

LTBMU Rare Plant Species & Fungi Diversity- 2012 Monitoring Report

USDA Forest Service, Lake Tahoe Basin Management Unit



Prepared by:
Stephanie McKnight, Botanical technician & Blake Engelhardt, Botanist
1/3/2013



TABLE OF CONTENTS

1. EXECUTIVE SUMMARY	2
2. RARE PLANT STATUS & CHANGE.....	2
3. FUNGI DIVERSITY	15
4. CONCLUSIONS	16
5. LITERATURE CITED.....	17
6. APPENDICES	19

1. EXECUTIVE SUMMARY

This report summarizes 2012 activities related to monitoring the status and change of Region 5 foresters sensitive plant species, Lake Tahoe Basin Management Unit (LTBMU) special interest plant species (vascular and non-vascular), and fungi diversity. In 2012, a total of 72 sensitive and special interest occurrences were visited. For sensitive plant species, 60 existing occurrences were revisited and 12 new occurrences were found. Based on census data of sensitive plant occurrences 41% were stable, 24% were increasing, 18% were decreasing, 11% were of unknown status, and 6% were new in 2012. For LTBMU special interest plant species, fourteen existing occurrences were revisited and seven new occurrences were found. Based on census data of LTBMU special interest plant occurrences, 74% were stable, 6% were increasing, 10% were of unknown status, and 10% were new in 2012. The large percentage of occurrences with unknown status is related to difficulty in quantifying the size of bryophyte occurrences. Long-term monitoring was conducted at nine *Draba asterophora* occurrences and at two *Lewisia longipetala* occurrences. Results of these monitoring programs are discussed in stand-alone interim reports. All three fungi diversity plots were revisited in 2012; a total of 26 species were found, 15 of which had not previously been found in the fungi plots.

2. RARE PLANT STATUS & CHANGE

Introduction and Management Direction

The Lake Tahoe Basin Management Unit (LTBMU) monitors the status and change of those plants on the Region 5 Regional Forester's Sensitive Species List that are known to occur in the basin (referred to as 'sensitive'), as well as Tahoe Regional Planning Agency (TRPA) sensitive plant species (referred to as 'TRPA') and LTBMU Special Interest plant species (referred to as SI); in this report, these plants are referred to collectively as rare plants. There are no federally Threatened, Endangered, Proposed, or Candidate species known to occur on LTBMU. National Forests are tasked with managing sensitive plants to ensure that they do not become threatened or endangered because of Forest Service activities (USDA FS 2005). The primary management action related to this direction is to avoid or minimize impacts to species whose viability has been identified as a concern (USDA FS 2005). TRPA plants are protected from significant adverse impacts due to vegetation management, grazing, or other project activities in the Lake Tahoe Basin, as outlined in TRPA's Code of Ordinances (TRPA 2012). All five species designated as TRPA sensitive species are also R5 sensitive species; they are discussed together. For sensitive plants, the indicator of threshold attainment is "the number of population sites that

are maintained as suitable habitat as determined by a qualified expert” (TRPA 1998) The Forest Service maintains a “watch” list of plant species—special interest species—that have not been designated as sensitive by the Regional Forester, but are of conservation concern on the LTBMU. This list includes species that are newly described, locally rare, range extensions or disjunct populations, plants of specific public interest, or species with too little information to determine their appropriate status. Appendix 1 contains a complete list of R5 sensitive, TRPA sensitive, and special interest plant species that are addressed by the LTBMU.

Methodology

A comprehensive monitoring program for sensitive and LTBMU special interest species was initiated in 2004. The objective of this monitoring program is to track the status and change of all known sensitive and special interest plant species sub-element occurrences in the LTBMU. In order to meet this objective, each sub-element occurrence (referred to as occurrence throughout the remainder of this document) is visited at least once every five years. In addition, occurrences are visited more frequently when: 1) new occurrences or sub-element occurrences are discovered (a minimum of two years of baseline data is obtained); 2) data suggests that an occurrence or sub-element is decreasing; or 3) the occurrence or sub-element occurrence status is in question (e.g. occurrence could not be relocated, species identification could not be confirmed, large unexplained year-to-year fluctuation in number of plants). Plants are assigned to an element occurrence (EO) and a sub-element occurrence (sub-EO). Two sub-occurrences are considered to be part of the same EO if they 1) occur within one kilometer of each other, 2) occur within three kilometers of each other and are connected by suitable habitat, or 3) occur within 10 km of each other and are connected by uninterrupted linear water-current flow along a riparian or lakeshore system (NatureServe 2004). Within an EO, individual plants or groups of plants are assigned to separate sub-EOs (e.g. a, b, c) if they are non-contiguous with the rest of the EO and it is more practical or precise to survey them as separate occurrences.

The most recent comprehensive monitoring occurred in 2009. In 2010-2012, revisits were made to occurrences that were 1) declining based on previous year’s visits; or 2) new occurrences where an additional year of baseline data was desired. The current status of all special interest plant species as of 2012 is summarized in Table 1, with the exception of *Rorippa subumbellata* (Tahoe yellow cress). Tahoe yellow cress (TYC) is monitored annually by the TYC Adaptive Management Working Group (AMWG) and the status of this species is discussed separately in AMWG annual reports. In 2012, 72 rare plant occurrences were visited. For sensitive plant species, 51 existing occurrences were revisited and six new occurrences were found. For LTBMU special interest plant species, seven existing occurrences were revisited and seven new occurrences were found. Table 2 summarizes the number of visited and known occurrences for each species from 2002 through 2012 in order to provide a census history for each species.

Planning

Revisits in 2013 should consist of visits to as many occurrences as possible that are decreasing, are of unknown status, were newly discovered in 2012, or were found to have inexplicably large increases. The first priority should be to visit sensitive plant occurrences, and if resources allow, special interest plant occurrences. There are 32 high priority sensitive plant occurrences to be revisited in 2013; eight are new as of 2012, two are new sub-elements of 2011, ten are

decreasing, four are of unknown status and six are increasing rapidly. There are an additional 21 medium to low priority special interest occurrences that could be visited in 2013 if resources allow; seven are new as of 2012, six are new as of 2011, one is decreasing, four are of unknown status, and one is increasing rapidly (Appendix 2). In 2013, all revisits should include mapping detailed occurrence or sub-element occurrence boundaries using GPS points. For those occurrences not revisited in 2011-2013, monitoring should occur in 2014, as a component of the scheduled five-year comprehensive monitoring of all sensitive and LTBMU special interest plant occurrences, if funding allows.

Table 1: Overall change¹ of sensitive and LTBMU special interest plant species known to occur on the Lake Tahoe Basin Management Unit.

Species	Legal Status ²	Total EO & Sub-EOs	New 2012	Stable	Increase	Decrease	Unknown
<i>Arabis rectissima</i> var. <i>simulans</i>	SI	5	0	0	1	0	4
<i>Arabis rigidissima</i> var. <i>demota</i>	S, TRPA	7	0	1	3	3	0
<i>Botrychium ascendens</i>	S	8	1	2	2	3	0
<i>Botrychium crenulatum</i>	S	4	0	2	0	2	0
<i>Botrychium minganense</i>	S	2	0	1	0	1	0
<i>Botrychium montanum</i>	S	3	2	0	0	1	0
<i>Bruchia bolanderi</i>	S	8	1	0	0	0	7
<i>Chaenactis douglasii</i> var. <i>alpina</i> ⁴	SI	9	4	0	0	0	5
<i>Claytonia megarhiza</i>	SI	3	0	1	1	0	1
<i>Dendrocollybia racemosa</i>	S	1	0	0	0	0	1
<i>Draba asterophora</i> var. <i>asterophora</i>	S, TRPA	40	1	25	9	3	2
<i>Draba asterophora</i> var. <i>macrocarpa</i>	S, TRPA	9	0	4	3	1	1
<i>Epilobium howellii</i>	S	10	2	1	4	3	0
<i>Helodium blandowii</i> ³	S	3	0	3	0	0	0
<i>Lewisia longipetala</i>	S, TRPA	12	1	4	5	2	0
<i>Meesia triquetra</i> ³	S	27	0	17	0	0	10
<i>Meesia uliginosa</i> ³	S	2	0	2	0	0	0
<i>Orthotrichum shevockii</i>	SI	3	0	0	0	0	3
<i>Peltigera gowardii</i>	S	4	2	0	0	0	2
<i>Pinus albicaulis</i> ⁵	S, C	-	-	-	-	-	-
<i>Scutellaria galericulata</i>	SI	5	0	3	2	0	0
<i>Sphagnum</i> spp. ³	SI	29	1	28	0	0	0

¹Overall change was determined by comparing the total number of plants from the date the occurrence was first observed to the total number of plants observed during the most recent census. All occurrence visits were within two weeks of the date the occurrence was first observed.

²S—R5 Regional Forester's Sensitive Species List; SI—LTBMU Special Interest, TRPA—Tahoe Regional Planning Agency Sensitive; C—Candidate for Federal listing under Endangered Species Act.

³Overall status of these bryophyte species are listed as either unknown (the occurrence was still present) or decrease (the occurrence was absent).

⁴Tracking for this species began in 2011.

⁵A monitoring protocol for status and change of this species has yet to be developed.

Table 2. Census history for known occurrences of sensitive and LTBMU special interest plant species. Number of occurrences visited during respective year with the total number occurrences in parentheses.

Species	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012
<i>Arabis rectissima</i> var. <i>simulans</i>	-	-	-	-	-	-	-	5 (5)	-	1(5)
¹ <i>Arabis rigidissima</i> var. <i>demota</i>	-	11 (11)	6 (17)	-	-	-	17 (17)	5 (14)	13 (16)	14(7)
<i>Botrychium ascendens</i>	-	-	-	-	1 (1)	4 (5)	5 (5)	6 (6)	5 (7)	5 (7)
<i>Botrychium crenulatum</i>	1 (1)	1 (1)	1 (1)	-	-	1 (1)	2 (2)	1 (2)	3 (4)	3 (4)
<i>Botrychium minganense</i>	-	-	1 (1)	-	-	1 (1)	2 (2)	2 (2)	1 (2)	-
<i>Botrychium montanum</i>	-	-	-	1 (1)	1 (1)	-	1 (1)	-	1 (1)	3 (3)
<i>Bruchia bolanderi</i>	-	-	-	1 (1)	-	-	5 (7)	5 (7)	3 (7)	2 (8)
<i>Chaenactis douglasii</i> var. <i>alpina</i>	-	-	-	-	-	-	-	-	5 (5)	4 (9)
<i>Claytonia megarhiza</i>	-	-	-	-	-	-	1 (1)	-	2 (3)	2 (3)
<i>Dendrocollybia racemosa</i> ²	-	-	-	-	-	-	-	-	-	-
<i>Draba asterophora</i> var. <i>asterophora</i>	-	22 (23)	3 (28)	-	-	-	34 (34)	10 (34)	6 (39)	11 (40)
<i>Draba asterophora</i> var. <i>macrocarpa</i>	-	6 (7)	-	-	-	-	7 (7)	3 (7)	5 (9)	4 (9)
<i>Epilobium howellii</i>	-	-	-	1 (1)	4 (4)	-	5 (5)	5 (6)	4 (8)	10 (10)
<i>Helodium blandowii</i>	-	-	-	-	-	-	3 (3)	-	1 (3)	0 (3)
<i>Lewisia longipetala</i>	2 (2)	6 (6)	-	1 (7)	-	-	8 (8)	7 (8)	3 (11)	6 (12)
<i>Meesia triquetra</i>	-	7 (7)	4 (10)	-	1 (11)	2 (13)	20 (22)	7 (22)	9 (27)	0 (27)
<i>Meesia uliginosa</i>	-	-	2 (2)	-	-	-	2 (2)	-	2 (2)	0 (2)
<i>Orthotrichum shevockii</i>	-	-	-	-	-	-	1 (2)	2 (2)	2 (3)	0 (3)
<i>Peltigera gowardii</i>	-	-	-	-	-	1 (1)	-	-	1 (2)	2 (4)
<i>Pinus albicaulis</i>	-	-	-	-	-	-	-	-	-	-
<i>Scutellaria galericulata</i>	-	-	-	-	-	-	3 (3)	2 (4)	3 (5)	3 (5)
<i>Sphagnum</i> spp.	-	-	-	-	2 (2)	4 (6)	14 (14)	14 (20)	10 (29)	1 (30)

¹Four occurrences were visited and determined not to be *Arabis rigidissima* var. *demota* (ARRID) in 2010, but one new ARRID occurrence was found, resulting in a net decrease from 17 occurrences in 2009 to 14 in 2010. In 2011, this assessment was confirmed and two additional occurrences were determined not to be ARRID; however four new occurrences were also found, increasing the total number of ARRID occurrences to 16 in 2011. In 2012, 9 occurrences were visited and determined to not be ARRID, decreasing the total number of ARRID occurrences to 7 in 2012.

²One occurrence of *Dendrocollybia racemosa* is known from a historical collection in 1982 near Tahoe City.

Special interest vascular plant monitoring consists of census counts and mapping the occurrence extent using GPS points and/or polygons. Beginning in 2013 polygons of occurrence or occurrence boundaries will be mapped during census or monitoring visits. Integrating the use of occurrence boundaries with census counts may improve assessment of long term population changes as well as assist project planning. Occurrence boundaries will be mapped to the best of a surveyor's abilities, but plants may still occur outside this boundary. The counting unit is the individual stem or rosette, depending on the species. At very large occurrences classes are used instead of a census count. This reduces errors associated with counting large numbers of plants and improves consistency when identifying individual plants of small stature and/or various stage classes. The classes are: a complete census if less than 100 individuals, 100-249, 250-499, 500-999, and 1000+. Assessments of occurrence status are solely based on census counts, not

statistical analysis. The standard set of statistical tools used by the majority of ecologists are difficult or inappropriate to use when analyzing rare species, either because assumptions such as normality or homoscedasticity do not hold, or because the required sample sizes are impossibly large (Ellison and Agrawal 2005).

Special interest moss and lichen species are more challenging than vascular plant species to quantify due to high stem densities and difficulty in identifying an individual plant. In order to assess the status and overall change of special interest moss and lichen species, the area of the occurrence (square meters) and ocular cover within that area is estimated. Revisits provide a way to assess presence/absence of previously identified occurrences and changes in the ocular cover provide insight into the overall change of the occurrence. However, percent cover can vary across different months of the year and estimates of cover can vary substantially between observers (Elzinga et al. 1998). For these reasons, quantitative data beyond presence/absence are currently not available. Future moss and lichen monitoring may involve permanent markers and the use of sampling techniques to enhance quantitative measurement.

Status of Sensitive Species

Arabis rigidissima var. *demota* (Galena Creek rockcress)

Arabis rigidissima var. *demota* is a challenging species to identify. This species hybridizes with *A. platysperma* and consistently distinguishing between these species and the hybrid is problematic. Initial census counts are not available for many of the known occurrences due to the difficulty in species identification. For this species presence/absence is the most reliable data that may be collected. There are approximately 18 occurrences of this species in California and Nevada, and three occurrences on LTBMU.

Fieldwork in 2012 focused on visiting all remaining unconfirmed *A. rigidissima* var. *demota* occurrences to determine species identification and validity. A total of fourteen occurrences were visited in 2012: ten revisits were completed at all the sub-elements of ARRID 3, 4, 5 and 6, ARRID 2b, and four new sub-elements found in 2011 (ARRID 1h-1i, 7a-7b). Plants at five of the revisited sub-elements were confirmed to be *A. rigidissima* var. *demota* (Table 3); plants at the remaining nine sub-elements were either identified as *A. platysperma* (Table 3) or the occurrence is no longer extant (ARRID 5a-b). As of 2012, there are seven confirmed sub element occurrences of *A. rigidissima* var. *demota* (1a, 1g-i, 2b, 7a-b); between 2012 and the initial census three occurrences increased, three decreased and one is stable. Element Occurrences 1g-1i decreased in 2012 and should be revisited in 2013.

Table 3. Summary of *A. rigidissima* var. *demota* occurrences 2009-2012

LTBMU EO	Species Present	2009 ¹	2010	2011	2012	Overall change	LTBMU Collection Number ²
ARRID 1a	Yes	10?		100		Increase	711
ARRID 1g	Yes		72	50		Decrease	-
ARRID 1h	Yes			25	11	Decrease	-
ARRID 1i	Yes			20	5	Decrease	709

LTBMU EO	Species Present	2009 ¹	2010	2011	2012	Overall change	LTBMU Collection Number ²
ARRID 2b	Yes	?		250	276	Increase	713
ARRID7a	Yes			100	121	Increase	-
ARRID7b	Yes			2	2	Stable	-
ARRID 1b	No	?	0	0			-
ARRID 1c	No	?	0	0			-
ARRID 1d	No	?	0	0			-
ARRID 1e	No	?	0	0			-
ARRID 1f	No	?		0			714 – <i>A. platysperma</i> 715 – <i>A. lyallii</i>
ARRID 2a	No	0		0			712 – <i>A. platysperma</i>
ARRID 3a	No	0			0		-
ARRID 3b	No	2?			0		-
ARRID 3c	No	?			0		-
ARRID 4a	No	0			0		-
ARRID 4b	No	2?			0		-
ARRID 5a	No	?			0		-
ARRID 5b	No	?			0		-
ARRID 6a	No	?			0		-
ARRID 6b	No	0			0		-

¹Question mark (?) indicates that species identification is in question.

²Collections are currently housed in the LTBMU herbarium at the Meyers Work Center, 3030 Highway 50, Meyers, CA.

***Botrychium* spp. (Moonworts)**

It is difficult to ascertain overall change among *Botrychium* occurrences on LTBMU. In 2012, two *Botrychium* occurrences increased, five decreased, two disappeared, and three were new. There are approximately 31 known occurrences of *B. ascendens* in California, six of which occur on LTBMU. There are approximately 59 occurrences of *B. crenulatum*, four of which occur on LTBMU. There are approximately 22 occurrences of *B. montanum* in California, three occurrences on LTBMU. There are approximately 28 occurrences of *B. minganense* in California with only two occurring on LTBMU.

Botrychium occurrence sizes can vary greatly from year to year and it is not uncommon for adjacent occurrences to increase and decrease simultaneously (Montgomery 1990, Muller 1992, 1993; Johnson-Groh and Farrar 1993; Lesica and Ahlenslager 1996; Johnson-Groh 1997). In addition to variability at the occurrence level, individual plants may remain dormant underground during some years, and then emerge and produce aboveground plants the following season (Montgomery 1990; Muller 1992, 1993; Lesica and Ahlenslager 1996; Johnson-Groh 1998). New plants are recruited into the population annually, but mature plants may disappear and then reappear after 1-3 years (Johnson-Groh 1998). Herbivory may reduce the chances that surveyors will detect all aboveground plants in a given season. Herbivory probably does not negatively affect the long term viability of an individual (Chadde and Kudray 2001). Continued

monitoring of *Botrychium* occurrences will help to determine whether observed fluctuations are due to long-term changes in occurrence size or part of the inter-annual variability often seen in occurrences of this genus.

Table 4. Number of plants observed at each of the LTBMU *Botrychium* element and sub-element occurrences from 2002 to 2012.

LTBMU EO	2002	2004	2005	2006	2007	2008	2009	2010	2011	2012	Overall Change ¹
BOAS1	-	-	-	-	4	-	1	8	-	-	Increase
BOAS2 ²	-	-	-	-	-	41	4	15	-	18	Decrease
BOAS3a ^{2,3}	-	-	-	-	-	14	5	1	22	75-100	Increase
BOAS3b	-	-	-	-	-	14	1	0	22	-	Stable
BOAS3c ^{2,3}	-	-	-	-	-	29	2	1	19	-	Stable
BOAS4	-	-	-	-	-	-	-	5	0	2	Decrease
BOAS5 ^{2,3}	-	-	-	-	-	-	-	-	52	31	Decrease
BOAS6	-	-	-	-	-	-	-	-	-	33	New 2012
BOCR1	3	2	3	-	-	2	2	-	-	0	Decrease
BOCR2 ³	-	-	-	-	-	-	800-1000	169 ⁴	1000+	-	Stable
BOCR3 ^{2,3}	-	-	-	-	-	-	-	-	47	31	Decrease
BOCR4	-	-	-	-	-	-	-	-	35	32	Stable
BOMI1	-	-	2	-	-	-	0	0	0	-	Decrease
BOMI2	-	-	-	-	-	3	1	4	-	-	Stable
BOMO1	-	-	-	34	11	-	5	-	4	0	Decrease
BOMO2	-	-	-	-	-	-	-	-	-	1	New 2012
BOMO3										1	New 2012

¹Overall change is determined by comparing the number of plants at the most recent and initial visits.

²In 2012, 23 specimens were collected from these five occurrences and sent to Don Farrar at Iowa State University for isozyme analysis and species verification.

³In 2011, twenty specimens were collected from these five occurrences and sent to Don Farrar at Iowa State University for isozyme analysis and species verification.

⁴This decrease was due to an incomplete survey as opposed to a true decrease.

Of the five *B. ascendens* occurrences visited in 2012, three decreased, one increased and one was new from time of initial observation. *B. ascendens* occurrence 3a showed a significant increase in 2012, with 75-100 plants found compared to 14 plants initially found in 2008. The lone occurrence of *B. montanum* (BOMO1), which initially had 34 plants in 2006, declined to only four plants in 2011, and zero plants were found in 2012. This occurrence is directly adjacent to a popular hiking trail and a small spring that is highly disturbed. It is unclear whether or not hikers have impacted the occurrence, but there has always been disturbance at this site due to its close proximity to the trail. Two new *B. montanum* occurrences, each with one plant, were found growing within *B. crenulatum* occurrences in 2012 (BOMO2 and BOMO3). This suggests that there may be additional *Botrychium* occurrences on the LTBMU that are comprised of multiple species, and surveyors should key out several plants within occurrences during census counts. Herbivory was observed at several occurrences in 2011 and 2012.

Botrychium specimens (23 in 2012, 20 in 2011) from several occurrences were sent to the

University of Ohio for genetic analysis in 2011 and 2012. Genetic analysis of the specimens will help confirm field identification of *Botrychium* occurrences within the LTBMU.

***Bruchia bolanderi* (Bolander's candle-moss)**

As of 2012, there were seven occurrences and eight sub-element occurrences of *Bruchia bolanderi* (Table 1) on LTBMU out of approximately 30 known occurrences in California. One new occurrence was discovered, one occurrence could not be verified to species, and the six remaining occurrences exhibited variability in plant number or have only been visited once; as such, it is difficult to ascertain any overall change in the LTBMU *B. bolanderi* occurrences. BRBO5 was lacking sporophytes and could not be positively identified. The new occurrence (BRBO7) was found in Desolation Wilderness during a habitat model validation survey. Due to the small stature of this species, it can be challenging to find and/or quantify occurrence extent, especially when the species is not fruiting. Occurrence size may vary depending on the timing of surveys because *B. bolanderi* plants senesce after spore dispersal, although spores are generally not set until late fall or early winter. This species does not compete well with other plants, therefore some disturbance is necessary to maintain open habitat (Harpel 2008). Additional efforts will be made during future monitoring to quantify occurrence sizes so that overall changes can be determined.

***Draba asterophora* var. *asterophora* (Lake Tahoe draba)**

Overall, the overall status of *Draba asterophora* var. *asterophora* is relatively stable or even improving. There are approximately 20 known occurrences of this species in California and Nevada, four of which are on LTBMU. The total number of *D. asterophora* var. *asterophora* plants on LTBMU is estimated at 19,500; estimate was made using the most recent census count for each occurrence. In 2012, of the 40 occurrences of *D. asterophora* var. *asterophora*, 24 were stable, three increased, one was new in 2012, and seven were unknown (due to only one census count or the inability to completely survey the occurrence because of safety concerns (Table 5). All the occurrences with long-term monitoring continue to support large numbers of plants (Table 5).

In 2012, a new occurrence (DRASA3i) was discovered on a ridge below Relay Peak. This occurrence of 4 individuals is roughly 600 meters north of DRASA3f along the Tahoe Rim Trail. Occurrence DRASA2h, at Heavenly Ski Resort, increased significantly in 2012. DRASA2h was first reported in 2009 with 45 individuals covering an area 15x30 meters. Surveys in 2012 have found that this occurrence covers almost 14 acres, with 1200-1500 individuals. The increase is likely due to an increase in survey area and effort as opposed to a true increase. Roughly 50 plants within DRASA2h remain flagged and marked with metal tags from a dissertation research project that was completed in 2008 (Smith et al. 2008). DRASA2n could not be found in 2012, and it is possible that ski resort maintenance activities have impacted this small occurrence (survey area was covered in debris from ski area tree removal). All of these occurrences should be revisited in 2013.

In 2011, four new occurrences were found at DRASA 1 along the ridge connecting Freel Peak and Job's Sister, and below Trimmer Peak. Two occurrences are of interest because they were found in unusual habitats. One occurrence (DRASA1o) occurs on a south-facing alpine slope. The other (DRASA1n) was found along a sandy, north-facing cut bank of a small alpine stream corridor. An additional occurrence consisting of 250+ plants was found in 2011 in the cirque

above Hell Hole, and represents a completely new element occurrence (DRASA4). In 2012, these occurrences were revisited, one had decreased (DRASA1n), two increased (DRASA1o and DRASA1q), and two were not visited due to safety concerns (DRASA1p, DRASA4). The largest of the occurrences, DRASA1q, covers a very large area on the saddle between Job's sister and Freel Peak connecting with DRASA1b to the south. A total of 1200-1500 plants were found at DRASA1q. In 2012, a historical occurrence (CNDDDB occurrence 2, last reported in 1978) was surveyed for on the northwest slope of Job's Sister. The occurrence was not found; however, the slope supports a large population of *Draba oligosperma* var. *oligosperma*. The historical occurrence is mapped directly above the large and newly discovered DRASA1q occurrence.

Table 5. Number of plants observed at each of the LTBMU *Draba asterophora* var. *asterophora* element and occurrences from 2004 to 2012.

LTBMU EO	2004	2005	2009	2010	2011	2012	Overall Change ¹
DRASA 1a	1000+		1000+	M(93)	M(105)	M(100)	Stable
DRASA 1b	1000+		1000+	M(99)	M(118)	M(110)	Stable
DRASA 1c	1000+		1000+				Stable
DRASA 1d	1000+		1000+	M(43)	M(53)	M(48)	Stable
DRASA 1e	375		250-499				Stable
DRASA 1f	4		5				Stable
DRASA 1g	175		100-250				Stable
DRASA 1h	750		500-999				Stable
DRASA 1i	116		X	6 ²			Stable
DRASA 1j	1022		1000+	M(144)	M(160)	M(161)	Stable
DRASA 1k	250-499		250-499				Stable
DRASA 1l			90			52	Decrease
DRASA 1m	X		250-499			1200	Increase
DRASA 1n					224	168	Decrease
DRASA 1o					100-250	250-499	Increase
DRASA 1p					300+		Unknown
DRASA 1q					100-250	1200-1500	Increase
DRASA 2a	250-499		250-499				Stable
DRASA 2b	500-999		250-499	780 / M(116)	M(155)	M(178)	Stable
DRASA 2c	250-499		250-499				Stable
DRASA 2d	100-249		100-249				Stable
DRASA 2e	500-999		500-999				Stable
DRASA 2f	1000+		1000+	M(131)	M(157)	M(169)	Stable
DRASA 2g			250-499			250-499	Stable
DRASA 2h			45			1200-1500	Increase
DRASA 2i		225	500+				Increase

LTBMU EO	2004	2005	2009	2010	2011	2012	Overall Change ¹
DRASA 2j		275	250-499				Stable
DRASA 2k		2	1				Stable
DRASA 2n			7			0	Decrease
DRASA 2o			33			46	Increase
DRASA 3a	500-999		500-999				Stable
DRASA 3b	500-999		1000+	M(168)	M(191)	M(197)	Increase
DRASA 3c	500-999		500-999				Stable
DRASA 3d	11		13				Stable
DRASA 3e	100-249		100-249				Stable
DRASA 3f			100-249			417	Increase
DRASA 3g		X	9	30			Increase
DRASA 3h		X	30	0 ³	31		Stable
DRASA3i						4	New 2012
DRASA 4					250+		Unknown

¹Overall change is determined by comparing the number of plants at the most recent and initial visits.

²DRASA 1i occurs in a very steep chute that is dangerous to ascend. Six plants were observed at the base of the chute in 2010 and plants were visible continuing upward; therefore DRASA1i is considered stable.

³Likely due to incorrect UTM coordinates as opposed to a true decline.

X—Indicates that the occurrence was known or visited but a census was not completed.

M—Indicated long-term monitoring was conducted. Numbers in parentheses are the number of plants in the long-term monitoring plots.

***Draba asterophora* var. *macrocarpa* (Cup Lake draba)**

The overall change of *Draba asterophora* var. *macrocarpa* is stable to increasing. There is one element occurrence with 10 sub-elements of this species in California, nine of which are on LTBMU and the remaining sub-element occurs on the El Dorado National Forest. The total number of *D. asterophora* var. *macrocarpa* on LTBMU is estimated at 6,500; estimate was made using the most recent census count/estimate for each occurrence. In 2012, of the nine *D. asterophora* var. *macrocarpa* sub-EOs at Saucer Lake/Ralston Peak, three have increased, four were stable, one decreased, and one was unknown (Table 6).

DRASM 1a (below Saucer Lake) had 43 plants in 2004, and could not be relocated in 2009 or 2010. In 2011, 250 plants were found at this occurrence, although they are in a slightly different location than the original 43 plants, but would still be considered the same occurrence. In 2012, DRASM1a was revisited and 184 plants were found. DRASM 1g (Ralston Peak) was not visited in 2012 due to concerns about worker safety in accessing it. The occurrence was initially identified but not counted in 2004, but there is no current information to confirm its location or size. In 2011 and 2010, attempts were made to relocate the occurrence but it could not be found.

In 2011, two new occurrences (DRASM1h and DRASM1i) were found in north-facing chutes below the ridge connecting Becker Peak, Talking Mountain, and Saucer Lake. One of these occurrences (DRASM 1i) consists of an estimated 3,500 individuals and is the largest *D. asterophora* var. *macrocarpa* occurrence known on the LTBMU. These new occurrences were revisited in 2012 and found to be stable. Occurrence DRASM1f was revisited in 2012 and found

to be larger than previous years with 500-750 individuals across 1.25 acres. This increase is likely due to an increased survey area versus a true increase.

Table 6. Number of plants observed at each of the LTBMU *Draba asterophora* var. *macrocarpa* element and occurrences from 2004 to 2011.

LTBMU EO	2004	2009	2010	2011	2012	Overall Change ¹
DRASM 1a	43	0	0	250	180	Decrease
DRASM 1b	1000+	100-249	1000+/M(130)	1000+/M(138)	1000+/M(123)	Stable
DRASM 1c	250-499	250-499				Stable
DRASM 1d	12	45				Increase
DRASM 1e	250-499	500-999	M(124)	M(176)	M(189)	Increase
DRASM 1f	X	250-499			500-750	Increase
DRASM 1g	X	0	0	0		Unknown
DRASM 1h				500-750	500-750	Stable
DRASM 1i				3000-4000	3000-4000	Stable

¹Overall change is determined by comparing the number of plants at the most recent and initial visits.

X—Indicates that the occurrence was known or visited but a census was not completed.

M—Indicates long-term monitoring was conducted. Numbers in parentheses are the number of plants in the long-term monitoring plots.

***Epilobium howellii* (Subalpine fireweed)**

The overall change of *Epilobium howellii* occurrences is difficult to assess as there is little known about the life history and long-term persistence of the species. Observations by surveyors suggest that the species is a weak perennial and may act more like an annual. In addition, plants are difficult to find when competing vegetation is dense. There are approximately 98 occurrences of this species consisting of an estimated one million plants in California. There are four occurrences on LTBMU.

Many occurrences have exhibited a similar pattern of initially containing a large numbers of plants and then gradually declining to zero plants over the next several seasons (Table 7). In 2012, plants were found at all existing *E. howellii* occurrences, many increasing from the previous year, and two additional new occurrences with 400+ plants each were discovered (EPHO3c, EPHO4b). Three existing occurrences (EPHO1a, EPHO3b and EPHO4b) increased significantly in 2012, and one (EPHO3a) decreased. The habitat around EPHO3a was extremely dry in 2012. In 2012, searches were expanded downstream and/or down-slope to areas where seed dispersal is most likely; however, new occurrences or additional plants were not found. In 2013, all occurrences should be revisited to better determine the overall change of this species. This species may be removed from the region 5 sensitive list in the future.

This species may be removed from the Region 5 Sensitive plant list in 2013.

Table 7. Census results of *Epilobium howellii* occurrences on the LTBMU from survey years 2007, and 2009-2012.

LTBMU EO	2006	2007	2009	2010	2011	2012	Overall Change
EPHO 1a		50	16			181	Increase
EPHO 1b	100	100	0	0	6	32	Decrease

LTBMU EO	2006	2007	2009	2010	2011	2012	Overall Change
EPHO 2a		25	18	0		27	Stable
EPHO 2b		25-30	16	0		48	Increase
EPHO 2c			100	0		32	Decrease
EPHO 3a				300	200+	129	Decrease
EPHO3b					300+	700-800	Increase
EPHO3c						442	New 2012
EPHO4a					250	500+	Increase
EPHO4b						700-800	New 2012

***Helodium blandowii* (Blandow's bog moss)**

In the Lake Tahoe area, *Helodium blandowii* was first collected in 2004 at Tahoe Meadows along Other Creek on the Humboldt-Toiyabe National Forest. On the LTBMU, it was first found in 2009 in two locations: Grass Lake and a fen/wet meadow complex just north of Armstrong Pass. The Grass Lake occurrence was still present during surveys conducted in 2012, but the occurrence size was not estimated. The size of moss occurrences is currently assessed by estimating total area of the occurrence and percent cover of the special interest species within that area. However, the patchy distribution of moss species results in significant variation between years and observers. Currently, only presence/absence is used to assess the overall change of this species. In the future, additional effort will be made to map the boundaries of these occurrences in order to assess the overall change of this species. There are approximately 12 occurrences of this species in California, two of which are on LTBMU.

***Lewisia longipetala* (Long-petaled lewisia)**

As of 2012, the majority of *Lewisia longipetala* occurrences were stable or had increased, with the exception of two occurrences above Dicks Lake (LELO 1b and 1c) (Table 8). The total number of *L. longipetala* on LTBMU is estimated at 11,500; estimate was made using the most recent census count or estimate for each occurrence. Revisits to existing occurrences were not possible in 2011 due to the persistent deep snowpack. In 2010 and 2012, conditions at LELO1b and 1c seemed particularly dry with very few persistent snowfields present. A new occurrence with 485 plants was found in a large cirque below Ralston Peak in 2012, and should be revisited in 2013. There are approximately 12 occurrences of this species in California, five of which are on LTBMU.

Table 8. Number of plants observed during *Lewisia longipetala* occurrence censuses from 2002 to 2012.

LTBMU EO	2002	2004	2006	2009	2010	2011	2012	Overall Change ¹
LELO 1a	6000	4450	-	7860/M(340)	M(392)	-	M(463)	Stable
LELO 1b	-	360	-	4	2	-	4	Decrease
LELO 1c	-	124	-	1	33	-	30	Decrease
LELO 1d	-	1	-	1	12	-	-	Increase
LELO 2	9	472	-	86	331	-	-	Stable
LELO 2b	-	-	-	800	1450	-	-	Increase
LELO 3a	-	1067	-	750	M(154)	-	M(136)	Stable

LTBMU EO	2002	2004	2006	2009	2010	2011	2012	Overall
LELO 3b	-	-	150	201	-	-	-	Stable
LELO 4a	-	-	-	-	-	1	3	Increase
LELO 4b	-	-	-	-	-	40	100-250	Increase
LELO 4c	-	-	-	-	-	100	100-250	Increase
LELO 5	-	-	-	-	-	-	485	New 2012

¹Overall change is determined by comparing the number of plants at the most recent and initial visits.

M—Indicates long-term monitoring was established and/or conducted. Numbers in parentheses are the number of plants in the long-term monitoring plots.

***Meesia triquetra* (Three-ranked hump-moss)**

Revisits were not made to any *M. triquetra* occurrences in 2012. This decision was based on the recommendation to remove this species from the Region 5 Sensitive plant list in 2013. As of 2011, 21 of the 22 existing occurrences of *M. triquetra* were still present and only one occurrence was absent. The absent occurrence is located just downstream of Incline Lake in the northeast Tahoe Basin. In 2010, the habitat no longer appeared suitable, potentially as a result of changes in Incline Lake discharge patterns. The occurrence was revisited in 2011 and was not found; conditions at the site consist of dense *Carex utriculata* stands and do not appear suitable for *M. triquetra*. As discussed previously, moss occurrences are currently assessed by estimating total area of the occurrence and percent cover of the target species within that area. Because the patchy distribution of moss species results in significant temporal and observer variation in occurrence extent, presence/absence is currently used to assess occurrence change. There are approximately 30 occurrences of this species in California, 12 of which are on LTBMU.

***Meesia uliginosa* (Broad-nerved hump-moss)**

Revisits to *M. uliginosa* occurrences were not made in 2012. *Meesia uliginosa* is currently known from two locations in the southern portion of the Lake Tahoe Basin, both of which were first observed in 2005. Based on visits made in 2011, both occurrences of *M. uliginosa* were still present. The challenges of quantifying the extent of occurrences of this species are similar as those discussed for other moss species. There are approximately 31 known occurrences of this species in California, two of which are on LTBMU.

***Pinus albicaulis* (Whitebark pine)**

Whitebark pine is a candidate for federal listing under the Endangered Species Act (ESA) as it faces an imminent risk of extinction due to climate change (USFWS 2011). The overall change of this species is declining; however, one-time demographic data from eight populations on the LTBMU indicates that these occurrences are stable. Populations at Rifle Peak, Snow Valley Peak, Heavenly, Freel Peak, Little Roundtop, Dick's Pass and West Shore Peaks all appear stable with a population growth rate greater than one ($\lambda > 1$), however the population at Mt. Rose may be in decline ($\lambda < 1$) (Maloney et al. 2012).

Status of LTBMU Special Interest Species

***Arabis rectissima* var. *simulans* (Washoe tall rockcress)**

The characteristics of *Arabis rectissima* var. *simulans* intergrade with those of *A. rectissima* var. *rectissima* and *A. holboellii*, making this species difficult to consistently distinguish. The most

recent taxonomic treatment of *Arabis* and *Boechea* (closely related genera) by Al-Shehbaz (2010) does not recognize the variety, bringing its validity into question; attempts by LTBMU botany staff to distinguish the variety have been mixed. Prior to 2010, individual plants had been potentially identified on the LTBMU but not confirmed as *A. rectissima* var. *simulans*. In 2010, five small occurrences of *A. rectissima* var. *simulans* were tentatively identified on the LTBMU. ARRES5 was visited in 2012 and confirmed as *A. rectissima* var. *simulans*. The remaining 4 occurrences (ARRES 1-4) should be revisited in 2013 to confirm presence or absence of this species.

***Sphagnum* spp. (Sphagnum moss)**

In 2012, one new occurrence of *Sphagnum* was identified in the Star Lake Meadow, below Star Lake (SPHAG11). Based on surveys completed from 2009-2011, all 20 existing sub-occurrences of *Sphagnum* spp. were extant. In addition, nine new sub-occurrences of *Sphagnum* were identified in 2011 at Hell Hole, Meiss Country, Armstrong Pass, Rubicon Peak, and Lonely Gulch. The occurrences visited in 2010 and 2011 appeared healthy; however, quantitative measurements are lacking, with the exception of the occurrences at Grass Lake and Hell Hole, which are monitored as a part of Grass Lake Research Natural Area and Hell Hole Long-term Monitoring. In 2011, *Sphagnum* collections were made at 15 occurrences (SPHAG 2, 4a-f, 5, 6a-c, 7a-b, 9, and 10) to begin assigning each occurrence to a specific species; species identification has not yet occurred.

5. FUNGI DIVERSITY

In the fall of 2008, three long-term fungi plots were established on the LTBMU by the Mycological Society of San Francisco. Following the Forest Service's Region 5 fungi monitoring protocol, plots were established in modeled suitable habitat for sensitive fungi species. Plots are located at Fountain Place, Page Meadow, and Blackwood Canyon. At each location, fungi are searched for in two concentric circular plots that are 1/10th acre and 1/5th acre in size.

All three fungi diversity plots were revisited in November 2012; a total of 26 species were collected, 15 of which had not been previously collected. Four species were identified at more than one of the plots, with *Dasyscyphus bicolor* and *Trichaptum abietinum* found at all three plots. Four species were documented at the Fountain Place plot, eight at Page Meadows, and 14 at Blackwood Canyon (Figure 3).

Between 2008 and 2012, a total of 73 unique species have been identified from the plots. Only two species (*Dasyscyphus bicolor* and *Strobilurus albidipilatus*) have been collected in every year from 2010 to 2012, and only four species (*Dasyscyphus bicolor*, *Heterotextus alpinus*, *Strobilurus albidipilatus*, and *Trichaptum abietinum*) have occurred in every plot at least once.

Both precipitation and temperature have been correlated with fungal phenology and species richness (Straatsma 2001). Qualitatively, October precipitation appears to correlate positively with fungi species richness within a given year (Figure 3). Precipitation data is from local Remote Automated Weather Stations (RAWS) from the Western Regional Climate Center. The Homewood RAWS station is near the Blackwood and Page Meadows plots, and the Meyers RAWS station is near the Fountain Place plot.

Only one sensitive fungi species, *Dendrocollybia racemosa*, is known to occur in the Lake Tahoe Basin. However, it was not observed in the fungi plots in any monitoring year. This species is currently only known on the LTBMU from a 1982 herbarium specimen collected near Tahoe City. This species is a mycoparasite and grows on the decaying remains of fungi in the genera of *Russula* and potentially *Lactarius*. If the potential host genera are found within plots during monitoring, they will be left to decay and revisited after a week if weather permits. This should increase chances of finding either fruiting bodies or sclerotia of *D. racemosa* (Machnicki 2006).

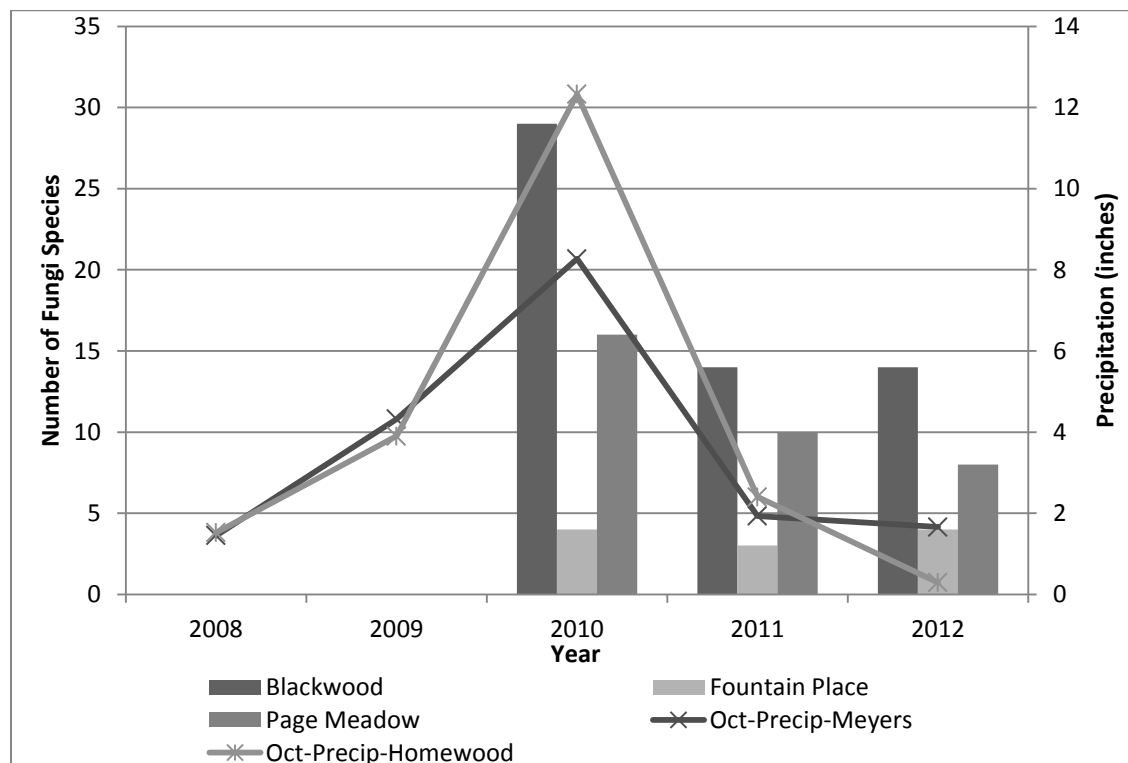


Figure 3. Number of fungi species observed at three permanent plots during surveys in 2008-2012. Precipitation for the month of October is from local RAWs stations.

4. CONCLUSIONS

Revisits in 2013 should consist of visits to as many occurrences as possible that are decreasing, of unknown status, or were newly discovered in 2012. The first priority will be to visit sensitive plant occurrences, and if resources allow, LTBMU special interest occurrences will be visited as well. There are 30 high priority sensitive plant occurrences to be revisited in 2013; 8 are new occurrences as of 2012, 11 are decreasing, 5 have increased significantly, and 6 are of unknown status. There are an additional 23 medium to low priority special interest and sensitive plant occurrences that could be visited in 2012 if resources allow; 7 are new as of 2012, 1 is decreasing, and 15 are of unknown status (Appendix 2). Of the 15 special interest occurrences of unknown status, 2 are California Natural Diversity Database reports from non USFS sources that need to be field verified in 2013 if funding allows.

5. LITERATURE CITED

- Al-Shehbaz, Ihsan A.. 2003. *Boechera rectissima*. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 16+ vols. New York and Oxford. Vol. 7, pp. 401.
- Chaddes, Steve and Kudray, Greg. 2001. Conservation Assessment for *Botrychium lunaria* (Common Moonwort). USDA Forest Service, Eastern Region.
- Ellison, Aaron M., and Anurag A. Agrawal. 2005. The Statistics of Rarity. *Ecology* 86:1079–1080.
<http://dx.doi.org/10.1890/04-1456>
- Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998 Measuring and monitoring plant populations. USDA-Bureau of Land Management Technical Reference 1730-1, Denver Colorado.
- Engelhardt, B.M. and Gross, S.E. 2011. Long-term monitoring plan: *Draba asterophora* var. *asterophora* & *Draba asterophora* var. *macrocarpa*. Lake Tahoe Basin Management Unit, USDA Forest Service, South Lake Tahoe, CA.
- Engelhardt, B.M. and Gross, S.E. 2011b. Long-term monitoring plan: *Lewisia longipetala*. Lake Tahoe Basin Management Unit, USDA Forest Service, South Lake Tahoe, CA.
- Engelhardt, B.M. and Gross, S.E. 2011c. Long-term monitoring plan: *Meesia triquetra* & *Sphagnum* spp. cover at Grass Lake Research Natural Area and Hell Hole. Lake Tahoe Basin Management Unit, USDA Forest Service, South Lake Tahoe, CA.
- Harpel, J.A. 2008. Species Fact Sheet: *Bruchia bolanderi*, Updated February 2011. USDA Forest Service, Region 6, Portland, OR. Accessed at: <http://www.fs.fed.us/r6/sfpnw/issssp/planning-documents/species-guides.shtml>, August 2011.
- Johnson-Groh, C. L. 1997. Field surveys for *Botrychium gallicomontanum* and phenology of *Botrychium mormo* in Minnesota. Report to the Minnesota Dept. Nat. Resources, St. Paul, MN.
- Johnson-Groh, C. L. 1998. Population demographics, underground ecology and phenology of *Botrychium mormo*. Pp. 103-108 in N. Berlin, P. Miller, J. Borovansky, U. S. Seal, and O. Byers, eds. *Population and habitat viability assessment (PHVA) for the goblin fern (Botrychium mormo) Final Report*. Conservation Biology Specialist Group, Apple Valley, MN.
- Johnson-Groh, C. L. and D. R. Farrar. 1993. Population dynamics of prairie moonworts (*Botrychium* subgenus *Botrychium*) in Iowa and Minnesota (abstract). *American Journal of Botany* 80: 109 (Abstract).
- Machnicki, N. 2006. *Russula crassotunicata* identified as host for *Dendrocollybia racemosa*. *Pacific Northwest Fungi*.
- Maloney, Patricia E.; Vogler, Detlev R.; Jensen, Camille E.; Delfino Mix, Annette. 2012. Ecology of whitebark pine populations in relation to white pine blister rust infection in subalpine forests of the Lake Tahoe Basin: Implications for restoration. *For. Ecol. Mgmt.* 280: 166-175.
- Montgomery, J.D. 1990. Survivorship and predation changes in five populations of *Botrychium dissectum* in Eastern Pennsylvania. *American Fern Journal* 80: 173-182.

Muller, S. 1992. The impact of a drought in spring on the sporulation of *Botrychium matricariifolium* (Retz) A. Br. in the Bitcherland (Northern Vosges, France). *Acta Oecologica* 13: 335-343.

Muller, S. 1993. Population dynamics in *Botrychium matricariifolium* in Bitcherland (northern Vosges Mountains, France). *Belgian Journal of Botany* 126: 13-19.

NatureServe. 2004. A Habitat-Based Strategy for Delimiting Plant Element Occurrences: Guidance from the 2004 Working Group, October 2004. NatureServe, Arlington, VA. Accessed at http://www.natureserve.org/library/delimiting_plant_eos_Oct_2004.pdf, August 2011.

Smith, E., Allphin, L., & Nielsen, D. 2008. *Incorporating demography, genetics, and cytology into long-term management plans for a rare, endemic alpine species: Draba asterophora*. Department of Plant and Wildlife Sciences, Brigham Young University, Provo, UT.

Straatsma, G., Ayer, F and Egli, S. 2001. Species richness, abundance, and phenology of fungal fruit bodies over 21 years in a Swiss forest plot. *Mycological Research* 105: (5): 515-523.

Tahoe Regional Planning Agency. 1998. Regional Plan for the Lake Tahoe Basin: Code of Ordinances. Section IX. Resource Management Provisions, Chapter 75: Sensitive and Uncommon Plant Protection and Fire Hazard Reduction.

Tahoe Regional Planning Agency. 2012. Regional Plan for the Lake Tahoe Basin: TRPA Code of Ordinances. Chapter 61.3.6: Vegetation Protection and Management.

USDA Forest Service. 1988. Land Resource Management Plan, Lake Tahoe Basin Management Unit, USDA Forest Service, South Lake Tahoe, CA.

USDA Forest Service. 2005. Forest Service Manual (FSM). Title 2600 – Wildlife, Fish, and Sensitive Plant Habitat Management, Amendment No. 2600-2005-1, Effective September 23, 2005. USDA Forest Service, Washington, D.C.

USFWS. 2011. Endangered and threatened wildlife and plants; 12 month finding on a petition to list *Pinus albicaulis* as Endangered or Threatened with critical habitat. *Federal Register*.

6. APPENDICES

Appendix 1. List of Forest Service Sensitive and LTBMU special interest plant species that are currently surveyed for and monitored when a population is known from the forest.

Species	Common Name	Legal Status ¹	Known on LTBMU
<i>Arabis rectissima</i> var. <i>simulans</i>	Washoe tall rockcress; bristlyleaf rockcress	SI	Y
<i>Arabis rigidissima</i> var. <i>demota</i>	Galena Creek rockcress	S, TRPA	Y
<i>Boechera tiehmii</i>	Tiehm's rockcress	S	N
<i>Botrychium ascendens</i>	upswept moonwort	S	Y
<i>Botrychium crenulatum</i>	scalloped moonwort	S	Y
<i>Botrychium lineare</i>	slender moonwort	S	Y
<i>Botrychium lunaria</i>	common moonwort	S	N
<i>Botrychium minganense</i>	Mingan moonwort	S	Y
<i>Botrychium montanum</i>	western goblin	S	Y
<i>Bruchia bolanderi</i>	Bolander's candlemoss	S	Y
<i>Chaenactis douglasii</i> var. <i>alpina</i>	alpine pincushion	SI	Y
<i>Claytonia megarhiza</i>	alpine spring-beauty	SI	Y
<i>Dendrocollybia racemosa</i>	branched collybia	S	Y ²
<i>Draba asterophora</i> var. <i>asterophora</i>	Tahoe draba	S, TRPA	Y
<i>Draba asterophora</i> var. <i>macrocarpa</i>	Cup Lake draba	S, TRPA	Y
<i>Epilobium howellii</i>	subalpine fireweed	S	Y
<i>Epilobium palustre</i>	marsh willowherb	SI	Y ²
<i>Erigeron miser</i>	starved daisy	S	N
<i>Eriogonum luteolum</i> v. <i>saltuarium</i>	golden carpet buckwheat	SI	N
<i>Eriogonum umbellatum</i> v. <i>torreyanum</i>	Torrey's buckwheat; Donner Pass buckwheat	S	N
<i>Glyceria grandis</i>	American mannagrass	SI	N
<i>Helodium blandowii</i>	Blandow's bogmoss	S	Y
<i>Hulsea brevifolia</i>	short-leaved hulsea	S	N
<i>Lewisia kelloggii</i> ssp. <i>hutchisonii</i>	Kellogg's lewisia	S	N
<i>Lewisia kelloggii</i> ssp. <i>kelloggii</i>	Kellogg's lewisia	S	N
<i>Lewisia longipetala</i>	long-petaled lewisia	S, TRPA	Y
<i>Meesia longiseta</i>	meesia moss	SI	N
<i>Meesia triquetra</i>	three-ranked humpmoss	S	Y
<i>Meesia uliginosa</i>	broad-nerved humpmoss	S	Y
<i>Myurella julacea</i>	myurella moss	SI	N
<i>Orthotrichum praemorsum</i>	orthotrichum moss	SI	Y ² Accession# JRS22039
<i>Orthotrichum shevockii</i>	Shevock's bristle-moss	SI	Y
<i>Orthotrichum spjutii</i>	Spjut's bristle-moss	SI	N
<i>Peltigera gowardii</i>	veined water lichen	S	Y
<i>Pinus albicaulis</i>	whitebark pine	S, C	Y
<i>Pohlia tundrae</i>	tundra pohlia moss	SI	Y ² Accession# JRS22659
<i>Potamogeton epihydrus</i> ssp. <i>nuttallii</i>	Nuttall's pondweed	SI	Y ²

Species	Common Name	Legal Status ¹	Known on LTBMU
<i>Rhamnus alnifolia</i>	alderleaf buckthorn	SI	Y ²
<i>Rorippa subumbellata</i>	Tahoe yellow cress	S	Y
<i>Schoenoplectus subterminalis</i>	swaying bulrush	SI	Y ²
<i>Scutellaria galericulata</i>	marsh skullcap	SI	Y
<i>Senecio hydrophiloides</i>	sweet marsh ragwort	SI	Y ²
<i>Sphagnum</i> spp.	sphagnum moss	SI	Y
<i>Stuckenia (Potamogeton) filiformis</i>	slender-leaved pondweed	SI	Y ²

¹S—R5 Regional Forester's Sensitive Species List; SI—LTBMU Special Interest, TRPA—Tahoe Regional Planning Agency Sensitive; C—Candidate for Federal listing under Endangered Species Act

²Known from herbarium or text records; the LTBMU staff does not currently have exact location information for these species and is therefore not tracking these populations.

Appendix 2. List of Forest Service Sensitive and LTBMU special interest plant species that are suggested for revisits in 2013.

Legal Status ¹	LTBMU EO	Revisit 2013	Justification for revisit
SI	ARRES 1	yes	confirm presence/absence, taxonomy uncertain for this species
SI	ARRES 2	yes	confirm presence/absence, taxonomy uncertain for this species
SI	ARRES 3	yes	confirm presence/absence, taxonomy uncertain for this species
SI	ARRES 4	yes	confirm presence/absence, taxonomy uncertain for this species
SI	CHDOA1a	yes	New occurrence 2011
SI	CHDOA1b	yes	New occurrence 2011
SI	CHDOA1c	yes	New occurrence 2011
SI	CHDOA1d	yes	New occurrence 2011
SI	CHDOA1e	yes	New occurrence 2011
SI	CHDOA2a	yes	New occurrence 2012
SI	CHDOA2b	yes	New occurrence 2012
SI	CHDOA2c	yes	New occurrence 2012
SI	CHDOA3a	yes	New occurrence 2012, old herbarium CNDDDB #5 report for Job's sister
SI	CHDOA3b	yes	Cheryl Beyer siting in CNDDDB from 2009
SI	CHDOA3c	yes	Cheryl Beyer siting in CNDDDB from 2009
SI	CHDOA4	yes	CNDDDB occurrence # 11 - see CHDOA4 folder in Heritage forms on O drive for info
SI	CLME3	yes	Unknown status, new 2011
SI	PEHY 2a	yes	New occurrence 2012, within fuels reduction project
SI	PEHY2b	yes	New occurrence 2012, within fuels reduction project
SI	SCGA 1a	yes	Large increase in occurrence
SI	SCGA 3	yes	Occurrence slightly smaller in 2011 vs. 2010
SI	SCGA 4	yes	Determine change for upcoming Meeks meadow project
SI	SPHAG11	yes	new 2012
S	ARRID 1h	yes	Decline in Occurrence
S	ARRID 1i	yes	Decline in Occurrence
S	BOAS 3a	yes	Large increase in occurrence
S	BOAS5	yes	Decline in occurrence
S	BOAS6	yes	New occurrence 2012, fuels reduction project
S	BOCR3	yes	Decline in occurrence

Legal Status¹	LTBMU EO	Revisit 2013	Justification for revisit
S	BOMO 1	yes	Decline in occurrence, highly disturbed area, may be extinct
S	BOMO2	yes	New occurrence 2012, 1 plant, confirm id
S	BOMO3	yes	New occurrence 2012, 2 plants, confirm id
S	BRBO 1	yes	High Meadows occurrence, not found 2011, needs revisit
S	BRBO 5	yes	ID could not be confirmed at 2012 visit, occurrence not observed since found in 2010
S	BRBO 7	yes	New occurrence 2012
S, TRPA	DRASA 1m	yes	Large increase in occurrence
S, TRPA	DRASA 2h	yes	Large increase in occurrence/heavenly ski resort trail construction in area
S, TRPA	DRASA 2n	yes	Decrease in occurrence
S, TRPA	DRASA 3f	yes	increase in occurrence
S, TRPA	DRASA1p	yes	New 2011, Did not visit in 2012, may be too dangerous to visit
S, TRPA	DRASA1q	yes	new occurrence boundary surveyed 2012, large increase in occurrence
S, TRPA	DRASA3i	yes	new occurrence 2012, only 4 plants - low priority
S, TRPA	DRASA4	yes	New 2011, Did not visit in 2012, may be too dangerous to visit
S, TRPA	DRASM 1a	yes	Decrease in occurrence
S, TRPA	DRASM 1f	yes	increase in occurrence
S ²	EPHO 1a	yes	increase in occurrence
S ²	EPHO 1b	yes	Decrease in occurrence
S ²	EPHO 2c	yes	Decrease in occurrence
S ²	EPHO 3a	yes	Decrease in occurrence
S ²	EPHO3b	yes	New occurrence 2012
S ²	EPHO3c	yes	New occurrence 2012
S ²	EPHO4b	yes	New occurrence 2012 - occurrence has large perennial individuals
S, TRPA	LELO5	yes	New occurrence 2012

¹S—R5 Regional Forester's Sensitive Species List; SI—LTBMU Special Interest, TRPA—Tahoe Regional Planning Agency Sensitive; C—Candidate for Federal listing under Endangered Species Act

²Currently R5 Sensitive, but likely to be removed from list in 2013