

**Results of a September 2009 Freshwater Mussel (Mollusca: Bivalvia:
Unionidae) Survey in the Partridge River near the Proposed NorthMet Mine
Project, northeastern Minnesota.**

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FINAL

INTRODUCTION

The PolyMet Mining Corporation is proposing to open and operate the NorthMet Mining Project located six miles South of Babbitt, northeastern Minnesota, near the Mesabi Iron Range. The deposit contains various metals including platinum, palladium, gold, copper, nickel, cobalt and silver. Permitting of the proposed mine requires completion of an Environmental Impact Statement. In order to submit an Environmental Impact Statement, the project applicant is required to conduct various environmental and biological investigations.

The United States Forest Service Region 9 (USFS R9) and PolyMet Mining, Inc. (PolyMet) are also in the process of completing an environmental impact statement (EIS) for a land exchange which includes lands within and around the proposed NorthMet Project. The USFS owns the surface rights in the land exchange area. As part of the land exchange, an evaluation of the species in the Partridge River within the Land Exchange parcel is required because the USFS is responsible for assuring the protection of sensitive and other animal species.

Freshwater mussels are one of the most imperiled groups of organisms in the world. About three-quarters of the 297 North American species are in decline or are extinct (Neves & Williams, 1994). Causes for this decline are many, but most include changes in land use and water use.

During 2004, I conducted mussel surveys in the vicinity of the proposed mine on the Partridge River, Embarrass River and Trimble Creek (Heath, 2004). During 2009, I conducted a mussel survey requested by Barr Engineering Company on the Partridge River at two sites that were assumed to be unimpacted by proposed mining operations and mine construction. The purpose of this report is to summarize the habitat characteristics of the fauna at the two selected sites in this River that have not been previously field surveyed as part of the PolyMet NorthMet Project EIS. This report presents results of the 2009 survey.

METHODS AND MATERIALS

This mussel survey was conducted during August 31, 2009 at two sites in the Partridge River. The upstream site was located about 180m downstream of the confluence with Yelp Creek and about 1.5km downstream of the headwaters of the Partridge River. The downstream site was located about 7.0km downstream of the headwaters of the Partridge River (Figure 1). Site photographs are given in Figures 2-5. The Partridge River discharges into the St. Louis River, which in turn empties into Lake Superior.

Universal Transverse Mercator coordinates were taken at each site using a Trimble® natural

resource grade Global Positioning Unit receiver. Linear distances of stream bottom sampled at each site were visually estimated. Descriptions of station locations are given in Table 1.

Freshwater mussels were collected by hand using snorkeling equipment. Mussels were searched visually and tactilely and all living and empty (dead) specimens encountered were collected, placed in a 0.125mm mesh- sized bag, brought to the surface, identified, enumerated, and measured. All substrate types were sampled including any unembedded large woody debris, undercut vegetated banks, and dense rooted aquatic macrophytes. Total length was measured as the maximum distance from the mussel's anterior end to its posterior end roughly parallel to the hinge line. Substrate types were visually and tactilely estimated.

RESULTS AND DISCUSSION

I found a total of 26 living and one dead mussel at the downstream site and no living or dead freshwater mussels at the upstream site. All mussels found were *Pyganodon grandis* Say, 1829 (giant floater). Photographs of specimens collected are given in Figures 6 and 7. No examples of additional species were found empty (dead). No species were found that were listed as state or federally endangered or threatened. Counts and sizes of mussels are given in Table 2.

Total catch per hour of living mussels was 28.3 at the downstream site and 0.0 at the upstream site. This compares to a mean of 22.7 living mussels per hour (minimum = 0.0, maximum = 50.0) during work in 2004 in the Partridge River and nearby streams (Heath, 2004). Although not measured, population densities appeared low at the downstream site, probably less than 2/m². At the downstream site where mussels were found, small individuals of *P. grandis* were present, suggesting recent recruitment of young (Figure 8). Various miscellaneous and physical information are presented in Table 1. I spent a total of 42 minutes underwater at the upstream site and 55 minutes underwater at the downstream site.

Substrate types varied little among and within sites. Generally, the sites were dominated by detritus, which consisted primarily of flocculent peat. At the downstream site, about 20% of the substrate appeared to be clay. At both sites, large woody debris was present. At both locations submerged *Sparganium* sp. (burreed) was common and shorelines consisted of sedges and alder. The mean depth was 2.5m at the upstream site and 1.5 at the downstream site.

I compared previous freshwater mussel zoogeographical information to results of this survey. Sietman (2003) reported ten freshwater mussel species from the Lake Superior Basin in Minnesota (Table 3). Of these ten, all but one (*Utterbackia imbecillis* (Say, 1829)) was reported from the St. Louis River

watershed of the Lake Superior Basin, of which the Partridge River is a part. In this investigation, I found only one of these nine species. It's likely that some of the balance of species occurs farther downstream in the St. Louis River mainstem. These species are more characteristic of larger streams and include *Strophitus undulatus undulatus* (Say, 1817), *Lampsilis cardium* (Rafinesque, 1820), *Lasmigona complanata complanata* (Barnes, 1823) and *Ligumia recta* (Lamarck, 1819).

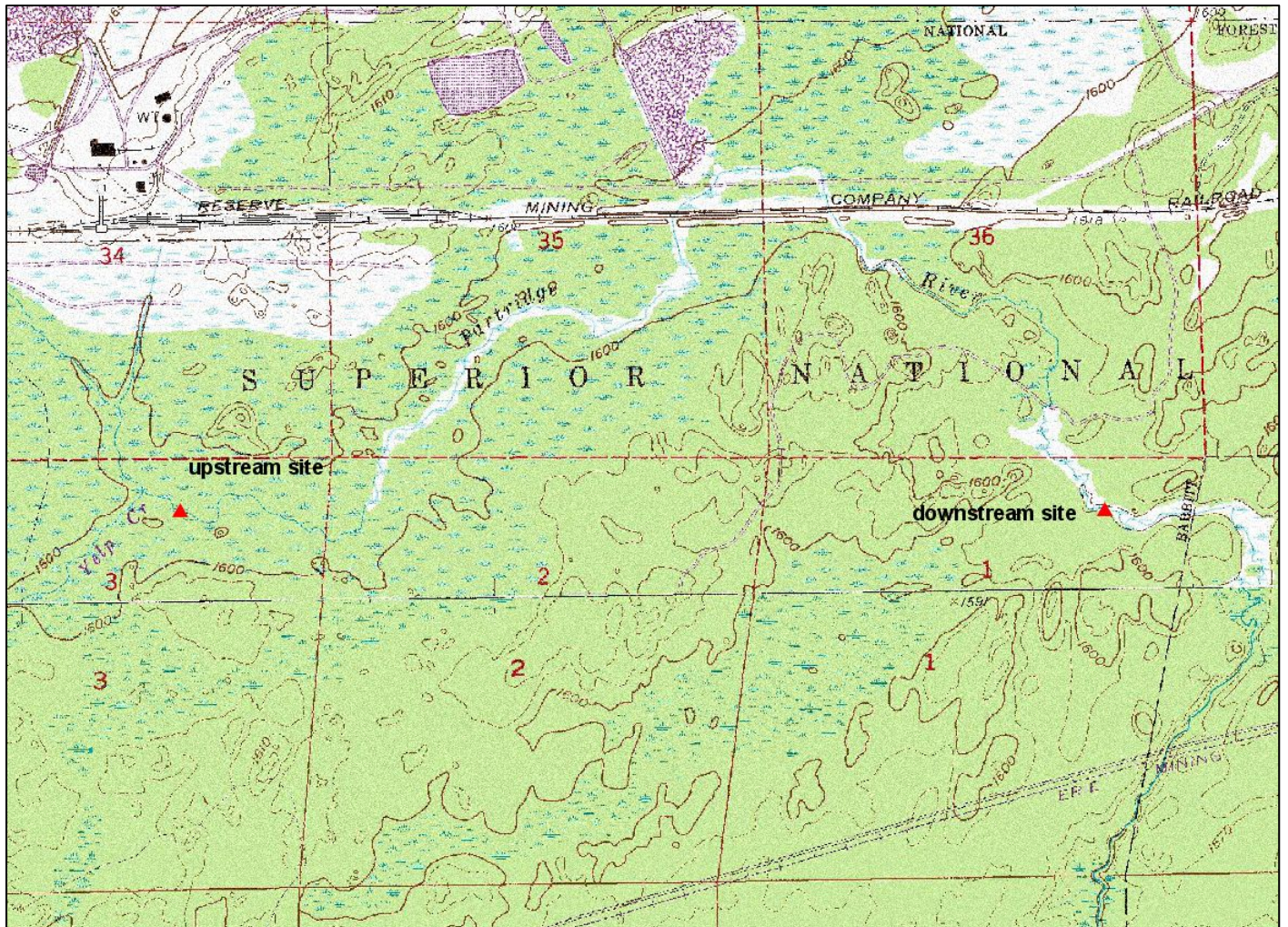
In both the Lake Superior basins in Minnesota and Wisconsin, the mussel fauna is depauperate compared to surrounding watersheds in the Mississippi River basin. For example, the St. Croix River can contain as many as 41 species at a site.

The fauna in the Partridge River surveyed in this investigation is typical for small streams in the western lake Superior Basin. The one species found in this survey is very widespread and common throughout the upper Midwest and is a generalist that occurs in nearly all types and sizes of waterbodies. It was not surprising to find that this species was the only one present this far up the watershed.

LITERATURE CITED

- Heath , David J. 2004. Results of a October 2004 Freshwater Mussel (Mollusca: Bivalvia: Unionidae) Survey in Trimble Creek, Partridge and Embarrass rivers near the Proposed NorthMet Mine Project, northeastern Minnesota. Prepared for Barr Engineering Company, Minneapolis, MN. 12 pp.
- Neves, R. J. and J. D. Williams. 1994. Status of the freshwater mussel fauna in the United States. J. Shellfish Res. 13(1): 345-346.
- Sietman, Bernard E. 2003. Field Guide to the Freshwater Mussels of Minnesota. Minnesota Department of Natural Resources, St. Paul, MN. 140 pp.

Figure 1. Location of Two Sites on the Partridge River Sampled for Freshwater Mussels on August 31, 2009 for the NorthMet Proposed Mine Project, St. Louis County, Minnesota.



**Figure 2. Partridge River Upstream Site Aug. 31, 2009.
View facing upstream.**



**Figure 3. Partridge River Upstream Site Aug. 31, 2009.
View facing downstream.**



**Figure 4. Partridge River Downstream Site Aug. 31, 2009.
View facing upstream.**



**Figure 5. Partridge River Downstream Site Aug. 31, 2009.
View facing downstream.**



Table 1. Location, Miscellaneous Data and Physical Information Collected at Two Freshwater Mussel Stations. Sampled on August 31, 2009 for the NorthMet Mine Project.

Location	Partridge River Upstream Site	Partridge River Downstream Site
Coordinates (UTM Zone 15N, NAD83)	577098E 5275461N	580516E 5275465N
Legal Description	T59N, R13W, section 3, NE¼ of NW¼ of NE¼	T59N, R13W, section 1, NW¼ of NE¼ of NE¼
Sample Reach (meters)	From about 0 to 80m upstream of coordinates, bank to bank.	From about 0 to 100m upstream of coordinates, bank to bank.
Instream Sampling Time (minutes)	42	55
Water Temperature (°C)	12.0	12.0
Substrate Description	100% detritus (primarily peat)	20% clay, 80% detritus (primarily peat)
Approximate Average Depth (m)	2.5	1.5
Current Velocity	Slow	Slow to Moderate

Figure 6. *Pyganodon grandis*.
Collected from Partridge River, Downstream Site on August 31, 2009.



Figure 7. *Pyganodon grandis*.
Collected from Partridge River, Downstream Site on August 31, 2009.



Table 2. Mussel Data Collected at Two Freshwater Mussel Sites. Sampled on August 31, 2009 for the NorthMet Mine Project.

Station	Partridge River Upstream Site	Partridge River Downstream Site
Number of <i>Pyganodon grandis</i> Say, 1829 (giant floater)	0 living 0 dead	26 living 1 dead
Mean, Minimum & Maximum total length of <i>P. grandis</i> (mm)	-- -- --	78 50 101

**Figure 8. Length distribution (mm) of *P. grandis*.
Partridge River, Downstream Site on August 31, 2009.**

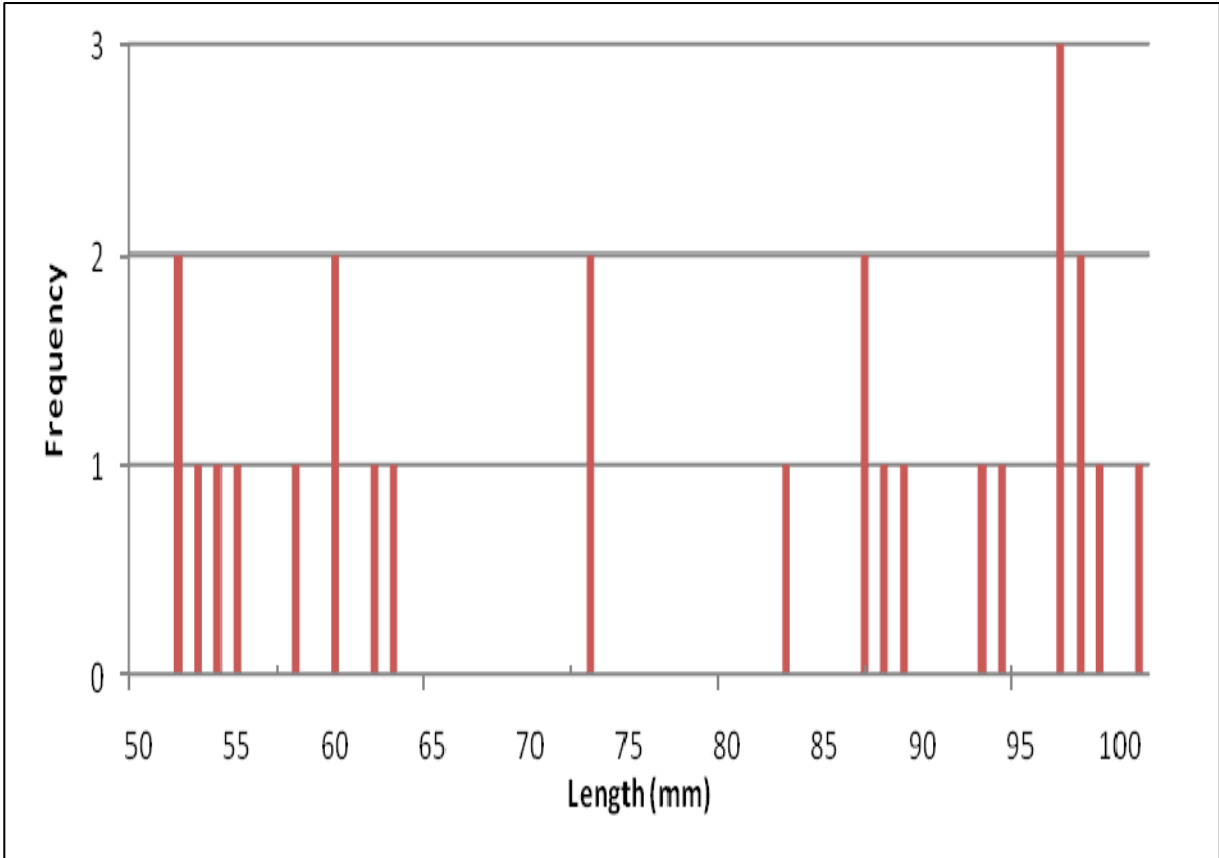


Table 3. Comparison between Mussel Species Reported from the Lake Superior Basin, St. Louis River Watershed (from Sietman, 2003) and this Survey (X = mussels reported).

Location	Lake Superior Basin	St. Louis River Watershed	This Study
Species			Partridge River
<i>Elliptio complanata</i> (Lightfoot, 1786)	X	X	
<i>Anodontooides ferussacianus</i> (I. Lea, 1834)	X	X	
<i>Lasmigona complanata complanata</i> (Barnes, 1823)	X	X	
<i>L. compressa</i> (I. Lea, 1829)	X	X	
<i>Pyganodon grandis</i> Say, 1829	X	X	X
<i>Strophitus undulatus undulatus</i> (Say, 1817)	X	X	
<i>Utterbackia imbecillis</i> (Say, 1829),	X		
<i>Lampsilis cardium</i> (Rafinesque, 1820)	X	X	
<i>L. siliquoidea</i> (Barnes, 1823)	X	X	
<i>Ligumia recta</i> (Lamarck, 1819)	X	X	

APPENDIX 1

FIELD DATA SHEETS

WBIC: _____ sheet 1 of 1 Source Code: _____ WI
 Date (mmddy): 083109 Waterbody: Partridge R Site/Bed Name: under r/c
 7.5' Quad: _____ Quadcode: _____ Lat: _____°' _____" N Long: _____°' _____" W.
 T _____ N, R _____, S _____, _____ of _____ of _____ of _____ Co.: _____ Fago R. Mi.: _____
 T _____ N, R _____, S _____, _____ of _____ of _____ of _____ Co.: _____ USACOE R. Mi.: _____
 Area Sa. ed(m²) _____ Tran. or Stat. # _____ Sta. Dist. from Bank(m): 5 Bank (L or R): R H₂O C: 12
 Current 1 Depth(m) 2.5 SUBSTRATE: _____ % bedrock _____ % hardpan _____ % boulder _____ % rubble
 _____ % gravel _____ % coarse sand _____ % fine sand _____ % muck & silt _____ % clay 100 % detritus
 Method (circle one): 1=random pt. 2=transect 3=shore coll. 4=inventory 5=rare & assoc. 6=targeted
 taxon 7= Harvest Sample 8=community rel. abun. 9=incremental coll. (by _____). other: _____
 Crew (circle collector): Heath, Peter Amles
 Directions: _____

Comments: Done Time: 10:15-12:57. Sampled at 80m
S275461N, S71098E. NAID 83

TAXON	total # for taxon		length	height	age	sex	gravid	tag	pres	length	height	age	sex	gravid	tag	pres
	living	dead														
No unionids																
Bliquyridae	2															
Sphaerium	2															
Gonyostoma	2															

(over)

WBIC: _____ sheet 1 of _____ Source Code: _____ WI
 Date (mmddy): 083109 Waterbody: Portage R Site/Bed Name: Lower site
 7.5' Quad.: _____ Quadcode: _____ Lat: _____ "N Long: _____ "W.
 T _____ N, R _____, S _____, _____ of _____ of _____ of _____ Co.: _____ Fago R. Mi.: _____
 T _____ N, R _____, S _____, _____ of _____ of _____ of _____ Co.: _____ USACOE R. Mi.: _____
 Area Sa. ed(m²) _____ Tran. or Stat. # _____ Sta. Dist. from Bank(m): _____ Bank (L or R): S H 2 O 0 C: 2
 Current 1 Depth(m) _____ SUBSTRATE: _____ % bedrock _____ % hardpan _____ % boulder _____ % rubble
 _____ % gravel _____ % coarse sand _____ % fine sand _____ % muck & silt 20 % clay 80 % detritus
 Method (circle one): 1=random pt. 2=transect 3=shore coll. 4=inventory 5=rare & assoc. 6=targeted
 taxon 7= Harvest Sample 8=community rel. abun. 9=incremental coll. (by _____). other: _____
 Crew (circle collector): North, Kenzie, air Ten 2000
 Directions: North

Comments: Pure time 12:55-14:00 1.5 m deep, more current
5275465N, 580516E, here than last site.

TAXON	total # for taxon		length	height	age	sex	gravid	tag	pres	length	height	age	sex	gravid	tag	pres
	living	dead														
<u>Soft mud</u>	<u>2</u>															
<u>Banded Hill T</u>	<u>5</u>															
<u>Cyprina</u>	<u>20</u>															
<u>P. g. grandis</u>	<u>26</u>	<u>1</u>	<u>94</u>							<u>97</u>						
			<u>97</u>							<u>87</u>						
			<u>98</u>							<u>83</u>						
			<u>60</u>							<u>93</u>						
			<u>89</u>							<u>53</u>						
			<u>98</u>							<u>63</u>						
			<u>97</u>							<u>101</u>						
			<u>52</u>							<u>88</u>						
			<u>60</u>							<u>62</u>						
			<u>73</u>							<u>58</u>						
			<u>87</u>							<u>54</u>						
			<u>55</u>							<u>73</u>						
			<u>99</u>							<u>52</u>						

(over)