

Final Report for the 2006 ISSSSP Project to “Voucher, Verify, and Update *Botrychium* Element Occurrences on the Colville National Forest (or Digging into Pandora’s *Botrychium* Box)”

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The target taxa and their status are shown on Table 1 below:

Table 1. *Botrychium* Species and Status.

Species	FWS	Heritage Global	State Rank	WA Status
Upswept moonwort (<i>Botrychium ascendens</i>)	SoC	G3	S2	S
Crenulate moonwort (<i>Botrychium crenulatum</i>)	SoC	G3	S3	S
Western moonwort (<i>Botrychium hesperium</i>)		G3	S1	S
Skinny moonwort (<i>Botrychium lineare</i>)	SoC	G1G2	S1	S
Two-spiked moonwort (<i>Botrychium paradoxum</i>)	SoC	G2	S1	S
Stalked moonwort (<i>Botrychium pedunculatum</i>)	SoC	G3	S1	S

The Draft R6 *Botrychium* Conservation Assessment highlights identification as one of the problems in managing *Botrychiums*. Several *Botrychium* experts (Dr. Herb Wagner, Dr. Don Farrar, Dr. Cindy Johnson-Groh, and Dave Wagner) have collected specimens on the Forest, as well as Forest personnel. The notion of *Botrychium* species has evolved. Funding for this project resulted in updating the identifications of Element Occurrences (EOs) with that of the current knowledge of *Botrychium* taxa, based on Dr. Don Farrar’s 2005 “Systematics of Western Moonworts.”

The prime objective of the project was to validate the Draft *Botrychium* Conservation Assessment, regarding the identification of species and their abundance on the Colville National Forest. Although *Botrychium michiganense* has not been described, specimens of it were included as a separate species in this project. This project occurred across the Colville National Forest. Vouchering collections followed standard herbarium techniques. Data management ascribed to the R6 NRIS database and GIS guidelines.

Funding for this project resulted in organizing 15 years of varying identifications from numerous collectors, as well as cleaning up sighting forms and GIS mapping efforts. Collections from the same site often had different identifications, as the nomenclature and notion of the species has changed. I firmly believe that all *Botrychium* sites must be vouchered.

Table 2 shows the proposed and completed work:

Table 2. Proposed and Completed Work.

Proposed	Completed
Verify identifications of 220 sheets of <i>Botrychium</i> vouchers collected from offices across the Forest.	Verified identifications of a total of 338 collections of <i>Botrychiums</i> . Of those, 144 were sensitive <i>Botrychium</i> species (listed in the above table) and 194 collections were common ones. See Tables 3 and 4.
Verify identifications of at least 70 sheets of <i>Botrychium</i> vouchers from the Forest deposited at herbaria at the University of Washington and University of Oregon.	Verified identifications of a total of 76 collections deposited at several herbaria. Of those, 25 collections were sensitive <i>Botrychium</i> species and 51 collections were common ones. See tables 3 and 4.
Compile photocopies of vouchers from Farrar, Wagner, and Wagner.	Compiled 46 photocopies from the proposed collectors. See Table 4, "PC" under "Collections."
Attach photocopies of these vouchers to sighting forms for permanent record of taxa at each vouchered EO.	Completed photocopies are at Colville National Forest Supervisor's Office.
Revisit and voucher 40 EOs of the 140 EOs of sensitive <i>Botrychium</i> species on the Forest.	Revisited 40 EOs and vouchered those sites where plants were found in 2006. See Table 5.
Update sighting forms, GIS layer, and database of any changes in identifications.	Updated R6 sighting forms, GIS layer and Forest database.

The results of the 2006 revisits and vouchering of 40 EOs of sensitive *Botrychium* species are shown in Table 5 and follow:

1. The target species was vouchered at 12 EOs.
2. The *Botrychium* species found were other than the target species at 7 EOs. The identification of the species will be changed to the one vouchered in 2006.
3. The *Botrychium* species found were other than the target species at 12 EOs. These sites should be revisited again to verify identification.
4. No *Botrychiums* were seen at 9 EOs.
5. A bonus was the discovery of a new EO for *B. crenulatum*.

When this project was proposed, the number of *Botrychium* EOs was 140. Verifying identifications resulted in identifying 118. A total of 460 collections have been gathered and matched to the 118 EOs (Table 4). Of the 118 EOs, 29 remain without vouchers (Table 6).

Work that remains:

1. Voucher 29 non-vouchered EOs.
2. Update the Washington Natural Heritage Program of the changes in the identifications for affected EOs.
3. Make labels and distribute vouchers to herbaria.

Table 3. Number of Collections of Common *Botrychium* Species Identified.

	Mounted at Colville NF	Not Mounted at CNF	At WTU Herbarium	At WS Herbarium	At Iowa State University
<i>B. lanceolaum</i>	4	1			2
<i>B. lunaria</i>	9	2	1		4
<i>B. minganense</i>	31	42	7	2	6
<i>B. montanum</i>	15	23	6	1	6
<i>B. multifidum</i>	5		1	1	
<i>B. pinnatum</i>	10	4	1		4
<i>B. simplex</i>	14	16	1		6
<i>B. virginianum</i>	8	10		2	
Total vouchers	96	98	17	6	28
Grand Total = 245					

Table 5. Results of 2006 Revisits by Category

Target Species	Date of Revisit	# of Plants Vouchered in 2006	Location Site and District #
Target species found and identification confirmed.			
B. crenulatum/EO 058	7-27-06	8 B. crenulatum 1 B. montanum 2 B. pinnatum	Addy Cr., D1
B. crenulatum/EO 093	7-24-06	2 B. crenulatum	SE Trib. Rabbit Cr., D1
B. crenulatum/EO 094	7-24-06	2 B. crenulatum	SW Trib. Rocky Cr, D1
B. crenulatum/EO 095	6-27-06	5 B. crenulatum	Peterson Trib., D1
B. crenulatum/EO 097	7-10-06	1 B. crenulatum	N Fk. Meadow Cr., D1
B. crenulatum/EO 098	6-26-06	2 B. crenulatum	Smackout, D1
B. crenulatum/EO 099	7-24-06	9 B. crenulatum 1 B. minganense 3 B. montanum	SE Trib. Rocky Cr., D1
B. crenulatum/EO 100	6-7-06	6 B. crenulatum	Taylor Cr., D2
B. crenulatum/EO 102	9-12-06	2 B. crenulatum	Matson Cr., D2
B. hesperium/FO 006	6-1 & 27-06	9 B. hesperium	S. Smackout #2, Mid Smackout Mdw., D1
B. paradoxum/EO 013	6-27-06	1 B. paradoxum	Mid Smackout Mdw., D1
B. pedunculosum/EO 017	7-10-06	2 B. pedunculosum	Mid Smackout Mdw, D1
Target species not found. Change identification to species found in 2006 or voucher.			
Target species B. ascendens/EO 005 Change to B. minganense	7-6-06	B. minganense seen 7-13-92.	600 Rd., D2
Target species B. ascendens/EO 014 Change to B. crenulatum FO 062	7-31-06	2 B. crenulatum 5 B. minganense	Power Lake, D3
Target species B. crenulatum/EO 050 Change to B. minganense	7-20-06	7 B. minganense 4 B. montanum	Canyon Cr., D2
Target species B. crenulatum/EO 060 Change to B. lunaria	7-12-06	B. lunaria seen 7-19-95	Little Vulcan Mountain, D4
B. crenulatum/EO 101 Change to B. minganense	6-7-06	1 B. minganense 2 B. virginianum	McKinley-Deep Cr. Trib., D2

Target Species	Date of Revisit	# of Plants Vouchered in 2006	Location Site and District #
Target species not found. Change identification to species found in 2006 or voucher.			
Target species B. pedunculatum/EO 008 Change to B. hesperium	6-1-06	1 B. hesperium (new)	Hande Cr. Gravel Pit, D1
Target species B. pedunculatum/EO 020 Change to B. michiganense (new)	6-26-06	14 B. michiganense (new)	Clinton Cr. Camp, D1
Target Species	Visit Date-- # of Target Plants	# of Plants Vouchered in 2005	Location
Target species not found. Other <i>Botrychium</i> species were found.			
B. crenulatum/EO 008	6-7-06	3 B. virginianum	N 705 Rd. Sec. 12, D2
B. crenulatum/EO 010	7-26-06	2 B. manganense 1 B. montanum	Manley Cr., D2
B. crenulatum/EO 012	6-22-06	7 B. manganense 1 B. montanum 1 B. virginianum	Flat Cr., D2
B. crenulatum/EO 015	7-25-06	1 B. lanceolatum 1 B. manganense	S. Fk. Boulder, D2
B. crenulatum/EO 057	6-26-06	1 B. montanum	Kolle Cr., D1
B. crenulatum/EO 065	7-26-06	1 B. manganense	S. Fk. Little Boulder 252 Rd., D2
B. crenulatum/EO 067	5-23-06	2 B. virginianum	Pepoon Lake, D2
B. crenulatum/EO 086	7-26-06	1 B. montanum	Seep/Intermittent Trib. Independent Cr., D2
B. crenulatum/EO 100	6-7-06	6 B. manganense	Taylor Cr., D2
B. paradoxum/EO 009	6-28-06	43 B. hesperium	Paradise Meadow, D1
B. paradoxum/EO 011	7-31-06	4 B. manganense 3 B. montanum	Tacoma Cr., D3
B. pedunculatum/EO 016	6-13-06	1 B. simplex	Lost Cr.-Rocky Rd., D1
No <i>Botrychiums</i> were found. Revisit.			
B. crenulatum/EO 017	7-25-06		S Fk Boulder Ck., D2
B. crenulatum/FO 040	7-25-06, 9-12-06		Nancy # 2 THPL Spring, D2
B. crenulatum/EO 042	7-10-06		Aladdin Blowdown # 2, D1
B. crenulatum/EO 059	8-1-06		Leslie Ck., D1

Target Species	Date of Revisit	# of Plants Vouchered in 2006	Location Site and District #
Target species not found. Other <i>Botrychium</i> species were found.			
B. crenulatum/EO 071	6-27-06		N Fk. Deer Cr., D1
B. crenulatum/EO 083	7-25-06		160/180 Rd Jct., D2
B. crenulatum/EO 104	7-20-06		S Fk. Barnaby Ck., D2
B. crenulatum/EO 105	7-24-06		150 Rd. Upstream S Trib. Rocky Ck # 1, D1
B. pedunculatum/EO 023	7-12-06		Goodrich Meadow, D4
Did not get to site; road problems.			
B. crenulatum/FO 057	7-26-06		2712 -214 Rd. Seep- Rd. bermed at jct., D3
B. crenulatum/EO 088	7-31-06		Kerry Ck- Matchstick blowdown, D2
New sighting.			
B. crenulatum/FO 063	7-31-06	1 B. crenulatum 3 B. manganense	Trib. to S. Fk. Tacoma Cr., D3

Table 6. Summary of Vouchered *Botrychium* Element Occurrences on the Colville National Forest.

	Species							
	<i>B. ascendens</i>	<i>B. crenulatum</i>	<i>B. hesperium</i>	<i>B. michiganense</i>	<i>B. lineare</i>	<i>B. paradoxum</i>	<i>B. pedunculosum</i>	Total
Total for the Forest								
# of EOs								
Vouchered	2	41	14		1	9	14	89
# of EOs	2	66	14		1	11	16	118
Colville District								
# of EOs								
Vouchered	2	11	9	8		5	9	44
# of EOs	2	16	9	8		5	9	49
Kettle Falls District								
# of EOs								
Vouchered	0	23	2		1	3	3	32
# of EOs	0	41	2		1	5	3	52
Newport District								
# of EOs								
Vouchered		4	1			1		6
# of EOs		5	1			1		7
Republic District								
# of EOs								
Vouchered		1					0	1
# of EOs		2					1	3
Sullivan Lake District								
# of EOs								
Vouchered		2	2				2	6
# of EOs		2	2				3	7