

**MONITORING TOBIAS' SAXIFRAGE (*SAXIFRAGA BRYOPHORA* VAR. *TOBIASIAE*)
ON THE PAYETTE NATIONAL FOREST: 2003 RESULTS**

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ABSTRACT

Tobias' saxifrage (*Saxifraga bryophora* var. *tobiasiae*) is a rare plant locally endemic to the mountains north of McCall in west-central Idaho. It is known from seven extant occurrences, all located on the Payette National Forest. A monitoring program was initiated for Tobias' saxifrage in 2001. The primary objective of the monitoring program is to provide population, habitat, and threat trend information that will help the Payette National Forest plan and manage for the species' long-term conservation. The monitoring protocol includes collecting Tobias' saxifrage census, ground disturbance, and plant community information, as well as taking photo point photographs. Transects were resampled in 2003 for a third consecutive year and results are summarized in this report. A total of 18 transects were sampled in 2003, including one new transect established at the Beaverdam Peak South occurrence. The 13 transects with three years of census data had a total of >3,314 Tobias' saxifrage plants, a number intermediate between the 2001 and 2002 tallies. The majority (65%) of all transects were strongly dominated by the non-reproductive rosette life stage. Transects dominated by the bulbil/no flowers stage class (35%) tended to have a small majority over the rosette stage. Less than 1% of the plants tallied had flowers, a substantially lower percentage compared to the previous two monitoring years. Most transects had small amounts of disturbance, much of it attributed to pocket gopher activity. Disturbance factors were recorded in a higher percentage of transect microplots than previous monitoring years. No plant community changes were detected in 2003, as plant composition and cover class values were very similar compared to 2001 and 2002. Another goal of the monitoring program is to monitor results of an experiment to reintroduce Tobias' saxifrage to an extirpated subpopulation at North Fork Pearl Creek. In 2002, a total of 180 Tobias' saxifrage bulbils were transplanted to the chosen reintroduction site. Four Tobias' saxifrage plants were found when the reintroduction transect was resampled in 2003. No new transplanting was done in 2003.

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TABLE OF CONTENTS

ABSTRACT i

ACKNOWLEDGMENTS i

TABLE OF CONTENTS ii

LIST OF FIGURES ii

LIST OF TABLES ii

LIST OF APPENDICES ii

INTRODUCTION 1

METHODS 1

RESULTS 2

DISCUSSION 9

REFERENCES 12

LIST OF FIGURES

Figure 1. Annual disturbance factors for Tobias’ saxifrage monitoring transects, 2001-2003 8

LIST OF TABLES

Table 1. Census monitoring data for Tobias’ saxifrage, 2001-2003 4

Table 2. Average number of bulbils/reproductive plant for Tobias’ saxifrage, 2001-2003..... 5

LIST OF APPENDICES

Appendix 1. Map, transect location form, and GPS coordinates for the new Beaverdam Peak South monitoring transect.

Appendix 2. Transect layout and sampling information for selected monitoring transects.

Appendix 3. Notes and general transect observations for 2003.

Appendix 4. Monitoring transect data sheets for Tobias’ saxifrage.

Appendix 5. Ocular Plant Species and Community Survey data sheets for 2003.

Appendix 6. Plant species composition and cover class data for Tobias’ saxifrage monitoring transects, 2001–2003.

INTRODUCTION

Tobias' saxifrage (*Saxifraga bryophora* var. *tobiasiae*) is a rare plant endemic to the mountains north of McCall in west-central Idaho. It is known from seven extant occurrences scattered over an area approximately 11 miles wide by 12 miles long. All occurrences are located on the Payette National Forest (NF) and Tobias' saxifrage is a Forest Service Region 4 Sensitive Species. Tobias' saxifrage occurs in subalpine forest community openings among slabs of exposed granitic bedrock, rock outcrop ledges, or gentle gravelly slopes. Micro-habitats are characterized by high cover of exposed bare soil and some level of substrate instability (Moseley 1989). Habitat suitable for Tobias' saxifrage tends to occur as small, scattered patches; each patch often no more than 30 feet long and half as wide. Occupied habitat is less than an acre at most, if not all locations. Population size can apparently fluctuate from one year to the next, but all occurrences support over 1,000 individuals.

In 2001, the Payette NF and the Idaho Department of Fish and Game Idaho Conservation Data Center (IDCDC) entered into a collaborative agreement to design and implement a rangewide, multi-year monitoring program for Tobias' saxifrage. The program was developed and baseline monitoring information collected in 2001 (Mancuso 2001). A second year of monitoring was conducted in 2002 (Mancuso 2003). A third consecutive year of monitoring occurred in 2003, and results are summarized in this report. The primary objectives for the 2003 season were to:

- 1) Resample monitoring transects at the Fisher Creek Saddle, North Fork Pearl Creek, Beaverdam Peak South, East of Duck Lake, Slab Butte, Granite Mountain, and Hazard Lake occurrences.
- 2) Establish an additional monitoring station at the Beaverdam Peak South occurrence.
- 3) Evaluate the success of an experiment to reintroduce Tobias' saxifrage to an extirpated site in the North Fork Pearl Creek occurrence.

METHODS

The objective of the monitoring program is to provide population, habitat, and threat trend information that will help the Payette NF plan and manage for the long-term conservation of Tobias' saxifrage. Monitoring information is collected from permanently marked transects and associated vegetation plots. The monitoring protocol consists of four components: (1) Tobias' saxifrage census monitoring; (2) ground disturbance and weed monitoring; (3) plant community monitoring; and (4) photo point photographs. In 2003, sampling, new transect establishment, and other components of the protocol followed methods previously outlined for the monitoring program (Mancuso 2001).

An additional objective of the monitoring program has been to monitor the results of an experiment to reintroduce Tobias' saxifrage to the North Fork Pearl Creek occurrence area. The occurrence at North Fork Pearl Creek was considered extirpated because searches failed to relocate plants after the 1994 Blackwell Fire (Moseley 1996). A transplant experiment was developed to reintroduce Tobias' saxifrage back into the North Fork Pearl Creek occurrence area. In 2001, Tobias' saxifrage bulbils from Granite Mountain were transplanted to two sites located in the vicinity of one of the former subpopulations (Mancuso 2001). Monitoring the three transplant transects (002-1, 002-2, 002-3) in 2002 revealed this initial transplant effort failed. None of the transplants survived. The transect sites were deemed too dry for Tobias' saxifrage and subsequently abandoned (Mancuso 2003).

In 2002, Tobias' saxifrage was rediscovered near one of the originally known North Fork Pearl Creek subpopulations (Mancuso 2003). Bulbils taken from this subpopulation were used in a second transplant experiment made in 2002 at a new reintroduction site in the vicinity of the northwestern most extirpated subpopulation. The new transplant transect established in 2002 was resampled in 2003. Monitoring methods used for the transplant site were identical to the other Tobias' saxifrage transects. General transplant protocols were explained in an earlier report (Mancuso 2001). Information specific to the establishment and location of the 2002 transplant transect at North Fork Pearl Creek was also detailed in an earlier report (Mancuso 2003).

General location, population, habitat, threat, and other information for all known Tobias' saxifrage occurrences is contained in Appendix 1 of last year's report (Mancuso 2003). Directions, map locations, GPS coordinates, transect layout, and other information for most monitoring transects was also provided in last year's report (Mancuso 2003). The map location, GPS coordinates, and directions to the new Beaverdam Peak South transect established in 2003, is contained in Appendix 1 of this report. Sampling and layout information for the new Beaverdam South transect, as well as for the Hazard Lake transect, and the reintroduction site transect at North Fork Pearl Creek is provided in Appendix 2. Notes and general observations for all the 2003 monitoring transects are summarized in Appendix 3.

Tobias' saxifrage monitoring data were collected between July 21 and July 29, 2003. A total of 18 transects were sampled. Seventeen of these are part of the regular monitoring program, and includes all 13 of the original transects established in 2001, 3 additional transects established in 2002, and the 1 new transect at Beaverdam Peak South sampled for the first time in 2003. The other transect sampled in 2003 was the Tobias' saxifrage reintroduction site at North Fork Pearl Creek. All seven known Tobias' saxifrage occurrences have at least one monitoring transect. Most have multiple transects. Copies of the 2003 data monitoring sheets are in Appendix 4.

RESULTS

Tobias' saxifrage census monitoring

A total of >5,125 Tobias' saxifrage plants were tallied at the 17 monitoring transects in 2003. This is an approximate number because plants were assigned to an abundance class category if more than 25 individuals occurred in a given stage class. The 5,125 total represents the collective minimum number of plants tallied along the transects.

Thirteen transects have three years (2001-2003) of census data. These transects had a total of >3,314 Tobias' saxifrage plants in 2003, a number intermediate between their 2001 and 2002 tallies. The 2003 total represents an increase of 27% compared to 2002, but is still 13% lower than their 2001 tally. Three (001-2, 005-1, 006-5) of the 13 transects with three years of census data had their highest tally in 2003, while another three (001-3, 005-2, 006-1) had their lowest tallies.

The two transects established in 2002, both had more plants in 2003 compared to last year. Census tallies in 2003 included three transects (002-4, 003-2, 005-1) with >650 plants. These represent the highest transect totals recorded during the three years of monitoring. One (006-4) of the two transects with no Tobias' saxifrage plants in 2002, had a few plants in 2003. The other transect (001-5) again had no plants in 2003. The total number of Tobias' saxifrage plants/transect in 2003 ranged from 0 to >840.

Census information includes three stage classes for individual Tobias' saxifrage plants: rosettes; plants with bulbils, but no flowers; and plants with both bulbils and flowers. The rosette stage is non-reproductive, while the other two stages are considered reproductive. In 2001, rosette plants were the most common life stage at all but one transect, usually being at least twice as abundant as either of the other life stages. In 2002, plants with bulbils/no flowers were the dominant life stage at the majority of transects. Stage class results in 2003 were more similar to 2001 than to 2002, with the majority (65%) of transects again strongly dominated by rosettes. Transects dominated by the bulbil/no flowers stage class (35%) tended to have a small majority over the rosette stage. Plants with bulbils and flowers have been the least common stage class each monitoring year. Strikingly, <1% of the plants tallied in 2003 had flowers. This is a substantially lower percentage compared to the previous two monitoring years. Census information for the three-year monitoring dataset is summarized in Table 1.

The average number of bulbils/reproductive plant was lower at all transects except one compared to previous years. In 2003, the average number of bulbils/reproductive plant ranged from a low of 1.8 at one of the Fisher Creek Saddle transects (001-4) to a high of 17.4 at the North Fork Pearl Creek (002-4). The average bulbil/plant production for all transects was 10.1, compared to 11.9 in 2001, and 19.6 in 2002. In 2002, many exceptionally large plants with >100 bulbils were observed at Hazard Lake (007-1). Plants matching this description were not seen at this occurrence, or anywhere else in 2003. Bulbil count information for each transect is summarized in Table 2.

Table 1. Census monitoring data for Tobias' saxifrage, 2001-2003.

Transect	# of plants			Life stage classes								
	Total			rosettes (ca %)			bulbils/no flowers (ca %)			bulbils/flowers (ca %)		
	2001	2002	2003	2001	2002	2003	2001	2002	2003	2001	2002	2003
Fisher Creek Saddle												
001-1	>342	>194	>219	>233 (68)	56 (29)	>145 (66)	109 (32)	>132 (68)	>74 (34)	0	6 (3)	0
001-2	>161	>224	>385	>80 (50)	>96 (43)	>259 (67)	>68 (42)	>86 (38)	>126 (33)	13 (8)	>42 (19)	0
001-3	>320	>175	>161	>217 (68)	>89 (51)	78 (48)	>100 (31)	>85 (49)	83 (52)	3 (1)	1 (<1)	0
001-4	26	13	23	24 (92)	7 (54)	17 (74)	2 (8)	6 (46)	6 (26)	0	0	0
001-5	5	0	0	1 (20)	0	0	4 (80)	0	0	0	0	0
NF Pearl Creek												
002-4	ns	>496	>840	ns	>210 (42)	>635 (76)	ns	>239 (48)	>201 (24)	ns	47 (10)	4 (<1)
002-5	ns	ns	4	ns	ns	0	ns	ns	4 (100)	ns	ns	0
Beaverdam Pk. South												
003-1	ns	107	181	ns	31 (29)	77 (43)	ns	74 (69)	104 (57)	ns	2 (2)	0
003-2	ns	ns	>686	ns	ns	432 (63)	ns	ns	241 (35)	ns	ns	13 (2)
East of Duck Lake												
004-1	>357	143	>233	>299 (84)	89 (62)	>208 (89)	5 (1)	29 (20)	16 (7)	53 (15)	25 (18)	9 (4)
Slab Butte												
005-1	>536	>324	>726	>297 (55)	>139 (43)	>348 (48)	>158 (30)	>165 (51)	>378 (52)	81 (15)	20 (5)	0
005-2	>513	>346	>265	>330 (64)	>135 (39)	>125 (47)	>112 (22)	>170 (49)	>140 (53)	71 (14)	41 (12)	0
Granite Mountain												
006-1	>564	>472	>440	>402 (71)	>326 (69)	>331 (75)	>150 (27)	>128 (27)	>109 (25)	12 (2)	18 (4)	0
006-2	>289	>121	>185	>220 (76)	>84 (69)	>150 (81)	65 (23)	33 (27)	35 (19)	4 (1)	4 (3)	0
006-3	>278	50	107	>219 (79)	16 (32)	54 (50)	51 (18)	33 (66)	53 (50)	8 (3)	1 (2)	0
006-4	15	0	12	11 (73)	0	8 (67)	4 (27)	0	4 (330)	0	0	0
006-5	>421	>372	>558	>268 (64)	>164 (44)	>411 (74)	>118 (28)	>142 (38)	>147 (26)	35 (8)	66 (18)	0
Hazard Lake												
007-1	ns	68	104	ns	13 (19)	18 (17)	ns	47 (69)	78 (75)	ns	8 (12)	8 (8)
Totals (%)	3827	3105	5129	2601 (68)	1455 (47)	3296 (64)	946 (25)	1369 (44)	1799 (35)	280 (7)	281 (9)	34 (1)

ns = not sampled; these transects were not established yet

Table 2. Average number of bulbils/reproductive plant for Tobias' saxifrage, 2001 - 2003.

Transect	Average # of bulbils		
	2001	2002	2003
Fisher Creek Saddle			
001-1	13.8	11.0	3.0
001-2	19.2	16.8	6.2
001-3	4.2	14.6	17.6
001-4	2.2	14.4	1.8
001-5	1.0	0	0
NF Pearl Creek			
002-4	ns	29.4	17.4
002-5	ns	ns	10.0
Beaverdam Peak South			
003-1	ns	15.6	12.8
003-2	ns	ns	20.0
East of Duck Lake			
004-1	19.2	29.0	7.8
Slab Butte			
005-1	15.0	15.0	10.8
005-2	12.2	13.0	7.0
Granite Mountain			
006-1 and 006-2	12.4	17.4	4.2
006-3 and 006-4	14.2	19.8	8.0
006-5	17.2	16.0	12.2
Hazard Lake			
007-1	ns	43.0	12.4

ns = not sampled; these transects were not established yet

Ground disturbance and weed monitoring

Disturbance information related to recreation, livestock, alpine knotweed (*Polygonum phytolaccaefolium*), invasive exotic weeds, and an "Other/Unknown" category were recorded as part of the monitoring protocol. One or more disturbance factors were recorded at 14 of the 18 transects in 2003. A total of 239 microplots was sampled for these 18 transects. A disturbance was recorded in 75 (31%) of the microplots. In comparison, 56 (25%) of the 224 microplots sampled at 16 transects in 2002, and 30 (17%) of the 181 microplots sampled at 13 transects in 2001 had disturbance evidence. The increase in percentage since 2001 is largely due to an increase in the number of microplots having pocket gopher or some unknown disturbance.

No disturbance was recorded along two of the Fisher Creek Saddle transects (001-4, 001-5) during three years of monitoring. No disturbance was recorded at the new Beaverdam Peak South transect (003-2) or at the uppermost Granite Mountain transect (006-5) in 2003. Disturbance factors have been recorded at all other transects one or more years. The number of microplots having disturbance evidence in 2003 increased at several transects compared to baseline tallies, most substantially at 001-3, 005-2, and 006-1. Annual disturbance factors and the number of microplots they occurred in are listed below for each transect. Figure 1 summarizes this information.

Fisher Creek Saddle

Transect 001-1: 13 microplots

Disturbance	2001	2002	2003
Other-pocket gopher	0	0	1
Other-elk prints	3	0	3
Other-water scour	0	2	0
Unknown	0	1	1

Transect 001-2: 17 microplots

Disturbance	2001	2002	2003
Alpine knotweed	3	2	1
Other-pocket gopher	0	2	2

Transect 001-3: 10 microplots

Disturbance	2001	2002	2003
Alpine knotweed	0	1	0
Other-pocket gopher	1	1	0
Other-deer prints	0	2	1
Unknown	0	4	8

North Fork Pearl Creek

Transect 002-4: 10 microplots

Disturbance	2002	2003
Other-pocket gopher(?)	1	0
Other-deer prints	0	1

Transect 002-5: 5 microplots

Disturbance	2003
Unknown	2

Beaverdam Peak South

Transect 003-1: 18 microplots

Disturbance	2002	2003
Other-pocket gopher	2	2

East of Duck Lake

Transect 004-1: 15 microplots

Disturbance	2001	2002	2003
Other-animal print (elk?)	0	1	2

Slab Butte

Transect 005-1: 13 microplots

Disturbance	2001	2002	2003
Alpine knotweed	0	1	0
Other-unknown animal print	0	0	1

Transect 005-2: 17 microplots

Disturbance	2001	2002	2003
Other-unknown animal print	0	1	1
Other-pocket gopher	0	0	7
Other-water scour	0	1	0
Other-fallen tree	0	1	1

Granite Mountain

Transect 006-1: 15 microplots

Disturbance	2001	2002	2003
Livestock – cattle prints	0	3	8
Other-pocket gopher	0	5	1
Other-water scour	0	2	0
Other-animal prints of uncertain origin	2	0	0
Unknown	0	1	1

Transect 006-2: 15 microplots

Disturbance	2001	2002	2003
Livestock – cattle prints	0	4	9
Other-animal prints of uncertain origin	11	5	4

Transect 006-3: 22 microplots

Disturbance	2001	2002	2003
Recreation	2	2	0
Alpine knotweed	1	0	0
Unknown	0	2	1

Transect 006-4: 22 microplots

Disturbance	2001	2002	2003
Recreation	2	0	3
Livestock	0	4	0
Alpine knotweed	3	3	2
Unknown	0	3	4
Other-pocket gopher	0	0	3

Transect 006-5: 12 microplots

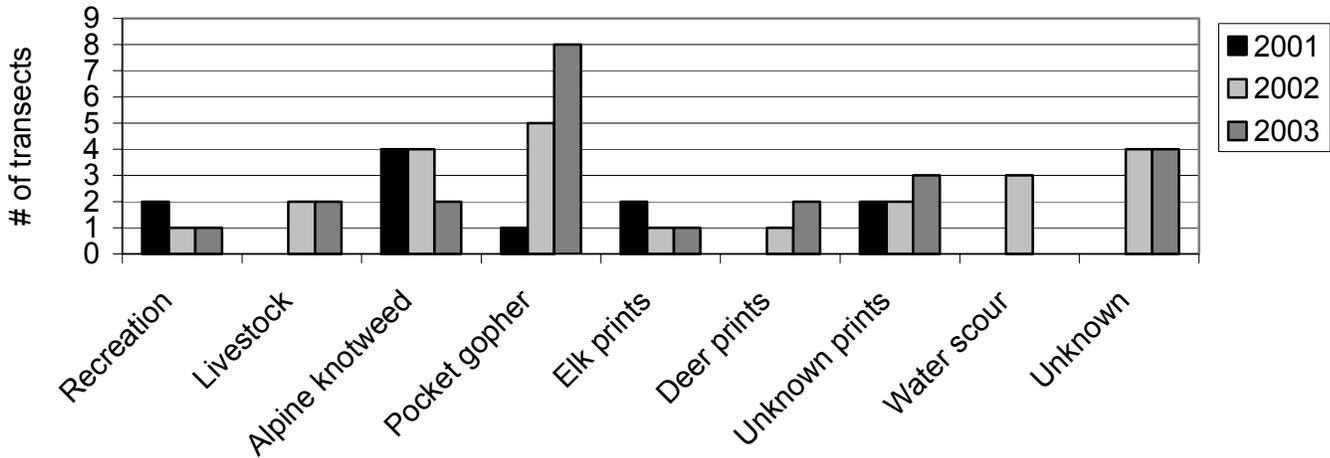
Disturbance	2001	2002	2003
Other-elk print	1	0	0

Transect 007-1: 15 microplots

Disturbance	2002	2003
Unknown	4	4
Other-pocket gopher	0	2

Figure 1.

Annual disturbance factors for Tobias' saxifrage monitoring transects, 2001-2003.
2001 $n = 13$, 2002 $n = 16$, 2003 $n = 18$



Plant community information

Most monitoring transects have an associated 1/10th acre vegetation plot. There is only one plot in cases where two transects are located very close to each other. A total of 15 plant community plots exist for the 18 monitoring transects. Fourteen of the plots were sampled in 2003. Baseline plant community information was collected for the two new transects (002-5, 003-2) established in 2003. In addition, a vegetation plot was established and baseline information collected at the transect closest to "Slab Butte Lake" (005-2). For various reasons, plant community data were not collected at this transect the previous two monitoring years. Lack of time prevented us from collecting plant community information at the East of Duck Lake (004-1) transect in 2003. However, the vegetation appeared to be unchanged from previous years.

Plant composition and cover value information collected in 2003 was compared to the 2001 and 2002 data sets. The data sets are very similar and no plant composition change was detected at any of the transects. Cover class values for rock, bare soil, litter, wood, basal vegetation, and moss/lichen were also estimated for each plot. Values for these attributes were unchanged from previous years as well. Copies of the 2003 plant community field data sheets are in Appendix 5. A compilation of the three-year plant community data set is in Appendix 6.

Photo points

Photo point photographs provide a visual, time-lapse record of the vegetation and other habitat conditions for each monitoring transect. Baseline photo point photographs were taken at the new Beaverdam Peak South transect (003-2). Repeat photographs were taken at all other monitoring transects in 2003. A full complement of photo point photographs was taken at most transects. A subset of photographs was taken at three transect (005-1, 006-5, 007-1). Landscape and plant community features depicted in photos taken in 2003 looked nearly identical to those from past years. The complete 2003 photo set was labeled, organized in a

binder, and given to the Payette NF as part of this report. A duplicate set of photos is on file at the IDCDC office in Boise.

Landscape disturbances

A separate part of the monitoring protocol requires estimating the distance from the transect to the nearest road, trail, and fire zone. This information did not change for any of the transects established in 2001 or 2002. The new transect at Beaverdam Peak South (003-2) is located in a relatively remote area, >100 m from the nearest road or trail. It was also >100 m from the nearest fire perimeter. The reintroduction transect at North Fork Pearl Creek (002-5) was also located >100 m from the nearest road or trail, but in an area that burned in the 1994 wildfire.

Reintroduction of Tobias' saxifrage at North Fork Pearl Creek

In 2002, a total of 180 Tobias' saxifrage bulbils were harvested from the known extant subpopulation at North Fork Pearl Creek (at transect 002-4). The bulbils were then transplanted to a new reintroduction transect (002-5) located approximately 0.3 mile further north. Four Tobias' saxifrage plants were found when the reintroduction transect was resampled in 2003. The four plants produced a total of 40 bulbils, ranging between 2 and 18 bulbils/plant. The bulbils were all small-sized, few if any >2 mm in diameter. Rosettes, or plants with flowers were not tallied along the transect. The other 176 (98%) bulbils planted in 2002 are assumed to have perished. No new transplanting was done in 2003.

DISCUSSION

Tobias' saxifrage census monitoring

Evidence of dry conditions was observed at several Tobias' saxifrage transects in 2003. To one degree or another, dry conditions appeared to be affecting Tobias' saxifrage plants at most transects. Small size (<5 mm diameter), a brownish to yellowish color, and curling leaves characterized the great majority of Tobias' saxifrage rosettes at several of the Fisher Creek Saddle (all except 001-2) and Granite Mountain (all except 006-1 and 006-5) transects. These characteristics occurred, but were less common at the North Fork Pearl Creek and Hazard Lake transects. Rosettes at the East of Duck Lake and Slab Butte transects showed little or no sign of drying out. Small inflorescences and low bulbil number (<5/plant) characterized reproductive plants at many transects. In addition, bulbils were nearly universally tiny (<2 mm in diameter) at many transects. It is unclear if this was associated with dry conditions, or the possibility that most bulbils were still in their early development stage. Large, multi-stemmed plants were very rare. Monitoring results showed that very few Tobias' saxifrage plants produced flowers in 2003. Few or no seed was produced at the Fisher Creek Saddle, Slab Butte, and Granite Mountain occurrences. Other occurrences had the potential for a limited amount of seed production in 2003.

Ground disturbance and weed monitoring

Recreation: Portions of the Granite Mountain occurrence (006) are located along a popular recreation trail. As in past years, no positively identified recreation-related disturbance was recorded at either of the lower Granite Mountain transects (006-1, 006-2), even though they are located adjacent to a section of trail that receives heavy use. Recreation-related disturbance in 2003 was restricted to a minor secondary trail that passes through the middle Granite Mountain transect (006-4). A few human footprints were observed near one (005-2) of the Slab Butte

transects for the first time in 2003. Fishermen or hikers may occasionally visit “Slab Butte Lake” (unnamed on USGS topographic map) in close proximity to this transect. Lack of a trail to the area discourages more use. Minimal or no recreational activity takes place in the vicinity of any of the other Tobias’ saxifrage occurrences.

Livestock: Cattle disturbance was recorded at the two lower Granite Mountain transects (006-1, 006-2), the same as in 2002. Ground disturbance of uncertain animal origin recorded at both transects in 2001 was also very likely related to cattle trampling. Evidence of sheep grazing and trampling was observed >100 m downslope of the transects located west of Fisher Creek Saddle. A shepherd camp was present at Fisher Creek Saddle at the time we were in the area. Ground disturbances related to livestock activity are currently not a factor at any of the other monitoring transects.

Alpine knotweed: This large native forb has been identified as a possible aggressive competitor to Tobias’ saxifrage (A. Hanson, Payette NF, pers. comm.). A few alpine knotweed plants were tallied along two transects in 2003. These transects also had alpine knotweed the previous two years. Alpine knotweed was not observed in two other transects that had this species in 2002, and one other in 2001. This annual discrepancy may indicate a transient or intermittent above-ground expression of alpine knotweed in Tobias’ saxifrage habitat. This species is often conspicuous adjacent to microsites occupied by Tobias’ saxifrage. However, the microsites themselves appear to be marginal habitat for alpine knotweed.

Invasive exotic weeds: In 2003, for the third year in a row, no noxious or other invasive weed species was observed along any of the transects. However, red sandspurry (*Spergularia rubra*), a small non-native annual was recorded at North Fork Pearl Creek (002-4). It represents the first non-native vascular plant species found in any of the vegetation plots. In the North Fork Pearl Creek area it appears to be most common in open areas subject to sheep disturbance. Habitat degradation related to exotic weed invasion is presently not a problem for Tobias’ saxifrage or its habitat.

Other/Unknown: Other disturbances recorded at one or more Tobias’ saxifrage transects include pocket gopher activity, elk prints, deer prints, prints of uncertain animal origin, and water scour. Unknown disturbances are typically small holes, divots, or some other surface depression due to unknown or uncertain causes. Pocket gopher activity was by far the most commonly recorded ground disturbance in 2003. It was recorded at eight transects, including four for the first time. Ground disturbances related to other wildlife species were less abundant and widespread. Disturbance related to water scour has not been consistently applied and recorded during transect sampling, but should be in the future.

Plant community information

Most transects had one or a few species found with trace (<1%) cover class in previous years, not recorded in 2003. Minor annual discrepancies like this are to be expected and do not represent plant community or habitat changes of any consequence for Tobias’ saxifrage. Some species are small and easily overlooked when represented by only a few individuals. Some are annual forbs that may be ephemeral or germinate only intermittently in the plot area, while some perennial forbs are dormant underground certain years.

Six species were recorded for the first time in 2003, including King’s sandwort (*Arenaria kingii*), Geyer’s sedge (*Carex geyeri*), Cusick’s Indian paintbrush (*Castilleja cusickii*), mountain beardtongue (*Penstemon montanus*), water-plantain buttercup (*Ranunculus alismaefolius*), and

red sandspurry. The buttercup was the only one to be recorded in >1 plot. It was very likely present previous years, but sampling a little earlier in 2003 allowed us to see it before it was totally dried and unrecognizable.

Most of the Tobias' saxifrage occurrences are located within open forest habitat belonging to the subalpine fir (*Abies lasiocarpa*) habitat type series (Steele et al. 1981). Exceptions are at Beaverdam Peak South (003), portions of the Slab Butte (005) occurrence, and the highest elevation portions of the Granite Mountain (006) occurrence. Trees are naturally sparse and well scattered at these locations and the habitat characterized by a relatively lush and diverse herbaceous community with varying amounts of shrub cover. The ground surface at most transect sites is dominated by rock, although bare ground or moss/lichen cover is high at some occurrences.

Reintroduction of Tobias' saxifrage at North Fork Pearl Creek

The survival rate of the Tobias' saxifrage bulbils transplanted in 2002 was only 2%. This is much lower than a similar experiment conducted by Kim Pierson as part of her Masters thesis studying the reproductive biology and ecology of Tobias' saxifrage (Pierson 1999). In her study, 79 of 144 (55%) fall planted bulbils emerged the following year. Forty-three of these remained rosettes the second year. The other 36 plants produced a panicle with bulbils, with 16 of these also producing flowers. Thirty-two of the transplanted plants emerged a third year as well.

The reasons for the low survival rate of the North Fork Pearl Creek transplants in 2003 are not known with any certainty. The large 1994 wildfire that swept through the Pearl Creek area killed the conifer trees formerly present at the transplant site. This obviously changed the shading and perhaps other microsite characteristics. The transplant site is likely hotter and drier for a longer period of time compared to pre-burn conditions. There may also be a higher density of competing herbaceous species, including alpine knotweed, due to increased sunlight. Another factor possibly contributing to the low success rate was the size of some of the bulbils used in the 2002 transplant experiment. The majority were relatively large, but a substantial number were quite small or less well developed. An assumption is that larger, well developed bulbils have a higher probability to survive.

I recommend the transplant transect (002-5) be sampled again in 2004, and in future monitoring years to document whether or not Tobias' saxifrage persists at the site. Augmentation of the transect with more bulbils may need to be considered in the future.

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Appendix 1

Map, transect location form, and GPS coordinates for the new Beaverdam Peak South monitoring transect.

Appendix 2

Transect layout and sampling information for selected monitoring transects.

Tobias' saxifrage monitoring transects

North Fork Pearl Creek (002-5)

Transect azimuth = 12°

Transect length = 6 m

*Microplots sampled at the 1 m, 2 m, 3 m, 4 m, and 5 m points, centered on the transect tape.

*Marker stake is a piece of red-painted "potato-digger" rebar. The end of the transect is marked by a piece of red-painted "potato-digger" rebar hammered into the ground at the 6 m point.

*Photo point photographs include (1) transect azimuth from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back toward start of transect; (3) 0° ; (4) 90° ; (5) 180° ; (6) 270° .

Beaverdam Peak South (003-2)

Transect azimuth = 75°

Transect length = 10 m

*Microplots sampled on the right (south) side of tape

*Marker stake is a piece of red-painted "potato-digger" rebar. The end of the transect is marked with a 12" nail hammered into the ground at the 8.5 m point (not the 10 m point due to presence of a large rock).

*Photo point photographs include (1) transect azimuth from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back toward start of transect; (3) 0° ; (4) 90° ; (5) 180° ; (6) 270° .

Hazard Lake (007-1) – Information for this transect was inadvertently left out of last year's report. Transect information is described here for the first time.

Transect azimuth = 139°

Transect length = 15 m

*Microplots sampled on the left (east) side of tape.

Microplots sampled every meter, starting from the 1 m mark.

*Marker stake is a piece of red-painted "potato-digger" rebar. The end of the transect is marked by a nail hammered into the ground at the 15.5 m point.

*Photo point photographs include (1) transect azimuth from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back toward start of transect; (3) 0° ; (4) 90° ; (5) 180° ; (6) 270° .

Appendix 3

Notes and general transect observations for 2003.

Transect notes and observations for 2003

Fisher Creek Saddle (001-1) – Scattered elk and pocket gopher activity were observed in the general vicinity of the transect.

Fisher Creek Saddle (001-2) – A few elk tracks and scattered pocket gopher activity occurred in the general transect area.

Fisher Creek Saddle (001-3) – The original rebar stake marking the location of this transect was missing. The cause and fate of the missing stake is a mystery. I replaced it with a large 8" nail, which now marks the location and starting point of the transect. The nail marking the end of the transect was still in place and used to help re-establish the transect, if not precisely, then within inches of its original location.

The large, prominent, branchless snag used as a local landmark to help relocate this transect has fallen to the ground. It lies north and almost parallel to the transect. It is 5.4 m at 65° azimuth from the transect marker stake to the base of the fallen snag. A smaller, arched snag that was another helpful relocation reference also recently fell.

Many small, neat holes of uncertain origin and averaging about 3 cm in diameter and 2 cm deep were scattered throughout the transect area. Deer and elk tracks were scattered in the area, while pocket gopher activity appeared limited.

Fisher Creek Saddle (001-4) – No disturbances were observed in the general transect area. Tobias' saxifrage plants were very uncommon.

Fisher Creek Saddle (001-5) - Subalpine fir trees in the area had curled needle tips, perhaps indicative of heat/drought stress. No disturbances were observed in the transect area, but evidence of sheep-related disturbance occurred within approximately 70 m downslope.

North Fork Pearl Creek (002-4) – No new disturbances or threats were observed in the transect area.

North Fork Pearl Creek (002-5) – Site appeared similar to 2002.

Beaverdam Peak South (003-1) – The site is undisturbed by human activity. Some ground rodent activity and a few wild ungulate tracks occur in the area. Most Tobias' saxifrage rosettes were small (<5 mm diameter). Most inflorescences had fewer than ten, tiny (<2 mm diameter) bulbils.

Beaverdam Peak South (003-2) – A new transect established in 2003. The transect site was chosen due to the relatively high density of Tobias' saxifrage compared to transect 003-1. Tobias' saxifrage was locally high common in scattered microsites across the bench-like slope. Minimal evidence of drying conditions at this site. Majority of Tobias' saxifrage rosettes were small in size. A variable number and size of bulbils characterized plants with inflorescences. Flowering plants were uncommon overall. A small bird nest (black-capped chickadee?) was observed approximately 1 –2 meters upslope of marker stake.

East of Duck Lake (004-1) – The only disturbance in the transect area was a few elk prints and droppings. The Tobias' saxifrage did not appear to be as common in the general area compared to the previous two years. Various size rosettes were present, including some relatively large individuals up to about 1 cm in diameter. Only a few plants showed signs of possible drought stress, although many inflorescences had only a few bulbils. Most of the blooming plants had multiple (3-5) flowers.

Slab Butte (005-1) – Transect site is undisturbed. Tobias' saxifrage was locally abundant in the transect area and showed little evidence of drought stress. Various size rosettes were present, including some relatively large individuals up to about 1 cm in diameter. A high percentage of bulbils appeared to be “normally” formed, not all tiny as at many other transects.

Slab Butte (005-2) – Pocket gopher activity was evident along and near the transect. Scattered elk tracks also occurred in the vicinity. This transect is located near “Slab Butte Lake” and several human footprints were observed along and around the transect.

Granite Mountain (006-1 and 2) – Some cattle trampling had already begun to impact the transect area. At the time of sampling, it appeared only a few passes by a few individuals had occurred. Tobias' saxifrage rosettes were mostly small, but some larger individuals also occurred. Most inflorescences had relatively few bulbils, often less than five. In addition, many of the bulbils were tiny (<2 mm diameter). No recreational off-trail disturbance was observed along transect 006-1.

The nail marking the end of the transect 006-1 had become loose, so it was replaced with a larger, more stout, 12 inch pin hammered into the ground.

Granite Mountain (006-3 and 4) – Tobias' saxifrage was uncommon in the general area and occurred as scattered individuals or small clusters of plants. Most rosettes were brownish and had curling leaves. All bulbils were tiny (<2 mm diameter) in size.

Flagging in the area indicated trail crew work in the area. The rebar transect marker stake was missing and suspect the trail crew removed it. We were able to replace the stake precisely in its original location because the hole was still present. A stout, 12 inch long pin was used to replace the original rebar stake. The nail marking the end of transect 006-3 was still in place and allowed us to precisely reconstruct this transect. The nail marking the end of transect 006-4 could not be found and was replaced using a stout, 6 inch long nail at the 10.75 m mark. The nail was hammered into a clump of Parry's rush to help hide the nail. However, this will probably make it tricky to relocate the nail in the future.

Granite Mountain (006-5) – No disturbances were noted in the transect area, although several elk were observed nearby. One old cowpie was found approximately 100 m from the transect. Tobias' saxifrage was locally abundant and represented by various size individuals. However, many of the rosettes appeared to be drying out and many bulbils were tiny (<2 mm diameter).

Hazard Lake (007-1) - Some pocket gopher activity and water runnels were the only disturbance signs in the transect area. The transect site appeared considerably drier than in 2002. A range of sizes characterized Tobias' saxifrage, but nothing like the large, showy plants observed last year.

Appendix 4

Monitoring transect data sheets for Tobias' saxifrage.

Appendix 5

Ocular Plant Species and Community Survey data sheets for 2003.

Appendix 6

Plant species composition and cover class data for Tobias' saxifrage monitoring transects, 2001–2003.

The following is a list of vascular plant species and associated cover class values for plant community plots sampled at each Tobias' saxifrage monitoring station. Transects 002-4, 003-1, and 007-1 were established in 2002, and therefore have no 2001 data. Transects 002-5 and 003-2 were established in 2003, and have no prior year data. Plant community information was collected at 005-2 for the first time in 2003. Transect plant community information was not collected at transect 005-1 in 2002, nor at 004-1 in 2003. Scientific name nomenclature follows Hitchcock and Cronquist (1973). Cover class values are as follows:

1 = <1%	30 = 25 - 34.9%	70 = 65 - 74.9%
3 = 1 - 4.9%	40 = 35 - 44.9%	80 = 75 - 84.9%
10 = 5 - 14.9%	50 = 45 - 54.9%	90 = 85 - 94.9%
20 = 15 - 24.9%	60 = 55 - 64.9%	98 = 95 - 100%

Species	Year	Transect															
		001 1	001 2	001 3	001 5	002 4	002 5	003 1	003 2	004 1	005 1	005 2	006 1	006 3	006 5	007 1	
Trees																	
<i>Abies lasiocarpa</i>	2001	10	10	20	10					3	3		20				
	2002	10	10	20	10	1		1		3			20			3	
	2003	10	10	10	10	1		1			3	3	20	1		3	
<i>Picea engelmannii</i>	2001			3						1			3	3			
	2002		1	3						1			10				
	2003		1	3	1			1					10				
<i>Pinus albicaulis</i>	2001			1	3									1			
	2002			1	3			1						1			
	2003			1	3			1				1		1			
<i>Pinus contorta</i>	2001		1										1				
	2002		1			1							1			3	
	2003		1			1	1					1	1			3	
Shrubs																	
<i>Lonicera utahensis</i>	2001			1						1							
	2002					1											
	2003					1						1					
<i>Phyllodoce empetriform.</i>	2001	10		3	20												
	2002	10		3	20			1									
	2003	10		3	10			1	1								
<i>Ribes montigenum</i>	2001				1					1	1						
	2002					1				1							
	2003				1	1					1	1					
<i>Salix scouleri</i>	2001																
	2002					1										1	
	2003					1										3	
<i>Sambucus cerulea</i>	2001		1														
	2002					1											
	2003					1										1	
<i>Sorbus scopulina</i>	2001			1													
	2002			1		1											
	2003			1		1											
<i>Spiraea densiflora</i>	2001									10	20		1		3		
	2002					3		3		10			1		3		
	2003					3		3	3		20	3	1		3		
<i>Vaccinium globuare</i>	2001																
	2002					3											
	2003					3											
<i>Vaccinium scoparium</i>	2001	3		10	10												
	2002	3		10	10			1									
	2003	3		10	20		1	1	1			3					
Graminoids																	
<i>Agrostis thurberiana (?)</i>	2001												1				
	2002												1				
	2003												1				
<i>Agrostis variabilis</i>	2001	1	1	1						1	1		3		1		
	2002	1	1	1		1				1			3	1	1		
	2003	1	1			1	1	1	1		1	1	3	1	1		
<i>Calamagrostis canaden.</i>	2001																
	2002	1				1											
	2003					1											
<i>Calamagrostis sp.</i>	2001												3				
	2002												3				
	2003												3				

	Year	Transect														
		001 1	001 2	001 3	001 5	002 4	002 5	003 1	003 2	004 1	005 1	005 2	006 1	006 3	006 5	007 1
<i>Carex geyeri</i>	2001															
	2002															
	2003					1										
<i>Carex microptera</i>	2001		1							1	1		3		1	
	2002		1			1				1			3		1	1
	2003		1			1	1		1		1		3		1	1
<i>Carex pachystachya</i>	2001												3			
	2002					1		1					3			
	2003												3			
<i>Carex paysonis</i>	2001			1												
	2002			1				3								
	2003							3	1							
<i>Carex rossii</i>	2001	1	1	1												
	2002	1		1		3										
	2003	1	1			1	1					1				
<i>Danthonia intermedia</i>	2001									1						
	2002							1		1						
	2003							1	1							
<i>Deschampsia cespitosa</i>	2001		1										1	3	10	
	2002							1					1	10	10	
	2003							1	3					3	10	1
<i>Deschampsia elongata</i>	2001															
	2002				1											1
	2003															
<i>Elymus glaucus</i>	2001		1							3	1					
	2002		1			1				3						
	2003		1			1	1				1				1	
<i>Juncus mertensiana</i>	2001															
	2002									1						
	2003															
<i>Juncus parryi</i>	2001	3	10	3	3					3	20		1	10	10	
	2002	3	10	3	3	3		10		10			3	10	10	3
	2003	3	10	3	3	3	1	10	3		20	3	3	10	10	3
<i>Juncus tenuis</i>	2001															
	2002															1
	2003															1
<i>Luzula hitchcockii</i>	2001	10		3	1								10			
	2002	10		3	1	10							10			
	2003	3	1	3	1	10	3	1	1		1	1	10			
<i>Melica bulbosa</i>	2001															1
	2002															1
	2003															1
<i>Muhlenbergia filiformis</i>	2001															
	2002															1
	2003															1
<i>Oryzopsis exigua</i>	2001			1	1											
	2002			1	1											
	2003			1	1											
<i>Poa sp.</i>	2001															
	2002			1		1										
	2003			1			1									
<i>Poa gracillima</i>	2001	1	1	1	1					1	1			1	1	
	2002	1	1	1	1	1		1		1				1	1	3
	2003	1	1	1	1	1		1	1		1	1		1	1	3

	Year	Transect														
		001 1	001 2	001 3	001 5	002 4	002 5	003 1	003 2	004 1	005 1	005 2	006 1	006 3	006 5	007 1
<i>Gayophytum</i> sp.	2001															
	2002					1										
	2003					1	1									
<i>Gentiana calycosa</i>	2001				1											
	2002															
	2003															
<i>Hieracium albertinum</i>	2001														1	
	2002														1	
	2003					1										
<i>Hieracium gracile</i>	2001		1	1	1					1	1					
	2002	1	1	1	1			1				1				
	2003	1	1	1	1			1	1		1	1	1			
<i>Hypericum formosum</i>	2001		10		1					3	1				10	
	2002		10		3					3					10	
	2003		10		3			1		1					3	1
<i>Lewisia triphylla</i>	2001	1	3	1	1					1	1		3	3	3	
	2002	3	3	3	1	1		1		1			3	3	1	1
	2003	3	3	3	3	1	1	1	1		1	3	3	3	1	1
<i>Ligusticum canbyi</i>	2001	3	3		1					10			3	1	3	
	2002	3	1		1					10			3	1	3	
	2003	3	3		1								3	3	3	
<i>Lupinus argenteus</i>	2001		1								3		3			
	2002		3			1							10			
	2003		3			1	1				3		10			
<i>Lupinus caudatus</i>	2001									3				3	3	
	2002									3				3	3	
	2003													3	3	
<i>Mimulus breweri</i>	2001														1	
	2002														1	1
	2003														1	
<i>Pedicularis bracteosa</i>	2001	1		1	1											
	2002	1		1	1											
	2003	1		1	1							1				
<i>Pedicularis racemosa</i>	2001			1	1								1			
	2002			1	1								1			
	2003			1	1							1				
<i>Penstemon globosus</i>	2001									10					10	
	2002			1		1				10				1	10	3
	2003			1		1	1							1	10	3
<i>Penstemon montanus</i>	2001															
	2002															
	2003								1							
<i>Perideridia bolanderi</i>	2001														3	
	2002					1									1	1
	2003					1			1						3	1
<i>Phlox diffusa</i>	2001															
	2002				1											1
	2003				1											1
<i>Polemonium pulcherri.</i>	2001	1	3	1						1	1		1			
	2002	1	1	1		1				1			1			1
	2003	1	1	1		1	1				1	1	1			1
<i>Polygonum bistortoides</i>	2001	1	1	1	1					1	1			1	1	
	2002			1	1			1		1				1	1	1
	2003			1	1			1	1		1			1	1	1

	Year	Transect														
		001 1	001 2	001 3	001 5	002 4	002 5	003 1	003 2	004 1	005 1	005 2	006 1	006 3	006 5	007 1
<i>Xerophyllum tenax</i>	2003			3	3											
Bare ground	2001	40	20	30	10					20	20		60	20	20	
	2002					10		3	3							10
	2003	40	20	40	10	10	70	10		20	20	40	60	20	20	20
Rock	2001	40	70	40	30					60	50		3	50	40	
	2002					70		70								50
	2003	40	70		30	70	30	70	80	70	60	50	3	50	50	50
Gravel	2001	1	10	3	3					10	10		20	10	20	
	2002					3		3								3
	2003	1	10	3	3	3	-	3	1	10	10	-	20	10	20	3
Wood	2001	1	3	1	1					1	1		1	0	1	
	2002					3		0								1
	2003	1	1	1	1	3	3	1	0	1	1	1	1	1	1	1
Moss/lichen	2001	3	1	10	50					10	10		3	10	10	
	2002					3		20								30
	2003	1		10	50	3	1	10	10	10	10	3	3	10	10	30
Litter	2001	3	3	10	10					3	3		10	3	3	
	2002					10		1								10
	2003	1	3	10	10	10	3	1	3	3	3	3	10	3	3	3
Basal vegetation	2001	10	10	10	10					10	10		10	10	10	
	2002					3		3								3
	2003	10	10	10	10	3	3	10	3	10	10	3	10	10	10	3