



Sensitive Plant Species Survey Report

PolyMet Plant Site

Prepared for
Poly Met Mining, Inc.

October 2017

Sensitive Plant Species Survey Report

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Contents

1.0	Executive Summary	1
2.0	Project Background.....	2
3.0	Methods	3
4.0	Results	4
5.0	Conclusions	7

List of Tables

Table 1	Species Preliminarily Identified by Barr in the July 2017 Sensitive Plant Species Survey	5
Table 2	Summary of Findings in the July 2017 Sensitive Plant Species Survey.....	6

List of Figures

Large Figure 1	Site Location Map
Large Figure 2	Sensitive Species Locations Map

List of Appendices

Appendix A	DNR Rare Feature Report Forms
Appendix B	Representative Photographs from July 12, 2017 Sensitive Plant Species Survey

1.0 Executive Summary

Poly Met Mining, Inc. (PolyMet) is proposing to construct the NorthMet Project (Project), located near Hoyt Lakes in St. Louis County, Minnesota. The Plant Site for the Project includes the former LTVSMC site. Botanists from Barr Engineering Co. conducted a sensitive plant species survey on July 12, 2017 at the Project Plant Site (Large Figure 1). The term "sensitive species", for the purposes of this survey, refers to any vascular plant species listed as endangered, threatened, or special concern (ETSC) by the Minnesota Department of Natural Resources (DNR).

No state-verified state-endangered or state-threatened species were located within the survey area; however, a state-special concern species, *Botrychium pallidum* (pale moonwort), was found (Large Figure 2). No federally-listed plant species were observed within the survey area. Minnesota's endangered species law (Minnesota Statute 84.0895) and associated rules (Minnesota Rules, part 6212.1800) only require a permit for the removal of state-endangered and state-threatened species (a "take permit"), but not for state-special concern species; therefore, no species are present at the Plant Site that require a take permit from DNR.

This report includes a discussion of methods and results from the July 2017 sensitive plant species survey. Detailed information on each sensitive plant species location is provided in Appendix A. Representative photographs are provided in Appendix B. An attached DVD includes an electronic version of this report, along with the DNR Observation Database spreadsheet and GIS file. All collected field specimens were submitted to DNR.

2.0 Project Background

PolyMet acquired and will use the former LTV Steel Mining Company (LTVSMC) site as the Project Plant Site (Large Figure 1). The Plant Site includes the former LTVSMC tailings basin and a Process Plant Area that includes the buildings involved in the processing of materials (Large Figure 2). The Plant Site is a brownfield site that has been previously disturbed by mining and logging activities. In addition, beaver activity is present within the wetlands located north and west of the Plant Site.

PolyMet will construct a new Flotation Tailings Basin (FTB) atop a portion of the former LTVSMC tailings basin. Collectively the FTB and the former LTVSMC tailings basin are referred to as the Tailings Basin. A component of the Project involves construction of a seepage containment system along the western, northern, and eastern edges of the Tailings Basin (Large Figure 1 and Large Figure 2). The FTB Seepage Containment System will intercept seepage from the Tailings Basin before it enters wetlands to the west and north, and pump the seepage back into the FTB.

The July 2017 sensitive plant species survey was conducted to determine if there were any state-threatened or state-endangered plant species within the Plant Site that may require a DNR take permit as part of the Project. The footprints of the Plant Site and FTB Seepage Containment System are shown on Large Figure 2.

3.0 Methods

A sensitive plant species survey was conducted on July 12, 2017 at the Project Plant Site. The survey methodology was comprised of four components – pre-field research, field studies, post-field verifications, and documentation of results. Barr submitted a work plan on July 11, 2016 for the study area. It was approved by DNR on July 27, 2016. However, Barr was unable to complete the sensitive plant species survey in 2016. Therefore, the same approved work plan was re-submitted to DNR on June 1, 2017. DNR acknowledged receipt of the work plan on July 14, 2017.

The survey area included Sections 3-10, 14, 15, and 17 in Township 59, Range 14 and Sections 32-34 in Township 60, Range 14, as shown on Large Figure 2. The DNR Natural Heritage Information System (NHIS) database was reviewed prior to the fieldwork to determine if there were any records of state-listed plant species in the vicinity of the survey area. If any recorded species were identified in the database, information was compiled on the preferred habitats, plant associations, phenology, and key identifying characteristics of these species prior to conducting the sensitive plant survey.

The sensitive plant survey was conducted on July 12, 2017 by Daniel Jones, who has a current special collection permit for taking and possessing endangered or threatened species (DNR Special Permit 22782; issued June 8, 2017), is listed on the DNR “General List of Botanical Consultants for Hire,” and is on the DNR list of qualified *Botrychium* surveyors.

If sensitive plant species were initially identified during the sensitive plant survey, a Global Positioning System (GPS) unit was used to obtain geographic coordinates of the location. Coordinates were recorded in the Universal Transverse Mercator system (Zone 15 North, meters) using the NAD83 datum. Digital photographs of the sensitive species were taken, and samples were collected following the DNR’s *Guidance on Documenting and Collecting Rare Plants* (Reference (1)). *Botrychium* species identified in the field were collected and submitted to DNR State Botanist Welby Smith, per the conditions of the collection permit.

Botrychium species found during the sensitive plant survey were identified using “Ophioglossaceae C. Agardh” in *Flora of North America (FNA), Volume 2: Pteridophytes and Gymnosperms* (Reference (2)) and *Systematics of Moonworts; Botrychium subgenus Botrychium* (Reference (3)).

4.0 Results

As described in Section 2.0, the survey area has previously been disturbed by mining and logging activities. There are several cover types present within the survey area; the dominant cover types include:

- Shallow and deep marshes dominated by *Typha* sp. (cattail species), *Phalaris arundinacea* (reed canary grass), and *Phragmites australis* (common reed). Several species of *Equisetum* (horsetails and scouring rushes) can be found near the perimeter of these areas. This cover type occurs primarily at the bottom of the tailings basin slopes along the western and northern edges of the tailings basin. There are also shallow and/or deep marsh habitats along the edges of the Plant Site.
- Open grass/forb communities growing on the slopes of the existing LTVSMC tailings basin and other previously graded areas in the Plant Site. These communities were likely seeded with typical grass/legume reclamation seed mixes during earlier slope stabilization efforts. They are densely to sparsely vegetated with grasses and leguminous plant species, such as *Lotus corniculata* (birdsfoot trefoil) and *Vicia* sp. (vetch species). Common forbs are also present, including *Astragalus canadensis* (Canada milkvetch), *Hieracium* sp. (hawkweed species), *Achillea millefolium* (common yarrow), and *Fragaria virginiana* (wild strawberry). Sparse clumps of young trees including *Populus tremuloides* (quaking aspen), *Betula papyrifera* (paper birch), and *Populus balsamifera* (balsam poplar), are also scattered along the lower slopes of the tailings basin.
- Young second-growth hardwood forest dominated by quaking aspen and paper birch. This community type is found primarily below the northeastern corner and eastern edge of the tailings basin, and is also present as a narrow strip between the base of the northern edge of the tailings basin and the wetland complex beginning further downslope.

During the sensitive plant species survey, the botanist documented locations of sensitive plant species within the open grass/forb community 1) along the lower slopes of the disturbed northern edge of the proposed FTB Seepage Containment System and 2) near the Process Plant Area (Large Figure 2). The soils in these areas are primarily fine sandy gravel and tailings grit; the extent of bare soil in these areas varies from approximately 5% to 20%. Overall, these disturbed, human-influenced site conditions typically provide very good habitat for certain *Botrychium* species, including those identified in the survey (Table 1).

Table 1 summarizes the species initially documented by Barr, their state status, the number of locations where each species was found, and the total number or estimated number of individual plants located.

Table 1 Species Preliminarily Identified by Barr in the July 2017 Sensitive Plant Species Survey

Scientific Name	Common Name	Minnesota Status ⁽¹⁾	Total Locations	Approximate Total Number
<i>Botrychium ascendens</i>	Upswept moonwort	E	2	87
<i>Botrychium lunaria</i>	Common moonwort	T	1	1

(1) MN Status: E – Endangered; T – Threatened.

For each location of the species listed in Table 1, a DNR Rare Feature Report Form was prepared; these forms are compiled in Appendix A. Table 2 summarizes the DNR Observation Database spreadsheet that will be submitted electronically along with this report. A DVD will be submitted with this report that includes the Rare Feature Report Forms (Appendix A), representative photographs taken of sensitive species within the survey area (Appendix B), the Observation Database spreadsheet, GIS file, and an electronic version of this report.

Sensitive plant species specimens collected at each of the locations were pressed and dried, and submitted along with a herbarium label for each specimen to DNR State Botanist Welby Smith for verification of the preliminary identifications. As summarized in Table 2, Welby Smith’s assessment did not concur with the preliminary identifications of two specimens, and could not conclusively verify the preliminary identifications of two other specimens. Instead, his assessment indicated that *Botrychium pallidum* (pale moonwort), a state-special concern species is present in the survey area. His assessment did not conclusively verify Barr’s preliminary identifications of *Botrychium lunaria* and a second location of *B. ascendens*.

Table 2 Summary of Findings in the July 2017 Sensitive Plant Species Survey

Record ID	Initial Barr Identification			DNR Verification			UTM Easting	UTM Northing	Approx. Number	Habitat Remarks
	Scientific Name	Common Name	MN Status ⁽¹⁾	Scientific Name	Common Name	MN Status ⁽¹⁾				
PM-0170712-TB-01 and PM-0170712-TB-02 ⁽²⁾	<i>Botrychium ascendens</i>	Upswept moonwort	E	<i>Botrychium pallidum</i>	Pale moonwort	SC	565563.1	5275936.4	47	Among dense <i>Astragalus canadensis</i> and <i>Lotus corniculata</i> , with a few small <i>Populus tremuloides</i> seedlings.
PM-0170712-TB-03	<i>Botrychium lunaria</i>	Common moonwort	T	Not verified			565566.5	5275937.1	1	Among dense <i>Astragalus canadensis</i> and <i>Lotus corniculata</i> , with a few small <i>Populus tremuloides</i> seedlings.
PM-0170712-TB-04	<i>Botrychium ascendens</i>	Upswept moonwort	E	Not verified			564867.9	5272811.6	40	Among grasses and forbs

Note: This table summarizes data provided to DNR for the Natural History Information System (NHIS) database. The full Observation Database spreadsheet will be submitted electronically to DNR on the DVD provided with this report.

(1) MN Status: E – Endangered; T – Threatened; SC – Special Concern

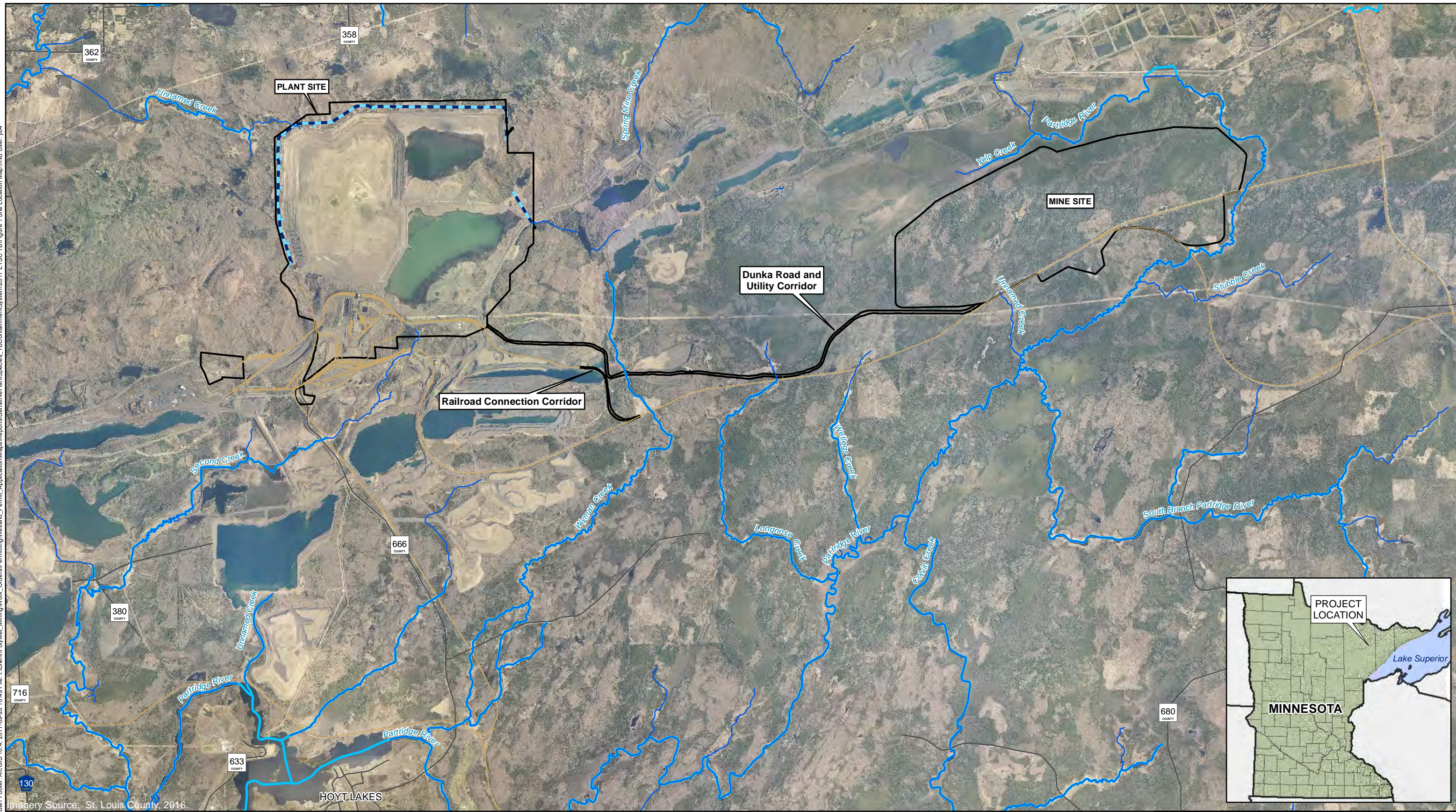
(2) Two collections of this species were made in one general location.

5.0 Conclusions

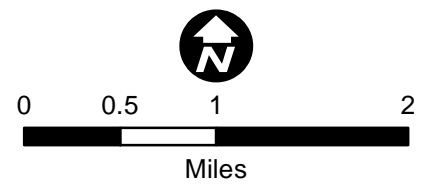
The DNR did not verify the preliminary identification of *Botrychium* species in the survey area as state-endangered *B. ascendens* and state-threatened *B. lunaria* within the survey area. Therefore, there is no verification of state-endangered or threatened species present at the Plant Site and a takings permit is not required for the survey area.

Large Figures

Barr Footer: ArcGIS 10.4, 2017-09-28 10:49 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Wetland_Permit_Application\Maps\Reports\SensitivePlantSpecies_TB\ContainmentSystem\2017_ET\SC\TB\Figure 1 Site Location Map.mxd User: jlb4



- EIS Project Areas
- FTB Seepage Containment System
- Public Waters Inventory (PWI) Watercourses¹
- National Hydrography Dataset (NHD) Rivers & Streams²
- Existing Private Railroad



SITE LOCATION MAP
NorthMet Project
Poly Met Mining, Inc.

¹These are provisional representations of PWI watercourses found on the current paper regulatory maps.
²The NHD is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from MnDNR 24K Streams and 1:24,000 USGS quadrangle maps.
 Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

Large Figure 1
Sensitive Plant Species Survey Report

Bar Footer: ArcGIS 10.4, 2017-10-05 11:10, File: L:\Client\PolyMet_Minna\Work_Orders\Permitting\Wetland_Permit_Application\Maps\Reports\SensitivePlantSpecies_TBContentman\System\2017_ETSC_TB\Figure_2_SensitiveSpecies_Locations_Map.mxd User: lib4



Sensitive Plant Species Locations	Wetlands	Public Waters Inventory (PWI) Watercourses ¹
EIS Project Areas	Existing Private Railroad	National Hydrography Dataset (NHD) Rivers & Streams ²
Section Lines	FTB Seepage Containment System	

0 1,000 2,000 4,000
Feet

¹These are provisional representations of PWI watercourses founaps. ²The NHD is a feature-based database that interconnects and uniquely identifies the stream segments or reaches that make up the nation's surface water drainage system. NHD features are created from MnDNR 24K Streams and 1:24,000 USGS quadrangle maps.
 Note: Due to previous disturbance, both data sources may show watercourses that no longer exist.

SENSITIVE SPECIES LOCATIONS
 NorthMet Project
 Poly Met Mining, Inc.

Large Figure 2
 Sensitive Plant Species Survey Report

Appendices

Appendix A

DNR Rare Feature Report Forms

Minnesota Natural Heritage Information System
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium pallidum
 Common Name: Pale moonwort
 Date: July 12, 2017 Time: 14:54
 Observer(s): Daniel W. Jones, Kinnan Stauber
 Barr Record ID: PM-20170712-TB-01

FOR DATABASE PERSONNEL USE ONLY
 El.Code: _____ Occ#: _____
 Single Source EO / Multi-Source EO
 Search effort: _____ min./(A/person)
 Data security? Yes No
 Mapped _____ QC1 _____
 Entered _____ QC2 _____
 Comments: _____

LOCATION

State: Minnesota County: St. Louis
 Quad Name(s): Isaac Lake

Twp: 60 Rng: 14 Sec: 33 NW ¼ of SE 1/4
 Twp: _____ Rng: _____ Sec: _____
 Twp: _____ Rng: _____ Sec: _____
 Twp: _____ Rng: _____ Sec: _____

or

UTM: Northing 5275936.4 Easting 565563.1 Zone 15N (Zone 15 preferred!)
 (NAD83) or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: _____ deg. _____ min. _____ sec. Longitude: _____ deg. _____ min. _____ sec. (provide degrees, minutes, and seconds)
 Source: _____

Map: A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

Directions/comments/description of location: This species was found along the northern edge of the former LTV Steel Mining Company (SMC) tailings basin, on restricted-access private property. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the lower access road located on the western and northwestern edge of the LTVSMC tailings basin.

OPT **SEARCH EFFORT** time actively searching _____ min. acres searched 0.1 # of observers 2

OPT **BIOLOGY** If the species was searched for but not found, check here: _____ Revisit needed? Y (N) When? _____

Population size: 47 (stems) or clonal stands (circle one) (counted) or estimated? (circle one)

Circle the description which most accurately fits the occurrence. If you circle more than one description in each line, on the line below the description indicate the percentage of the population in each stage.

Leaves: dormant budding new leaf full leaf leaf fall
 _____ + _____ + _____ + 100 + _____ =100%
Flowers & Fruit: dormant budding early flower full flower early fruit mature fruit dispersing seed
 _____ _____ _____ _____ _____ 100 _____
Age structure: seedlings immature 1st yr.(biennials) mature
 _____ _____ _____ 100

Vigor: feeble normal vigorous
20 50 30

Evidence of reproduction?: (Yes) No If yes; Type: sexual asexual both (circle one)

Evidence: sporophores present with mature spores

Comments (e.g., note symbiosis, parasitism, disease, plant density or patchiness): _____

OPT **HABITAT**

Topography:

- crest
- upper slope
- mid-slope
- lower slope
- bottom

Moisture:

- hydric
- wet-mesic
- mesic
- dry-mesic
- xeric

(circle all that apply)

Light:

- open
- partial
- filtered
- shade

Aspect:

- N NE
- E SE
- S SW
- W NW
- flat

Slope:

30 % or _____ °
Measured or estimated?
(circle one)

Elevation:

_____ m or _____ ft.

Plant community: Artificial open grass and legume-dominated forb reclamation area, with young deciduous tree seedlings/saplings.

Soil/substrate type: Tailings aggregate.

Comments: Typical of most *Botrychium* habitat observed at old mining sites, but on steeper slopes than usual.

OPT **CONSERVATION**

List disturbances, if any: On slope of LTVSMC tailings basin berm. Berm has been seeded with a reclamation mix of grasses and leguminous species, dominated by *Astragalus canadensis* and *Lotus corniculata*. Occasional small groups of *Populus tremuloides* also present on the lower slopes.

List threats, if any: The northeastern edge of the LTVSMC tailings basin berm will be re-graded and amended to raise its elevation. As a result, the plant location will be removed.

IDENTIFICATION

Specimen collected? Yes No If yes, Collector: Daniel W. Jones Date of Collection: 07/12/2017

Collectors Address & Phone: c/o Barr Engineering Co., 4300 MarketPointe Drive, Minneapolis, MN 55435, (952) 832-

2875 Repository: _____ Accession #: U Minn Herbarium Collection #: _____

Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.

Photograph taken? Yes No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): Systematics of Moonworts: *Botrychium* Subgenus *Botrychium*, Donald Farrar June 2006; *Flora of North America*, vol. 2, *Ophioglossaceae*, Wagner Jr. and Wagner, add'l *Botrychium* notes from Donald Farrar.

Comments: Initial field ID by D. Jones was *Botrychium ascendens*. Collected specimens submitted to Welby Smith, who determined that the specimen was *B. pallidum*.

FOR DATABASE PERSONNEL USE ONLY

Verified by: _____ Date sent to Herbarium _____ Date collector notified of outcome: _____

OPT **SUMMARY** (circle one in each column)

Condition:

- A – habitat pristine
- B
- C
- D – habitat degraded

Quality:

- A – stand large, productive, vigorous
- B
- C
- D – stand small, feeble

Viability:

- A – quality likely to remain constant
- B
- C
- D – quality certain to deteriorate

Defensability:

- A – protectable
- B
- C
- D – not protectable

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat in footprint of proposed large-scale earthwork.

OPT = **OPTIONAL Section (i.e., you are not required to fill in these sections to submit a record)**

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to sharron.nelson@dnr.state.mn.us - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium pallidum
 Common Name: Pale moonwort
 Date: July 12, 2017 Time: NA
 Observer(s): Daniel W. Jones, Kinnan Stauber
 Barr Record ID: PM-20170712-TB-02

FOR DATABASE PERSONNEL USE ONLY
 El.Code: _____ Occ#: _____
 Single Source EO / Multi-Source EO
 Search effort: _____ min./(A/person)
 Data security? Yes No
 Mapped _____ QC1 _____
 Entered _____ QC2 _____
 Comments: _____

LOCATION

State: Minnesota County: St. Louis
 Quad Name(s): Isaac Lake

Twp: 60 Rng: 14 Sec: 33 NW ¼ of SE 1/4
 Twp: _____ Rng: _____ Sec: _____
 Twp: _____ Rng: _____ Sec: _____
 Twp: _____ Rng: _____ Sec: _____

or

UTM: Northing 5275936.4 Easting 565563.1 Zone 15N (Zone 15 preferred!)
 (NAD83) or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: _____ Longitude: _____ (provide degrees, minutes, and seconds)
 deg. min. sec. deg. min. sec. Source: _____

Map: A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

Directions/comments/description of location: This species was found along the northern edge of the former LTV Steel Mining Company (SMC) tailings basin, on restricted-access private property. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the lower access road located on the western and northwestern edge of the LTVSMC tailings basin. Note: Co-located with PM-20170712-TB-01.

OPT **SEARCH EFFORT** time actively searching _____ min. acres searched 0.1 # of observers 2

OPT **BIOLOGY** If the species was searched for but not found, check here: _____ Revisit needed? Y (N) When? _____

Population size: 47 (stems) or clonal stands (circle one) (counted) or estimated? (circle one)

Circle the description which most accurately fits the occurrence. If you circle more than one description in each line, on the line below the description, indicate the percentage of the population in each stage.

Leaves: dormant budding new leaf (full leaf) leaf fall
 _____ + _____ + _____ + 100 + _____ = 100%

Flowers & Fruit: dormant budding early flower full flower early fruit (mature fruit) dispersing seed
 _____ + _____ + _____ + _____ + _____ + 100 + _____

Age structure: seedlings immature 1st yr.(biennials) (mature)
 _____ + _____ + _____ + 100

Vigor: (feeble) (normal) (vigorous)
 _____ 20 _____ 50 _____ 30

Evidence of reproduction?: (Yes) No If yes; Type: (sexual) asexual both (circle one)

Evidence: Sporophores present with mature spores

Comments (e.g., note symbiosis, parasitism, disease, plant density or patchiness): _____

OPT **HABITAT**

Topography:
crest
upper slope
mid-slope
lower slope
bottom

Moisture:
hydric
wet-mesic
mesic
dry-mesic
xeric
(circle all that apply)

Light:
open
partial
filtered
shade

Aspect:
N NE
E SE
S SW
W NW
flat

Slope:
30 % or _____ °
Measured or estimated?
(circle one)

Elevation:
_____ m or _____ ft.

Plant community: Artificial open grass and legume-dominated forb reclamation area, with young deciduous tree seedlings/saplings.

Soil/substrate type: Tailings aggregate.

Comments: Typical of most Botrychium habitat observed at old mining sites, but on steeper slopes than usual.

OPT **CONSERVATION**

List disturbances, if any: On slope of LTVSMC tailings basin berm. Berm has been seeded with a reclamation mix of grasses and leguminous species, dominated by Astragalus canadensis and Lotus corniculata. Occasional small groups of Populus tremuloides also present on the lower slopes.

List threats, if any: The northeastern edge of the LTVSMC tailings basin berm will be re-graded and amended to raise its elevation. As a result, the plant location will be removed.

IDENTIFICATION

Specimen collected? Yes No If yes, Collector: Daniel W. Jones Date of Collection: 07/12/2017

Collectors Address & Phone: c/o Barr Engineering Co., 4300 MarketPointe Drive, Minneapolis, MN 55435, (952) 832-2875 Repository: _____ Accession #: U Minn Herbarium Collection #: _____

Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.

Photograph taken? Yes No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): Systematics of Moonworts: Botrychium Subgenus Botrychium, Donald Farrar June 2006; Flora of North America, vol. 2, Ophioglossaceae, Wagner Jr. and Wagner, add'l Botrychium notes from Donald Farrar.

Comments: Initial field ID by D. Jones was Botrychium ascendens. Collected specimens submitted to Welby Smith, who determined that the specimen was B. pallidum.

FOR DATABASE PERSONNEL USE ONLY
Verified by: _____ Date sent to Herbarium _____ Date collector notified of outcome: _____

OPT **SUMMARY** (circle one in each column)

Condition:

Quality:

Viability:

Defensability:

A – habitat pristine

A – stand large, productive, vigorous

A – quality likely to remain constant

A – protectable

B

B

B

B

C

C

C

C

D – habitat degraded

D – stand small, feeble

D – quality certain to deteriorate

D – not protectable

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat in footprint of proposed large-scale earthwork.

OPT = **OPTIONAL Section (i.e., you are not required to fill in these sections to submit a record)**

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to sharron.nelson@dnr.state.mn.us - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

Minnesota Natural Heritage Information System
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium cf. lunaria

Common Name: Common moonwort

Date: July 12, 2017 Time: 15:27

Observer(s): Daniel W. Jones, Kinnan Stauber

Barr Record ID: PM-20170712-TB-03

LOCATION

State: Minnesota County: St. Louis

Quad Name(s): _____

Twp: 60 Rng: 14 Sec: 33 NW ¼ of SE ¼

Twp: _____ Rng: _____ Sec: _____

Twp: _____ Rng: _____ Sec: _____

Twp: _____ Rng: _____ Sec: _____

or

UTM: Northing 5275937.1 Easting 56556.5 Zone 15N (Zone 15 preferred!)

NAD83 or NAD27? (circle one) (NAD83 preferred!)

Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: _____ Longitude: _____ (provide degrees, minutes, and seconds)
deg. min. sec. deg. min. sec. Source: _____

Map: A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

Directions/comments/description of location: This species was found along the northern edge of the former LTV Steel

Mining Company (SMC) tailings basin, on restricted-access private property. Access to the site is by permission of Poly Met

Mining, Inc. only. Access to the site is via the lower access road located on the western and northwestern edge of the

LTVSMC tailings basin. Note: Adjacent to PM-20170712-TB-01.

OPT **SEARCH EFFORT** time actively searching _____ min. acres searched 0.1 # of observers 2

OPT **BIOLOGY** If the species was searched for but not found, check here: _____ Revisit needed? Y When? _____

Population size: 1 stems or clonal stands (circle one) counted or estimated? (circle one)

Circle the description which most accurately fits the occurrence. If you circle more than one description in each line, on the line below the description indicate the percentage of the population in each stage.

Leaves: dormant budding new leaf full leaf leaf fall
_____ + _____ + _____ + 100 + _____ =100%

Flowers & Fruit: dormant budding early flower full flower early fruit mature fruit dispersing seed
_____ + _____ + _____ + _____ + _____ + 100 + _____

Age structure: seedlings immature 1st yr.(biennials) mature
_____ + _____ + _____ + 100

Vigor: feeble normal vigorous
_____ + 100 + _____

Evidence of reproduction?: Yes No If yes; Type: sexual asexual both (circle one)

Evidence: sporophores present with mature spores

Comments (e.g., note symbiosis, parasitism, disease, plant density or patchiness): _____

FOR DATABASE PERSONNEL USE ONLY	
El.Code: _____	Occ#: _____
Single Source EO / Multi-Source EO	
Search effort: _____ min./(A/person)	
Data security? Yes No	
Mapped _____	QC1 _____
Entered _____	QC2 _____
Comments: _____	

OPT **HABITAT**

<u>Topography:</u> crest upper slope mid-slope lower slope bottom	<u>Moisture:</u> hydric wet-mesic mesic dry-mesic xeric (circle all that apply)	<u>Light:</u> open partial filtered shade	<u>Aspect:</u> N NE E SE S SW W NW flat	<u>Slope:</u> 30 % or _____° Measured or estimated? (circle one) <u>Elevation:</u> _____m or _____ft.
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Plant community: Artificial open grass and legume-dominated forb reclamation area, with young deciduous tree seedlings/saplings.

Soil/substrate type: Tailings aggregate.

Comments: Typical of most *Botrychium* habitat observed at old mining sites, but on steeper slopes than usual.

OPT **CONSERVATION**

List disturbances, if any: On slope of LTVSMC tailings basin berm. Berm has been seeded with a reclamation mix of grasses and leguminous species, dominated by *Astragalus canadensis* and *Lotus corniculata*. Occasional small groups of *Populus tremuloides* also present on the lower slopes.

List threats, if any: The northeastern edge of the LTVSMC tailings basin berm will be re-graded and amended to raise its elevation. As a result, the plant location will be removed.

IDENTIFICATION

Specimen collected? (Yes) No If yes, Collector: Daniel W. Jones _____ Date of Collection: 07/12/2017

Collectors Address & Phone: c/o Barr Engineering Co., 4300 MarketPointe Drive, Minneapolis, MN 55435, (952) 832-2875

Repository: _____ Accession #: U Minn Herbarium Collection #: _____

Specimens submitted to the NHNRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.

Photograph taken? (Yes) No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): *Systematics of Moonworts: Botrychium Subgenus Botrychium*, Donald Farrar June 2006; *Flora of North America*, vol. 2, *Ophioglossaceae*, Wagner Jr. and Wagner, add'l *Botrychium* notes from Donald Farrar.

Comments: Initial field ID by D. Jones was *Botrychium lunaria*. Collected specimens were submitted to Welby Smith, who was unable to conclusively verify the field identification.

FOR DATABASE PERSONNEL USE ONLY
Verified by: _____ Date sent to Herbarium _____ Date collector notified of outcome: _____

OPT **SUMMARY** (circle one in each column)

<u>Condition:</u> A – habitat pristine B (C) D – habitat degraded	<u>Quality:</u> A – stand large, productive, vigorous B (C) D – stand small, feeble	<u>Viability:</u> A – quality likely to remain constant B C (D) – quality certain to deteriorate	<u>Defensability:</u> A – protectable B C (D) – not protectable
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Rank: A B C or (D) (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat in footprint of proposed large-scale earthwork.

OPT = **OPTIONAL Section (i.e., you are not required to fill in these sections to submit a record)**

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to sharron.nelson@dnr.state.mn.us - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

Form DRAFT September 13, 2005

Minnesota Natural Heritage Information System
Rare Feature Reporting Form – Plants (public form)

Scientific Name: Botrychium cf. ascendens
 Common Name: Upswept moonwort
 Date: July 12, 2017 Time: 16:35
 Observer(s): Daniel W. Jones, Kinnan Stauber
 Barr Record ID: PM-20170712-TB-04

FOR DATABASE PERSONNEL USE ONLY
 El.Code: _____ Occ#: _____
 Single Source EO / Multi-Source EO
 Search effort: _____ min./(A/person)
 Data security? Yes No
 Mapped _____ QC1 _____
 Entered _____ QC2 _____
 Comments: _____

LOCATION

State: Minnesota County: St. Louis

Quad Name(s): _____

Twp: 59 Rng: 14 Sec: 33 NW ¼ of SW ¼

Twp: _____ Rng: _____ Sec: _____

Twp: _____ Rng: _____ Sec: _____

Twp: _____ Rng: _____ Sec: _____

or

UTM: Northing 5272811.6 Easting 564867.9 Zone 15N (Zone 15 preferred!)

NAD83 or NAD27? (circle one) (NAD83 preferred!) Source (e.g. GPS, quad): Trimble Geo7X GPS

or

Latitude: _____ deg. _____ min. _____ sec. Longitude: _____ deg. _____ min. _____ sec. (provide degrees, minutes, and seconds) Source: _____

Map: A map should accompany this form. The map may be a photocopy of a USGS 7.5 min. topographic quadrangle and a hand-drawn shape, or in electronic format such as a pdf or shapefile. Draw a dashed line around the area searched, if applicable.

Directions/comments/description of location: This species was located in a disturbed area within the former LTVSMC plant site, near storage of old pipeline sections, on restricted-access private property. Access to the site is by permission of Poly Met Mining, Inc. only. Access to the site is via the main road to the former LTVSMC plant site.

OPT **SEARCH EFFORT** time actively searching _____ min. acres searched 0.01 # of observers 2

OPT **BIOLOGY** If the species was searched for but not found, check here: _____ Revisit needed? Y N When? _____

Population size: 40 stems or clonal stands (circle one) counted or estimated? (circle one)

Circle the description which most accurately fits the occurrence. **If you circle more than one description** in each line, on the line below the description indicate the percentage of the population in each stage.

Leaves: dormant budding new leaf full leaf leaf fall
 _____ + _____ + _____ + 100 + _____ = 100%

Flowers & Fruit: dormant budding early flower full flower early fruit mature fruit dispersing seed
 _____ + _____ + _____ + _____ + _____ + 100 + _____

Age structure: seedlings immature 1st yr.(biennials) mature
 _____ + _____ + _____ + 100

Vigor: feeble normal vigorous
 _____ + 100 + _____

Evidence of reproduction?: Yes No If yes; Type: sexual asexual both (circle one)

Evidence: sporophores present with mature spores

Comments (e.g., note symbiosis, parasitism, disease, plant density or patchiness): _____

OPT **HABITAT**

<u>Topography:</u> crest upper slope mid-slope lower slope <u>bottom</u>	<u>Moisture:</u> hydric wet-mesic mesic <u>dry-mesic</u> xeric (circle all that apply)	<u>Light:</u> <u>open</u> partial filtered shade	<u>Aspect:</u> <u>N</u> NE E SE S SW W NW flat	<u>Slope:</u> 0-1 % or _____ ° Measured or <u>estimated?</u> (circle one) <u>Elevation:</u> _____ m or _____ ft.
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Plant community: Artificial open grass and forb disturbed area, with young deciduous tree seedlings/saplings.

Soil/substrate type: Tailings aggregate.

Comments: Typical of most *Botrychium* habitat observed at old mining sites, but on steeper slopes than usual.

OPT **CONSERVATION**

List disturbances, if any: On a flat, disturbed area within the former LTVSMC plant site, in apparent a storage area of old pipeline segments. There are occasional small groups of *Populus tremuloides* nearby.

List threats, if any: The site has clearly been graded in the past, and may be re-graded as part of the planned renovation of the former LTV plant. As a result, the plant location may be removed.

IDENTIFICATION

Specimen collected? (Yes) No If yes, Collector: Daniel W. Jones Date of Collection: 07/12/2017

Collectors Address & Phone: c/o Barr Engineering Co., 4300 MarketPointe Drive, Minneapolis, MN 55435, (952) 832-2875

Repository: _____ Accession #: U Minn Herbarium Collection #: _____

Specimens submitted to the NHRP/MCBS will be accessioned into the U. Minn. Herbarium in St. Paul unless the collector requests another repository.

Photograph taken? (Yes) No

Basis for ID (list author, year, title and publisher for manuals, keys, experts, etc. consulted, if any): *Systematics of Moonworts: Botrychium Subgenus Botrychium*, Donald Farrar June 2006; *Flora of North America*, vol. 2, *Ophioglossaceae*, Wagner Jr. and Wagner, add'l *Botrychium* notes from Donald Farrar.

Comments: Initial field ID by D. Jones was *Botrychium ascendens*. Collected specimens were submitted to Welby Smith, who was unable to conclusively verify the field identification.

FOR DATABASE PERSONNEL USE ONLY
Verified by: _____ Date sent to Herbarium _____ Date collector notified of outcome: _____

OPT **SUMMARY** (circle one in each column)

<u>Condition:</u> A – habitat pristine <u>B</u> <u>C</u> D – habitat degraded	<u>Quality:</u> A – stand large, productive, vigorous <u>B</u> <u>C</u> D – stand small, feeble	<u>Viability:</u> A – quality likely to remain constant B <u>C</u> <u>D</u> – quality certain to deteriorate	<u>Defensability:</u> A – protectable B <u>C</u> <u>D</u> – not protectable
---	---	--	---

Rank: A B C or D (circle one) –summary of above factors

Comments: Species is located in an artificial, previously-disturbed habitat.

OPT = **OPTIONAL Section (i.e., you are not required to fill in these sections to submit a record)**

Return to: Data Manager, Natural Heritage and Nongame Research Program, Minn. DNR, 500 Lafayette Rd. Box 25, St. Paul, MN 55155

Form may also be emailed to sharron.nelson@dnr.state.mn.us - emailed forms MUST be accompanied by a map of the observation, either in shapefile, pdf, or some other widely viewable format.

Appendix B

Representative Photographs from July 12, 2017 Sensitive Plant Species Survey

Appendix B – Selected photos from PolyMet Plant Site Sensitive Plant Species Survey



Photo 1. PM-20170712-001 – *Botrychium ascendens* (MNDNR identified as *B. pallidum*)



Photo 2 - PM-20170712-001 – *Botrychium ascendens* (detail) (MNDNR identified as *B. pallidum*)



Photo 3. Site PM-20170712-002 – *Botrychium ascendens* (MNDNR identified as *B. pallidum*)



Photo 4. Site PM-20170712-002 – *Botrychium ascendens* (detail) (MNDNR identified as *B. pallidum*)



Photo 5. PM-20170712-003 – *Botrychium lunaria* (MNDNR identification inconclusive)



Photo 6. PM-20170712-003 – *Botrychium lunaria* (detail) (MNDNR identification inconclusive)



Photo 7. Habitat for *Botrychium* collections (PM-20170712-001, -002, -003)



Photo 8. Habitat for *Botrychium* collections (PM-20170712-001, -002, -003)



Photo 9. Site PM-20170712-004 – *Botrychium ascendens* (MNDNR identification inconclusive)



Photo 10. Habitat for *Botrychium* collection (PM-20170712-004) (MNDNR identification inconclusive)