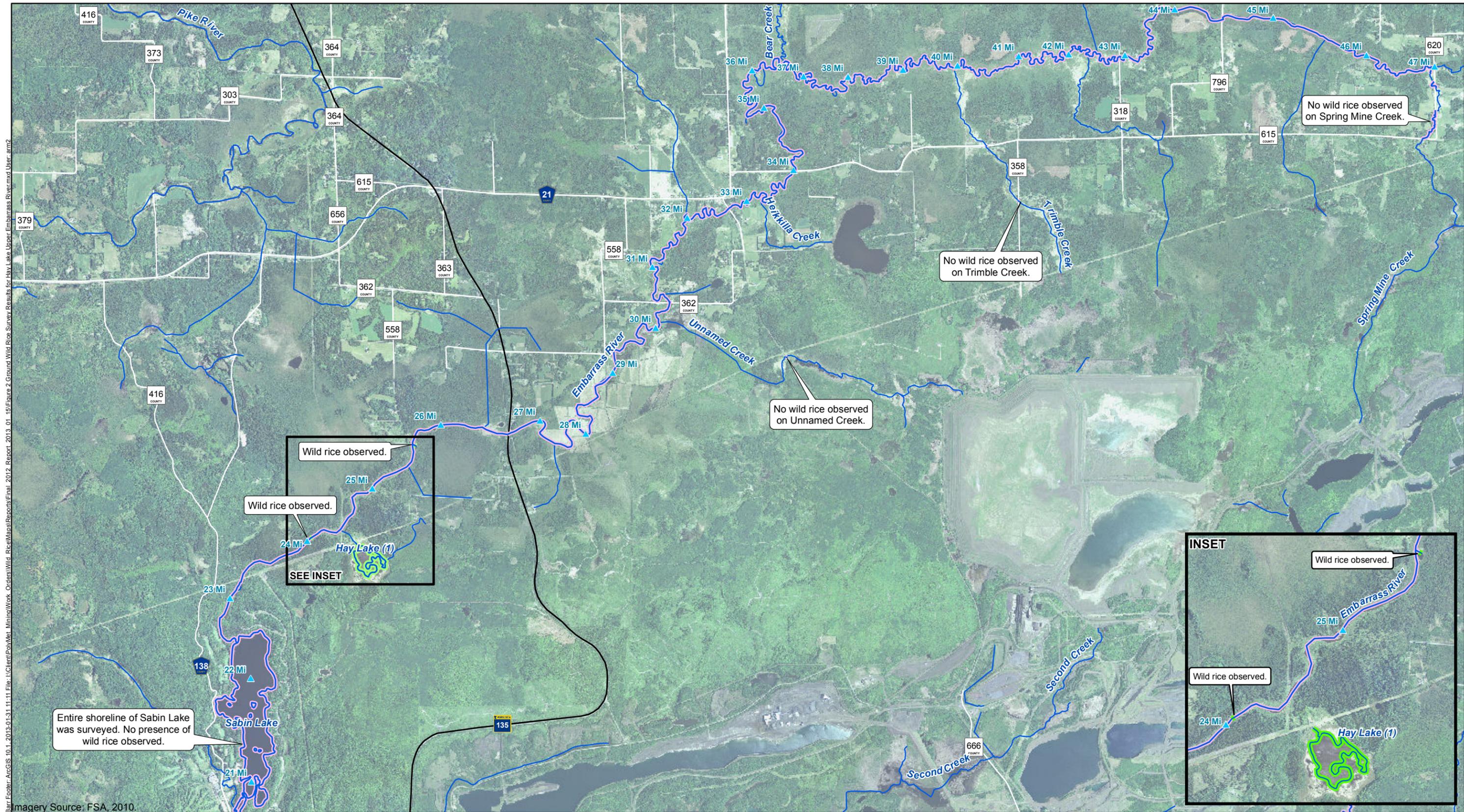
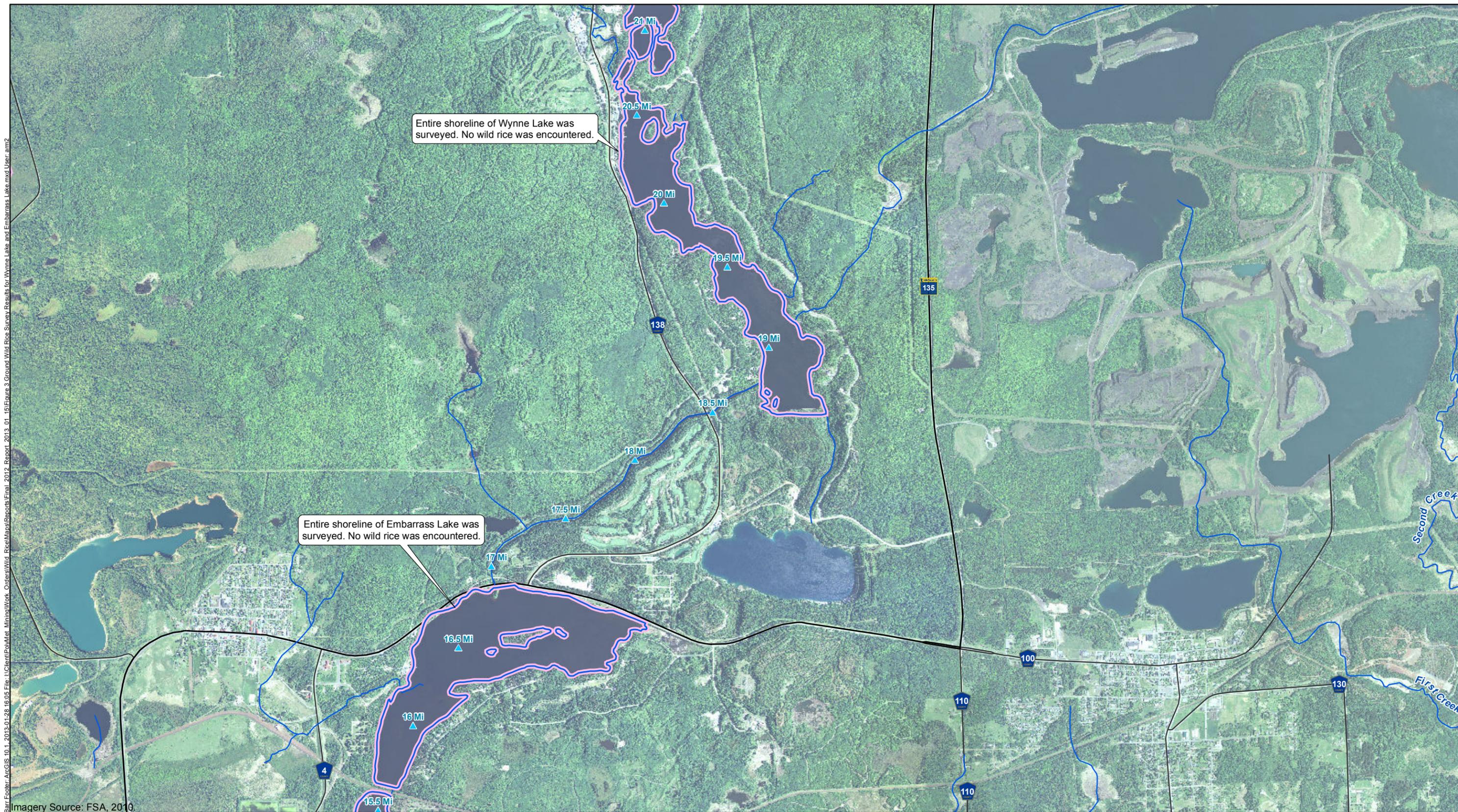


Figure 2
GROUND WILD RICE SURVEY RESULTS FOR HAY LAKE (1)
(MNID 69435), THE UPPER EMBARRASS RIVER, SPRING
MINE CREEK, UNNAMED CREEK (PM11), AND TRIMBLE CREEK
NorthMet Project
Poly Met Mining, Inc.
Hoyt Lakes, Minnesota



- Wild Rice Density in 2012
- 1 No Wild Rice Observed
- 2 1 <10% Wild Rice Coverage
- 3 10-25% Wild Rice Coverage
- 4 25-50% Wild Rice Coverage
- 5 50-75% Wild Rice Coverage
- 6 >75% Wild Rice Coverage
- Embarass River Mile Markers
- Stream Segments Surveyed in 2012
- Lake Shoreline Surveyed in 2012

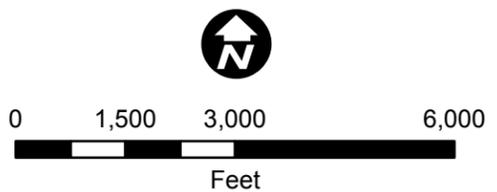


Figure 3
 GROUND WILD RICE SURVEY RESULTS FOR
 WYNNE AND EMBARRASS LAKES (EMBARRASS RIVER)
 NorthMet Project
 Poly Met Mining, Inc.
 Hoyt Lakes, Minnesota

Imagery Source: FSA, 2010.
 Bar: Footer: ArcGIS 10.1, 2013-01-28 16:05 File: \\Client\PolMet_Minima\Work_Orders\Wild_Rice\MapReports\Final_2012_Report_2013_01_15\Figure 3 Ground Wild Rice Survey Results for Wynne Lake and Embarrass Lake.mxd User: arm2

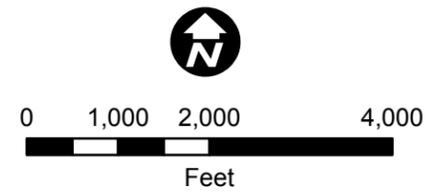
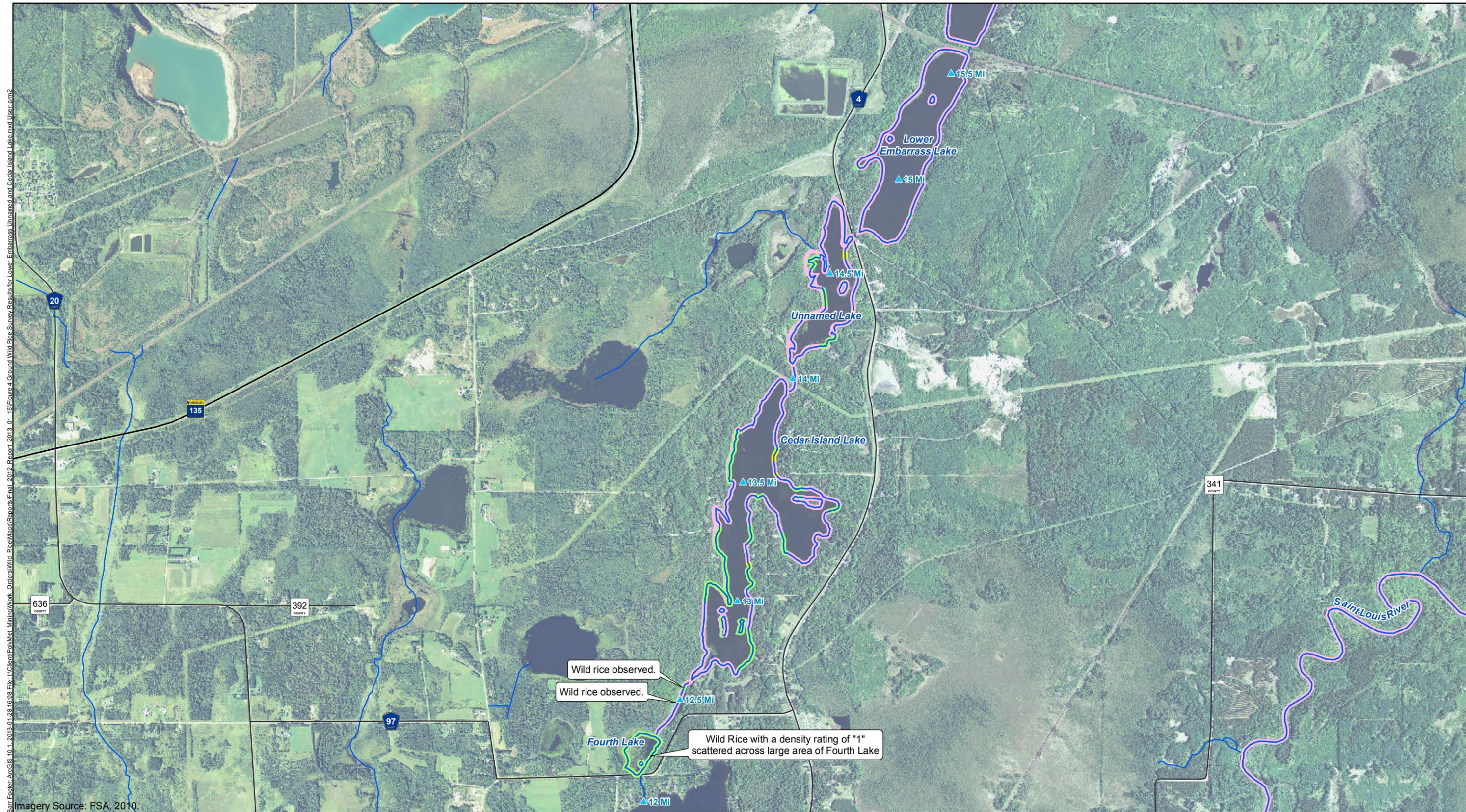
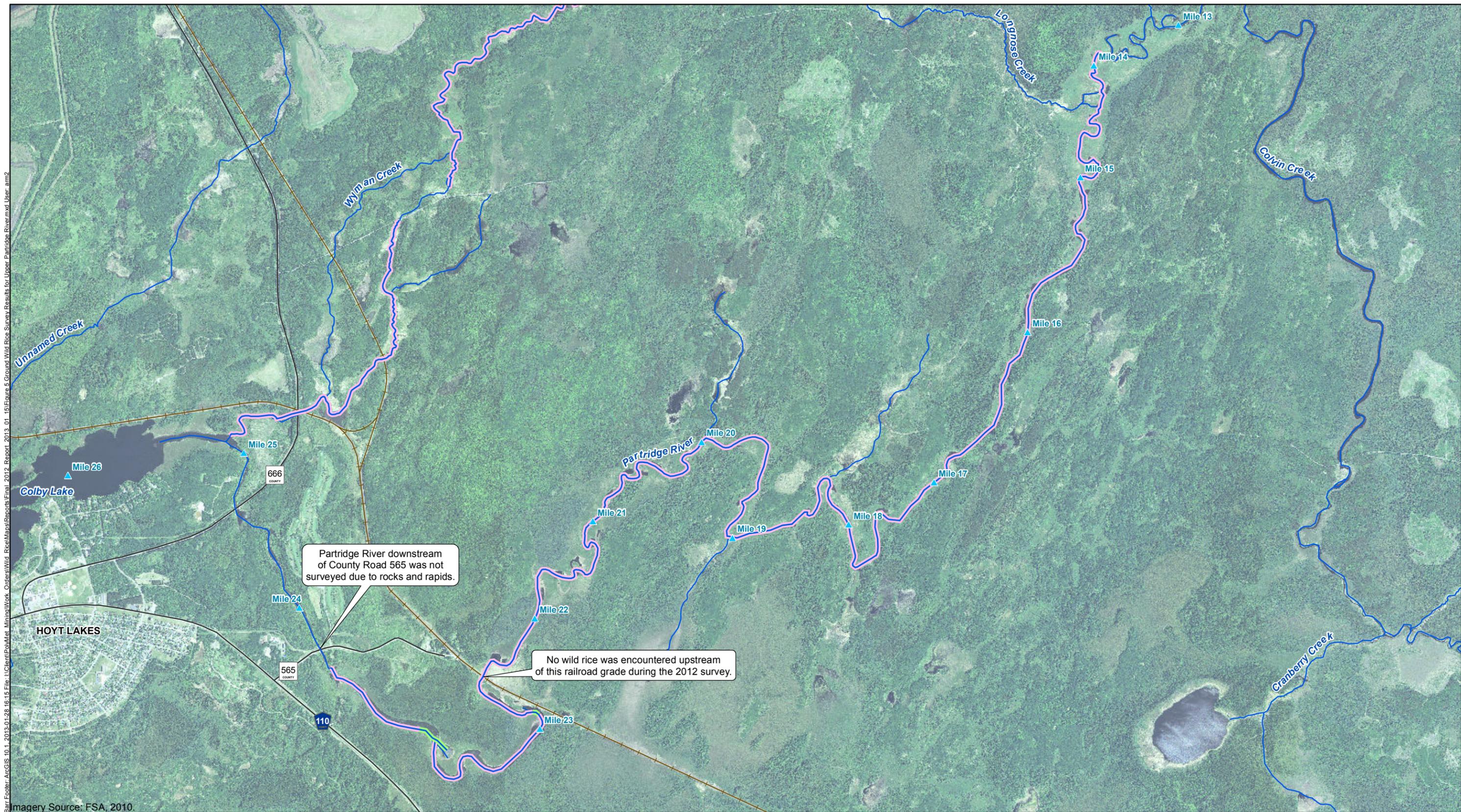


Figure 4
 GROUND WILD RICE SURVEY RESULTS FOR
 LOWER EMBARRASS LAKE, UNNAMED LAKE,
 CEDAR ISLAND LAKE AND FOURTH LAKE
 NorthMet Project
 Poly Met Mining, Inc.
 Hoyt Lakes, Minnesota

Bar Footer: ArcGIS 10.1, 2013-01-28 16:08 File: \\Client\Pol\Met_Minna\Work_Orders\Wild_Rice\Map\Reports\Final_Report_2013_01_15\Figure 4 Ground Wild Rice Survey Results for Lower Embarrass, Unnamed and Cedar Island Lake.mxd User: am2



Barr Footer: ArcGIS 10.1 2013-01-28 16:15 File: \\Client\PolMet_Minima\Work_Orders\Wild_Rice\Mapa\Reports\Final_2012_Report_2013_01_15\Figure 5 Ground Wild Rice Survey Results for Upper Partridge River.mxd User: am2

Imagery Source: FSA, 2010.

- | | |
|---|---|
| <p>Wild Rice Density in 2012</p> <ul style="list-style-type: none"> No Wild Rice Observed 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 | <ul style="list-style-type: none"> Partridge River Miles Stream Segments Surveyed in 2012 Lake Shoreline Surveyed in 2012 |
|---|---|

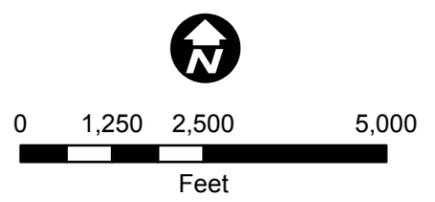


Figure 5
 GROUND WILD RICE SURVEY RESULTS
 FOR THE UPPER PARTRIDGE RIVER
 NorthMet Project
 Poly Met Mining, Inc.
 Hoyt Lakes, Minnesota



Barr Footer: ArcGIS 10.1, 2013-01-28 16:02 File: I:\Client\PolMet_Minima\Work_Orders\Wild_Rice\Mapa\Reports\Final_2012_Report_2013_01_15\Figure 6 Ground Wild Rice Survey Results for Lower Partridge River.mxd User: am2

- Imagery Source: FSA, 2010.
- | | |
|---|---|
| <ul style="list-style-type: none"> Wild Rice Density in 2012 No Wild Rice Observed 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 | <ul style="list-style-type: none"> Partridge River Miles Stream Segments Surveyed in 2012 Lake Shoreline Surveyed in 2012 |
|---|---|

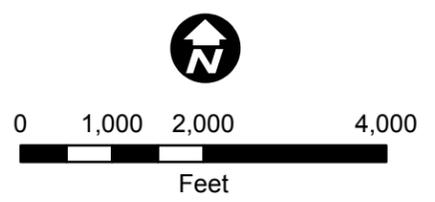


Figure 6
 GROUND WILD RICE SURVEY RESULTS
 FOR THE LOWER PARTRIDGE RIVER
 AND A PORTION OF SECOND CREEK
 NorthMet Project
 Poly Met Mining, Inc.
 Hoyt Lakes, Minnesota

Bar Footer: ArcGIS 10.1, 2013-01-30 17:36 File: I:\Client\PolMet_Minima\Work_Orders\Wild_Rice\Map\Reports\Final_2012_Report_2013_01_15\Figure 7 Ground Wild Rice Survey Results for Hay and Rice Lakes Pike River.mxd User: arm2

Imagery Source: FSA, 2010.

Wild Rice Density in 2012

-  No Wild Rice Observed
-  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

Stream Segments Surveyed in 2012

-  Stream Segments Surveyed in 2012
-  Lake Shoreline Surveyed in 2012



Wild rice with a density rating of "1"
scattered across large area of Little Rice Lake.

Wild rice with a density rating of "1"
scattered across large area of Hay Lake (2).



Figure 7
GROUND WILD RICE SURVEY RESULTS
FOR HAY LAKE (2) (MN ID 690579), LITTLE RICE
LAKE (MN ID 690578) AND THE PIKE RIVER
NorthMet Project
Poly Met Mining, Inc.
Hoyt Lakes, Minnesota

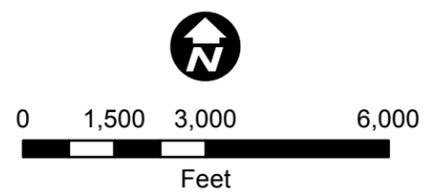
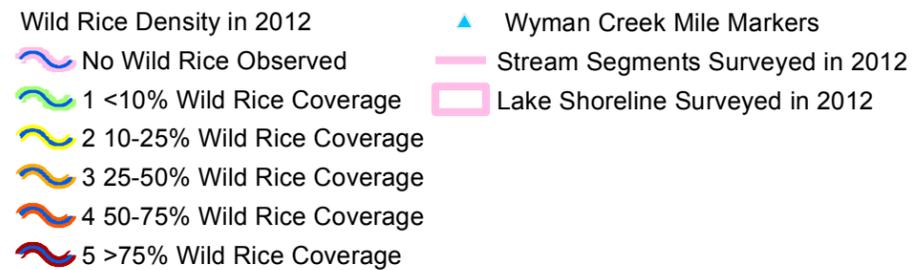
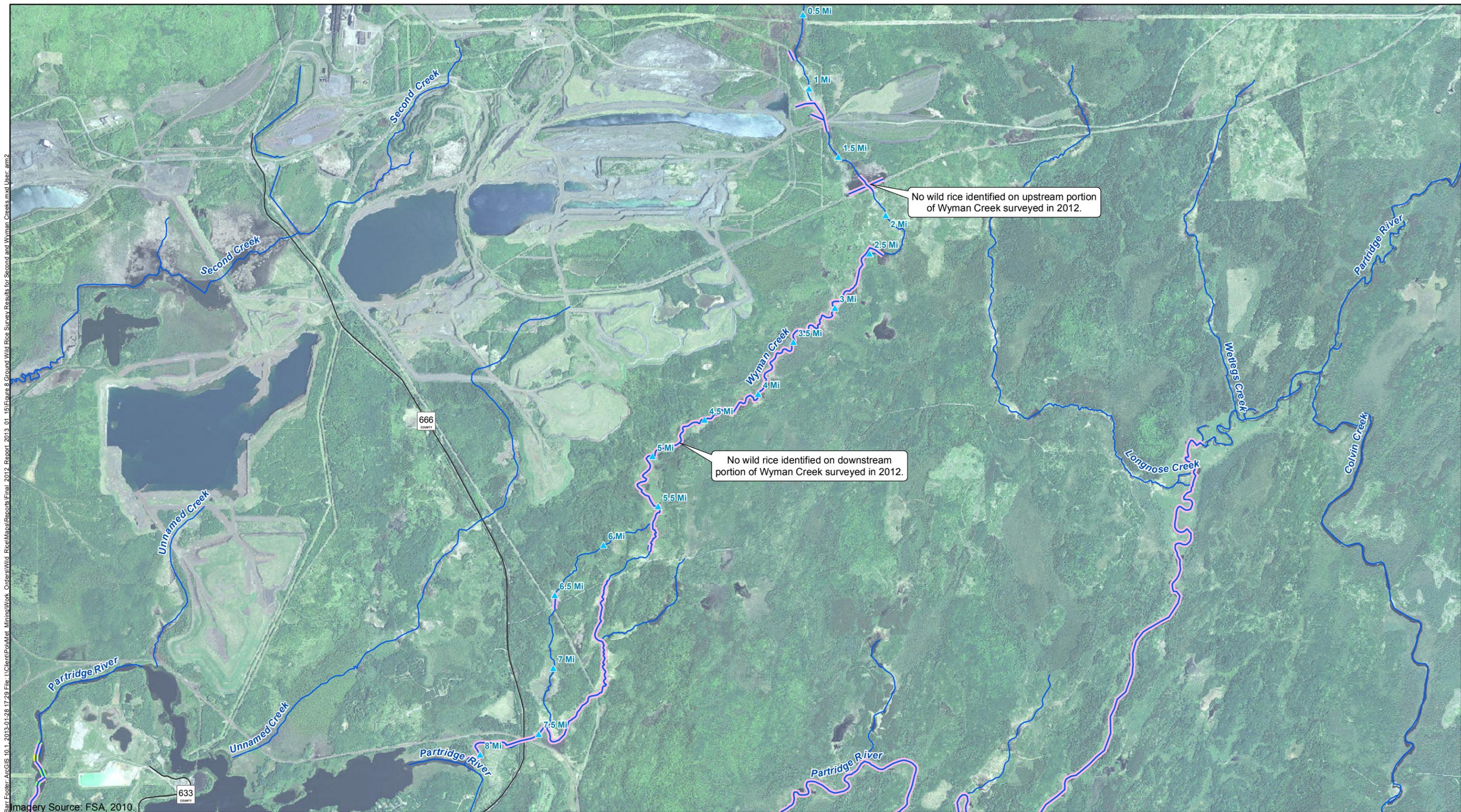
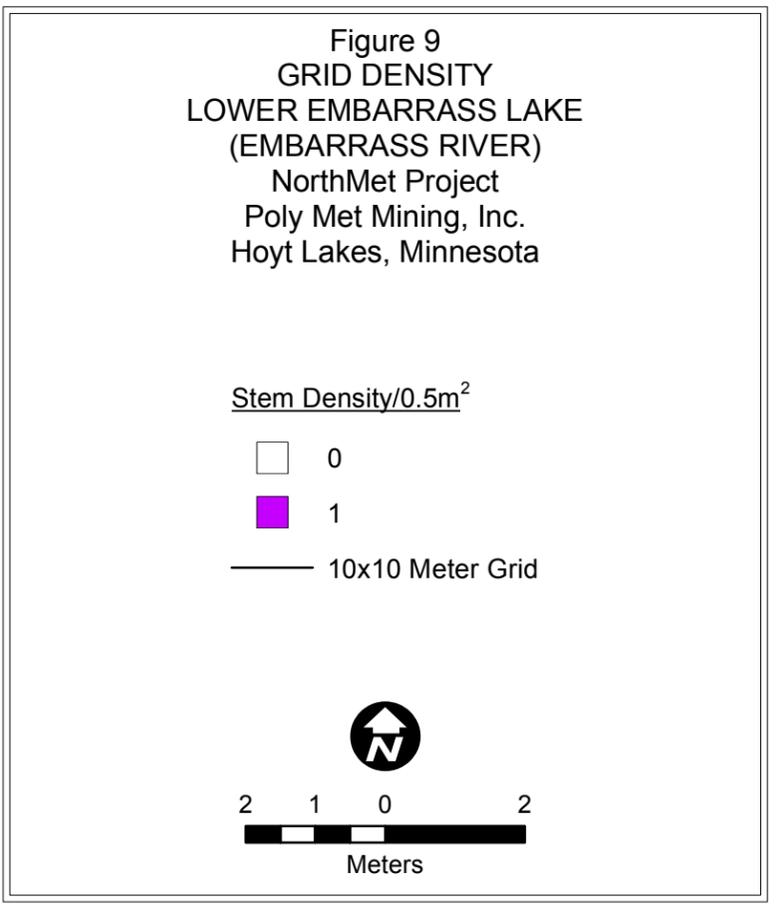
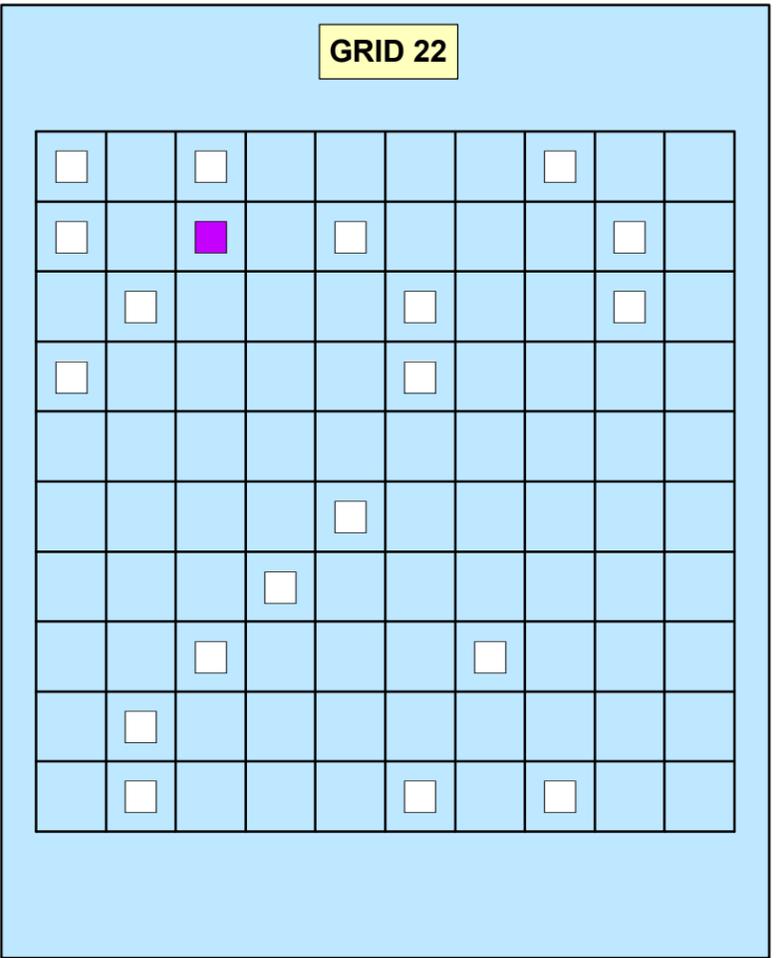
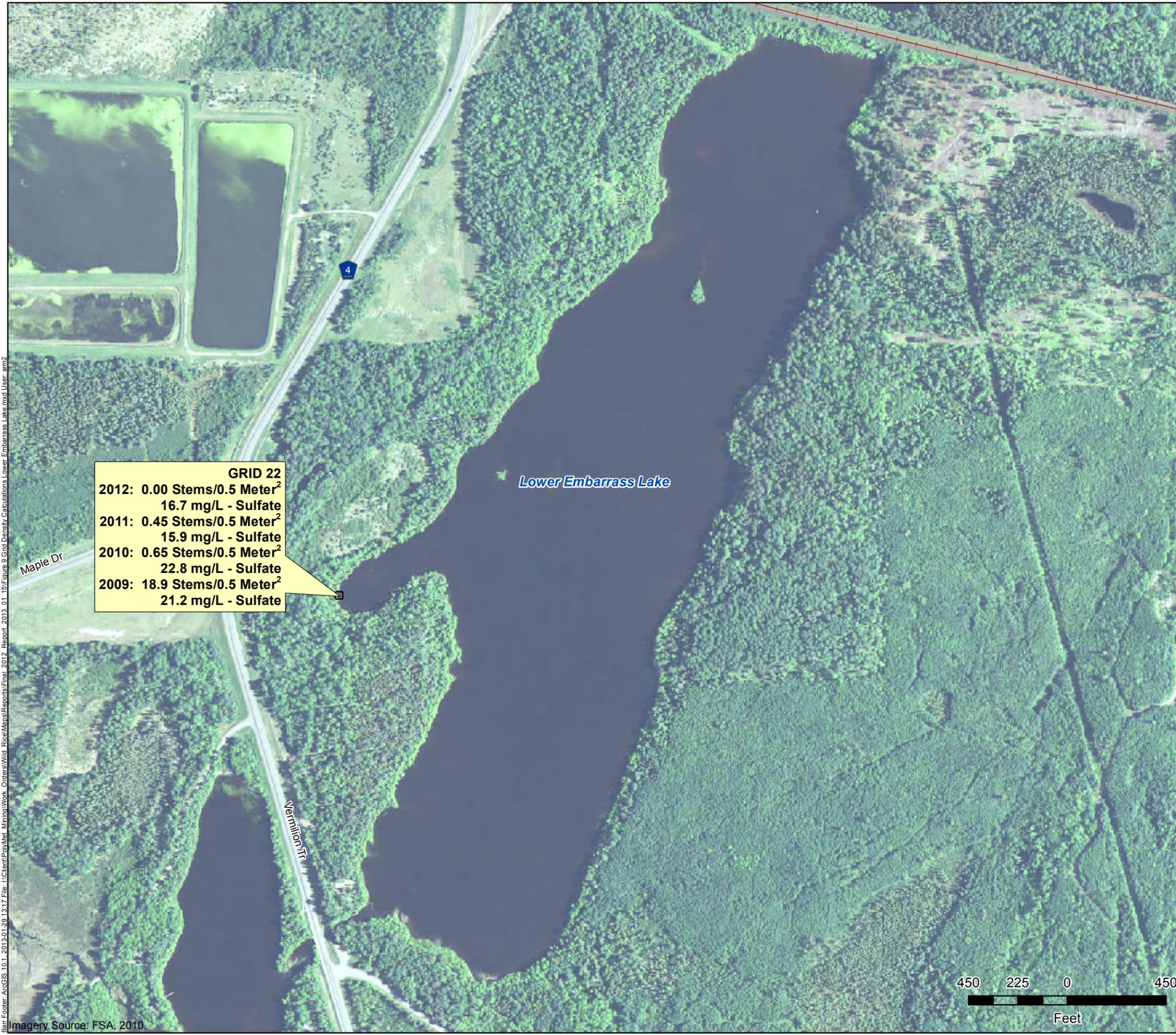


Figure 8
 GROUND WILD RICE SURVEY
 RESULTS FOR WYMAN CREEK
 NorthMet Project
 Poly Met Mining, Inc.
 Hoyt Lakes, Minnesota



Barr Footer: ArcGIS 10.1, 2013-01-29 13:17 File: I:\Client\PolMet_Minima\Work_Orders\Wild_Rice\Mapa\Reports\Final_2012_Report_2013_01_15\Figure 9 Grid Density Calculations Lower Embarrass Lake.mxd User: am2

Imagery Source: FSA, 2010.



Barr Footer: ArcGIS 10.1, 2013-01-29 13:17 File: I:\Client\PointMet_Minima\Work Orders\Wild_Rice\Mapa\Reports\Final_2012_Report_2013_01_15\Figure 10 Grid Density Calculations Unnamed Lake.mxd User: am2

GRID 21
 2012: 2.0 Stems/0.5 Meter²
 16.4 mg/L - Sulfate
 2011: 1.7 Stems/0.5 Meter²
 17.3 mg/L - Sulfate
 2010: 5.1 Stems/0.5 Meter²
 23.0 mg/L - Sulfate
 2009: 20.0 Stems/0.5 Meter²
 20.9 mg/L - Sulfate

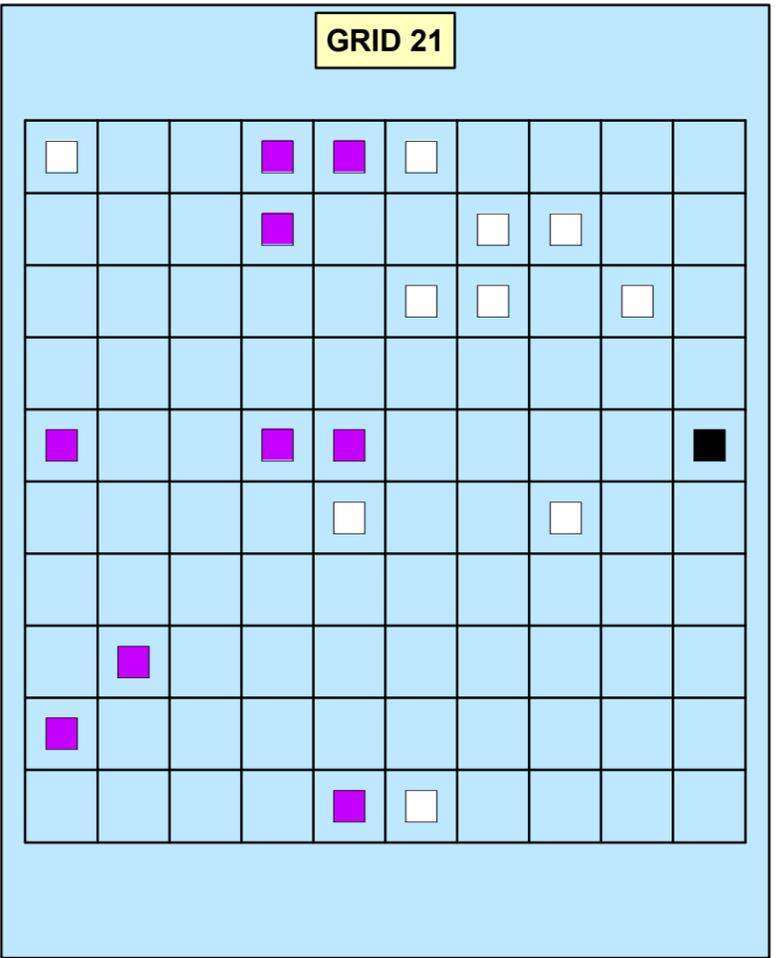
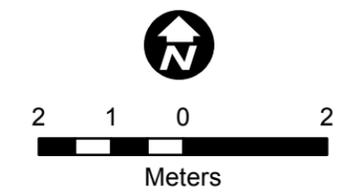
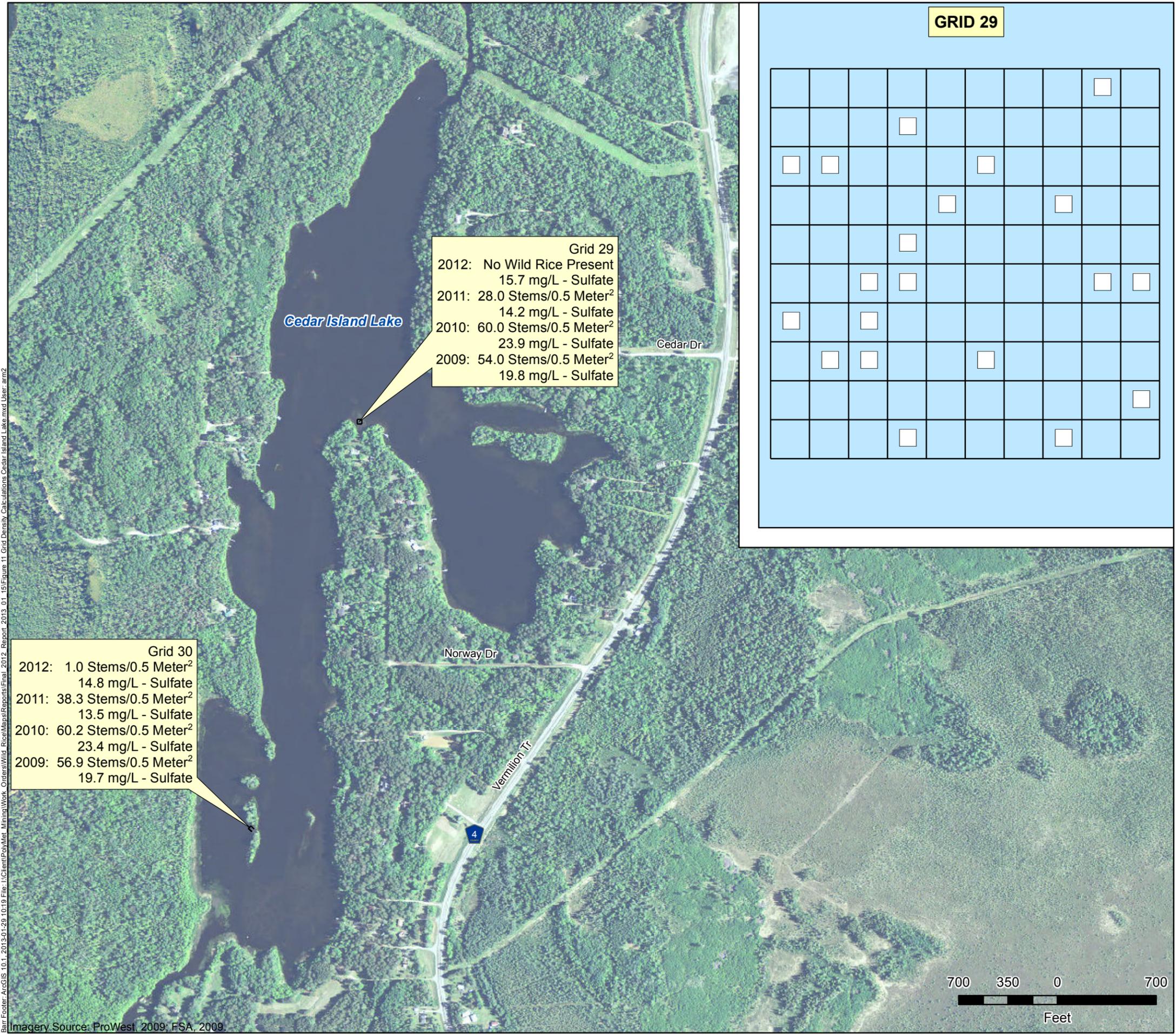


Figure 10
 GRID DENSITY
 UNNAMED LAKE
 (EMBARRASS RIVER)
 NorthMet Project
 Poly Met Mining, Inc.
 Hoyt Lakes, Minnesota

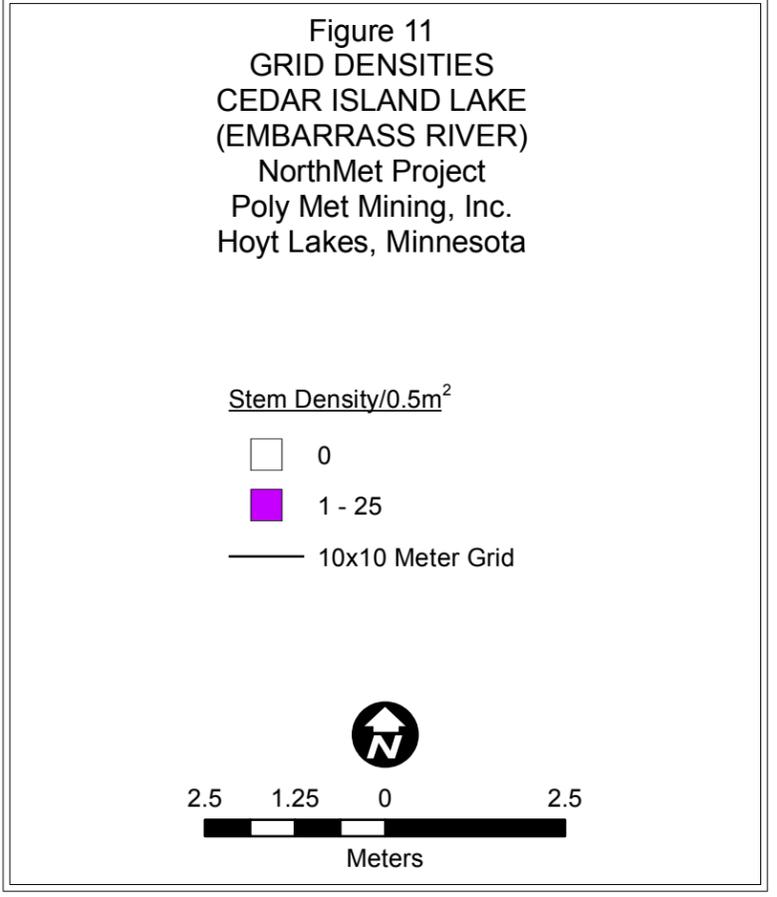
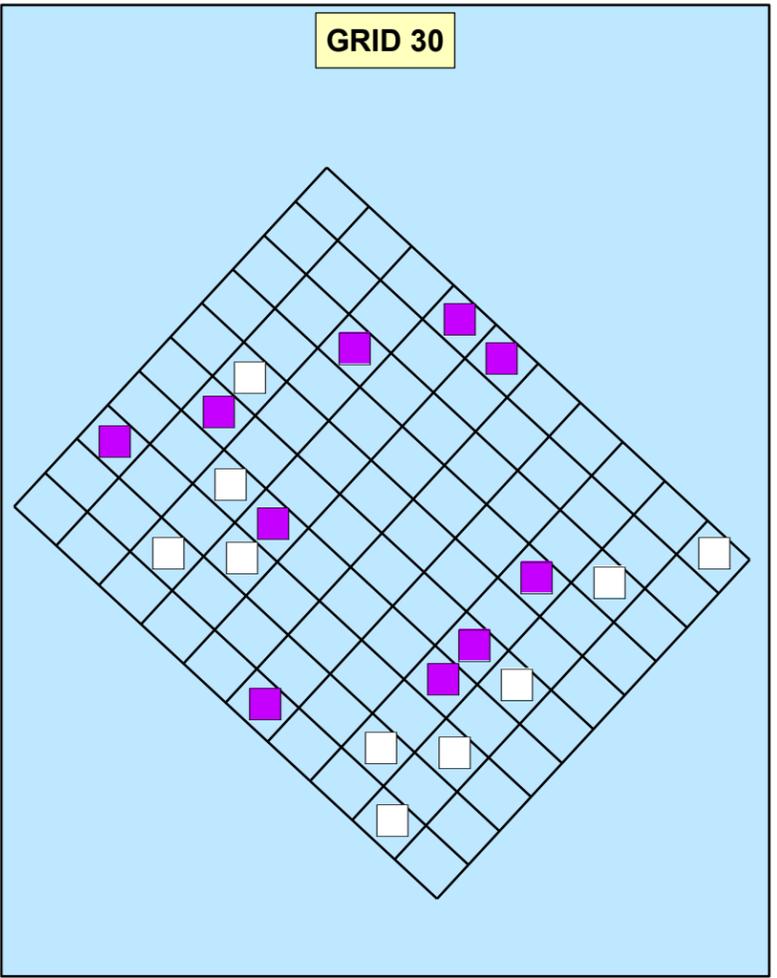
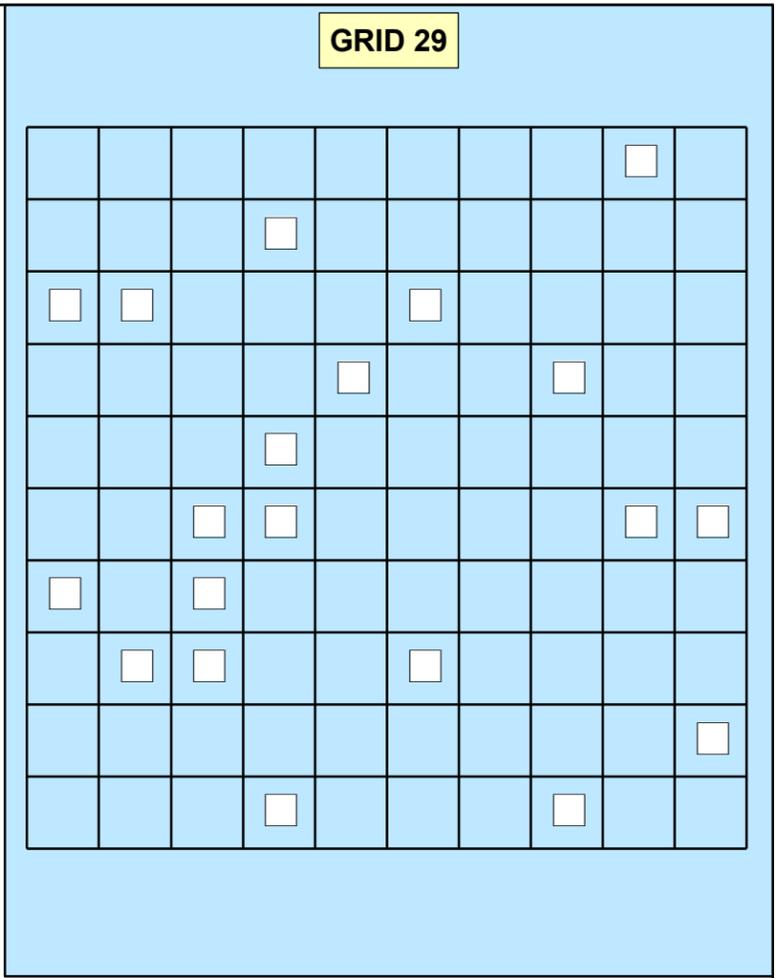
Stem Density/0.5m²
 ■ No Sample Taken
 □ 0
 ■ 1 - 25
 — 10x10 Meter Grid





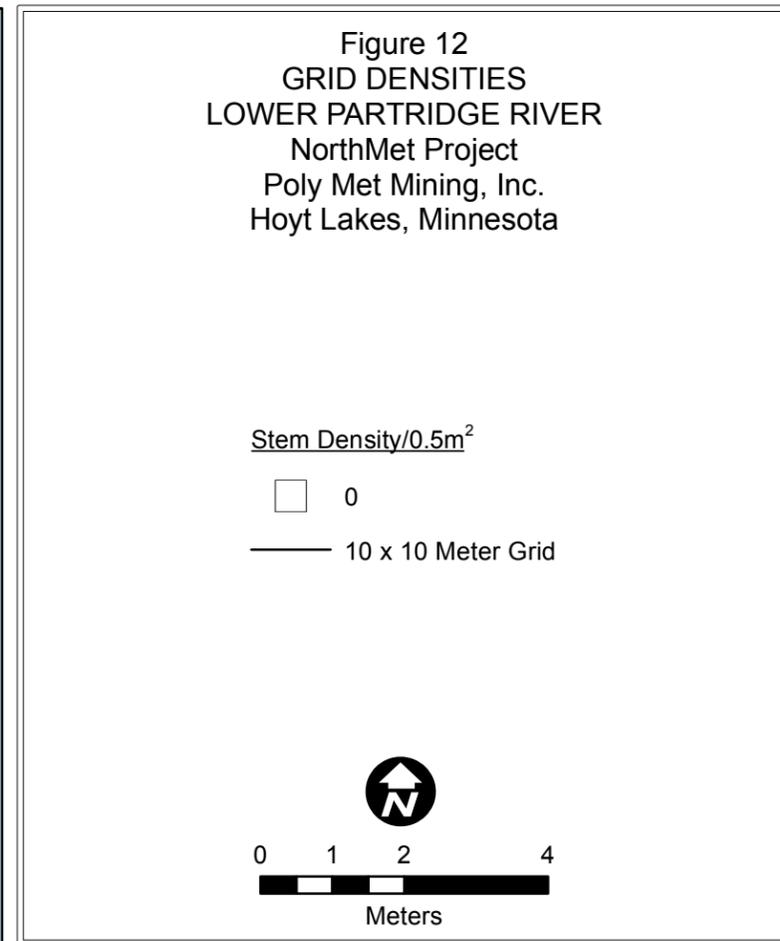
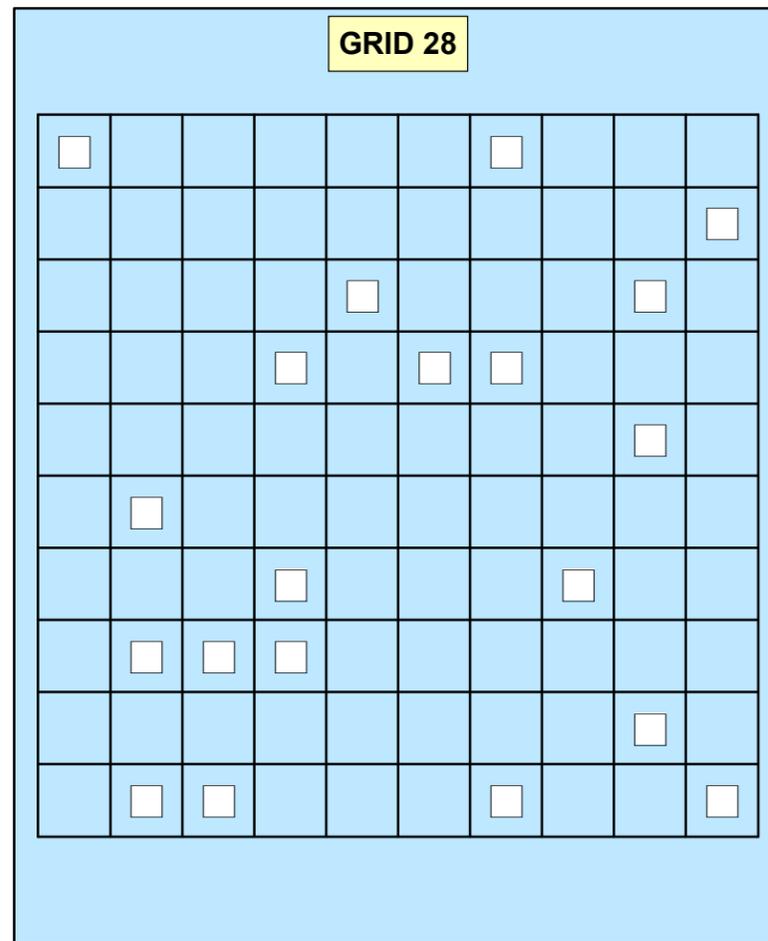
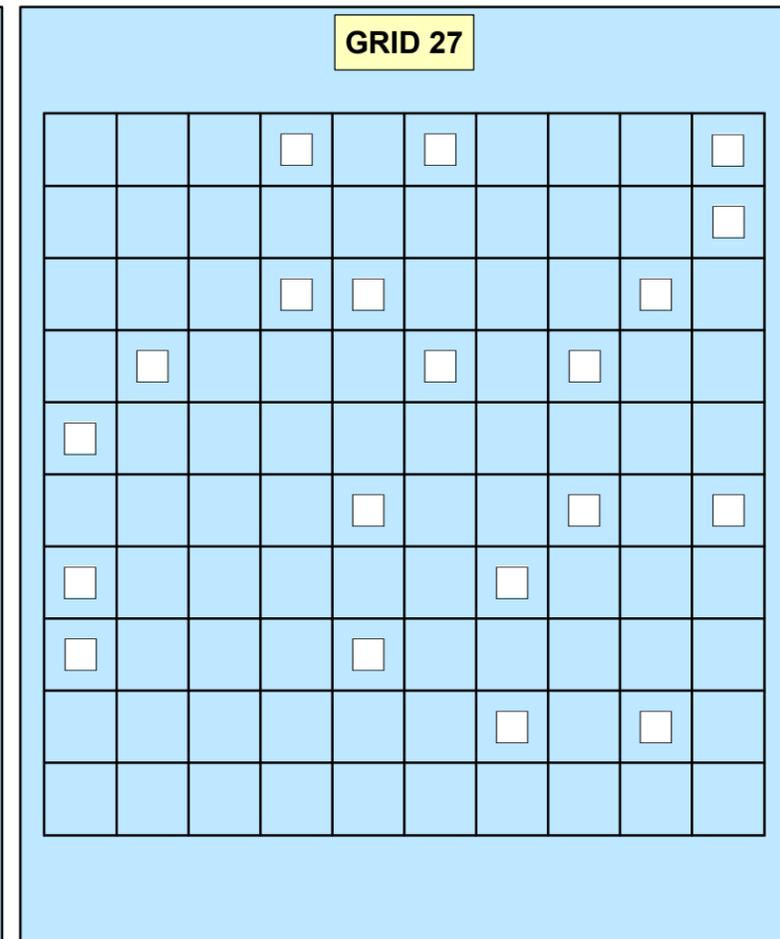
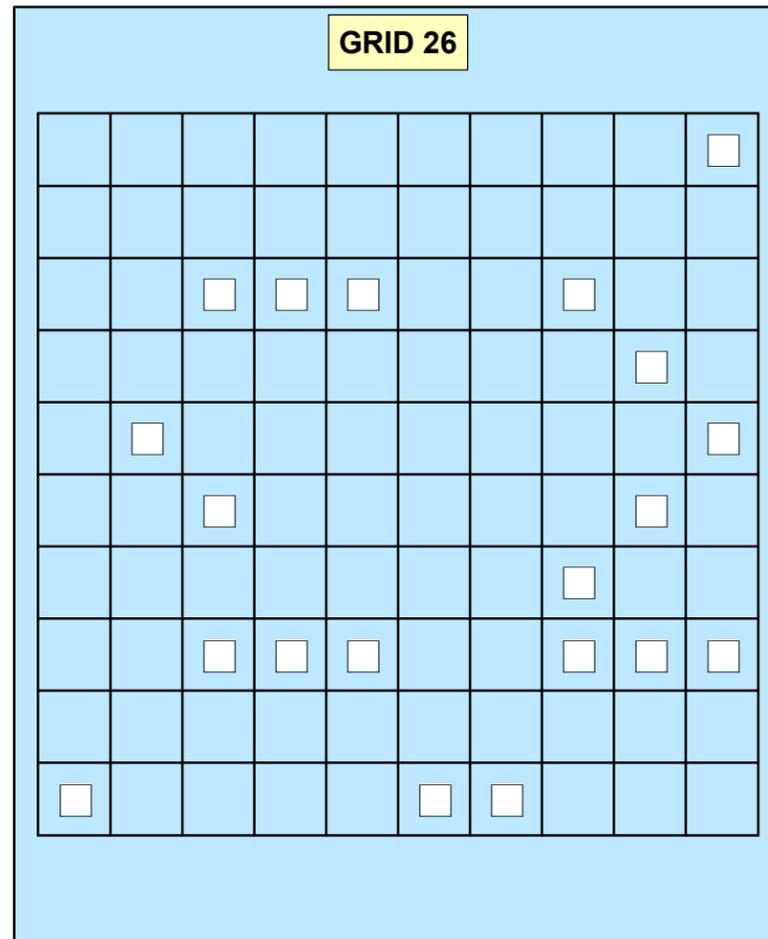
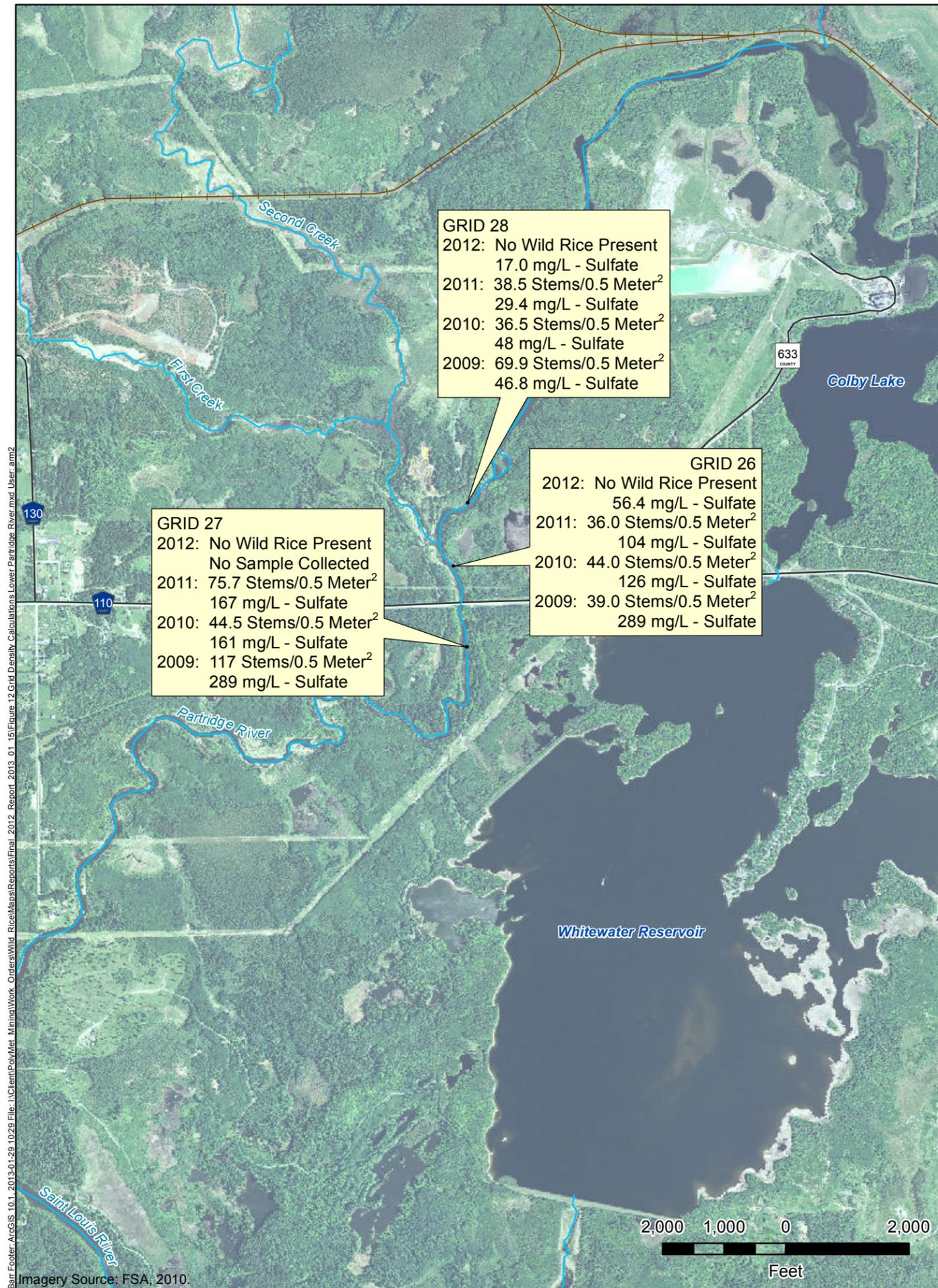
Grid 29
 2012: No Wild Rice Present
 15.7 mg/L - Sulfate
 2011: 28.0 Stems/0.5 Meter²
 14.2 mg/L - Sulfate
 2010: 60.0 Stems/0.5 Meter²
 23.9 mg/L - Sulfate
 2009: 54.0 Stems/0.5 Meter²
 19.8 mg/L - Sulfate

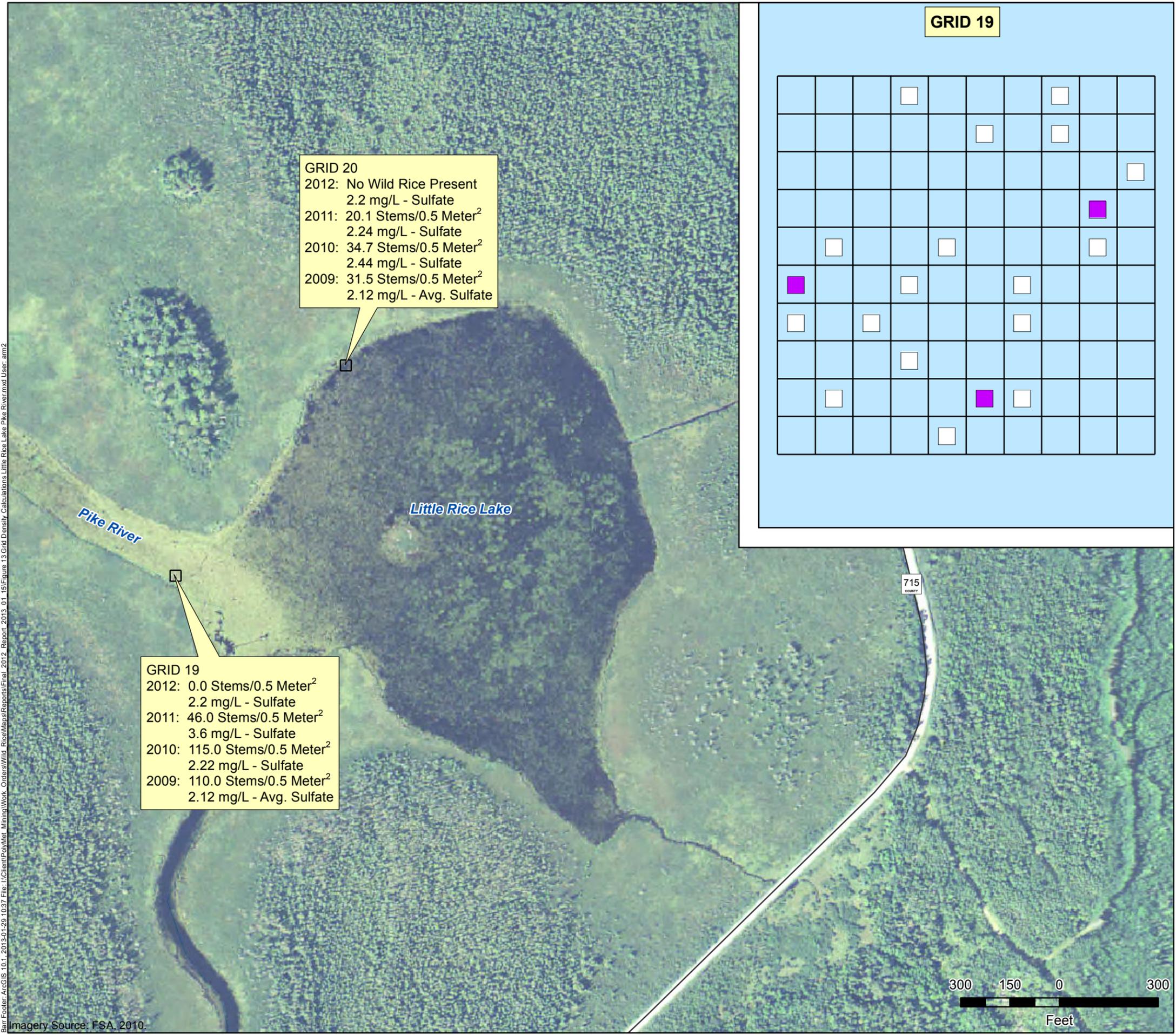
Grid 30
 2012: 1.0 Stems/0.5 Meter²
 14.8 mg/L - Sulfate
 2011: 38.3 Stems/0.5 Meter²
 13.5 mg/L - Sulfate
 2010: 60.2 Stems/0.5 Meter²
 23.4 mg/L - Sulfate
 2009: 56.9 Stems/0.5 Meter²
 19.7 mg/L - Sulfate



Barr Footer: ArcGIS 10.1, 2013-01-29 10:19 File: I:\Client\Polymet_Minima\Work_Orders\Wild_Rice\Mapa\Reports\Final_2012_Report_2013_01_15\Figure 11_Grid_Density_Calculations_Cedar_Island_Lake.mxd User: arm2

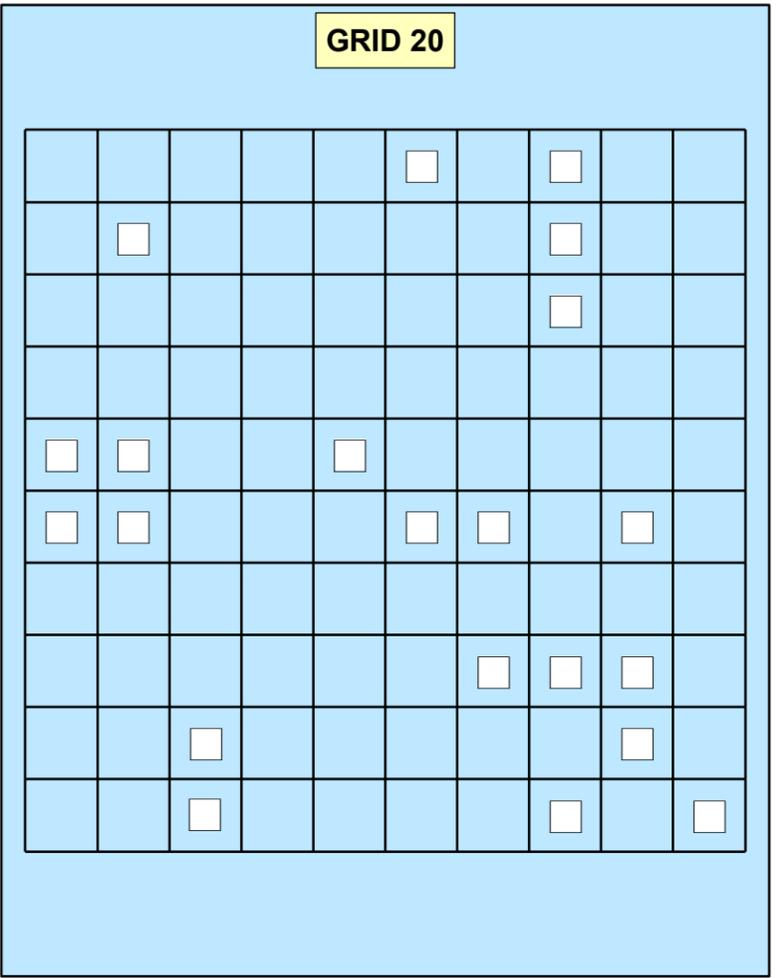
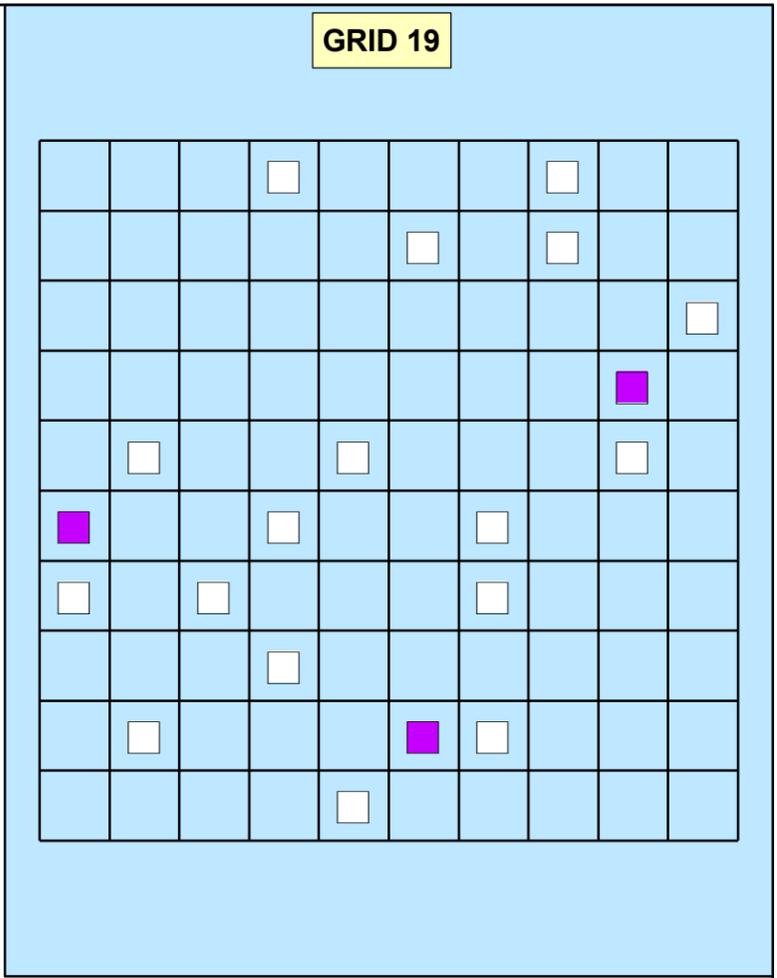
Imagery Source: ProWest, 2009; FSA, 2009.





GRID 20
 2012: No Wild Rice Present
 2.2 mg/L - Sulfate
 2011: 20.1 Stems/0.5 Meter²
 2.24 mg/L - Sulfate
 2010: 34.7 Stems/0.5 Meter²
 2.44 mg/L - Sulfate
 2009: 31.5 Stems/0.5 Meter²
 2.12 mg/L - Avg. Sulfate

GRID 19
 2012: 0.0 Stems/0.5 Meter²
 2.2 mg/L - Sulfate
 2011: 46.0 Stems/0.5 Meter²
 3.6 mg/L - Sulfate
 2010: 115.0 Stems/0.5 Meter²
 2.22 mg/L - Sulfate
 2009: 110.0 Stems/0.5 Meter²
 2.12 mg/L - Avg. Sulfate



**Figure 13
 GRID DENSITIES
 LITTLE RICE LAKE
 (PIKE RIVER)
 NorthMet Project
 Poly Met Mining, Inc.
 Hoyt Lakes, Minnesota**

Stem Density/0.5m²

0
 1
 10x10 Meter Grid

0 1 2 4
Meters

Figure 14 Mean and Standard Deviation of Total Calculated Plant Weight (g) in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

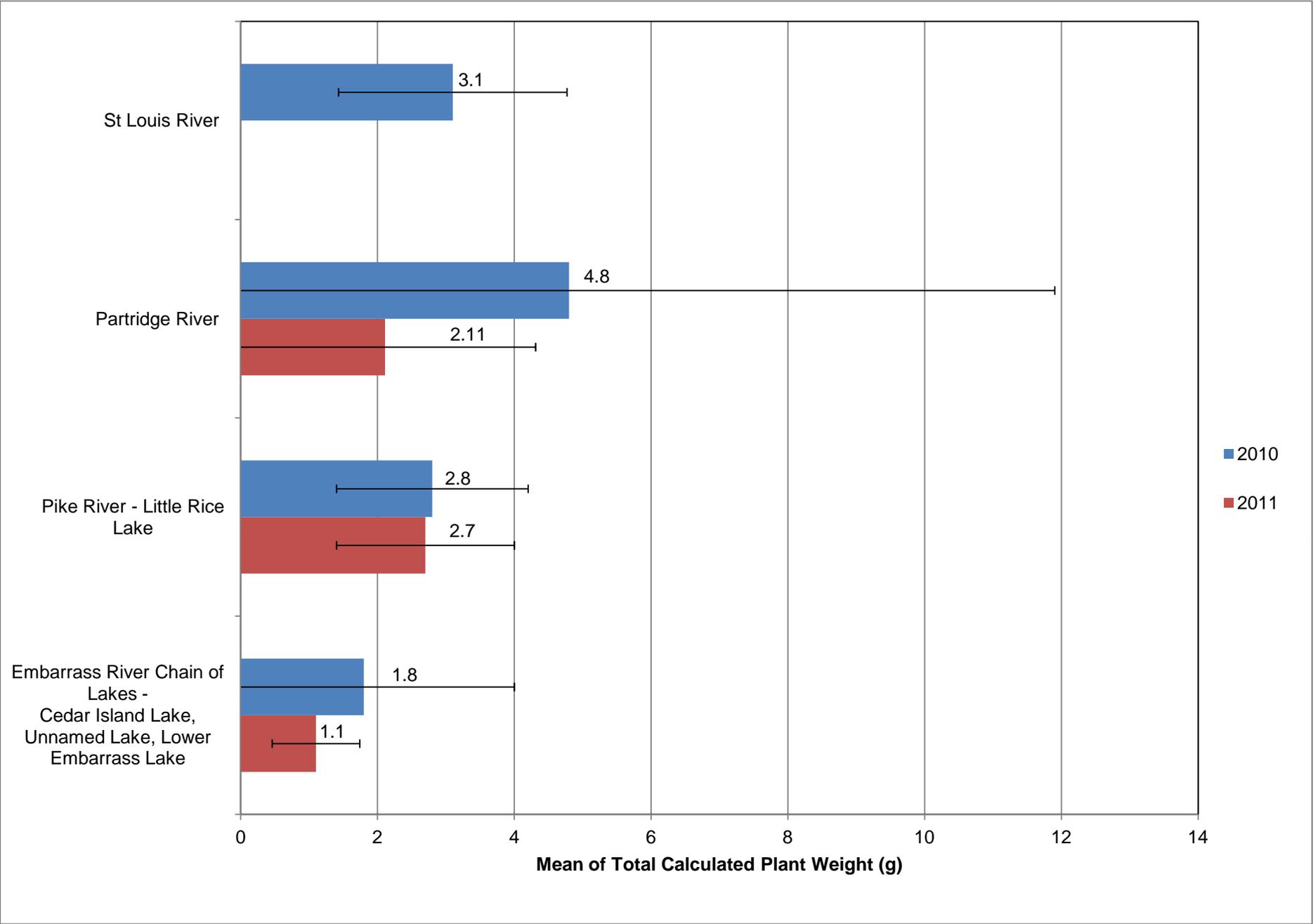


Figure 15 Mean and Standard Deviation of Root Weight (g) in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

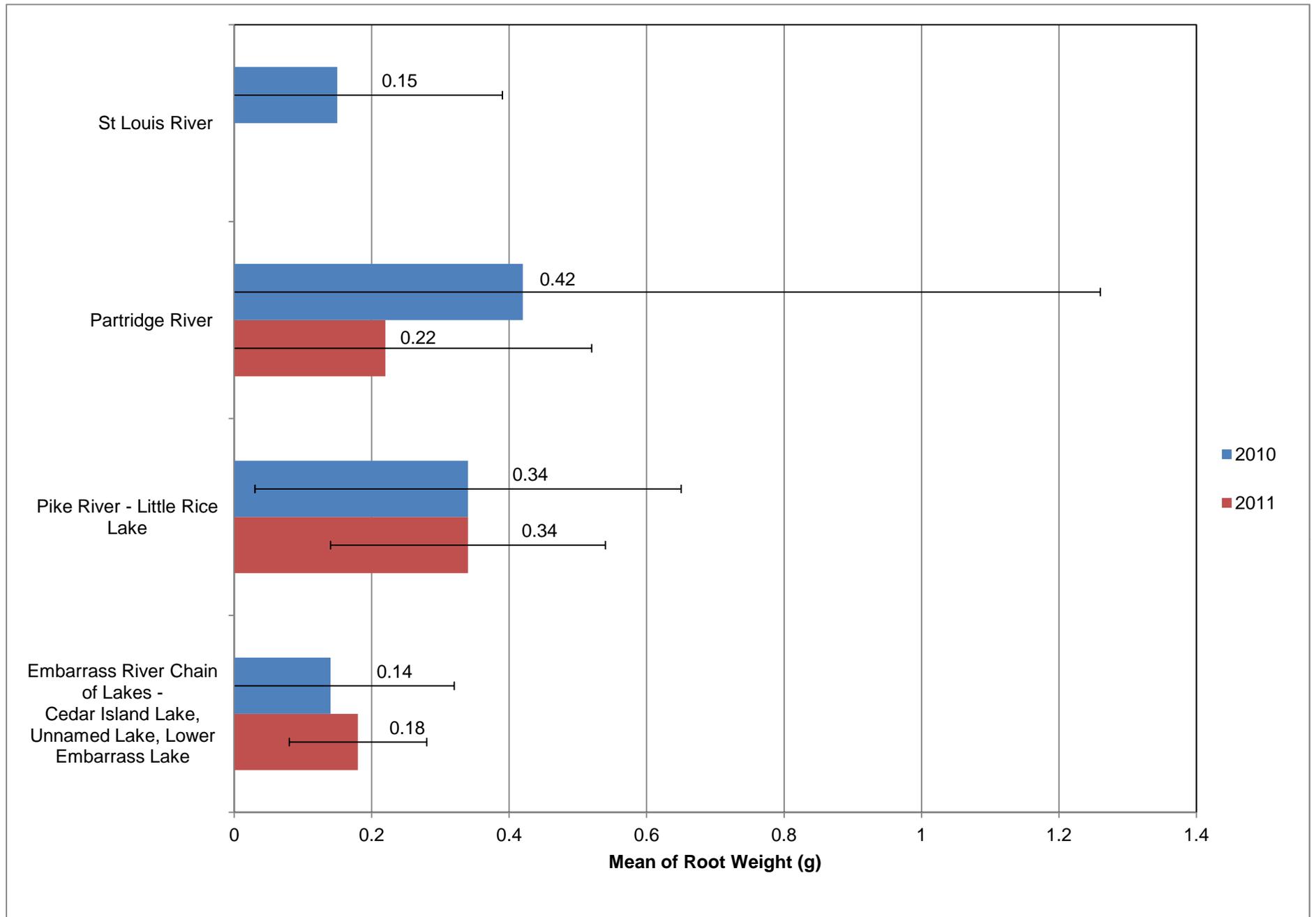


Figure 16 Mean and Standard Deviation of Shoot Weight (g) in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

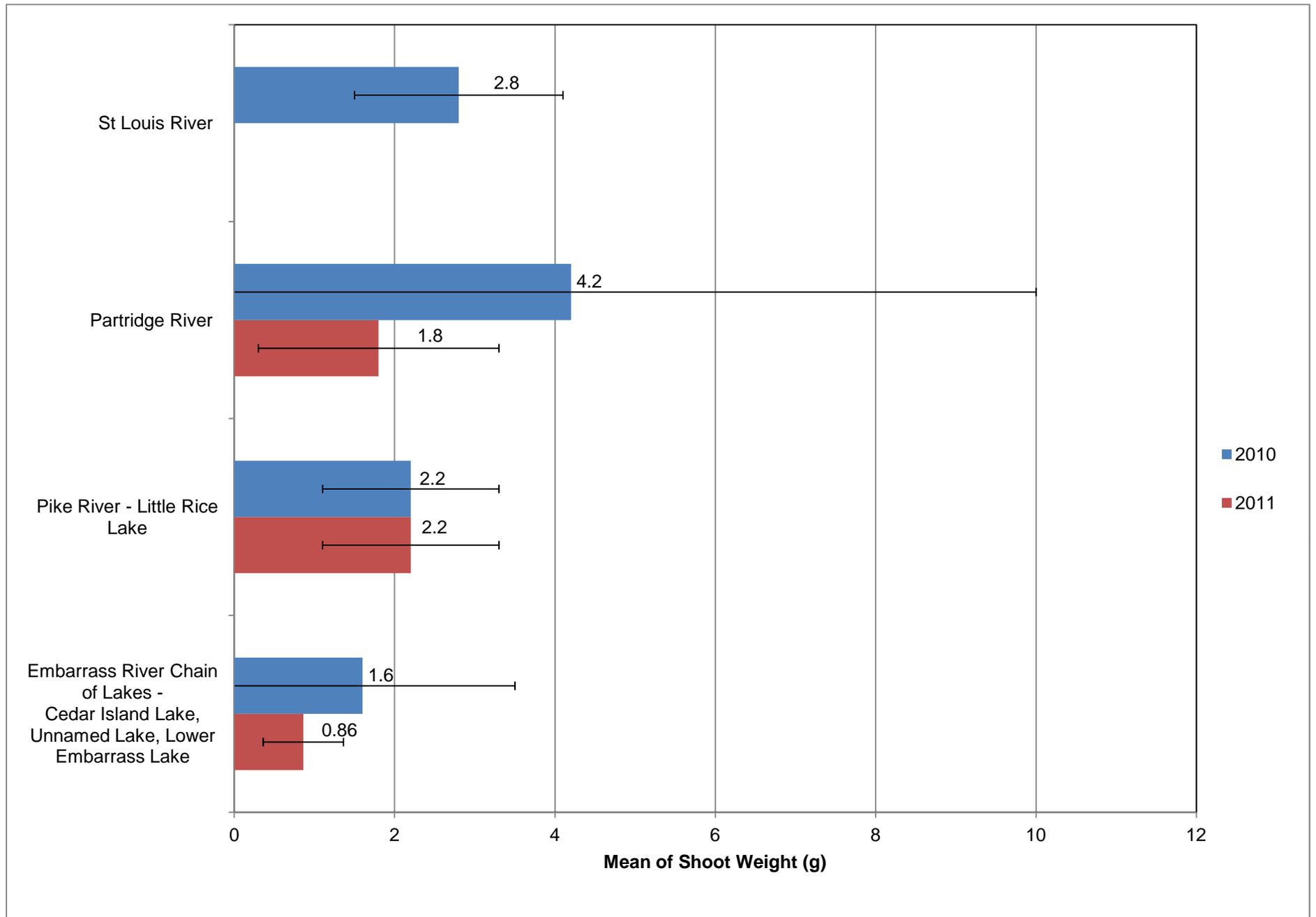


Figure 17 Mean and Standard Deviation of
Calculated Seed Weight (g) in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

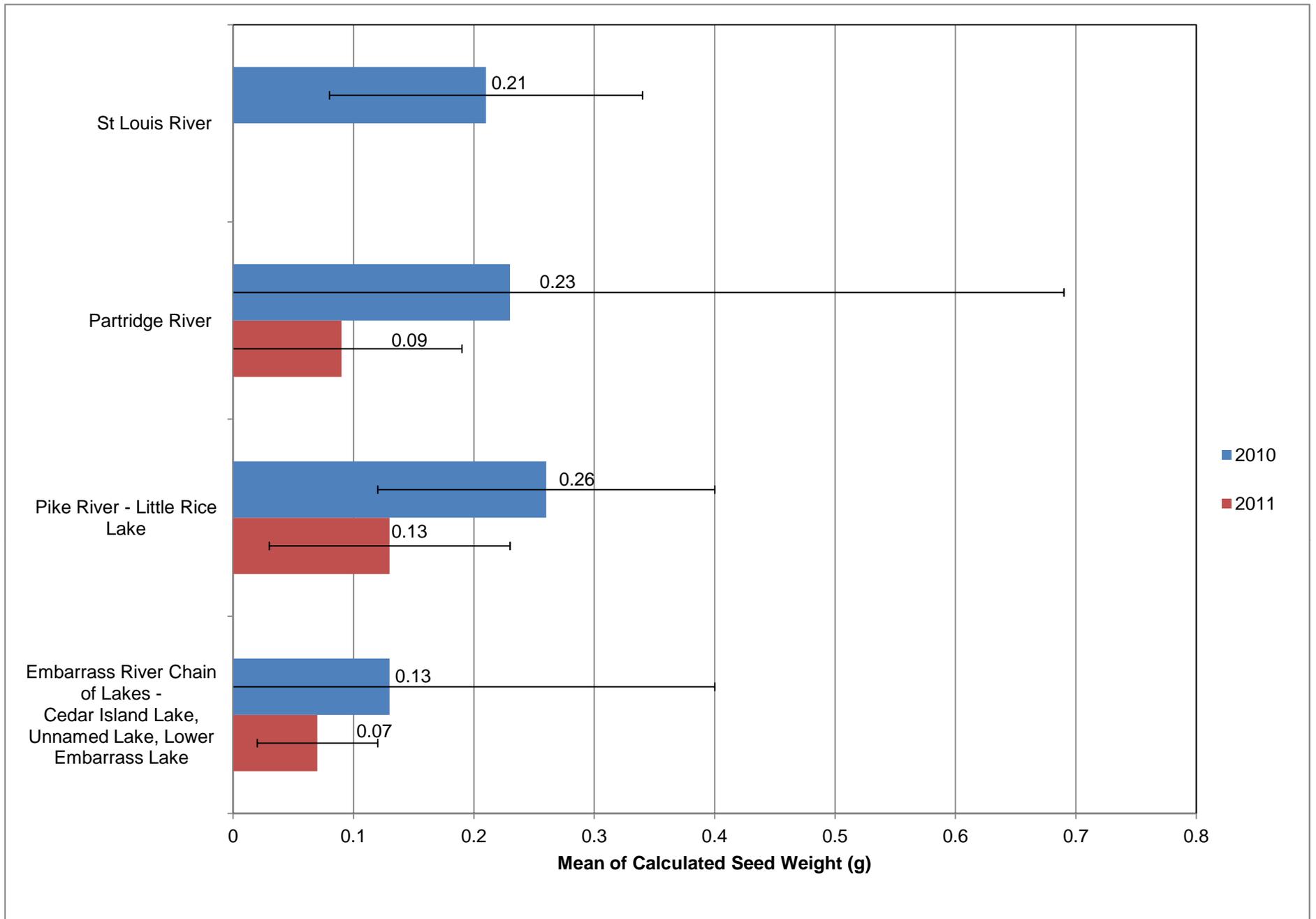


Figure 18 Mean and Standard Deviation of the Calculated Seed Number in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

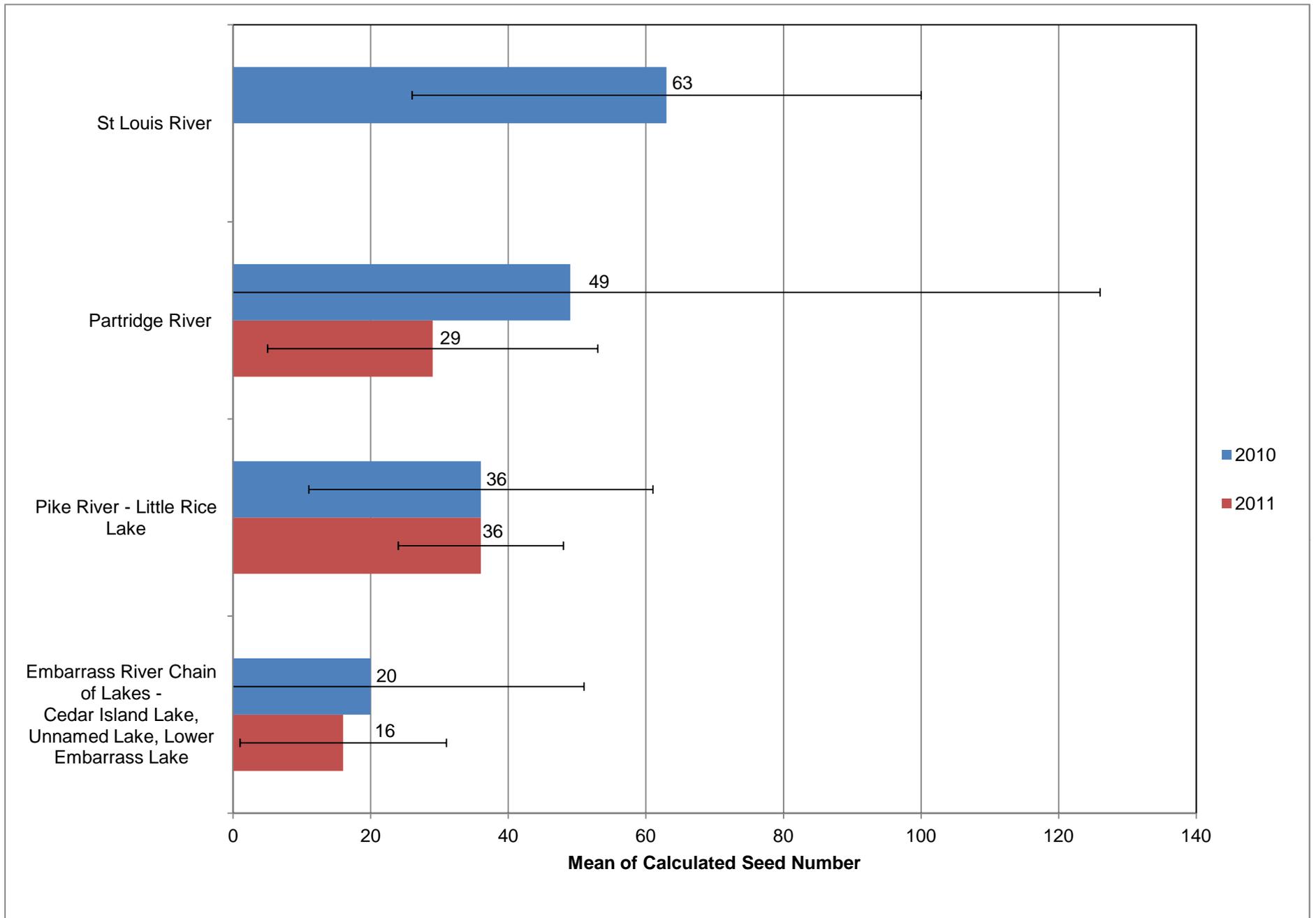


Figure 19 Median of
Total Calculated Plant Weight (g) in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

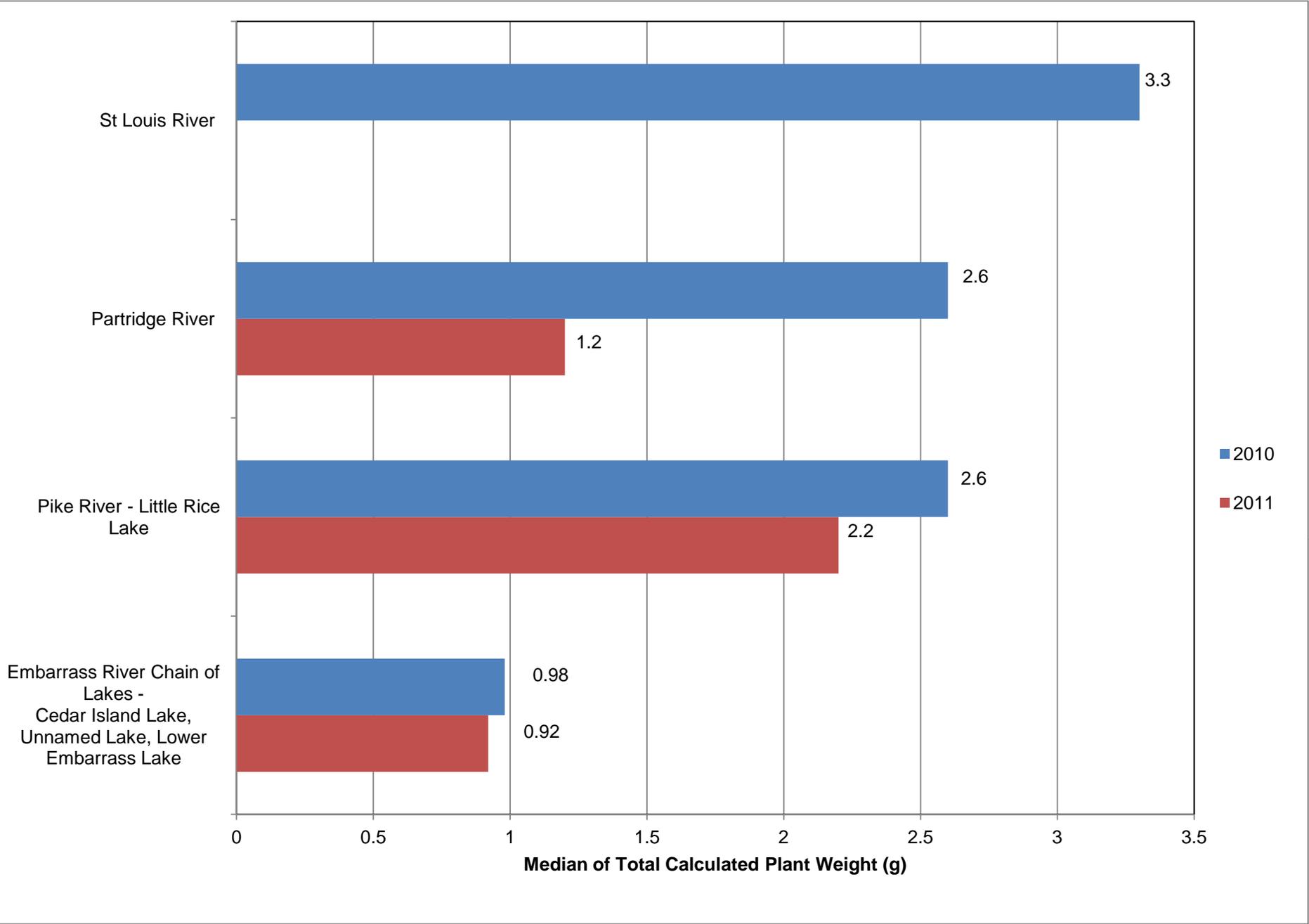


Figure 20 Median of
Root Weight (g) in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

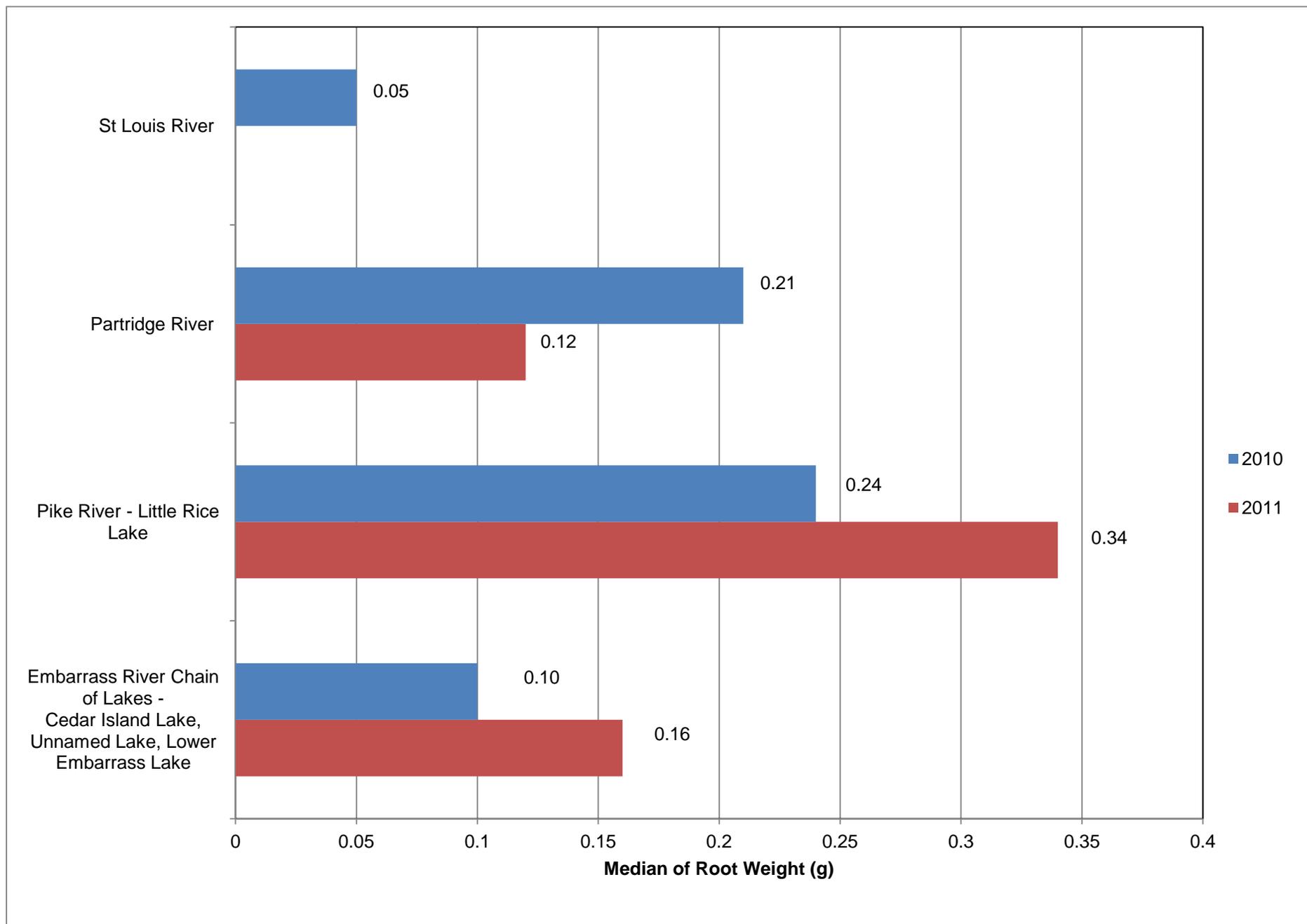


Figure 21 Median of
Shoot Weight (g) in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

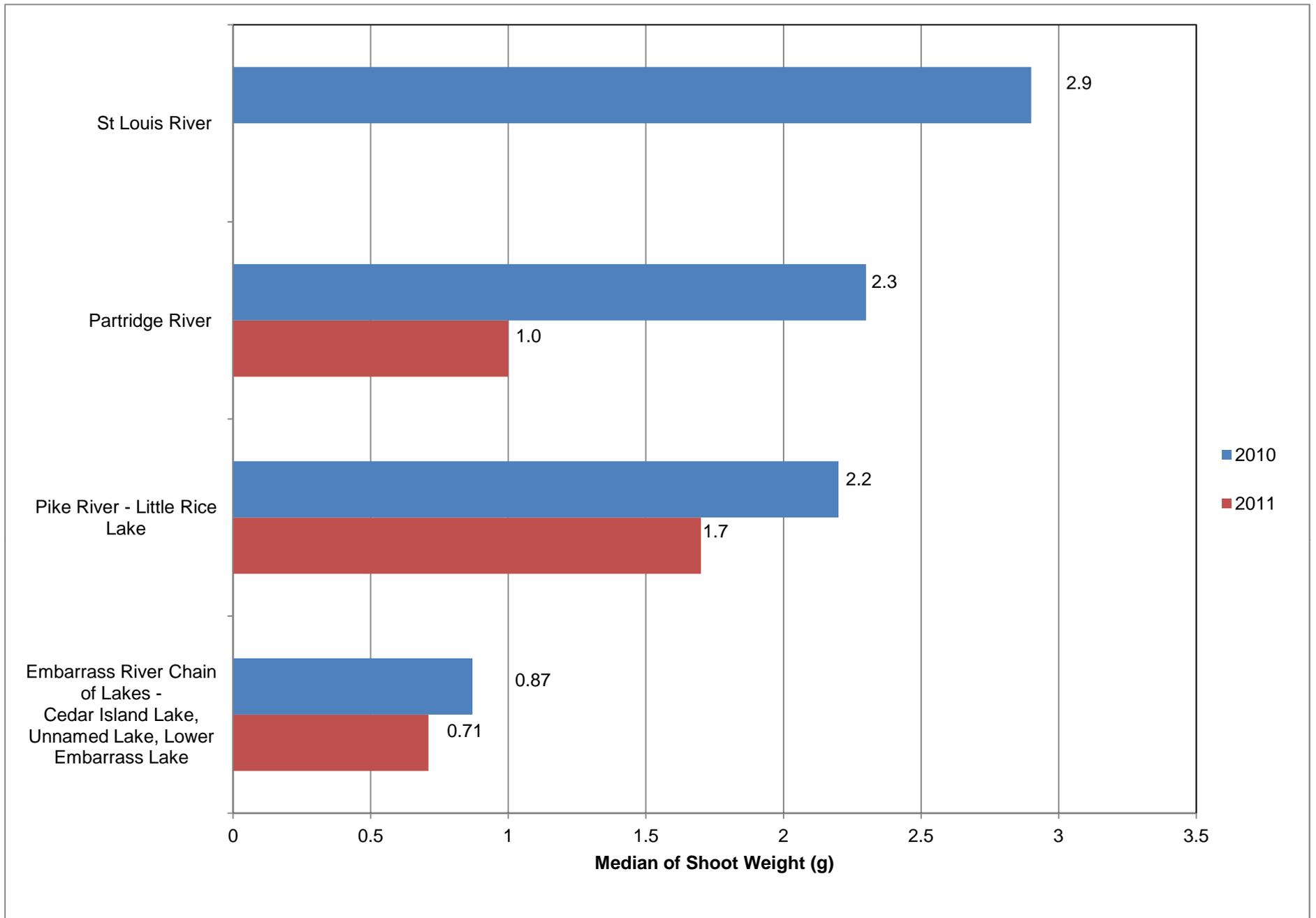


Figure 22 Median of
Seed Weight (g) in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

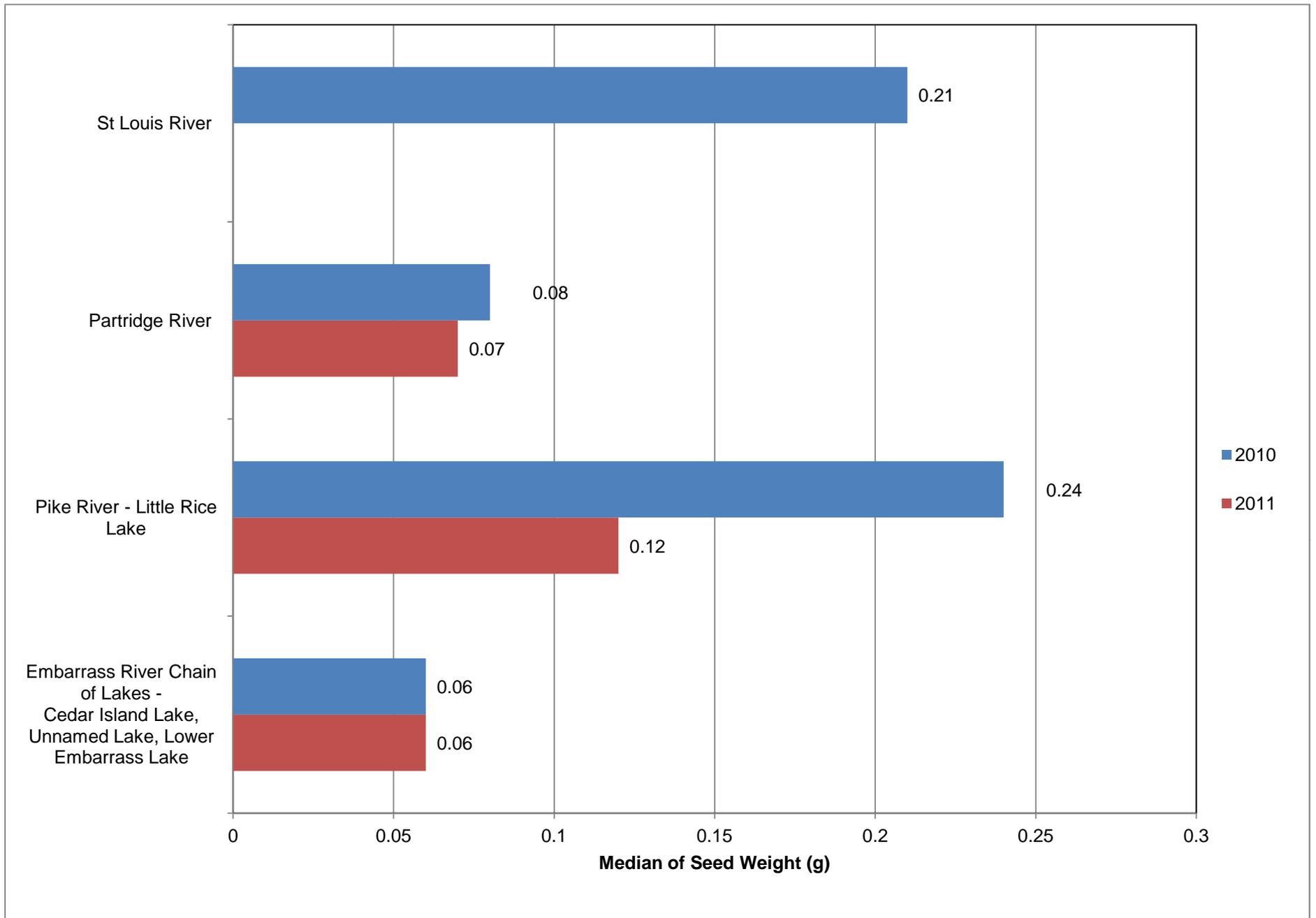


Figure 23 Median of
the Calculated Seed Number in the Partridge River, Pike River, and Embarass River Water Bodies, 2010-2011, and St Louis River, 2010

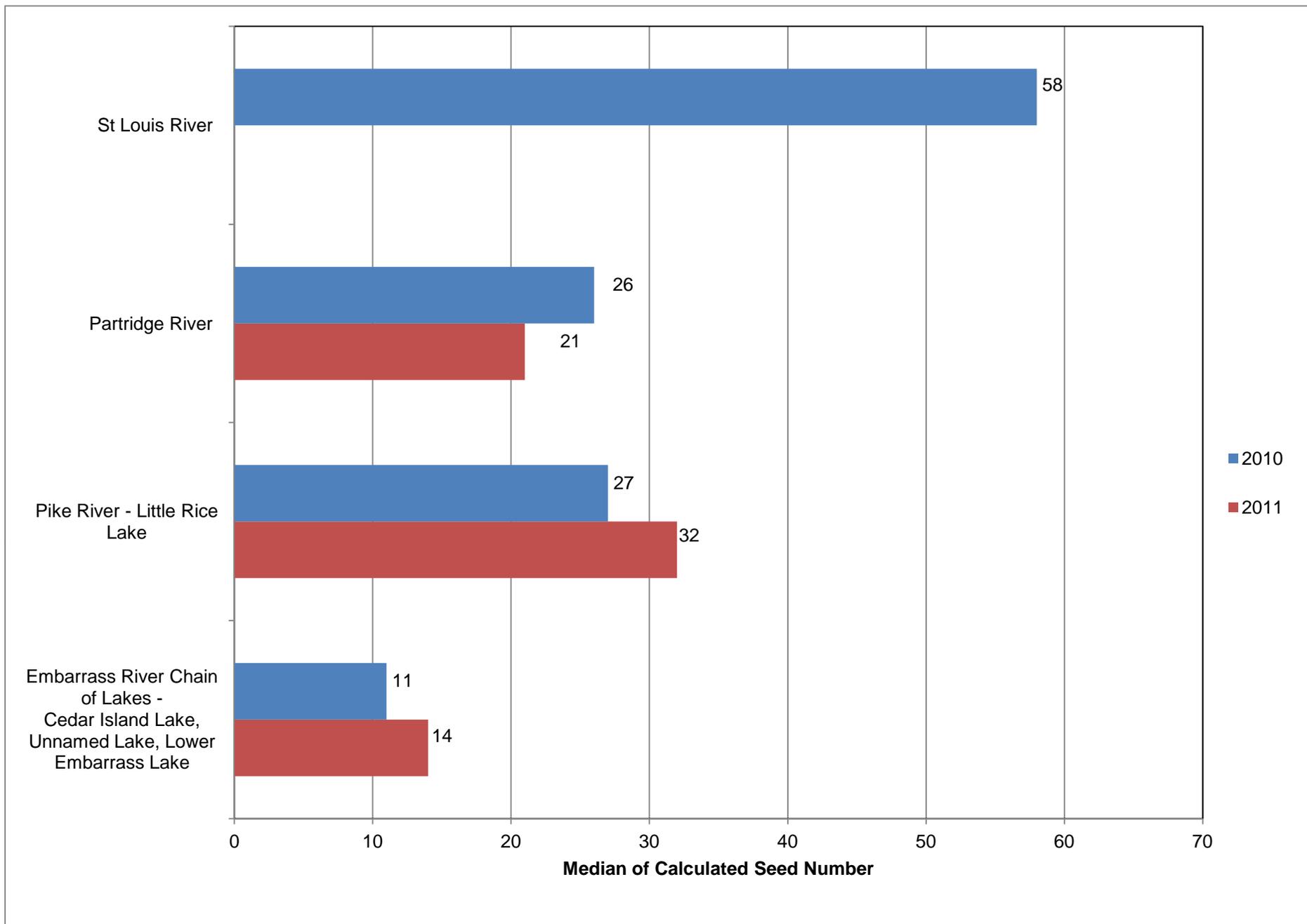


Exhibit A

2012 Wild Rice Study Area Photographs



Figure A1: Cedar Island Lake (sparse wild rice) – August 9, 2012



Figure A2: Cedar Island Lake (sparse wild rice) – August 23, 2012



Figure A3: Little Rice Lake (sparse wild rice) – August 8, 2012



Figure A4: Pike River (sparse wild rice) – August 7, 2012



Figure A5: Hay Lake near Pike River (sparse wild rice) – August 22, 2012



Figure A6: Partridge River at Second Creek (moderate wild rice) – August 7, 2012



Figure A7: Upper Partridge River (no wild rice) – August 9, 2012



Figure A8: Second Creek (moderate wild rice) – August 30, 2012



Figure A9: Upper Embarrass River (sparse wild rice), August 16, 2012



Figure A10: Hay Lake near Embarrass River (sparse wild rice) – August 16, 2012