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## Technical Memorandum

**To:** Rich Baker, MNDNR Natural Heritage and Nongame Research Program  
**From:** Daniel W. Jones  
**Subject:** Results of Autumn 2007 Field Surveys for *Botrychium rugulosum* at PolyMet Mine Site  
**Date:** November 7, 2007  
**Project:** 2369862  
**c:** John Borovsky, Jim Scott, Stuart Arkley

Field surveys were conducted in late August and early September 2007 for *Botrychium rugulosum* (St. Lawrence grapefern) at the PolyMet mine site in St. Louis County. These surveys were conducted in response to a July 2004 report on earlier *Botrychium* surveys at the site. The July 2004 report noted that the timing and thoroughness of the 2004 surveys may have been insufficient to yield reliable results for *Botrychium rugulosum*, and recommended an additional survey at a later point in the growing season. The autumn 2007 surveys provided more thorough coverage of the PolyMet mine site, and occurred at a point in the season where the species is better developed and more distinguishable from similar species.

During the autumn 2007 surveys, one population of *Botrychium rugulosum* was located along Dunka Road. Areas adjacent to all other internal roads were surveyed, as well as representative areas away from roads. The majority of the dominant vegetation cover types on the PolyMet mine site do not provide suitable habitat for *Botrychium rugulosum*.

### Methods

Surveys for *Botrychium rugulosum* were conducted on August 25, 2007 and September 5-9, 2007. The earlier survey was conducted by Barr botanist Daniel DeJoode; the September field work was conducted by Barr botanist Daniel Jones.<sup>1</sup> [Note: Minnesota DNR botanist Welby Smith was contacted by phone on August 28, 2007 to confirm that the timing of the surveys was appropriate for *Botrychium rugulosum*. He agreed that the proposed survey schedule was appropriate.]

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<sup>1</sup> Mr. Jones and Dr. DeJoode are both currently on the MDNR "List of Botanical Consultants for Hire."

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Previous surveys for *Botrychium rugulosum* and other listed species were conducted separately in July and August 2004 by Gary Walton and by Deborah Pomroy. Surveys specific to *Botrychium rugulosum* were conducted over a seven-day period by Cindy Johnson-Groh in July 2004. Altogether in 2004, a total of 45 days were spent on the site searching for listed species, including *Botrychium rugulosum*.

The survey area for the autumn 2007 surveys included both sides of Dunka Road for the length of the mine site, as well as the internal road network to the extent that it was accessible. Isolated segments of the internal road network are inundated or have been recently regraded for logging operations. Inundated segments were crossed to access upland segments further up the road where necessary. Locations of potential *Botrychium rugulosum* populations were recorded using Garmin eTrex (Jones) or Trimble (DeJoode) GPS units, using UTM NAD83 Zone 15 coordinates. Track logs or waypoints were also recorded to document the survey coverage. Digital photos were taken of suspected *Botrychium rugulosum*.

Identification of *Botrychium rugulosum* followed “Ophioglossaceae C. Agardh”<sup>2</sup>. In addition, the Barr botanists compared digital photos of *Botrychium* located on the site with specimens at the Bell Herbarium at the University of Minnesota. The native plant communities of the site were also characterized using the Ecological Classification System (ECS) developed by the MNDNR.<sup>3</sup>

## Results

One population of *Botrychium rugulosum* was located along Dunka Road, approximately 15’ south of the road at the edge of a young stand of black spruce, balsam fir and tamarack. The detailed description of this population follows:

- Site PMR9601 – *Botrychium rugulosum* along Dunka Road approximately 1900’ east of the Dunka Road gate.
  - UTM coordinates (UTM NAD83, Zone 15 North):
    - 5274295 North, 579806 East

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<sup>2</sup> Wagner, W.H. and F.S. Wagner. 1993. Ophioglossaceae C. Agardh, in Flora of North America, Volume 2: Pteridophytes and Gymnosperms. 1993. Oxford University Press. New York, New York.

<sup>3</sup> Minnesota Department of Natural Resources. 2003. Field Guide to the Native Plant Communities of Minnesota: The Laurentian Mixed Forest Province. Ecological Land Classification Program, Minnesota County biological Survey, and Natural Heritage and Nongame Research Program. MNDNR St. Paul, MN.

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- Habitat: Approximately 15' from edge of gravel roadway, in shoulder area dominated by native and non-native grasses and forbs, near edge of young spruce, balsam fir and tamarack forest.
- Associated species: *Larix laricina*, *Abies balsamifera*, *Picea mariana*, *Lycopodium calvatum*, *Antennaria neglecta*, *Botrychium. multifidum*, *Trifolium pratense*, *Anaphalis margaritacea*, grasses.
- Individuals present: 4
- Collection? No. Insufficient population size (fewer than 20 individuals).

The location of the *Botrychium rugulosum* population found in the autumn 2007 survey is shown in Figure 1. The coverage of the August-September 2007 surveys is also shown on that figure. In addition to the *Botrychium rugulosum* population, two other *Botrychium* species were found. In all, nearly 100 individuals of *Botrychium multifidum* were found, as well as three individuals of *Botrychium matricariifolium*.

The dominant native plant community on the PolyMet mine site is Northern Wet-Mesic Boreal Hardwood-Conifer Forest (MNn44). Other native plant communities present include Northern Poor Dry-Mesic Mixed Woodland (FDn32), Northern Rich Spruce Swamp, Basin (FPn62) Northern Poor Conifer Swamp (APn81), Northern Open Bog (APn90) and Northern Spruce Bog (APn80).

**Discussion**

The September 2004 report<sup>4</sup> on the July 2004 *Botrychium* surveys at the PolyMet site states that “because surveys were conducted in July (too early for mature leaf morphology) it is impossible to conclude that (*Botrychium rugulosum*) does or does not occur in the PolyMet project area.” The report further recommends that “a survey later in the growing season would allow a more definitive conclusion (of the distinction between *Botrychium rugulosum* and *B. multifidum*) based on morphology.” With the completion of the autumn 2007 field surveys, a more comprehensive assessment is available for the presence *Botrychium rugulosum*, based on an appropriate survey time.

The autumn 2007 surveys focused on Dunka Road and the internal roads of the PolyMet site. However, internal portions of the PolyMet mine site were also surveyed. No *Botrychium rugulosum* was identified along the internal roads or further off of the roads. Most of the vegetation cover within the mine site is characterized by mixed hardwood-conifer forest, with dense ground cover. Other areas are characterized by

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<sup>4</sup> Johnson-Groh, C. *Botrychium* (Moonwort) Rare Plant Surveys for PolyMet Project; July 2004. Prepared for Barr Engineering Company, September 2004.

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bogs and marshes, or by recent logging and regeneration. None of these conditions are optimal for the growth of *Botrychium rugulosum*.

The assessment of the presence of *Botrychium rugulosum* at the PolyMet mine site reflects the work of four separate botanical surveys in 2004 and in 2007. A total of thirteen days have been spent in the field by professional botanists searching specifically for *Botrychium rugulosum*. Portions of an additional 39 days were spent in 2004 searching for the species. The result of these combined field efforts provides the most comprehensive, and likely most accurate, accounting of the presence of *Botrychium rugulosum* on the PolyMet mine site.