

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

By

Michael Mancuso
Conservation Data Center

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Idaho Department of Fish and Game
Natural Resource Policy Bureau
600 South Walnut, P.O. Box 25
Boise, ID 83707



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ABSTRACT

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, all located on the Payette National Forest. Its limited distribution and the small number of known populations makes Tobias' saxifrage one of the rarest plant species in Idaho and an important conservation concern for the Payette National Forest. Population and habitat trend information was identified as a need by the Payette Forest to help it manage for the long-term conservation of Tobias' saxifrage. To address this information need, a rangewide, multi-year monitoring program was designed and implemented in 2001. The monitoring protocol includes collecting Tobias' saxifrage census, ground disturbance, and plant community information, as well as taking photo point photographs. Baseline monitoring information was collected at permanently marked transects in 2001. Transects were resampled in 2002, and results are summarized in this report. The number of Tobias' saxifrage plants decreased at all but one of 13 transects with two years of data. Plants with bulbils/no flowers were the dominant life stage at most transects in 2002. This differs from 2001, when rosette plants were the most common life stage. Most transects had small amounts of disturbance, much of it attributed to pocket gopher activity. Transects at Granite Mountain were the only ones where livestock and recreation disturbances were recorded. Introduced weeds were not a factor at any occurrences. Another goal of the monitoring program was to monitor results of an experiment to reintroduce Tobias' saxifrage plants to an extirpated subpopulation at North Fork Pearl Creek. The 2001 transplant experiment failed. Another transplant attempt was made in 2002 at a different site.

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INTRODUCTION

Tobias' saxifrage (*Saxifraga bryophora* var. *tobiasiae*) is a rare plant endemic to the mountains north of McCall, in west-central Idaho. Its rangewide distribution covers an area approximately 11 miles wide by 12 miles long. It is known from seven extant occurrences, all located on the Payette National Forest. One occurrence previously thought to be extirpated as a result of the Blackwell Fire in 1994, was rediscovered in 2002. 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 related to meltwater runoff (Moseley 1989). Habitat suitable for Tobias' saxifrage tends to occur as small, scattered patches; each patch often no more than 10 meters 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, and in some cases greater than 10,000 individuals.

Tobias' saxifrage is a Forest Service Region 4 Sensitive species for the Payette NF. Its limited distribution and the small number of known populations makes it one of the rarest plant species in Idaho and an important conservation concern for the Payette NF. Past research has provided basic life history and reproductive biology information concerning Tobias' saxifrage (Pierson 1999). In contrast, there has been little information collected regarding population and habitat trends, especially in regard to several known and potential threats. This kind of information is important to resource managers responsible for the long-term conservation of Tobias' saxifrage. Targeting this information need, the Payette NF and the Idaho Department of Fish and Game's Conservation Data Center (IDCDC) entered into a collaborative agreement to design and implement a rangewide, multi-year monitoring program for Tobias' saxifrage in 2001. The program was developed and baseline monitoring information collected in 2001 (Mancuso 2001). A second year of monitoring was conducted in 2002, and results are summarized in this report. The primary objectives for the 2002 season were to:

- 1) Resample monitoring transects established in 2001 at the Fisher Creek Saddle, East of Duck Lake, Slab Butte, and Granite Mountain occurrences.
- 2) Establish monitoring stations at the Beaverdam Peak South and Hazard Lake occurrences.
- 3) Evaluate the success of an experiment to reintroduce Tobias' saxifrage to the extirpated North Fork Pearl Creek occurrence in 2001; and based on this evaluation, continue or modify the experiment.

METHODS

The objective of the monitoring program is to provide information that will help the Payette NF plan and manage for the long-term conservation of Tobias' saxifrage. Towards this end, a monitoring protocol was developed to collect trend information for Tobias' saxifrage population numbers, habitat conditions, and a group of existing and potential threat factors. The monitoring program is designed to provide information relevant to a specific geographic location or occurrence. An occurrence is the standard data base contrivance used throughout the Natural Heritage/Conservation Data Center network for tracking rare species or other elements. Monitoring information is collected from permanently marked transects and associated vegetation plots. The monitoring stations are comprised of a single, variable-length belt transect with marked start and end points. The transects are labeled and identified using the IDCDC's

Element Occurrence number, which is a three-digit reference code used for data base tracking purposes.

The 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 2002, transect establishment, sampling, and other components of the monitoring protocol followed the methods detailed in last year's report (Mancuso 2001). An additional task for 2002 was to monitor the results of an experiment to reintroduce Tobias' saxifrage to the North Fork Pearl Creek occurrence area. This occurrence was considered extirpated because several searches (e.g., Moseley 1996) failed to relocate plants after the 1994 Blackwell Fire. Tobias' saxifrage bulbils transplanted in 2002 repeated the protocol outlined in the 2001 report (Mancuso 2001).

RESULTS

Tobias' saxifrage monitoring data were collected between July 30 and August 8, 2002. The 13 transects at 4 occurrences (001, 004, 005, 006) originally established and sampled in 2001, were all resampled in 2002. New transects at North Fork Pearl Creek (002), Beaverdam Peak South (003), and Hazard Lake (007) were also established and sampled in 2002. All known Tobias' saxifrage occurrences now have at least one monitoring transect. Location, population, habitat, and threat information for each occurrence record is in Appendix 1. GPS points and maps of all the monitoring transects are in Appendix 2. Appendix 3 has information to relocate the new transects established in 2002. Transect-specific sampling information is in Appendix 4, while copies of the 2002 data monitoring sheets are in Appendix 5. The rediscovery of Tobias's saxifrage at North Fork Pearl Creek (002) was a highlight of the 2002 monitoring effort.

Tobias' saxifrage census monitoring

A total of >3,105 Tobias' saxifrage plants were tallied at the 16 transects in 2002. 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 three stage classes were rosettes; plants with bulbils, but no flowers; and plants with both bulbils and flowers). The total represents the collective minimum number of plants tallied along the transects. The 13 transects with two years of census data had a total of >2,434 plants, a decrease of approximately 37% compared to 2001. Only one transect (001-2) had more Tobias' saxifrage plants in 2002 than 2001. All others showed declines ranging from 12% to 72% compared to 2001 tallies. Two transects (001-5, 006-4) with low numbers of plants in 2001, had no Tobias' saxifrage plants recorded in 2002. The total number of Tobias' saxifrage plants/transect in 2002 varied from a low of 0, to a high of >495.

Rosette plants were the most common life stage at all but one transect in 2001, usually being at least twice as abundant as either of the other life stages. In comparison, plants with bulbils/no flowers were the dominant life stage at the majority of transects in 2002. Plants with bulbils and flowers were the least common stage class at most transects in 2001, and all transects in 2002. Most flowering plants appeared to have maturing fruit capsules, but no seed data were collected as part of the monitoring protocol.

The average number of bulbils/reproductive plant increased at six transects and declined at three transects. In 2002, the average number of bulbils/reproductive plant varied from a low of 11 at one of the Fisher Creek Saddle transects (001-1) to a high of 43 at the Hazard Lake occurrence (007-1). The average bulbil/plant production for all transects was 16.7 in 2002,

compared to 10.5 in 2001. The occurrence at Hazard Lake (007) had the largest Tobias' saxifrage plants I have ever seen. Some plants approached 30 cm in height and contained greater than 100, and in a few cases greater than 200 bulbils. Census information for each transect is summarized in Table 1.

Table 1 . Tobias' saxifrage census monitoring data for 2001 and 2002.

Transect	# of plants		Life Stage classes						Avg. # bulbils	
			rosettes (ca%)		bulbils/no flowers (ca%)		bulbils/flowers (ca%)			
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Fisher Creek Saddle										
001-1	342+	194+	233+ (68)	56 (29)	109 (32)	132+ (68)	0	6 (3)	13.8	11.0
001-2	161+	224+	80+ (50)	96+ (43)	68+ (42)	86+ (38)	13 (8)	42+ (19)	19.2	16.8
001-3	320+	175+	217+ (68)	89+ (51)	100+ (31)	85+ (49)	3 (1)	1 (<1)	4.2	14.6
001-4	26	13	24 (92)	7 (54)	2 (8)	6 (46)	0	0	2.2	14.4
001-5	5	0	1 (20)	0	4 (80)	0	0	0	1.0	0
NF Pearl Creek										
002-4	ns	496+	-	210+ (42)	-	239+ (48)	-	47 (10)	-	29.4
Beaverdam Peak S.										
003-1	ns	107	-	31 (29)	-	74 (69)	-	2 (2)	-	15.6
East of Duck Lake										
004-1	357+	143	299+ (84)	89 (62)	5 (1)	29 (20)	53 (15)	25 (18)	19.2	29.0
Slab Butte										
005-1	536+	324+	297+ (55)	139+ (43)	158+ (30)	165+ (51)	81 (15)	20 (5)	15.0	15.0
005-2	513+	346+	330+ (64)	135+ (39)	112+ (22)	170+ (49)	71 (14)	41 (12)	12.2	13.0
Granite Mountain										
006-1	564+	472+	402+ (71)	326+ (69)	150+ (27)	128+ (27)	12 (2)	18 (4)	12.4	17.4
006-2	289+	121+	220+ (76)	84+ (69)	65 (23)	33 (27)	4 (1)	4 (3)	see 006-1	see 006-1
006-3	278+	50	219+ (79)	16 (32)	51 (18)	33 (66)	8 (3)	1 (2)	14.2	19.8
006-4	15	0	11 (73)	0	4 (27)	0	0	0	see 006-3	0
006-5	421+	372+	268+ (64)	164+ (44)	118+ (28)	142+ (38)	35 (8)	66 (18)	17.2	16.0
Hazard Lake										
007-1	ns	68	-	13 (19)	-	47 (69)	-	8 (12)	-	43.0

ns = not sampled; these transects were established in 2002

Ground disturbance and weed monitoring

Disturbance factors that are part of the monitoring protocol were recorded at 14 of the 16 transects in 2002. In most cases, disturbance factors were limited to less than half of the microplots/transect. The most common ground disturbances were from pocket gopher activity and animal prints of unknown or unclear origin. Cattle disturbance was recorded at the two lower Granite Mountain transects (006-1 and 006-2). These were the same transects with disturbances very likely caused by cattle trampling in 2001. Livestock grazing is currently not a disturbance factor at any of the other monitoring transect areas.

Portions of the Granite Mountain occurrence are located along a popular recreation trail. Recreation-related disturbance in 2002 was restricted to a minor secondary trail that passes through the middle Granite Mountain transect (006-3). No positively identified recreation-related disturbance was recorded at either lower Granite Mountain transect, even though they are located adjacent to a section of trail that receives heavy use. The other Tobias' saxifrage occurrences apparently receive little or no recreational activity.

Alpine knotweed (*Polygonum phytolaccaefolium*) is a large native forb that has been identified as a possible aggressive competitor to Tobias' saxifrage. Small amounts of alpine knotweed were tallied in microplots at only four transects in both 2001 and 2002. In contrast, its in all but one vegetation plot, where it often has relatively high cover. Only two transects had alpine knotweed both years. The other two transects had it recorded only one of the two sampling years. No noxious or other invasive weed species were observed along any of the transects in 2002. Disturbance factors encountered at each transect are briefly discussed and then summarized in Table 2.

Fisher Creek Saddle

Transect 001-1: 3 of the 13 microplots had "unknown/other disturbances" in both 2001 and 2002, although they were different microplot stations each year. The disturbances appeared to be animal (elk?) prints each year.

Transect 001-2: 2 of 17 microplots had "unknown/other disturbances" attributed to pocket gopher activity in 2002. No disturbance of this type was recorded in 2001. Alpine knotweed was recorded in 3 microplots in 2001, but only 2 in 2002.

Transect 001-3: 7 of 10 microplots had "unknown/other disturbances" in 2002 attributed to either deer prints, pocket gopher activity, or holes/divots of unknown origin. No disturbance of this type was recorded in 2001. Alpine knotweed was recorded in 1 microplot in 2001, compared to none in 2002.

Transect 001-4: no disturbance factors recorded either year.

Transect 001-5: no disturbance factors recorded either year.

North Fork Pearl Creek

Transect 002-4: 1 of 10 microplots had "unknown/other disturbances" in 2002 attributed to pocket gopher activity.

Beaverdam Peak South

Transect 003-1: 2 of 18 microplots had "unknown/other disturbances" in 2002 attributed to pocket gopher activity.

Table 2. Presence/absence of disturbance factors at Tobias' saxifrage monitoring transects for 2001 and 2002. X = present in at least one transect microplot.

Transect	Disturbance factors									
	Recreation disturbance		Sheep/Cattle disturbance		Unknown/other disturbance		<i>Polygonum phytolaccaefolium</i>		Weeds	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Fisher Ck. Saddle										
001-1					X	X				
001-2						X	X	X		
001-3					X	X		X		
001-4										
001-5										
NF Pearl Creek										
002-4					ns	X				
Beaverdam Pk. S.										
003-1					ns	X				
East of Duck Lake										
004-1						X				
Slab Butte										
005-1								X		
005-2						X				
Granite Mountain										
006-1				X	X	X	X			
006-2				X	X	X				
006-3	X	X				X	X			
006-4	X					X	X	X		
006-5						X				
Hazard Lake										
007-1					ns	X				

ns = not sampled; these transects were established in 2002

East of Duck Lake

Transect 004-1: 1 of 15 microplots had “unknown/other disturbances” in 2002 attributed to an unknown animal print. No disturbance of this type was recorded in 2001.

Slab Butte

Transect 005-1: Alpine knotweed was recorded in 1 of the 13 microplots in 2002, but none in 2001.

Transect 005-2: 3 of 17 microplots had “unknown/other disturbances” in 2002 that included water runoff rills, a tree falling across the transect, and unknown animal prints. No disturbances were recorded at this transect in 2001.

Granite Mountain

Transect 006-1: 7 of 15 microplots had “unknown/other disturbances” in 2002, compared to 2 microplots in 2001. Most of the disturbance signs were related to pocket gopher activity. In addition, cattle disturbance sign was recorded in 3 microplots for 2002.

Transect 006-2: All 15 microplots had “unknown/other disturbances” in 2001, attributed to soil depressions of uncertain origin. In 2002, this same disturbance was recorded for 5 microplots. In addition, cattle disturbance sign was recorded in 4 microplots for 2002. This transect is located immediately adjacent to the Granite Mountain trail.

Transect 006-3: 3 of 22 microplots had “unknown/other disturbances” in 2002. No disturbance of this type was recorded in 2001. Alpine knotweed was recorded in 1 microplot in 2001, but none in 2002. A small spur trail that runs through 2 microplots was recorded as “recreation disturbance” in both years.

Transect 006-4: 3 of 22 microplots had “unknown/other disturbances” in 2002. No disturbance of this type was recorded in 2001. Alpine knotweed was recorded in 3 microplots both years. A small spur trail that runs through 2 microplots was recorded as “recreation disturbance” in 2001, but not in 2002.

Transect 006-5: 1 of 12 microplots had “unknown/other disturbances” in 2001, most likely an elk print. No disturbance of this type was recorded in 2002.

Hazard Lake

Transect 007-1: 4 of 15 microplots had “unknown/other disturbances” in 2002 that were likely the result of pocket gopher activity.

Plant community information

Vegetation at most transect sites is characterized by scattered conifers (or burned snags), patches of low shrubs, and a diverse mix of graminoid and forb species. Forbs dominate the vegetation cover at most plots, while rock and bare soil typically account for most of the ground cover. Tobias’ saxifrage occurs in forest openings with low or no conifer canopy cover. These openings are within forest vegetation classified as the *Abies lasiocarpa* habitat type series (Steele et al. 1981).

Most monitoring transects have an associated vegetation plot. However, in cases where two transects are located very close to each other, only one vegetation plot is sampled. As a result, there are 12 plant community plots for the 16 monitoring transects. Baseline plant community information was collected for the three new transects established in 2002. A second year of plant community information was collected at all other transect sites in 2002, except for Slab Butte (005). Lack of time prevented plant community sampling at this occurrence. The vegetation at Slab Butte in 2002 looked similar to 2001, and plant community data would likely have shown no difference for the two years.

Plant community monitoring is based on changes in composition and/or cover class values within a 1/10th acre vegetation plot surrounding the Tobias’ saxifrage transect. Changes in the species list or their associated cover classes from one sampling period to the next are used to monitor changes in the plant community. This sampling method has an acceptable accuracy standard of +/- one cover class, and an increase or decrease of two or more cover classes is indicative of a measurable change. Plant composition and cover value information collected in 2002 was compared to the 2001 data set. The data sets were very similar for both years and no plant community changes were detected at any of the transects. A table summarizing plant community data results for both 2001 and 2002 is in Appendix 6. Copies of the 2002 plant community field data sheets are in Appendix 7.

A total of 101 vascular plant taxa were tallied for the 11 plots sampled in 2002, including 4 tree, 9 shrub, 24 graminoid, and 64 forb species. This is an increase of 16 species over 2001. The increase can partly be attributed to sampling more plots; but also, several new species reported in 2002 are annuals and simply may not have been present in 2001. In addition, annual discrepancies in the recording some small species present in only trace amounts (e.g., represented by only one or two individual plants) are inevitable because they are easily overlooked, especially if not in flower.

Subalpine fir (*Abies lasiocarpa*) was the most common tree recorded in the plots. Pink mountain-heather (*Phyllodoce empetriformis*), subalpine spiraea (*Spiraea densiflora*), and whortleberry (*Vaccinium scoparium*) were common in a few plots, but no shrub species was present in more than half of the plots. The number of graminoids varied from 4 to 12 species/plot. Parry's rush (*Juncus parryi*) was often the most abundant and the only graminoid encountered in all plots. Variant bentgrass (*Agrostis variabilis*) and slender bluegrass (*Poa gracillima*) were two other graminoids with high constancy values. Forb diversity was consistently high, ranging between 15 and 32 species/plot. Alpine knotweed, threeleaf lewisia (*Lewisia triphylla*), subalpine daisy (*Erigeron peregrinus*), and yellow fawn-lily (*Erythronium grandiflorum*) were the forbs with the highest constancy. Overall, 18 (28%) forb species occurred in at least half of the plots, compared to 12 (19%) species encountered in only one plot. No introduced species were observed in the plots in either 2001 or 2002. In addition, no plots had recorded changes for rock, bare soil, litter, or moss/lichen ground cover values.

Photo points

Photo point photographs provide a visual, time-lapse record of the vegetation and other habitat conditions for each monitoring transect. Repeat photo monitoring is useful to document site-specific change or lack of change to landscape features of interest (Hall 2001). Over time, photographs may be useful to document events and impacts related to wildfire, weed invasion, livestock use, recreational use, or other disturbances. They may also serve to document successional changes, and to corroborate information collected for the plant community component of the monitoring protocol. Photos taken in 2001, or 2002 for the three new transects, serve as the baseline to compare and evaluate future photographs. Landscape and plant community features depicted in photos taken in 2002 looked nearly identical to those shot in 2001. One exception was a photo which showed a large tree had fallen across one of the transects at Slab Butte (005-2). Appendix 4 includes a lists of photographs taken at each transect. The complete 2002 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 is summarized in Table 3 for all transects. The new transect at Hazard Lake is the only monitoring site located within 100 m of a road. The new transect at Beaverdam Peak South is the most remote of the monitoring sites. Only 6 of the 16 transects are located more than 100 m from areas that burned in the large 1994 wildfire complex.

Table 3. Distance to the nearest road, trail, and fire zone for Tobias' saxifrage monitoring transects.

Transect	Nearest road	Nearest trail	Nearest fire zone
Fisher Creek Saddle			
001-1	>100 m	>100 m	<10 m
001-2	>100 m	>100 m	<10 m
001-3	>100 m	>100 m	10-100 m
001-4	>100 m	>100 m	10-100 m
001-5	>100 m	>100 m	10-100 m
NF Pearl Creek			
002-4	>100 m	>100 m	<10 m
Beaverdam Peak S.			
003-1	>100 m	>100 m	>100 m
East of Duck Lake			
004-1	>100 m	>100 m	<10 m
Slab Butte			
005-1	>100 m	>100 m	>100 m
005-2	>100 m	>100 m	>100 m
Granite Mountain			
006-1	>100 m	<10 m	<10 m
006-2	>100 m	<10 m	<10 m
006-3	>100 m	<10 m	>100 m
006-4	>100 m	<10 m	>100 m
006-5	>100 m	>100 m	>100 m
Hazard Lake			
007-1	10-100 m	>100 m	<10 m

Reintroduction of Tobias' saxifrage at North Fork Pearl Creek

Prior to 1994, Tobias' saxifrage was known from four small subpopulations in the upper North Fork Pearl Creek area. They were all thought to be extirpated following the Blackwell fire that intensively burned most of the area in 1994. In 2002, Tobias' saxifrage was rediscovered at one of the original subpopulation sites, but again, no plants were found at the other three subpopulation areas. The rediscovered subpopulation covers a small area and was probably simply overlooked in previous post-fire searches, as opposed to becoming newly re-established in 2002. Updated occurrence information for North Fork Pearl Creek is included in Appendix 1.

In 2001, a total of 313 Tobias' saxifrage bulbils from the Granite Mountain occurrence were transplanted to three transects (002-1, 002-2, 002-3) located in the vicinity of one of the extirpated North Fork Pearl Creek subpopulations (Mancuso 2001). The transects were revisited in 2002, but no Tobias' saxifrage was observed. All of the transplanted bulbils apparently perished. Because of this failure, plant community and photo point components of the protocol were not repeated in 2002. Based on experience gained the past two years, it was determined the reintroduction transect sites were unsuitable for Tobias' saxifrage and should be abandoned. The relatively exposed, xeric condition of the transect sites was the primary reason they were assessed to be poor choices for continued use with the reintroduction experiment.

It was decided to try the transplant experiment again, but use source material from the newly rediscovered North Fork Pearl Creek subpopulation, and a different reintroduction site. One new

reintroduction transect (002-5) was established in the vicinity of the northwestern most extirpated subpopulation. It is located approximately 0.3 mile west of the subpopulation site used for the 2001 transplant experiment. Directions and other location information for the new transplant transect is included in Appendix 3. Appendix 2 includes a map of the transect, while Appendix 4 contains sampling information about the transect.

Bulbils collected from the rediscovered North Fork Pearl Creek subpopulation were transplanted to the new transect (002-5) on August 8, 2002. A total of 180 bulbils were transplanted following the same protocol used in 2001 (Mancuso 2001). Photo point photographs were taken, but ground disturbance and plant community information were not collected for the new transect. This information will be collected in 2003 if transplanting is successful.

DISCUSSION

Tobias' saxifrage census monitoring

Census results from 2002 indicate the abundance and stage class ratio of Tobias' saxifrage are subject to substantial annual fluctuation. The number of Tobias' saxifrage plants decreased along most transects, but concurrently, the ratio of reproductive plants versus vegetative rosettes increased, and in several cases the average number of bulbils/plant also increased. Will this result in a greater number of rosette versus reproductive plants in 2003, similar to the 2001 pattern? Two transects that had a few Tobias' saxifrage plants in 2001, had none in 2002. These transects will continue to be monitored to see if Tobias' saxifrage reappears. It will take several more years of collecting census information before we begin to understand the natural range of variability regarding fluctuations in population abundance and persistence. Understanding the natural range of variability is a necessary precursor to assessing Tobias' saxifrage population trends.

Ground disturbance and weed monitoring

Most Tobias' saxifrage occurrences are located in areas free from human-related disturbances. The exception is at Granite Mountain (006), where two subpopulations occur along a popular recreation trail. One of these subpopulations occurs along a section of trail that gets motorized and horse, as well as foot traffic. Impacts to Tobias' saxifrage positively related to these activities have not been observed either monitoring year. Soil depressions observed both years have lacked sufficient detail to clearly identify the source as foot, horse, or other prints. This same subpopulation has recorded cattle trampling disturbance both monitoring years. Livestock have used the lower Granite Mountain area for many years and their effect, if any, on the abundance and persistence of Tobias' saxifrage in the area is unknown. Monitoring may provide some insights into this question, but the existing protocol is not designed to answer questions of cause and effect.

The main disturbance at several occurrences appears to be pocket gopher activity. The amount of gopher-related soil surface disturbance at an occurrence varies from minor to pronounced. It is unknown if there is a threshold level of gopher disturbance that could negatively effect Tobias' saxifrage. The invasion of noxious or other non-native weeds is presently not occurring within Tobias' saxifrage occurrences. It is unclear if alpine knotweed, a native forb that increases with certain disturbances, has displaced or limited the expansion of Tobias' saxifrage at any occurrence. This species tends to be common near, but in most cases does not directly occur with Tobias' saxifrage. Most of the alpine knotweed plants recorded along the transects have

been small basal leaf clusters. It is unclear if these are individual genets, or ramets from nearby clones. Monitoring has revealed that these small basal plants can be ephemeral.

Plant community information

Tobias' saxifrage habitat occurs as rocky inclusions in areas supporting one of several subalpine fir habitat types. Subalpine fir habitat type sites well represented by lodgepole pine (*Pinus contorta*) typifies some Tobias' saxifrage occurrences, while colder, more exposed sites tend to be dominated by open stands of subalpine fir itself. Vegetation dominated by an herb/shrub stage follows a stand-destroying fire in either situation (Crane and Fischer 1986). This herb/shrub stage characterizes all of the Tobias' saxifrage occurrence that have burned in the past decade. Successional changes are slow in these harsh subalpine environments and it may be many years before substantial plant community differences are recorded at the transect sites.

Photo points

Landscape-level photos should be taken every year a disturbance or other change needs to be documented. With this caveat, I do not think it is necessary to retake landscape photographs each year. Every three to five years is probably more than sufficient to document general landscape characteristics for most sites. I recommend transect-level photos be taken whenever monitoring is conducted.

Reintroduction of Tobias' saxifrage at North Fork Pearl Creek

Tobias' saxifrage has apparently been extirpated from three of the four subpopulations it was known from prior to the Blackwell fire. It is likely the heat of the fire directly killed some Tobias' saxifrage plants. However, indirect fire effects have likely contributed more to the local extirpations by changing conditions at each of the former subpopulation sites. This is largely because nearly all trees at the subpopulations were killed. The lack of tree canopy resulted in increased solar exposure and drier, less protected, or ameliorated conditions. Increased sunlight has also promoted an increase in ground cover for many herbaceous species. This would likely contribute to increased competitive interactions with Tobias' saxifrage. Another consequence of the fire was the high level of sediment deposition that occurred after the burn. This sedimentation could have buried Tobias' saxifrage bulbils too deep for them to survive, and/or changed substrate characteristics. These changes are likely all detrimental to the establishment and persistence of Tobias' saxifrage.

I recommend the sites chosen for the transplant experiment in 2001 be abandoned. It is now clear these original transplant transect sites are too xeric and not suitable for Tobias' saxifrage. Another transplant site was chosen for 2002, in a different former subpopulation area. It is located on a west-facing (285⁰), gentle middle slope position opening, with steeper slopes both above and below. Half-buried boulders surround the opening, as do burned snags. Alpine knotweed is common in the general area. This transplant site appears to be only marginally suitable for Tobias' saxifrage. I suspect it is too warm and dry for too long a time during the growing season for Tobias' saxifrage. Future transplant sites may have to be chosen to be located not where Tobias' saxifrage once occurred, but in places that seem to meet its habitat requirements under prevailing conditions.

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Appendix 1

Element Occurrence Records for Tobias' saxifrage.

SAXIFRAGA BRYOPHORA VAR TOBIASIAE Occurrence Number: 001
TOBIAS' SAXIFRAGE

Place Name: FISHER CREEK SADDLE

County: Idaho; Valley USGS quadrangle: BLACK TIP

Latitude: 450914N Longitude: 1160528W

TOWNRANGE:	SECTION:	TRSNOTE:
021N003E	16	S2
021N003E	17	S2, S2S2N2
021N003E	20	NW4
021N003E	22	N2NW4

Location:

Approximately 19 air miles north of McCall, along ridges at the head of Fisher Creek, both east and west of Fisher Creek Saddle. Forest Service Road #281 provides access to the saddle. The occurrence extends along ca 2 plus miles of the ridge complex.

Survey Date: 2001-07-26

Last Observed: 2002-07-30 First Observed: 1977

EORANK: A

EORANK Comments: Large and more or less undisturbed.

Population Data:

1977-1978: No data. Collected by Packard and Tobias. 1989: Many small populations scattered along slope. Greater than 10,000 individuals, 50% mature (with bulbils), 40% immature rosettes, few with flowers. Also one small population on cirque headwall in upper Cougar Creek. Area surveyed by Bob Moseley, Barbara Ertter, and Chris Davidson. 1995: Area surveyed by Moseley, Kim Pierson, and Nellie Tobias, finding four large discontinuous populations. Occurrence lies in the center of the 1994 Corral Fire area. The westernmost population was unburned due to the rocky habitat. The population west of Fisher Creek Saddle had only widely scattered spot fires that were localized due to discontinuous fuels, leaving the Saxifraga largely unaffected. The open forest occupied by Saxifraga immediately SE of the saddle thoroughly burned, but population densities do not appear to be affected by increased erosion. The west half of the easternmost population thoroughly burned but Saxifraga densities appear unaffected, while the eastern half had only spot fires and the habitat was largely unaffected. 2000: Specimen collected by Joy Handley, University of Wyoming. 2001: In the past, many 1000's of genets were observed in the subpopulations west of Fisher Creek Saddle. The westernmost subpopulation was not visited in 2001, and fewer than 1000 plants were observed in the western subpopulation closer to the saddle. Some of the microhabitats that had many genets in the past, had few or no plants in 2001. Both subpopulations located east of the saddle comprised of scattered small microsites supporting a few (<100) to many (500 or more) saxifrage plants, totaling an estimated 2000-3000 genets. Most of the area within the occurrence polygons is unoccupied by the saxifrage and many suitable-looking microhabitat sites did not have plants in 2001. Majority of plants were rosettes; reproductive plants common in the eastern subpopulation, although most plants with bulbils and no flowers; bulbil and flower production was very scant at the western subpopulation. Observations by Michael Mancuso, CDC; Kim Pierson, Sawtooth NF; and Alma Hanson, Payette NF. 2002: Several subpopulations both east and west of the saddle were revisited for monitoring purposes. All stage classes represented. Overall, fewer plants tallied compared to 2001. Observations by Michael Mancuso and Shelley Cooke, IDCDC.

Habitat Description:

Scattered gravelly ledges, pocket gopher mounds, and run-off channels on E, S, W, and NW-facing aspects; upper to lower slope positions. Granite substrate. Open Abies lasiocarpa and Pinus albicaulis woodland habitats, with relatively high herb and small shrub cover in most places. The Saxifraga

occurring in open microhabitats with high bare ground cover. Associated with *Lewisia triphylla*, *Polygonum austiniae*, and *P. phytolaccifolium*.

Minimum Elevation: 7500 ft. Size: 180 AC

Land Ownership: Payette NF, McCall RD and New Meadows RD.

Comments:

Protection Comments:

A very small portion of the population due W of Fisher Saddle is within Bruin Mountain RNA. Sheep graze the area but don't appear to threaten the population. Increased erosion as a result of fire could be a threat. 2002: No new disturbances or threats.

Management Comments:

In collaboration with the Payette NF, the CDC established five monitoring transects within the occurrence in 2001. 2002: All five monitoring transects resampled.

Specimens: N. Tobias s.n. (NY, CAS).

P. Packard 78-251 (ID).

P. Packard and N. Tobias 78-281 (CIC).

P. Packard and N. Tobias 78-237 (CIC).

C. Wellner 1622 (ID).

B. Ertter 7775 (UC).

B. Ertter 8745 (UC).

J. Handley 7649 (RM).

SAXIFRAGA BRYOPHORA VAR TOBIASIAE Occurrence Number: 002
TOBIAS' SAXIFRAGE

Place Name: NORTH FORK PEARL CREEK

County: Valley USGS quadrangle: BOX LAKE

Latitude: 450525N Longitude: 1155910W

TOWNRANGE:	SECTION:	TRSNOTE:
020N004E	08	NE4NE4, center E2E2E2
020N004E	09	N2N2

Location:

About 14 miles NE of McCall. Headwaters of the North Fork of Pearl Creek, ca 0.5 air miles N of Pearl Lake. Access is via Forest Service Road #432 to the trailhead of FS Trail #109.

Survey Date: 1996-08-27

Last Observed: 2002-08-08 First Observed: 1988

EORANK: C

EORANK Comments: Apparently extirpated by the 1994 Blackwell Fire and subsequent increased erosion. EORANK changed from X to C in 2002. One subpopulation rediscovered in 2002. The subpopulation is small in extent, but has fairly large number of plants, and no obvious anthropogenic threats. The 1994 wildfire that burned surrounding forest probably reduced the amount of suitable Tobias' saxifrage habitat in the area.

Population Data:

1988-1989: Ca 200 genets, all vegetative; occurs in 4 very small subpopulations. Area surveyed by Bob Moseley, Idaho CDC. 1995: Area surveyed by Kim Pierson and others, Payette NF, in July without success. Area surveyed again in August by Moseley and Pierson without finding any plants. All four populations discovered in 1988 and 1989 are within the 1994 Blackwell Fire. The area was severely burned with almost complete mortality of trees and highly altered soils due to heat. It is speculated that the small ledges and channels occupied by the plants were inundated by the obviously high sediment loads being carried by snowmelt and rain as overland flow. 1996: Visited by Moseley on August 27. Still no sign of Saxifraga. 2001: No Saxifraga found during searches by Michael Mancuso, CDC, in early September. 2002: The southernmost of the four original subpopulations rediscovered. All stage classes represented. This subpopulation comprised of two main groupings. The largest (southernmost) grouping with 1500-2500 genets in several narrow strips spread over ca 0.2 acre. Most plants occur at the monitoring station established for the subpopulation; another ca 100 genets occur about 15 m, and 250 genets about 25 m to the north of the monitoring station. The second grouping is located <0.1 mile NE of the monitoring site and has 200-300 genets in an ca 10m x 3m area. No Tobias' saxifrage found in vicinity of three other original subpopulations. These are still considered extirpated. Observations by Michael Mancuso and Kevin Church, IDCDC; Kirsten Severud, IDFG volunteer; and Chantelle DeLay, Payette NF.

Habitat Description:

Dry; mid-slope; W-aspect and flat; 0-15% slope; full sun to partial shade; gravelly ledges and in ephemeral snow runoff channels. *Abies lasiocarpa* and *Pinus albicaulis* woodland with *Lewisia triphylla*, *Polygonum austinae*, *P. phytolaccifolium*, and *Lupinus caudatus*. 2002: Northwest-facing aspect; upper to middle slope position; ca 150 slope. Thin soil over granite bedrock, mainly where soil can be deposited and accumulate a bit between bedrock slabs. Subalpine fir forest surrounding the rock outcrop area fully burned in 1994 wildfire; associated species include *Juncus parryi*, *Luzula hitchcockii*, *Veratrum californicum*, *Spiraea densiflora*, *Polytrichum juniperinum*.

Minimum Elevation: 7400 ft. Size: 0.1 AC

Land Ownership: Payette NF, McCall RD.

Comments:

Protection Comments:

Sheep grazing in the area probably does not threaten occurrence. 2001: Sheep grazing disturbances locally heavy in general occurrence area. Approximately 1500 sheep were in or near the occurrence area in September 2001. 2002: : No evidence of anthropogenic disturbance at rediscovered subpopulation. It seems unlikely more than a few sheep would venture onto the rocky area supporting the subpopulation.

Management Comments:

Area should be surveyed periodically over the next several years to determine if the species persisted, but was not visible in 1995. 2001: Saxifraga bulbils collected at Granite Mountain were transplanted along three transects in the general occurrence area; with plans to monitor this reintroduction experiment in future years. 2002: The 2001 reintroduction of Tobias' saxifrage failed. Another attempt to reintroduce plants made in 2002 at a site ca 0.3 mile east of Crestline Trail trailhead. In collaboration with the Payette NF, the IDCDC established one monitoring transect at the rediscovered subpopulation.

Specimens: B. Ertter 7819 (UC).

SAXIFRAGA BRYOPHORA VAR TOBIASIAE Occurrence Number: 003
TOBIAS' SAXIFRAGE

Place Name: BEAVERDAM PEAK SOUTH

County: Valley USGS quadrangle: BOX LAKE

Latitude: 450023N Longitude: 1155750W

TOWNRANGE: SECTION: TRSNOTE:
019N004E 04 SW4NE4, NW4SE4, SE4SE4

Location: On the E slope of 2 unnamed peaks S of Beaverdam Peak; ca 10 air miles NE of McCall, ca 0.5 mile SE of Box Lake.

Survey Date: 1995-08-16
Last Observed: 2002-08-07 First Observed: 1989-07-27

EORANK: A
EORANK Comments: Undisturbed and isolated.

Population Data:

1989: Ca 1500 genets, 10% in leaf, 80% in bud, 10% in flower; few flowers present; several subpopulations scattered on ledges. Area surveyed by Bob Moseley, Idaho CDC. 1995: Occurrence is within the perimeter of the 1994 Blackwell Fire but habitat in the vicinity of the populations did not burn as it was protected by discontinuous fuel and bedrock slabs. Forests below the populations were severely burned. Observations by Moseley. 2002: A few small areas with 100-300 Tobias' saxifrage plants found along the upper series of granite ledges. An estimated 5000+ additional plants found on ledge series further downslope. All stage classes represented, including many plants with one or more flowers. Additional plants may occur in general area. Observations by Michael Mancuso and Kevin Church, IDCDC; Kirsten Severud, IDFG volunteer; and Alma Hanson, Payette NF.

Habitat Description:

N, NE, E aspects; thin, gravelly soil over granite bedrock; on sloping and level ledges, and other portions of slope where soil has accumulated over or between slabs of bedrock; plants occurring in bare soil openings, on moss mats, and intermixed with other vegetation. Widely scattered *Abies lasiocarpa* and *Pinus albicaulis* dot the slope; associated species include *Spiraea densiflora*, *Phyllodoce empetriformis*, *Lewisia triphylla*, *Erythronium grandiflorum*, *Polygonum phytolaccifolium*, and *Juncus parryi*.

Minimum Elevation: 7600 ft. Size: 2 AC

Land Ownership: Payette NF, McCall RD.

Comments:

Additional populations may be discovered in the Beaverdam Peak - Box Lake area on the divide between NFK Lake Fork and the NFK Payette River.

Protection Comments:

Remote, undisturbed site; no apparent threats.

Management Comments:

2002: In collaboration with the Payette NF, the IDCDC established a monitoring transect at this occurrence.

Specimens: Moseley 1563 (ID); Ertter 8790 (UC); Mancuso 2363 (ID)

SAXIFRAGA BRYOPHORA VAR TOBIASIAE Occurrence Number: 004
TOBIAS' SAXIFRAGE

Place Name: EAST OF DUCK LAKE

County: Valley USGS quadrangle: BRUNDAGE MTN.

Latitude: 450644N Longitude: 1160831W

TOWNRANGE: SECTION: TRSNOTE:
021N003E 31 NW4SW4

Location:

About 18 miles NNW of McCall. East of the divide between Corral and Fisher Creeks, ca 0.5 air miles east of Duck Lake. About 0.5 air miles west of FS Road 281 and 1.3 air miles north of Slab Butte.

Survey Date: 1995-08-17

Last Observed: 2002-07-31 First Observed: 1995-08-17

EORANK: B

EORANK Comments: Small, but undisturbed and vigorous.

Population Data:

1995: Ca 250 genets, 90% vegetative and 10% in flower. Population age class structure is unknown. Population is small and local but appears vigorous. Observation on a cursory survey by Bob Moseley, Idaho CDC. 2001: An estimated 5,000 genets, perhaps more, in groupings scattered over ca 1 acre; variable density, but locally common. Majority of plants were rosettes, but also many individuals with flowers and/or bulbils; some plants with multiple flowers. Observation by Michael Mancuso, IDCDC. 2002: Plants locally common, although apparently not as numerous as in 2001; all stage classes represented, including many plants with one or more flowers; also numerous relatively large plants with >50 bulbils each. Observations by Michael Mancuso and Shelley Cooke, IDCDC.

Habitat Description:

Bare soil among boulders, ledges, and in run-off channels on moderately steep NE-facing subalpine slope. Slope dominated by herbaceous vegetation with scattered conifers. Polygonum phytolaccifolium, Penstemon globosus, Hypericum formosum, Lupinus argenteus, and Spiraea densiflora are common community associates. Severely burned Abies lasiocarpa forests occurs below and to a lesser degree above the population. Population is within the 1994 Corral Fire area, ca 0.75 mile N of its southern perimeter. Immediate area around population was largely unaffected except for some of the conifers, probably because of discontinuous fuels.

Minimum Elevation: 7400 ft. Size: 1 AC

Land Ownership: Payette NF, McCall RD.

Comments:

Protection Comments:

Undisturbed area. 2001: Undisturbed except for 1994 wildfire. 2002: No new disturbances or threats.

Management Comments:

In collaboration with the Payette NF, the CDC established a monitoring transect within this occurrence in 2001. 2002: Monitoring transect resampled.

Specimens: Michael Mancuso #2200 (ID).

SAXIFRAGA BRYOPHORA VAR TOBIASIAE Occurrence Number: 005
TOBIAS' SAXIFRAGE

Place Name: SLAB BUTTE

County: Valley USGS quadrangle: BRUNDAGE MTN.

Latitude: 450534N Longitude: 1160810W

TOWNRANGE:	SECTION:	TRSNOTE:
020N003E	06	SE4SE4SW4
020N003E	07	NW4NE4, SE4NE4NW4

Location:

About 17 air miles NNW of McCall and about 1 mile east of Goose Lake. East-facing slopes below Slab Butte; around small unnamed lake and continuing north for about 0.3 mile.

Survey Date: 2001-07-19

Last Observed: 2002-07-31 First Observed: 1989-07-28

EORANK: A

EORANK Comments:

Several groupings totaling 1000's of plants; many robust individuals; largely undisturbed.

Population Data:

1989: Ca 250 genets in 2 small populations; no flowers seen. Area surveyed by Bob Moseley, Idaho CDC. 1995: Moseley located 2 additional small populations N and S of those found in 1989. 2001: At least two new colony areas discovered; occurrence comprised of at least 6 colony areas clustered around Slab Butte Lake ranging in size from ca 0.1 to over 0.5 acre and containing several 100 to several 1000 genets. Total of over 10,000 genets; rosettes are most common life stage class, but many plants with flowers and/or bulbils; plants with multiple flowers and red fruits also observed. Observations by Michael Mancuso, CDC; Kirsten Severud, IDF&G volunteer; and Alma Hanson, Payette NF. 2002: Plants locally common, although apparently not quite as numerous as in 2001; all stage classes represented; approximately equally split between rosettes and reproductive individuals; most flowering plants with only one flower. Observations by Michael Mancuso and Shelley Cooke, IDCDC.

Habitat Description:

Ledges, concave chutes, narrow strips of water runout areas, and openings amongst boulders and slabs of exposed bedrock. Gravelly, granitic, shallow soil; in deeper soil and duff in one area. Open light to partial shade of conifers. NE-and E-facing aspects; gently sloping to moderately steep areas; occasionally where more or less flat. Associated with *Lewisia triphylla* and *Polygonum austiniae*; *Spiraea densifolia*, *Juncus parryi*, *Polygonum phytolaccifolium*, and *Erigeron peregrinus* are common community associates. Occurrence is ca 0.5 mile S of the burn perimeter of the 1994 Corral Fire.

Minimum Elevation: 7550 ft. Size: 3 AC

Land Ownership: Payette NF, McCall RD.

Comments:

Unsurveyed potential habitat occurs to north and south of occurrence. Additional inventories may reveal more small subpopulations in the general area.

Protection Comments:

2002: A mature subalpine fir fell across part of one subpopulation, but no other disturbances or threats observed.

Management Comments:

In collaboration with the Payette NF, the CDC established two monitoring transects at this occurrence in 2001. 2002: All monitoring transects resampled.

Specimens: Michael Mancuso #2199 (ID).

SAXIFRAGA BRYOPHORA VAR TOBIASIAE Occurrence Number: 006
TOBIAS' SAXIFRAGE

Place Name: GRANITE MOUNTAIN

County: Adams USGS quadrangle: BRUNDAGE MTN.

Latitude: 450610N Longitude: 1161023W

TOWNRANGE:	SECTION:	TRSNOTE:
020N002E	02	SW4NE4
020N002E	03	SE4SE4
020N002E	10	NE4NW4, NW4SE4NW4

Location:

About 13 air miles NNW of McCall, about 1 mile west of Goose Lake; on the SE and E flanks of Granite Mountain.

Survey Date: 2001-07-23

Last Observed: 2002-08-02 First Observed: 1999

EORANK: A

EORANK Comments: At least three subpopulations, one of which is relatively large and mostly undisturbed.

Population Data:

1999: An estimated 500+ individuals observed. Population vigor assessed as good. cursory survey by Alma Hanson and Hank Clouser, Payette NF. 2001: Three subpopulations - the lower trail area is less than 0.2 acre in size, but has several 1000 genets; the middle subpopulation (three tree area) is no more than 0.1 acre in size and has ca 300-500 genets; the upper subpopulation contains scattered groupings over several acres and several 1000 genets. Observations by Michael Mancuso, CDC; Kirsten Severud, IDF&G volunteer; and Alma Hanson, Payette NF. 2002: Plants locally common at the lower and upper subpopulation areas, although not quite as numerous as in 2001, and notably fewer plants observed at the middle subpopulation; lower subpopulation with ca 2,500 genets, the middle with 100-200 genets, the upper area with ca 2000+ genets; all stage classes represented. Observations by Michael Mancuso, IDCDC.

Habitat Description:

The lower trail site is a small opening in an *Abies lasiocarpa*-dominated forest alongside the Granite Mountain trail. Burned snags surround the site, which itself did not burn in 1994. The opening is dominated by a diverse mix of forbs and graminoids; with gravelly soil and bedrock close to the surface; gentle to moderately steep NE-facing slope. The middle subpopulation is a moderately steep, NE-E-facing, rocky subalpine slope with a series of small rock outcrops and ledges and high cover of broken rock and exposed granite bedrock. The vegetation is dominated by a diverse forb-graminoid community, with scattered *Abies lasiocarpa* and *Pinus albicaulis*. The upper subpopulation occurs in open, rocky, E- to SE-facing subalpine area with granite bedrock at or near the surface. The vegetation is dominated by a diverse forb-graminoid community with scattered individual or small islands of *Abies lasiocarpa* and *Pinus albicaulis*. No evidence of recent fire.

Minimum Elevation: 7800 ft. Size: 10 AC

Land Ownership: Payette NF, New Meadows RD.

Comments:

Overall site quality assessed as fair at one site and good at all others.

Protection Comments:

2001: The Granite Mountain trail runs alongside two of the subpopulations. The lower trail area is used by hikers, motorcycles, ORVs, horses and maybe others, while the upper areas see little if any motorized use. Cattle use appears light at the upper two subpopulation, but heavy trampling disturbance was observed in September at the lower trail subpopulation. 2002: Cattle trampling disturbance observed at the lower subpopulation; some Tobias' saxifrage plants crushed or dislodged from soil; majority of plants unaffected at time of survey; potential for additional disturbance, as cattle present in general area. No new disturbances or threats observed at the middle or upper subpopulations.

Management Comments:

In collaboration with the Payette NF, the CDC established five monitoring transects within this occurrence in 2001. 2002: All monitoring transects resampled.

Specimens:

SAXIFRAGA BRYOPHORA VAR TOBIASIAE Occurrence Number: 007
TOBIAS' SAXIFRAGE

Place Name: HAZARD CREEK

County: Idaho USGS quadrangle: HAZARD LAKE

Latitude: 451147N Longitude: 1160835W

TOWNRANGE: SECTION: TRSNOTE:
022N003E 31 SW4; unsurveyed

Location:

Salmon River Mountains, ca 0.5 mile south of Hazard Lake, just east of USFS Road #257; ca 20 miles north of McCall.

Survey Date:

Last Observed: 2002-08-01 First Observed: 2000-07-14

EORANK: B

EORANK Comments: Local population but with a relatively large number of plants. Full extent of population remains to be determined.

Population Data:

2000: Specimen collected by B. E. Nelson. 2002: 2,500+ genets; potential for more in general area as population boundaries not fully investigated; plants locally common, but occurring in patches; plants with bulbils/no flowers the most common stage class; some huge plants, approaching 30 cm tall, multi-branched, with large basal leaves, and upwards of 100+ bulbils; flowering plants common, but usually with one or only a few flowers. Observations by Michael Mancuso IDCDC, Marilyn Olsen and Chantelle DeLay, Payette NF.

Habitat Description:

Gentle to moderately steep, rocky, NW-facing slope with granite bedrock at or near the surface. Large, exposed slabs of bedrock and boulders cover the slope. Saxifrage occurs in mesic concavities having thin gravelly soil over bedrock. Area burned in 1994 and most trees killed, but scattered green trees persist; open conifer canopy in area with saxifrage, but denser forest located up and downslope. Associated species include *Suksdorfia ranunculifolia*, *Erigeron peregrinus*, *Antennaria alpina*, *Lewisia triphylla*, *Juncus parryi*, and moss species.

Minimum Elevation: 7160 ft. Size: 0.2 AC

Land Ownership: Payette NF, New Meadows RD.

Comments:

Protection Comments:

No current threats from road located within 100 m of occurrence. Future road-related activities such as weed spraying should consider proximity of saxifrage population. Two snags adjacent to occurrence recently cut down, so there is potential for disturbance from woodcutters. No evidence of livestock grazing or recreation activity disturbances.

Management Comments:

2002: In collaboration with the Payette NF, the IDCDC established a monitoring transect at this occurrence.

Specimens: B. E. Nelson 50598 (RM).

Appendix 2

Map locations and GPS coordinates for Tobias' saxifrage monitoring and transplant transects.

GPS coordinates for Tobias' saxifrage monitoring and reintroduction transects.

All coordinates are UTM 11T based on Map Datum = NAD 27 Central

001 Fisher Creek Saddle – Transect 1	0570403 E	5000254 N
001 Fisher Creek Saddle – Transect 2	0571062 E	5000241 N
001 Fisher Creek Saddle – Transect 3	0569502 E	5000808 N
001 Fisher Creek Saddle – Transect 4	0569500 E	5000835 N
001 Fisher Creek Saddle – Transect 5	0569561 E	5000787 N
002 North Fork Pearl Creek – Transect 1	0580455 E	4993165 N
002 North Fork Pearl Creek – Transect 2	0580453 E	4993152 N
002 North Fork Pearl Creek – Transect 3	0580606 E	4993260 N
002 North Fork Pearl Creek – Transect 4	0579876 E	4992635 N
002 North Fork Pearl Creek – Transect 5	0579820 E	4993228 N
003 Beaverdam Peak South – Transect 1	0581122 E	4984597 N
004 East of Duck Lake – Transect 1	0567495 E	4995568 N
005 Slab Butte – Transect 1	0568051 E	4993341 N*
005 Slab Butte – Transect 2	0568073 E	4993149 N
006 Granite Mountain – Transects 1&2	0565037 E	4994479 N
006 Granite Mountain – Transects 3&4	0563688 E	4993765 N
006 Granite Mountain – Transect 5	0563103 E	4993161 N
007 Hazard Lake – Transect 1	0567322 E	5004921 N

* The GPS coordinates included here for transect 005-1 are a correction. The wrong coordinates were noted in the 2001 monitoring report.

Appendix 3

Location forms for Tobias' saxifrage monitoring and transplant transects established in 2002.

Appendix 4

Transect, sampling, and photo point information for Tobias' saxifrage monitoring and transplant transects.

All compass readings were taken with declination set at 0° . Left- versus right-hand sides of the transect tape is determined by standing at the transect's starting point (the transect marker stake) and facing the end of the transect.

Tobias' saxifrage monitoring transects

Fisher Creek Saddle (001)

Transect 001-1

Transect azimuth = 280°

Transect length = 12 m

*Microplots sampled on left side of tape.

*Microplots sampled at every meter mark starting at the 0 meter point – for a total of 13 microplots.

*Marker stake is a piece of straight, red-painted rebar. The end of the transect marked by a tagged nail hammered into the ground at the 11 m mark (not 12 m because of presence of rock).

*This transect is superimposed over one of Kim Pierson's original research plots. The monitoring marker stake is located approximately 4 m uphill of Kim's yellow-capped rebar stake.

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

Transect 001-2

Transect azimuth = 215°

Transect length = 8 m

*Microplots sampled on left side of tape.

*Microplots sampled every 0.5 meter mark starting at the 0 meter point – for a total of 17 microplots.

*Marker stake is a piece of red-painted rebar. The end of the transect marked by a tagged nail hammered into the ground at the 8 m mark.

*Microplots #7, 9, 14, 15, 16, 17 are largely 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 towards start of transect; (3) 0° ; (4) 90° ; (5) 180° ; (6) 270° .

Transect 001-3

Transect azimuth = 90°

Transect length = 10 m

*Microplots sampled on left side of tape.

*Microplots sampled every meter mark starting at the 1 meter point – for a total of 10 microplots.

*Marker stake is a piece of red-painted "potato-digger" rebar. The end of the transect marked by a tagged nail hammered into the ground at the 10 m mark immediately adjacent to a rock about 0.5 m^2 in size.

*This transect is superimposed over a microsite that Kim Pierson used for her Tobias' saxifrage reproduction study. It was not one of her regular research transects, but is located less than 30 m south of her research plot #6.

*Photo point photographs include: (1) transect azimuth, from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back towards start of transect; (3) 0° ; (4) 90° ; (5) 140° (180° view blocked by trees); (6) 270° .

Transect 001-4

Transect azimuth = 337°

Transect length = 10 m

*Microplots sampled on right side of tape.

*Microplots sampled every meter mark starting at the 1 meter point – for a total of 10 microplots.

*Marker stake is a piece of red-painted “potato-digger” rebar. The end of the transect marked by a tagged nail hammered into the ground at the 11.1 m mark immediately adjacent to a rebar stake originally placed in the ground by Kim Pierson.

*This transect is superimposed directly over Kim Pierson’s original research plot #6. Rebar stakes marking the start, middle, and end of her transect were all still in place. The monitoring marker stake was hammered into the ground directly adjacent to her start stake.

*Photo point photographs include: (1) transect azimuth, from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back towards start of transect; (3) 0° ; (4) 90° ; (5) 150° (180° view blocked by trees); (6) 270° .

Transect 001-5

Transect azimuth = 85°

Transect length = 10 m

*Microplots sampled on right side of tape.

*Microplots sampled every meter mark starting at the 1 meter point – for a total of 10 microplots.

*Marker stake is a piece of red-painted “potato-digger” rebar. The end of the transect marked by a tagged nail hammered into the ground at the 11 m mark immediately adjacent to a rebar stake originally placed in the ground by Kim Pierson.

*This transect is superimposed directly over what I believe was Kim Pierson’s original research plot #11. Two rebar stakes from her plot were still in place. I placed our monitoring marker stake directly adjacent to her uphill (start?) stake.

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

North Fork Pearl Creek (002)

Transect 002-4

Transect azimuth = 264°

Transect length = 10 m

*Microplots sampled on left (south) side of tape.

*Microplots sampled every meter mark, starting at the 1 meter point – for a total of 10 microplots.

*Marker stake is a piece of red-painted “potato-digger” rebar. The end of the transect marked by a 7” nail hammered into the ground at the 10 m mark. The tape runs along the edge of a soil/bare bedrock interface.

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

Beaverdam Peak South (003)

Transect 003-1

Transect azimuth = 170°

Transect length = 10 m

*Microplots sampled on right (west) side of tape.

*Microplots sampled each 0.5 meter mark, starting at the 1 meter point – for a total of 18 microplots.

*Marker stake is a piece of red-painted “potato-digger” rebar. The end of the transect marked by a 7” nail hammered into the ground at the 9 m mark (not 10 m because of a rock in the way).

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

East of Duck Lake (004)

Transect 004-1

Transect azimuth = 326°

Transect length = 8 m

*Microplots sampled on left side of tape.

*Microplots sampled every 0.5 meter starting at the 1 meter point – for a total of 15 microplots.

*Marker stake is a piece of orange-painted “potato-digger” rebar. The end of the transect marked by a tagged nail hammered into the ground at the 8 m mark.

*Microplot #4 (at 2.5 m mark) is mostly 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 towards start of transect; (3) 0° ; (4) 90° ; (5) 180° ; (6) 270° .

Slab Butte (005)

Transect 005-1

Transect azimuth = 64°

Transect length = 13 m

*Microplots sampled on left side of tape.

*Microplots sampled every meter mark starting at the 1 meter point – for a total of 13 microplots.

*Marker stake is a piece of red-painted “potato-digger” rebar. The end of the transect marked by a tagged nail hammered into the ground at the 13 m mark.

*Microplots #8 and 12 are mostly rock; microplot #10 is all granite bedrock.

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

Transect 005-2

Transect azimuth = 33°

Transect length = 17 m

*Microplots sampled on right side of tape.

*Microplots sampled every meter mark starting at the 1 meter point – for a total of 17 microplots.

*Marker stake is a piece of straight red-painted rebar. The end of the transect marked by a tagged nail hammered into the ground at the 17 m mark.

*Microplot #4 is largely 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 towards start of transect; (3) 0° ; (4) 90° ; (5) 170° (180° view blocked by trees and boulder); (6) 270° .

Granite Mountain (006)

Transect 006-1 (lower trail site)

Transect azimuth = 335⁰

Transect length = 15 m

*Microplots sampled on right side of tape.

*Microplots sampled every meter mark starting at the 1 meter point – for a total of 15 microplots.

*Marker stake is a piece of red-painted “potato-digger” rebar. The end of the transect marked by a tagged nail hammered into the ground at the 15 m mark.

*Photo point photographs include: (1) transect azimuth, from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back towards start of transect; (3) 0⁰; (4) 90⁰; (5) 160⁰ (180⁰ view blocked); (6) 270⁰.

Transect 006-2 (lower trail site)

Transect azimuth = 354⁰

Transect length = 15 m

*Microplots sampled on left side of tape.

*Microplots sampled every meter mark starting at the 1 meter point – for a total of 15 microplots.

*This transect is referenced using the red-painted “potato-digger” rebar that marks the start of Transect #1. The start of Transect #2 is 10.2 m @ 153⁰ from the marker stake and runs along the west edge of the Granite Mountain hiking trail. The end of the transect is unmarked because I did not want to leave a tagged nail along the edge of the trail.

*Photo point photographs include: (1) transect azimuth, from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back towards start of transect.

Transect 006-3 (three tree site)

Transect azimuth = 64⁰

Transect length = 11 m

*Microplots sampled on right side of tape.

*Microplots sampled every 0.5 meter mark starting at the 0 meter point – for a total of 22 microplots.

*Marker stake is a piece of red-painted “potato-digger” rebar. The end of the transect marked by a tagged nail hammered into the ground at the 10 m mark (not 11 m due to presence of rock).

*The transect ends just upslope of the main Granite Mountain hiking trail. A small spur trail runs through microplots #13 and 14.

*Photo point photographs include: (1) transect azimuth, from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back towards start of transect; (3) 0⁰; (4) 90⁰; (5) 180⁰; (6) 270⁰.

Transect 006-4 (three tree site)

Transect azimuth = 7⁰

Transect length = 11 m

*Microplots sampled on right side of tape.

*Microplots sampled every 0.5 meter mark starting at the 0 meter point – for a total of 22 microplots.

*The starting point for this transect is the same red-painted “potato-digger” rebar stake that marks the start of the adjacent Transect #3. The transect ends just west of the main tread for the Granite Mountain hiking trail. A minor spur trail passes through microplots #16 and 17.

*Photo point photographs include: (1) transect azimuth, from start point (marker stake) to end of transect; (2) transect back azimuth, from end point back towards start of transect.

Transect 006-5 (below lookout site)

Transect azimuth = 109°

Transect length = 12 m

*Microplots sampled on left side of tape.

*Microplots sampled every meter mark starting at the 1 meter point – for a total of 12 microplots.

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

Tobias' saxifrage reintroduction transect

North Fork Pearl Creek (002)

Reintroduction transects 002-1, 002-2, and 002-3 were recommended to be abandoned. See the 2001 monitoring report for transect information.

Transect 002-5

Transect azimuth = 12° (perpendicular to slope)

Transect length = 6 m

*Planting template centered over the 1 m, 2 m, 3 m, 4 m, and 5 m points along the transect. A total of 36 bulbils planted/template

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

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

Appendix 5

Tobias' saxifrage monitoring transect data sheets.

Appendix 6

Plant community plot data for Tobias' saxifrage monitoring stations, 2001 and 2002.

Vascular plant list 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 cover class data. Plant community information was not collected at transect 005-1 in 2002, and therefore it shows only 2001 cover class values. 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%

A few plant species were misidentified at several transects while collecting plant community data in 2001. Corrections were made for the following species in 2002: *Erigeron peregrinus* was misidentified as *Aster integrifolius* in many plots; *Senecio crassulus* was misidentified as *S. integerrimus* in some plots; and *Carex paysonis* was misidentified as *C. lenticularis* in at least one plot.

Plant community plot data for Tobias' saxifrage monitoring stations, 2001 and 2002.

Species	Year	Transect											
		001 1	001 2	001 3	001 5	002 4	003 1	004 1	005 1	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
<i>Picea engelmannii</i>	2001			3				1		3	3		
	2002		1	3				1		10			
<i>Pinus albicaulis</i>	2001			1	3						1		
	2002			1	3		1				1		
<i>Pinus contorta</i>	2001		1							1			
	2002		1			1				1			3
Shrubs													
<i>Lonicera utahensis</i>	2001			1				1					
	2002					1							
<i>Phyllodoce empetriformis</i>	2001	10		3	20								
	2002	10		3	20		1						
<i>Ribes montigenum</i>	2001				1			1	1				
	2002					1		1					
<i>Salix scouleri</i>	2001												
	2002					1							1
<i>Sambucus cerulea</i>	2001		1										
	2002					1							
<i>Sorbus scopulina</i>	2001			1									
	2002			1		1							
<i>Spiraea densiflora</i>	2001							10	20	1		3	
	2002					3	3	10		1		3	
<i>Vaccinium membranaceum</i>	2001												
	2002					3							
<i>Vaccinium scoparium</i>	2001	3		10	10								
	2002	3		10	10		1						
Graminoids													
<i>Agrostis thurberiana</i> (?)	2001									1			
	2002									1			
<i>Agrostis variabilis</i>	2001	1	1	1				1	1	3		1	
	2002	1	1	1		1		1		3	1	1	
<i>Calamagrostis canadensis</i>	2001												
	2002	1				1							
<i>Calamagrostis sp.</i>	2001									3			
	2002									3			
<i>Carex microptera</i>	2001		1					1	1	3		1	
	2002		1			1		1		3		1	1
<i>Carex pachystachya</i>	2001									3			
	2002					1	1			3			
<i>Carex paysonis</i>	2001			1									
	2002			1			3						

		01-1	01-2	01-3	01-5	02-4	03-1	04-1	05-1	06-1	06-3	06-5	07-1
<i>Carex rossii</i>	2001	1	1	1									
	2002	1		1		3							
<i>Danthonia intermedia</i>	2001							1					
	2002						1	1					
<i>Deschampsia cespitosa</i>	2001		1							1	3	10	
	2002						1			1	10	10	
<i>Deschampsia elongata</i>	2001												
	2002				1								1
<i>Elymus glaucus</i>	2001		1					3	1				
	2002		1			1		3					
<i>Juncus mertensiana</i> (?)	2001												
	2002							1					
<i>Juncus parryi</i>	2001	3	10	3	3			3	20	1	10	10	3
	2002	3	10	3	3	3	10	10		3	10	10	
<i>Juncus tenuis</i>	2001												
	2002												1
<i>Luzula hitchcockii</i>	2001	10		3	1					10			
	2002	10		3	1	10				10			
<i>Melica bulbosa</i>	2001											1	
	2002											1	
<i>Muhlenbergia filiformis</i>	2001												
	2002												1
<i>Oryzopsis exigua</i>	2001			1	1								
	2002			1	1								
<i>Poa</i> sp.	2001												
	2002			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
<i>Poa secunda</i>	2001												
	2002					1							
<i>Sitanion hystrix</i>	2001											1	
	2002											1	
<i>Stipa occidentalis</i>	2001									1			
	2002									1			
<i>Trisetum spicatum</i>	2001	1	1					1	1				
	2002	1	1			1		1					1
Forbs													
<i>Achillea millefolium</i>	2001											1	
	2002					1	1	1			3	1	1
<i>Anaphalis margaritacea</i>	2001		1							10	3		
	2002	1	1			3		1		10			1
<i>Antennaria alpina</i>	2001			1	1			1				1	
	2002			1			3	1				1	3
<i>Antennaria lanata</i>	2001	3	1	3	3				1		1	1	
	2002	3	1	3	3						1		
<i>Arabis</i> sp.	2001											1	
	2002						1				1		

		01-1	01-2	01-3	01-5	02-4	03-1	04-1	05-1	06-1	06-3	06-5	07-1
<i>Arenaria aculeata</i>	2001		1	1	3				3		1	1	
	2002		1	1	1	1	1				1	1	1
<i>Aquilegia flavescens</i>	2001												
	2002							1					
<i>Arnica latifolia</i>	2001	1	1	1				1	1				
	2002	1	1	1	1	1		1					
<i>Aster foliaceus</i>	2001										1	1	
	2002					1		1			3	1	
<i>Aster integrifolius</i>	2001												
	2002							1					3
<i>Calochortus eurycarpus</i>	2001											1	
	2002											1	1
<i>Castilleja linearifolia</i>	2001												
	2002												1
<i>Castilleja miniata</i>	2001		1					3			1	1	
	2002		1					3			3	1	
<i>Cheilanthes gracillima</i>	2001								1				
	2002												
<i>Chionophila tweedyi</i>	2001			1									
	2002			1	1								
<i>Collinsia parviflora</i>	2001		1										
	2002		1			1							
<i>Cryptogramma crispera</i>	2001		1					1	1		1	1	
	2002					1	1	1			1	1	1
<i>Cymopterus glauca</i>	2001										1		
	2002										1		
<i>Cystopteris fragilis</i>	2001							1					
	2002							1					2
<i>Delphinium nuttallianum</i>	2001							1				1	
	2002							1					1
<i>Dodecatheon jeffreyi</i>	2001	10		3	3								
	2002	10		3	3								
<i>Epilobium alpinum</i>	2001	1	1										
	2002	1											
<i>Epilobium angustifolium</i>	2001	3	3	1	1			1				1	
	2002		1	1		3		1					3
<i>Epilobium minutum</i>	2001												
	2002					1				1		1	1
<i>Erigeron alpigenus</i>	2001				1								
	2002				1								
<i>Erigeron peregrinus</i>	2001	3	1	3	1			3	1	3	1	1	
	2002	3	1	3	1	1	1	3		3			1
<i>Eriogonum flavum</i>	2001											3	
	2002											3	
<i>Eriogonum pyrolifolium</i>	2001											1	
	2002						1					1	
<i>Erythronium grandiflorum</i>	2001	1	1	1	1			1	1	1	1		
	2002	1	1	1	1	1	1	1		1	1	1	1

		01-1	01-2	01-3	01-5	02-4	03-1	04-1	05-1	06-1	06-3	06-5	07-1
<i>Galium bifolium</i>	2001											1	
	2002												
<i>Gayophytum</i> sp.	2001												
	2002					1							
<i>Gentiana calycosa</i>	2001				1								
	2002												
<i>Hieracium albertinum</i>	2001											1	
	2002											1	
<i>Hieracium gracile</i>	2001		1	1	1			1	1				
	2002	1	1	1	1		1			1			
<i>Hypericum formosum</i>	2001		10		1			3	1			10	
	2002		10		3			3				10	
<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
<i>Ligusticum canbyi</i>	2001	3	3		1			10		3	1	3	
	2002	3	1		1			10		3	1	3	
<i>Lupinus argenteus</i>	2001		1					3	3	3			
	2002		3			1		3		10			
<i>Lupinus caudatus</i>	2001										3	3	
	2002										3	3	
<i>Mimulus breweri</i>	2001											1	
	2002											1	1
<i>Pedicularis bracteosa</i>	2001	1		1	1								
	2002	1		1	1								
<i>Pedicularis racemosa</i>	2001			1	1					1			
	2002			1	1					1			
<i>Penstemon globosa</i>	2001							10				10	
	2002			1		1		10			1	10	3
<i>Perideridia bolanderi</i>	2001											3	
	2002					1						1	1
<i>Phlox diffusa</i>	2001												
	2002				1								1
<i>Polemonium pulcherrimum</i>	2001	1	3	1				1	1	1			
	2002	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
<i>Polygonum douglasii</i>	2001												
	2002							1		1			
<i>Polygonum kelloggii</i>	2001	1						1		1	1	1	
	2002	1	1					1			1	1	1
<i>Polygonum minimum</i>	2001								1			1	
	2002					1		1				1	1
<i>Polyg. phytolaccaefolium</i>	2001		30	1	1			10	10	1	10	10	
	2002		30	1	1	3	1	3		1	10	10	1
<i>Potentilla flabellifolia</i>	2001	1								3			
	2002	1								3			
<i>Sax. bryophora tobiasiae</i>	2001	1	1	1	1			1	1	10	1	1	
	2002	1	1	1		3	1	1		3	1	3	1

Appendix 7

Community Survey and Ocular Plant Species data sheets.