



**Botanical
and Ecological Inventory
of Selected Peatland Sites on
the Shoshone National Forest**

Prepared for—

Shoshone National Forest
808 Meadow Lane
Cody, Wyoming 82414

Prepared by—

Sabine Mellmann-Brown
Wyoming Natural Diversity Database
University of Wyoming
P.O. Box 3381
Laramie, Wyoming 82071

Challenge Cost-Share Agreement No. 02-CS-11021400-012

May 2004

Contents

Summary.....	iii
Acknowledgements.....	iii
Introduction.....	1
Methods 2	
Site Selection.....	2
Study Area Description	2
Field Inventory	3
Results 4	
Inventory of sensitive plant species.....	4
Clay Butte Fen.....	5
Little Bear Lake Fen	7
Sawtooth Peatbeds.....	11
Potential Peatland sites for Future Study	14
References.....	15

Report Citation:

Mellmann-Brown, Sabine. 2004. Botanical and Ecological Inventory of Selected Peatland Sites on the Shoshone National Forest. Report prepared for Shoshone National forest by Wyoming Natural Diversity Database, Laramie, WY.

Cover Page Photo: Little Bear Lake Fen – Pool with *Sparganium natans*.
Photo by Sabine Mellmann-Brown

Tables

Table 1: Cover values for vascular plant species: Plots CB1 - CB 7, Clay Butte Fen

Table 2: Water pH and temperature for the Clay Butte Fen (air temperature 62° F)

Table 3: Cover values for vascular plant species: Plots LB1 – LB 13, Little Bear Lake Fen

Table 4: Water pH and temperature for the Little Bear Lake Fen (air temperature 64° F)

Table 5: Cover values for vascular plant species: Plots SB1 – SB 10, Sawtooth Peatbeds

Appendices

Appendix A: Element Occurrence Records

Appendix B: Maps and Site Photographs

Appendix C: Preliminary vascular plant checklist of Shoshone National Forest peatlands

Summary

The peatland inventory for the Shoshone National Forest has been an ongoing project. Peatlands are specialized habitat in Wyoming, that harbor high concentrations of Wyoming plant species of special concern. In 2003, botanical and ecological studies were conducted at the peatland basins south of Clay Butte, the Little Bear Lake Fen, and the Sawtooth Peatbeds. This report summarizes the findings regarding plant species of special concern, floristic inventory and vegetation composition of these three wetlands.

Five occurrences of rare or limited-distribution species were documented in the study area. Substantial populations of *Carex livida*, *Carex limosa*, and *Carex diandra* were found in the Clay Butte peatland basin. These occurrences have been previously recorded and data on population size and vegetation composition were updated and expanded (ERO Resources Corporation 2000, WYNDD 2003). One previously known occurrence of *Carex limosa* and a new occurrence of *Sparganium natans* were located in the Little Bear Lake Fen.

A total of 52 vascular plants were recorded while gathering community data in the three peatlands surveyed. Bryophytes were collected on all sites, but have not yet been identified. Appendix C includes an updated vascular checklist for Shoshone National Forest peatland sites. Twenty-two plant species were added to this list.

Acknowledgements

This study was conducted as a challenge cost-share project supported by the Shoshone National Forest. Kent Houston provided Forest Service coordination and support. Multiple maps, tables and lists were taken from a previous peatland report by Bonnie Heidel and Scott Laursen (2003). Bonnie Heidel also provided logistic support, expertise, and encouragement, and critically reviewed this report.

Botanical and Ecological Inventory of Selected Peatland Sites on the Shoshone National Forest

Introduction

The inventory of peatlands in the Shoshone National Forest has been an ongoing project. Fertig and Jones (1992) have documented the unique plant composition and wetland communities at Swamp Lake. The flora of a peatland basin northeast of Lily Lake has been described by Jones and Fertig (1999). In 2002, those former sites were revisited and two further peatland sites at Little Moose Lake and south of Clay Butte were surveyed by Wyoming Natural Diversity Database. The botanical and ecological peatland inventory report by Heidel and Laursen (2003) summarizes the results of peatland surveys prior to 2003.

During the summer of 2003, floristic surveys were completed in three wetland complexes at Little Bear Lake, at Sawtooth Mountain, and in the peatland basin south of Clay Butte. This latter site was included because surveys in prior years were done early in July when much of the vegetation was submerged and did not encompass the entire vegetation at this site.

The results from the 2003 field surveys are presented in this report. This report should be considered an addition to the pilot floristic and ecological inventory report by Heidel and Laursen (2003). When appropriate, survey results are compared to the data collected by Heidel and Laursen (2003), and new information was added to their tables and lists.

This document provides an expansion of previous knowledge on peatland sites in the northern part of the Shoshone National Forest. To date, in-depth botanical and ecological data are available for six peatlands on the Forest. The inventory of peatland sites of the Shoshone National Forest is by no means complete – it is a project in progress.

Methods

Site Selection

Three peatland sites in the northern part of the Shoshone National Forest were selected for this inventory project. Criteria for selection were: previous knowledge of sensitive plant occurrences (WYNDD 2003, ERO Resources Corporation 2000) or special landscape features (Pierce 1961, Collins et al. 1984), and a lack of detailed botanical and ecological information. Include in this study were a peatland basin south of Clay Butte (referred to as Clay Butte Fen), a fen southeast of Little Bear Lake, and the Sawtooth Peatbeds.

Study Area Description

The study areas are located in the Beartooth Mountains of Wyoming. U.S. Highway 212 borders the northern edge of the Clay Butte Fen in Section 12, Township 57 North, Range 106 West. At Little Bear Lake, U.S. Highway 212 transverses the northern section of Little Bear Lake Fen. The peatland is located in Section 11, Township 57 North, Range 105 West. The Sawtooth Peatbeds are accessed by the Morrison 4WD Trail, which runs along the northeastern edge of the large fen complex, in Section 29, Township 57 North, Range 104 West.

The study areas range in elevation from 2,740 meters (8,980 feet) for the Clay Butte Fen to 2,910 meters (9,560 feet) at Little Bear Lake and 2,950 meters (9,670 feet) at the Sawtooth Peatbeds. Subalpine forest with *Picea engelmannii* and *Pinus contorta* surrounds the lowest wetland, at Clay Butte. The Little Bear Lake Fen and, particularly, the Sawtooth Peatbeds are situated in the upper subalpine zone, where dense forest gives way to gradually more open woodland up to treeline.

Few climatic data are available for characterizing the subalpine environment of the Beartooth Mountains. The general climate character is continental. Prevailing winds are from the southwest, west, and northwest throughout the year. The SNOTEL site located near the Beartooth Lake Campground (WY9E10S) at 2,727 meters elevation is the only permanent, high elevation weather station in the vicinity of the study areas.

The average annual precipitation at Beartooth Lake (1980-1997) was 860 mm (Fig. 1). Seventy-eight percent of the precipitation at Beartooth Lake occurred as snow in the winter and

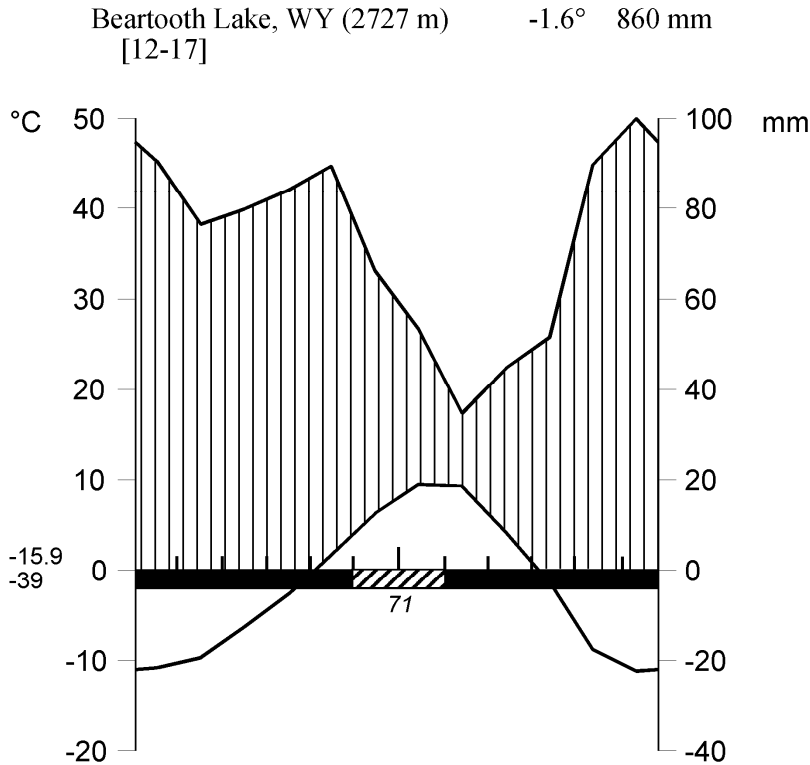


Figure 1: Climate diagram for the Beartooth SNOTEL station in subalpine spruce-fir forest, 1980-1997. Data following the station name are: elevation, mean annual temperature in °C, annual precipitation, and years of record for temperature and precipitation data. The upper line shows monthly precipitation, the lower line shows mean monthly temperature. Black bars indicate months with mean minimum temperature < 0°C, diagonally hatched bar indicates months with absolute minimum temperature < 0°C. Number of frost free days is 71; average daily minimum of coldest month is -15.9°C; coldest temperature on record is -39°C.

spring. Wind exposed areas in the upper subalpine zone are commonly swept clear of snow, while snow banks on leeward slopes and depressions may persist until August. The number of frost-free days between 1986 and 1998 ranged from 41 to 89 days. Frost may occur any month of the year.

Precambrian rocks, predominantly composed of gneisses, migmatites, and granitoids, surround all studied peatlands (Lafrenz et al. 1986). Glacial till deposits are common in many valley bottoms. The Clay Butte Fen may receive subsurface runoff from the calcareous sediment layers that form Clay Butte.

The studied wetlands had high amounts of organic substrates. Soils of the Clay Butte and Little Bear Lake Fens would classify as Histosols. Permafrost can be found in the Sawtooth Peatbeds at a depth of less than 1 meter and the soils would classify to the Gelisol order (Soil Survey Staff 1999).

Field Inventory

Peatlands were visited during the latter part of August and September 2003. General site descriptions were supplemented with detailed sketches of major vegetation zones and other topographic features of the site. In all wetlands, vegetation zones were sampled in 0.5 m² plots, following the inventory methods described by Heidel and Laursen (2003). Plant cover was

estimated to the nearest 10%, including cover classes for trace (1%), sparse (5%), and almost complete cover (98%). Due to time constraints, no running floristic list of all occurring species was recorded.

All unknown plant species were either keyed in the field or collected and later identified. Taxonomic references used to identify vascular plant species include Dorn (2001), Hermann (1970), Hitchcock et al. (1969), Hitchcock and Cronquist (1976), and Fertig and Markow (2001). Bryophytes from all vegetation plots were collected and are awaiting identification.

Surface water pH readings were taken at multiple locations in each wetland. Due to equipment malfunction, pH values at the Sawtooth Peatland will have to be repeated at some other time. Equipment was calibrated in the field, using pH4, pH7 and pH10 buffer solutions. Locations for pH measurements were noted in sketches for future reference.

Results

Inventory of sensitive plant species

Peatlands on the Shoshone National Forest contain 23 known sensitive plant species. No new sensitive species were recorded during this study.

Five occurrences of Forest Service Sensitive or Wyoming species of concern were documented in the study area. Substantial populations of *Carex livida*, *Carex limosa*, and *Carex diandra* were found in the Clay Butte peatland basin. These occurrences have been previously recorded (ERO Resources Corporation 2000, WYNDD 2003). During this survey, plant occurrences were further described and detailed data on population size and vegetation composition were collected. One previously known occurrence of *Carex limosa* and a new occurrence of *Sparganium natans* were located in the Little Bear Lake Fen. The *Carex limosa* population was quite extensive throughout the southern portion of the Little Bear Lake Fen. *Sparganium natans* was growing in several pools between stands of *Carex limosa* and *Carex scopulorum*. See Appendix A for further details on these occurrences.

Clay Butte Fen

County: Park

Location: T57N R106W, Section 12, Beartooth Butte, WY Quad, 7.5'

Elevation: 2,740 meters (8,980 feet)

Directions: Go east on Highway 212. Peat basin is located on the south side of the road, immediately east of the turnoff to the Clay Butte Fire Tower.

Description: Small basin at the head of a tributary to Beartooth Creek, somewhat rectangular in outline. Small outlet to the South. Surrounded by subalpine forest.

The Clay Butte Fen was surveyed by Heidel and Laursen (2003) on July 2, 2002. Data from four vegetation plots sampling *Carex aquatilis* – *Viola epipsela*, *Carex utriculata*, and *Salix planifolia* - *Carex aquatilis* plant associations were collected. On July 2, 2002 water levels were still high and large sections of the vegetation were submerged. Heidel and Laursen (2003) noted that aerial photo zonation patterns could not be discerned on the ground.

In 2003, the site was visited on August 22 and September 26. Water levels at that time were low and all vegetation zones apparent on the aerial photos were recognizable in the field.

The northern section of the fen is characterized by the willows *Salix eastwoodiae*, *Salix planifolia*, and *Salix farriarum*. South of these willow communities, a band of *Carex utriculata* can be distinguished on the aerial photograph as well as on the ground; this is followed to the south by a narrow strip of *Carex diandra* and *Carex aquatilis* adjacent to expansive areas with *Carex limosa* and/or *Eleocharis quinqueflora* on reddish marl substrate. One large and several smaller open water pools are located in the central and southern part of the peatland. *Nuphar polysepala* and *Menyanthes trifoliata* inhabit the larger non-concentric pool in the central part of the fen. Large populations of *Carex livida* can be found on slightly raised areas throughout the central and southern parts of the peatland.

INVENTORY OF SELECTED PEATLAND SITES
ON THE SHOSHONE NATIONAL FOREST

Table 1: Cover values for vascular plant species: Plots CB1 - CB 7, Clay Butte Fen

Species	CB 7	CB 3	CB 4	CB 6	CB 5	CB 2	CB 1
<i>Salix eastwoodiae</i>	30	.	.	.	.	.	.
<i>Salix farriae</i>	10	.	.	.	.	.	.
<i>Carex utriculata</i>	60	90	.	.	.	.	.
<i>Salix planifolia</i>	.	.	20	3	3	20	.
<i>Carex aquatilis</i>	.	.	30	3	20	20	.
<i>Carex livida</i>	.	.	10	40	30	.	.
<i>Potentilla diversifolia</i>	.	.	10	3	1	.	.
<i>Polygonum viviparum</i>	.	.	10	1	3	.	.
<i>Packera subnuda</i>	.	.	3	30	1	.	.
<i>Betula glandulosa</i>	.	.	3	.	10	.	.
<i>Equisetum variegatum</i>	.	.	3	1	1	.	.
<i>Carex gynocrates</i>	.	.	20	10	.	.	.
<i>Gentianopsis detonsa</i>	.	.	3	1	.	.	.
<i>Pedicularis groenlandica</i>	.	.	.	3	3	1	20
<i>Carex buxbaumii</i>	3	.	.
<i>Carex saxatilis</i>	1	.	.
<i>Carex diandra</i>	30	.
<i>Carex limosa</i>	30
<i>Menyanthes trifoliata</i>	20
<i>Equisetum arvense</i>	3	.	.	.	.	.	.
<i>Calamagrostis canadensis</i>	3	.	.	.	.	.	.
<i>Angelica arguta</i>	.	.	3	.	.	.	.
<i>Symphyotrichum</i> sp.	.	.	3	.	.	.	.
<i>Juncus longistylis</i>	.	.	3	.	.	.	.
<i>Danthonia intermedia</i>	.	.	1	.	.	.	.
<i>Eleocharis quinqueflora</i>	.	.	.	3	.	.	.
<i>Deschampsia cespitosa</i>	.	.	.	1	.	.	.
<i>Symphyotrichum foliaceum</i> var. <i>apricum</i>	.	.	.	1	.	.	.
Soil (< 2mm)	3	10	.	.	.	.	.
Gravel (2 - 75mm)
Cobble (7.5 - 25cm)
Boulder (> 25cm)
Bedrock
Litter (< 6mm)	10	.	.	3	10	.	.
Wood (> 6mm)
Lichen
Moss	20	.	90	80	80	98	98
Dead rooted plants
Clubmoss
Cushion Plant

Three species of special concern, *Carex limosa*, *Carex diandra*, and *Carex livida* were documented during the 2003 surveys. Updated Element Occurrence Records for these species can be found in Appendix A. In the northern Rocky Mountains, *Carex livida* is known to occur in *Carex lasiocarpa* communities, *Carex simulata* communities and *Eleocharis quinqueflora* communities (Tuhy and Jensen 1982; Fertig and Jones 1992; Chadde et al. 1998). The characteristic species of those communities are absent from the Clay Butte wetland. The *Carex livida* population at Clay Butte is one of the highest known occurrences of this species, which may explain the unusual composition of the encountered plant communities.

Two other species of concern, *Carex leptalea* and *Eriophorum gracile*, have been reported from the Clay Butte Fen (ERO Resources Corporation 2000). Neither of these species were located during the 2003 survey.

Data from seven vegetation plots were collected (Table 1). Water temperature and pH were measured 1) at the eastern edge of the large pool, adjacent to a stand of *Carex diandra*, 2) in a stand of *Carex limosa* south of a shallow round water pool, and 3) in a water pool surrounded by *Carex limosa*, near vegetation plot CB 5 with *Carex livida*. (Fig.3). pH values varied from 6.2 to 8.2 (Table 3).

Table 2: Water pH and temperature for the Clay Butte Fen (air temperature 62° F)

Location	Water	
	Temperature	Water pH
pH 1	52° F	7.7
pH 2	60° F	6.2
pH 3	60° F	8.2

Little Bear Lake Fen

County: Park

Location: T57N R105W, Section 11; Deep Lake, WY Quad, 7.5'

Elevation: 2,910 meters (9,560 feet)

Directions: Go east on U.S. Highway 212, past the Island Lake turnoff, and past Little Bear Lake. The fen is located at the southeastern end of Little Bear Lake, north and south of the highway.

Description: Peatland basin at the inlet of Little Bear Lake, elongated but irregular in outline. Little Bear Creek runs through the northern edge of the wetland. To the northwest, the fen grades into wet subalpine meadow that borders the lakeshore. Highway 212 separates the wetland into northern and southern sections and may impede drainage of the southern section into the lake. The basin is surrounded by subalpine meadows and open woodland.

The Little Bear Lake Fen was visited on August 29 and September 26, 2003. Standing water was still present in most pools and in stands of *Carex utriculata*. While some open water areas occur north of Highway 212, the central portion of the fen with larger pools and somewhat concentric vegetation zones is located to the south. All vegetation data were collected in this central part of the fen.

Carex scopulorum is the most ubiquitous species in the wetland. This species forms large stands close to the highway as well as throughout the central portion of the fen, and it is often associated with *Carex saxatilis*. Some areas close to the highway are also dominated by stands of *Carex aquatilis* and *Carex canescens*. Stands of *Carex utriculata* are uncommon, except along some of the deeper pools. These stands can be recognized on aerial photographs and in the field by their light green to yellow color and tall stature. Large areas in the central part of the fen are occupied by stands of *Carex limosa*. This species is often dominant and is associated with *Carex scopulorum* and *Carex saxatilis*. In three small pools in between *Carex limosa* vegetation, populations of *Sparganium natans* were located. At the time of the surveys, *Eriophorum angustifolium* was flowering in large portions of the fen.

A low shrubland with *Salix glauca* is located at the southern end of the wetland. The outer portions of the wetland can be characterized as a subalpine wet meadow, with species like *Caltha leptosepala*, *Packera subnuda*, *Symphotrichum foliaceum*, and others. These areas exhibit elongated hummocks and depressions, a miniature form of the strings and flarks of patterned fens. Raised areas have a high moss cover and shared dominance of forbs and graminoids. Bryophytes include *Sphagnum* spp. Low areas are dominated by sedges.

Two species of special concern, *Carex limosa* and *Sparganium natans* were documented during the 2003 surveys. Element Occurrence Records for these species can be found in Appendix A.

Data from 13 vegetation plots are displayed in Table 3. Water temperature and pH were measured 1) immediately north of a large rock outcrop in a shallow pool, 2) in a small round

INVENTORY OF SELECTED PEATLAND SITES
ON THE SHOSHONE NATIONAL FOREST

pool with *Sparganium natans* and mucky substrate with some surface water at the time of the survey, and 3) in a *Carex utriculata* stand south of the large rock outcrop (Fig.5). The pH values varied from 6.5 to 7.4 (Table 4).

Table 3: Cover values for vascular plant species: Plots LB1 – LB 13, Little Bear Lake Fen

Species	LB 2	LB 7	LB 8	LB 5	LB 3	LB 10	LB 4	LB 11	LB 9	LB 13
<i>Carex scopulorum</i>	50	20	20	10	20	30	50	30	10	50
<i>Carex saxatilis</i>	.	20	20	10	30	10	10	3	.	1
<i>Carex limosa</i>	.	40	50	40	.	.	3	.	.	.
<i>Eriophorum angustifolium</i>	.	.	.	10	3	10	.	.	.	.
<i>Caltha leptosepala</i>	3	10	10	30	20
<i>Carex illota</i>	30	.	10	3	.
<i>Packera subnuda</i>	30	30	20	20
<i>Sedum rhodanthum</i>	10	10	.
<i>Deschampsia cespitosa</i>	10	10
<i>Symphyotrichum foliaceum</i> var. <i>apricum</i>	3	3	3
<i>Polygonum bistortoides</i>	3	10
<i>Salix glauca</i>	50	.
<i>Antennaria</i> sp.	20	.
<i>Pedicularis groenlandica</i>	3	.	.	10	.
<i>Kalmia microphylla</i>	3	.	.	.
<i>Poa</i> sp.	3	.	.
<i>Phleum alpinum</i>	3	.
<i>Epilobium anagallidifolium</i>	1	.	3	.
<i>Carex utriculata</i>
<i>Carex aquatilis</i>
<i>Carex canescens</i>	1
<i>Sparganium natans</i>
<i>Callitriche palustris</i>
Soil (< 2mm)	.	30	20	40	.	.	.	.	.	.
Gravel (2 - 75mm)
Cobble (7.5 - 25cm)
Boulder (> 25cm)
Bedrock
Litter (< 6mm)	3	10
Wood (> 6mm)
Lichen
Moss	70	40	40	10	30	90	70	80	70	60
Dead rooted plants	20	20	20	.	50	30	20	10	.	.
Clubmoss
Cushion Plant

Plots SP 11 on raised ribbon

INVENTORY OF SELECTED PEATLAND SITES
ON THE SHOSHONE NATIONAL FOREST

Cont. Tab. 3

Species	LB 1	LB 12	LB 6
<i>Carex scopulorum</i>	.	.	.
<i>Carex saxatilis</i>	.	.	.
<i>Carex limosa</i>	.	.	.
<i>Eriophorum angustifolium</i>	.	.	.
<i>Caltha leptosepala</i>	.	.	.
<i>Carex illota</i>	.	.	.
<i>Packera subnuda</i>	.	.	.
<i>Sedum rhodanthum</i>	.	.	.
<i>Deschampsia cespitosa</i>	.	.	.
<i>Symphyotrichum foliaceum</i> var. <i>apricum</i>	.	.	.
<i>Polygonum bistortoides</i>	.	.	.
<i>Salix glauca</i>	.	.	.
<i>Antennaria</i> sp.	.	.	.
<i>Pedicularis groenlandica</i>	.	.	.
<i>Kalmia microphylla</i>	.	.	.
<i>Poa</i> sp.	.	.	.
<i>Phleum alpinum</i>	.	.	.
<i>Epilobium anagallidifolium</i>	.	.	.
<i>Carex utriculata</i>	40	.	.
<i>Carex aquatilis</i>	.	40	.
<i>Carex canescens</i>	.	30	.
<i>Sparganium natans</i>	.	.	40
<i>Callitriche palustris</i>	.	.	5
Soil (< 2mm)	.	3	60*
Gravel (2 – 75mm)	.	.	.
Cobble (7.5 - 25cm)	.	.	.
Boulder (> 25cm)	.	.	.
Bedrock	.	.	.
Litter (< 6mm)	.	.	.
Wood (> 6mm)	.	.	.
Lichen	.	.	.
Moss	70	70	.
Dead rooted plants	30	.	.
Clubmoss	.	.	.
Cushion Plant	.	.	.

*depression with standing water

Table 4: Water pH and temperature for the Little Bear Lake Fen (air temperature 64° F)

Location	Water Temperature	Water pH
pH 1	56° F	6.7
pH 2	59° F	7.4
pH 3	59° F	6.5

The drainage pattern of the Little Bear Lake Fen may be altered due to imminent road construction. Currently, water levels are monitored with six surface water gauges and 13 wells. Eventually, the raised portion of the road through the wetland will be replaced by a bridge. This may restore the natural drainage pattern, but may also lower current water levels in the southern section of the fen.

Sawtooth Peatbeds

County: Park

Location: T57N R104W, Section 29; Deep Lake, WY Quad, 7.5'

Elevation: 2,950 meters (9,670 feet)

Directions: Go east on Highway 212, past the Island Lake turnoff. Turn right onto Morrison 4WD Trail, traveling south. Stay on the Morrison 4WD Trail past the Sawtooth Meadows and Sawtooth Mountains, for approximately 6 -7 miles. The trail will lead to the north-eastern edge of the fen complex. The road is not passable for most vehicles.

Description: Large unique fen-palsa (approximately 8 ha) located in broad subalpine valley shaped by glacial scouring (Collins et al. 1984). The fen complex is oval to rectangular in shape and drains to the south into Thief Creek. The palsa, the central part of the complex, is raised 1 to 2 meters (3 to 6 feet) above the surrounding fen. It is a large peat deposit with reported permafrost at 38 to 46 cm depth (15 to 18") (Pierce 1961). The palsa is almost devoid of vegetation and exhibits polygons caused by frost cracking and thaw depression pools. The uniqueness of this geomorphologic feature as the only known palsa in the lower 48 United States is well described in Pierce (1961) and Collins et al. (1984). The fen-palsa complex grades into wet subalpine meadows and open subalpine woodland with *Picea engelmannii* and *Pinus albicaulis*.

The Sawtooth Peatbeds were visited on August 24, 2003. Standing water was common in many areas of the fen surrounding the palsa. The peat substrate of the palsa itself was extremely dry and sparse vegetation was concentrated along the polygon shaped cracks. *Deschampsia*

cespitosa and *Festuca brachyphylla* dominate the variable vegetation cover. Vegetation plots SP 5 and SP 6 are located on top of the palsa and do not describe the plant composition of the surrounding wetland.

The fen is dominated by graminoid vegetation. The most ubiquitous species are *Carex scopulorum* and *Carex canescens*. In the southern part of the wetland, large stands with *Carex aquatilis* and *Carex illota* were sampled. *Eriophorum angustifolium* occurs in two areas of the fen, in the northern section and on the southwestern edge on a gradual east exposed slope. Some of the slightly raised areas of the fen are occupied by *Salix planifolia* communities. Toward the outer edge of the fen, the sedge and willow communities are replaced by more diverse vegetation, typical for subalpine wet meadows. *Deschampsia cespitosa* is common on top and in between large mossy hummocks and is associated with *Polygonum bistortoides*, *Vaccinium scoparium*, *Sibbaldia procumbens*, *Caltha leptosepala*, *Potentilla diversifolia* and *Phleum alpinum*.

The moss cover is high in most communities. In some areas bryophytes form raised hummocks with few vascular plants present. *Sphagnum* spp. are rare but do occur in the wetland immediately north of the raised palsa. Water pH was measured in three different areas of the wetland and indicated circumneutral conditions. However, values were not reliable due to instrument malfunction and are not displayed in this report. Water temperature in a large round thaw depression pool was 10° F above measured water temperatures in other parts of the wetland. This may be explained by the dark color and isolating qualities of the peat substrate in and around the depression pool.

No species of special concern are known to occur in the Sawtooth Peatbeds (WYNDD 2003). The results of the 2003 survey substantiate these findings.

INVENTORY OF SELECTED PEATLAND SITES
ON THE SHOSHONE NATIONAL FOREST

Table 5: Cover values for vascular plant species: Plots SB1 – SB 10, Sawtooth Peatbeds

Species	SP 7	SP 4	SP 2	SP 3	SP 1	SP 8	SP 9	SP 10	SP 6	SP 5
<i>Carex aquatilis</i>	98	.	.	.	.	.	.	.	.	.
<i>Carex canescens</i>	.	50	10	3	3	.	.	10	.	.
<i>Carex scopulorum</i>	.	.	30	50	40	20	3	50	.	.
<i>Salix planifolia</i>	.	.	40	.	.	.	.	.	.	.
<i>Sedum rhodanthum</i>	.	.	20	.	.	.	.	.	.	.
<i>Viola</i> sp.	.	.	3	3	.	.	.	.	.	.
<i>Deschampsia cespitosa</i>	.	.	.	3	.	20	1	.	30	1
<i>Carex illota</i>	50	.	.	.
<i>Caltha leptosepala</i>	.	.	3	.	.	.	30	.	.	.
<i>Epilobium anagallidifolium</i>	.	.	.	3	.	.	.	.	.	.
<i>Eriophorum angustifolium</i>	3	.	.	.	.	.
<i>Symphyotrichum foliaceum</i> var. <i>apricum</i>	20	10	.	.	.
<i>Potentilla diversifolia</i>	10	.	.	5	.
<i>Polygonum bistortoides</i>	3	1	.	3	.
<i>Sibbaldia procumbens</i>	10	.	.	.	.
<i>Antennaria corymbosa</i>	3	.	.	.	.
<i>Packera subnuda</i>	20	.	.	.
<i>Festuca brachyophylla</i>	20	.
<i>Luzula spicata</i>	3
<i>Veronica wormskoldia</i>	.	.	.	1	.	.	.	.	.	.
<i>Stellaria borealis</i>	.	.	.	1	.	.	.	.	.	.
Soil (< 2mm)	.	1	10	.	.	20	.	.	30	98
Gravel (2 - 75mm)
Cobble (7.5 - 25cm)
Boulder (> 25cm)
Bedrock
Litter (< 6mm)	.	1	20	50	1	10	10	1	20	.
Wood (> 6mm)
Lichen	.	.	3	.	.	.	.	.	10	.
Moss	.	90	70	10	90	20	40	90	10	.
Dead rooted plants	70	3	.	.	.	.	.	.	.	.
Clubmoss
Cushion Plant

Plots SP 5 and SP 6 on palsa, very dry, polygon patterned cracks abundant.

Potential Peatland sites for Future Study

Wetlands surveyed up to date cover the lower and upper subalpine zone, and extend toward timberline in the case of the Sawtooth Peatlands. To date, no alpine fens have been included in this inventory. While species diversity may be low in high elevation peatlands (Chadde et al. 1998), plant composition is unique and includes disjunct populations of circumboreal species.

A further site of interest is the large peatland complex at the headwater of a tributary to Littlerock Creek (Section 34, Township 58 North, Range 104 West) at an elevation of 3,243 meters (10,640 feet). Two plant species of concern are known to occur in this wetland, *Eriophorum callitrix* and *Carex nelsonii* (WYNDD 2003). The headwaters of Wyoming Creek, in Section 27, Township 58 North, Range 104 West, are another possible study area, with known occurrences of *Eriophorum callitrix*, *Juncus triglumis*, *Koenigia islandica*, *Phippsia algida*, *Carex nelsoni*, *Carex misandra*, and *Pedicularis oederi* (ERO Resources Corporation 2000, WYNDD 2003). Portions of these occurrences are inside the U.S. Highway 212 right-of-way and may be severely disturbed during the planned reconstruction and widening of the road.

At lower altitude, several wetlands in the vicinity of the Clay Butte Fen or south of Chain Lakes may warrant a closer look. Many of these wetlands cannot be accessed by road or trail and have never been surveyed.

References

- Chadde, S. W., J.S. Shelly, R.J. Bursik, R.K. Moseley, A.G. Evenden, M. Mantas, F.R. Rabe, and B. Heidel. 1998. Peatlands on National Forests of the Northern Rocky Mountains: Ecology and Conservation. United States Department of Agriculture, Forest Service, General Technical Report RMRS-GTR-11, Ogden, UT.
- Collins, E.I., R.W. Lichvar, and E. F. Evert. 1984. Description of the only known fen-palsa in the contiguous United States. *Arctic and Alpine Research* 16:255-258.
- Dorn, R.D. 2001. Vascular plants of Wyoming, third edition. Mountain West Publishing, Cheyenne, WY.
- ERO Resources Corp. 2000. Final report: plant species of concern—Portions of U.S. 212 (FH 4), The Beartooth Highway, Park County, Wyoming and Park County, Montana. Prepared for Federal Highway Administration, Central Federal Lands Highway Division. Denver, CO.
- Fertig, W. and G. Jones. 1992. Plant communities and rare plant species of the Swamp Lake Botanical Area, Clark's Fork Ranger District, Shoshone National Forest. Unpublished report prepared for the Shoshone National Forest by the Wyoming Natural Diversity Database, Laramie, WY.
- Fertig, W. and S. Markow. 2001. Guide to the willows of Shoshone National Forest. USDA Forest Service General Technical Report RMRS-GTR-83. Ogden, UT.
- Heidel, B. and S. Laursen. 2003. Botanical and ecological inventory of peatland sites on the Shoshone National Forest. Report prepared for Shoshone National Forest by Wyoming Natural Diversity Database, Laramie, WY.
- Hermann, F.J. 1970. Manual of the Carices of the Rocky Mountains and Colorado Basin. USDA Forest Service, Agricultural Handbook 374, Washington DC.
- Hitchcock, C.L., A. Cronquist and M. Ownbey. 1969. Vascular cryptogams, gymnosperms, and monocotyledons. *In*: Hitchcock, C.L., A. Cronquist, M. Ownbey and J.W. Thompson. Vascular Plants of the Pacific Northwest. Part 1. University of Washington Press, Seattle, WA.
- Hitchcock, C.L. and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, WA.
- Jones, G. and W. Fertig. 1999. Ecological evaluation of the potential Lake Creek Research Natural Area within the Shoshone National Forest, Park County, Wyoming. Prepared for the Shoshone National Forest, Wyoming Natural Diversity Database, Laramie.
- Lafrenz W.B., R.D. Shuster, and P.A. Mueller. 1986. Archean and proterozoic granitoids of the Hawley Mountain area, Beartooth Mountains, Montana. Pages 79-89 in: Montana Geological Society and Yellowstone Bighorn Research Association. Geology of the Beartooth uplift and adjacent basins. Yellowstone Bighorn Research Association 50th anniversary edition.
- Pierce, W.G. 1961. Permafrost and thaw depressions in a peat deposit in the Beartooth Mountains, northwestern Wyoming. U.S. Geological Survey Professional Paper, 424B: B154-B156.
- Tuhy, J. S. and S. Jensen. 1982. Riparian classification for the Upper Salmon/Middle Fork

Salmon River drainages, Idaho. Smithfield, UT, White Horse Associates.

USDA, Natural Resources Conservation Service. 1999. Soil taxonomy, a basic system of soil classification for making and interpreting soil surveys. Second edition. Agricultural Handbook No. 436. U.S. Government Printing Office, Washington, D.C.

Wyoming Natural Diversity Database. 2003. Database Search , Species of Concern in T56-58N, R103-107W, Park County, WY.

Appendix A:
Element Occurrence Records

Element Occurrence Record

Scientific Name: *Carex diandra*
Common Name: Lesser panicled sedge

TNC Global Rank: G5
Forest Service Status: Sensitive, USFS Region 2
WYNDD State Rank: S1/S2
Federal Status: None

WY Distribution: Peripheral

County: Park
USGS Quad Name: Beartooth Butte

Township: 57 N
Range: 106 W
Section: 12
T/R/S Comments: SE4 of NW4

Survey Date: August 22, 2003
Elevation: 8,980 feet

Location:

Clay Butte Fen: Wetland south of U.S. 212, just east of the access road to Clay Butte Fire Tower.

Element Occurrence Data:

Locally common, co-dominant or dominant in small subpopulations of approx. 30 m² in size. 60% fruiting and 40% vegetative.

Habitat description:

On and adjacent to floating mat of fen, in dense moss cover. Associated with *Carex aquatilis* and small amounts of *Salix planifolia*. Toward the center of the wetland *Carex diandra* occurs with *Carex limosa*. Water pH 7.7, measured adjacent to *Carex diandra* stand.

Comments:

Species often growing in narrow corridor between *Carex limosa* communities on thick floating mat and *Carex utriculata* communities in saturated mud with standing water. Species also observed in small stand adjacent to large non-concentric pool. Community data recorded in vegetation plot CB 2.

Specimens:

Mellmann-Brown, S. (1510) 1998.

Sources:

Mellmann-Brown, Sabine. Plant ecologist. Cooke City, MT 59020
ERO Resources Corporation 2000

Element Occurrence Record

Scientific Name: *Carex limosa*

Common Name: Mud sedge

TNC Global Rank: G5

WYNDD State Rank: S2

Forest Service Status: None

Federal Status: None

WY Distribution: Disjunct

County: Park

USGS Quad Name: Beartooth Butte

Township:

Range:

Section:

T/R/S Comments:

57 N

106 W

12

SE4 of NW4

Survey Date: August 22, 2003

Elevation: 8,980 feet

Location:

Clay Butte Fen: Wetland south of U.S. 212, just east of the access road to Clay Butte Fire Tower.

Element Occurrence Data:

Common, in places dominant species in large areas in the central part of the wetland. 100% fruiting.

Habitat description:

On floating mat with high moss cover (90%), or/and on reddish marl. Vascular plant cover low. Associated with *Pedicularis groenlandica*, *Salix planifolia*, and *Menyanthes trifoliata*. In many areas dominant with vegetation cover of 25 - 30%. Water pH 6.2 and 8.2, measured in/adjacent to *Carex limosa* stands.

Comments:

Community data recorded in vegetation plot CB 1.

Specimens:

No new specimen collected

Sources:

Mellmann-Brown, Sabine. Plant ecologist. Cooke City, MT 59020;
ERO Resources Corporation 2000
WYNDD 2003

Element Occurrence Record

Scientific Name: *Carex livida*

Common Name: Livid sedge

TNC Global Rank: G5

WYNDD State Rank: S1

Forest Service Status: Sensitive, USFS Region 1 & 2

Federal Status: None

WY Distribution: Disjunct

County: Park

USGS Quad Name: Beartooth Butte

Township:	Range:	Section:	T/R/S Comments:
57 N	106 W	12	SE4 of NW4

Survey Date: August 22, 2003

Elevation: 8,980 feet

Location:

Clay Butte Fen: Wetland south of U.S. 212, just east of access road to Clay Butte Fire Tower.

Element Occurrence Data:

Locally common, often co-dominant, and sometimes dominant, throughout the central part of wetland, with covers from 5-40 %. 50% fruiting, 50% vegetative.

Habitat description:

On slightly elevated areas next to and on floating mats of fen. Ground saturated but not flooded at time of survey. In heavy moss cover, associated with *Carex aquatilis*, *Carex gynocrates*, *Eleocharis quinqueflora*, *Packera subnuda*, and scattered stunted willows (*Salix planifolia*, *Salix farriae*, *Salix wolfii*). Water pH 8.2, measured near *Carex livida* occurrence.

Comments:

Community data recorded in vegetation plots CB 4, CB 5, and CB 6

Specimens:

No new specimen collected.

Sources:

Mellmann-Brown, Sabine. Plant ecologist. Cooke City, MT 59020;
ERO Resources Corporation 2000;
WYNDD 2003

Element Occurrence Record

Scientific Name: *Carex limosa*

Common Name: Mud sedge

TNC Global Rank: G5

WYNDD State Rank: S2

Forest Service Status: None

Federal Status: None

WY Distribution: Disjunct

County: Park

USGS Quad Name: Deep Lake

Township: Range:

57 N 105 W

Section:

11

T/R/S Comments:

SE4 of NW4;

Survey Date: August 29, 2003

Elevation: 9,560 feet

Location:

Little Bear Lake Fen: Wetland southeast of Little Bear Lake, near U.S. 212

Element Occurrence Data:

Locally common, dominant to co-dominant in throughout the center of the fen. Occurrence restricted to south side of U.S. 212, south of large rock outcrop. Cover of *Carex limosa* up to 50%. 100% fruiting.

Habitat description:

On water saturated reddish marl with moderate bryophyte cover, substrate often exposed. Associated species are *Carex scopulorum*, *Carex saxatilis*, and *Eriophorum angustifolium*.

Comments:

Community data recorded in vegetation plots LB 4, LB 5, LB 7, and LB 8.

Specimens:

No new specimens collected.

Sources:

Mellmann-Brown, Sabine. Plant ecologist. Cooke City, MT 59020;
ERO Resources Corporation 2000

Element Occurrence Record

Scientific Name: *Sparganium natans*

Common Name: Arctic burr-reed

TNC Global Rank: G5

WYNDD State Rank: S1

Forest Service Status: None

Federal Status: None

WY Distribution: Peripheral

County: Park

USGS Quad Name: Deep Lake

Township: Range:

57 N 105 W

Section:

11

T/R/S Comments:

SE4 of NW4;

Survey Date: August 29, 2003

Elevation: 9,560 feet

Location:

Little Bear Lake Fen: Wetland southeast of Little Bear Lake, near U.S. 212

Element Occurrence Data:

Dominant in 3 pools in the southern part of the fen. Size of sub-populations approximately 10 x 15 feet, 5 x 20 feet, and 7 x 10 feet. 40% flowering, 60% vegetative.

Habitat description:

Floating on standing water in saturated mud. In one of the pools *Sparganium natans* is associated with *Callitriche palustris*. Water pH 7.4. Pools are surrounded by stands of *Carex scopulorum* and *Carex limosa*.

Comments:

Community data recorded in vegetation plot LB 6.

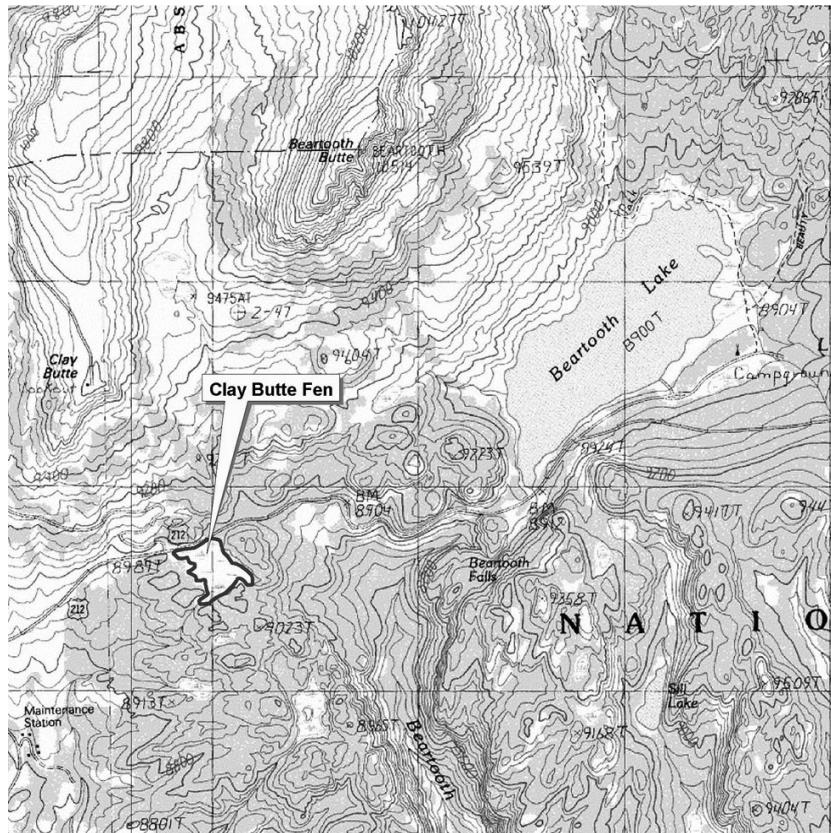
Specimens:

No specimen collected. Species documented with photographs.

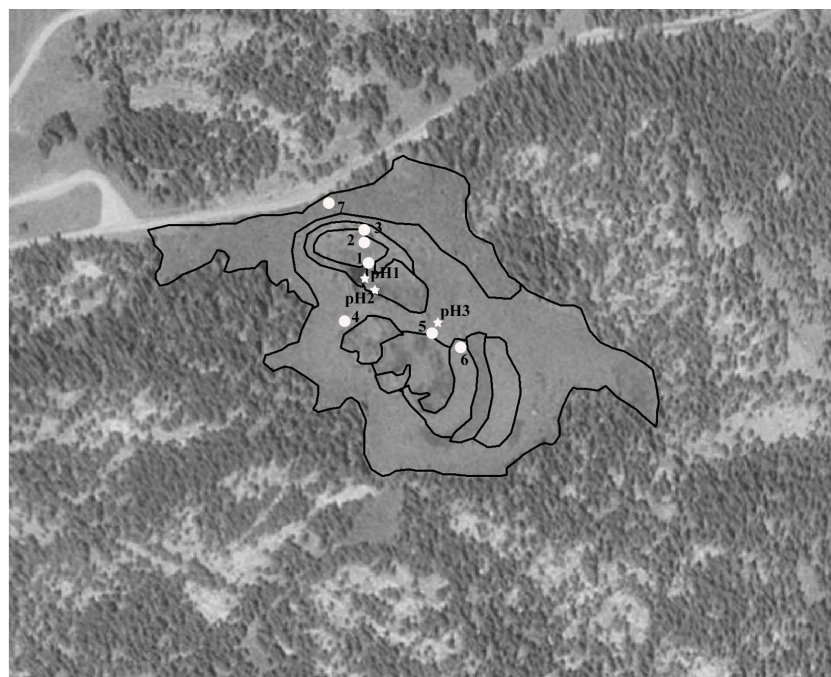
Sources:

Mellmann-Brown, Sabine. Plant ecologist. Cooke City, MT 59020

**Appendix B:
Site Maps and Photographs**



Location of Clay Butte Fen (from Beartooth Butte 7.5' quad)



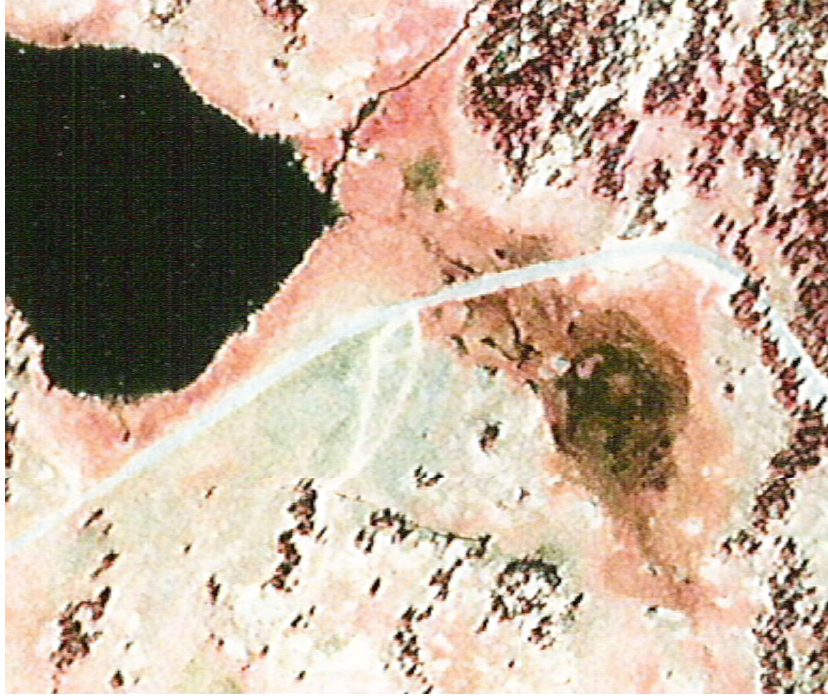
Aerial photograph of Clay Butte Fen indicating plot locations and pH measurements



Location of Little Bear Lake Fen (from Beartooth Butte 7.5' quad)



Aerial photograph of Little Bear Lake Fen indicating plot locations and pH measurements



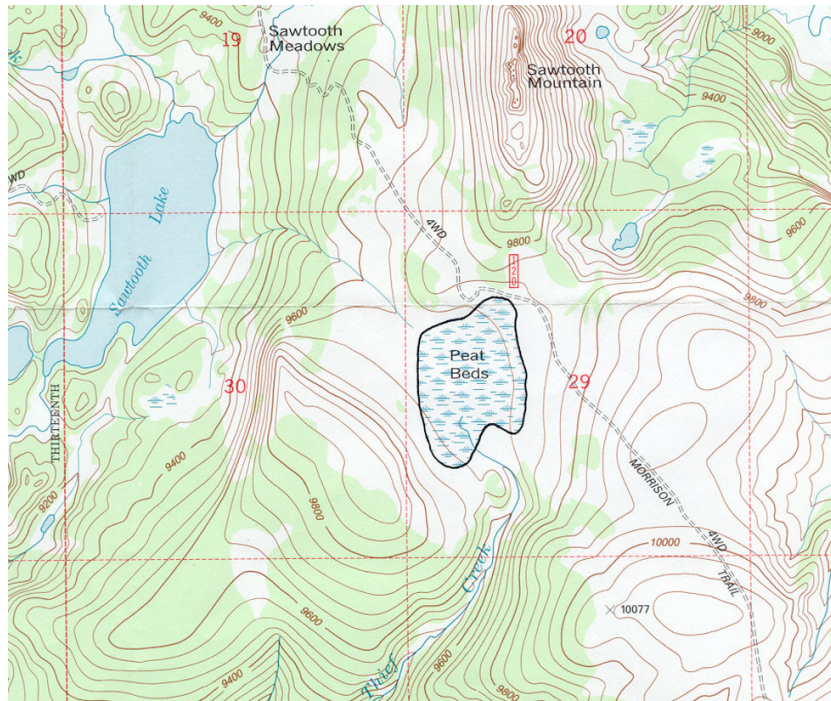
Color Aerial Photograph of Little Bear Lake Fen



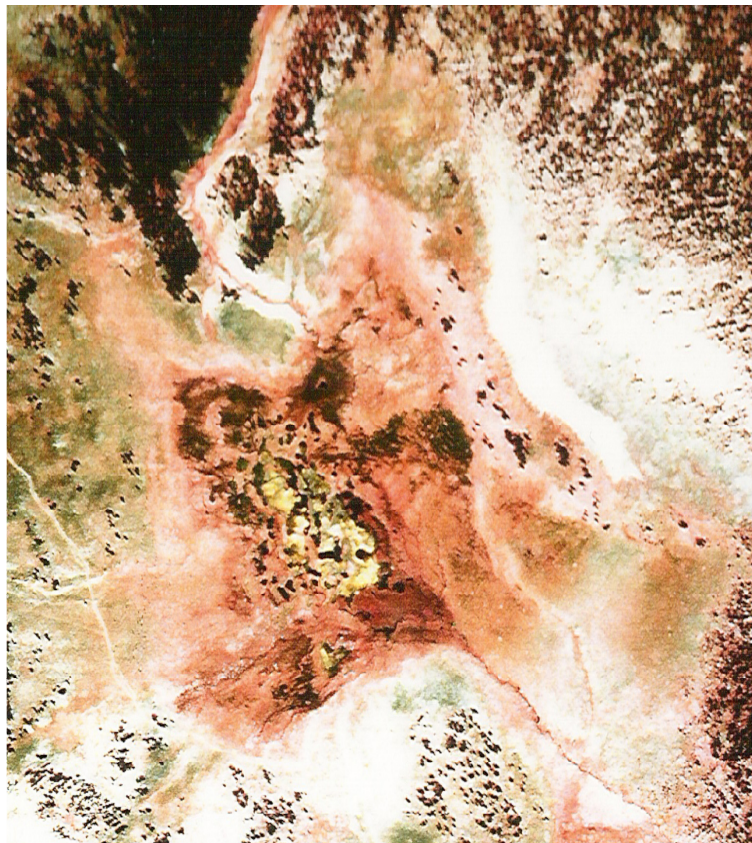
Little Bear Lake Fen - *Sparganium natans* habitat.
Photo by Sabine Mellman-Brown



Little Bear Lake Fen - *Sparganium natans*.
Photo by Sabine Mellman-Brown



Location of Sawtooth Peatbeds (from Deep Lake 7.5' quad)



Color Aerial Photograph of Sawtooth Peatbeds



Sawtooth Peatbeds - view of raised palsa from surrounding fen.
Photo by Sabine Mellman-Brown



Sawtooth Peatbeds - view from raised palsa to surrounding wetland.
Photo by Sabine Mellman-Brown



Sawtooth Peatbeds - edge of thaw depression pool
Photo by Sabine Mellman-Brown

**Appendix C:
Preliminary Vascular Plant Checklist
of Shoshone National Forest Peatlands**

(Modified from Heidel and Laursen 2003, additions in bold)

Family [_aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Acer	<i>Acer glabrum</i>	Includes var <i>douglasii</i> & var <i>glabrum</i>	X					
Adox	<i>Sambucus racemosa</i> var. <i>melanocarpa</i>		X					
Alli	<i>Allium brevistylum</i>		X					
Alli	<i>Allium cernuum</i>	Includes var. <i>cernuum</i> & var. <i>obtusum</i>	X					
Api	<i>Angelica arguta</i>		X			X		
Api	<i>Heracleum</i> <i>sphondylium</i> var. <i>lanatum</i>	<i>Heracleum lanatum</i> , <i>H.</i> <i>maximum</i>	X					
Api	<i>Osmorhiza</i> <i>depauperata</i>		X					
Aster	<i>Achillea millefolium</i> var. <i>lanulosa</i>	Incl. var. <i>alpicola</i> & var. <i>occidentalis</i>	X					
Aster	<i>Anaphalis</i> <i>margaritacea</i>		X					
Aster	<i>Antennaria corymbosa</i>					X		
Aster	<i>Antennaria lanata</i>							X
Aster	<i>Antennaria</i> <i>microphylla</i>		X					
Aster	<i>Antennaria</i> <i>pulcherrima</i>		X	X				
Aster	<i>Artemisia ludoviciana</i>		X					
Aster	<i>Artemisia tridentata</i> var. <i>vaseyana</i>	Includes <i>Artemisia</i> <i>tridentata</i> var. <i>pauciflora</i>	X					
Aster	<i>Chrysanthemum</i> <i>leucanthemum</i>	<i>Leucanthemum vulgare</i>	X					
Aster	<i>Chrysothamnus</i> <i>viscidiflorus</i>		X					
Aster	<i>Cirsium arvense</i>	Includes var. <i>horridum</i> & var. <i>integrifolium</i>	X					
Aster	<i>Cirsium scariosum</i>		X					
Aster	<i>Cirsium vulgare</i>		X					
Aster	<i>Ericameria nauseosa</i>	<i>Chrysothamnus</i> <i>nauseosus</i> var. <i>nauseosus</i>	X					
Aster	<i>Erigeron acris</i>	Includes ssp. <i>debilis</i> & ssp. <i>politus</i>	X					
Aster	<i>Erigeron peregrinus</i> var. <i>scaposus</i>	<i>Erigeron peregrinus</i> var. <i>callianthemus</i>	X					
Aster	<i>Eurybia conspicua</i>	<i>Aster conspicuus</i>	X					
Aster	<i>Lactuca oblongifolia</i>	<i>Lactuca pulchella</i> , <i>Lactuca tatarica</i> var <i>pulchella</i>	X					
Aster	<i>Matricaria</i> <i>matricarioides</i>	<i>Matricaria discoidea</i>	X					
Aster	<i>Packera paupercula</i>	<i>Senecio pauperculus</i>	X					

Preliminary vascular checklist of Shoshone National Forest peatland sites

Family [_aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Aster	<i>Packera subnuda</i>	<i>Senecio cymbalarioides</i> , <i>Packera buekii</i>		X	X	X	X	X
Aster	<i>Petasites frigidus</i> var. <i>sagittatus</i>	<i>Petasites sagittatus</i>	X					
Aster	<i>Senecio lugens</i>		X					
Aster	<i>Senecio serra</i>		X					
Aster	<i>Symphotrichum boreale</i>	<i>Aster junciformis</i> ; <i>A. borealis</i>	X					
Aster	<i>Symphotrichum foliaceum</i> var. <i>apricum</i>	<i>Aster foliaceus</i> var. <i>apricus</i>				X	X	X
Aster	<i>Symphotrichum lanceolatum</i> var. <i>hesperium</i>	<i>Aster lanceolatus</i> var. <i>hesperius</i> ; <i>A. hesperius</i>	X					
Aster	<i>Taraxacum laevigatum</i>		X					
Aster	<i>Taraxacum officinale</i>		X	X				
Aster	<i>Tragopogon dubius</i>		X					
Berberid	<i>Mahonia repens</i>	<i>Berberis repens</i>	X					
Betul	<i>Alnus incana</i> var. <i>occidentalis</i>	<i>Alnus incana</i> ssp. <i>tenuifolia</i>	X		X			
Betul	<i>Betula glandulosa</i>	<i>Betula nana</i>	X		X	X		
Boragin	<i>Lappula squarrosa</i>	<i>Lappula echinata</i>	X					
Brassic	<i>Boechera holboellii</i>	<i>Arabis holboellii</i> var. <i>pinetorum</i>	X					
Brassic	<i>Cardamine breweri</i>	Includes var. <i>breweri</i> & var. <i>leibergii</i>	X					
Brassic	<i>Euclidium syriacum</i>		X					
Callitrich	<i>Callitriche palustris</i>						X	
Calochort	<i>Prosartes trachycarpa</i>	<i>Disporum trachycarpum</i>	X					
Campanul	<i>Campanula rotundifolia</i>		X					
Caprifoli	<i>Lonicera involucrata</i>		X					
Caprifoli	<i>Symphoricarpos albus</i>		X					
Caryophyll	<i>Silene latifolia</i>	<i>Lychnis alba</i> ; <i>Melandrium dioicum</i> ; <i>Silene latifolia</i> ssp. <i>alba</i>	X					
Caryophyll	<i>Stellaria borealis</i>							X
Caryophyll	<i>Stellaria longifolia</i>		X					
Caryophyll	<i>Stellaria longipes</i>		X					
Ceratophyll	<i>Ceratophyllum demersum</i>		X					
Chenopodi	<i>Chenopodium capitatum</i>		X					
Chenopodi	<i>Chenopodium capitatum</i> var. <i>parvicapitatum</i>	<i>Chenopodium overi</i> , <i>C. foliosum</i>	X					
Convallari	<i>Maianthemum racemosum</i> var. <i>amplexicaule</i>	<i>Smilacina racemosa</i>	X					
Convallari	<i>Maianthemum stellatum</i>	<i>Smilacina stellata</i>	X					
Corn	<i>Cornus sericea</i>	<i>Cornus stolonifera</i> var. <i>stolonifera</i>	X					
Crassul	<i>Sedum lanceolatum</i>	Includes ssp. <i>lanceolatum</i> & ssp. <i>subalpinum</i>	X					

Preliminary vascular checklist of Shoshone National Forest peatland sites

Family [aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Crassul	<i>Sedum rhodanthum</i>						X	X
Cupress	<i>Juniperus communis</i> var. <i>depressa</i>		X					
Cupress	<i>Juniperus horizontalis</i>		X	X				
Cyper	<i>Carex aquatilis</i>		X	X	X	X	X	X
Cyper	<i>Carex aurea</i>		X	X				
Cyper	<i>Carex buxbaumii</i>		X		X	X		
Cyper	<i>Carex canescens</i>	Includes var. <i>subliolacea</i> & <i>C.</i> <i>lapponica</i>			X		X	X
Cyper	<i>Carex capillaris</i>		X	X				
Cyper	<i>Carex concinna</i>		X					
Cyper	<i>Carex diandra</i>		X	X	X	X		
Cyper	<i>Carex disperma</i>		X		X			
Cyper	<i>Carex gynocrates</i>	<i>Carex dioica</i>	X	X		X		
Cyper	<i>Carex illotoa</i>						X	X
Cyper	<i>Carex interior</i>		X					
Cyper	<i>Carex lasiocarpa</i>			X	X			
Cyper	<i>Carex leptalea</i>		X	X				
Cyper	<i>Carex limosa</i>		X	X	X	X	X	
Cyper	<i>Carex livida</i>	<i>C. livida</i> var. <i>radicaulis</i>	X			X		
Cyper	<i>Carex macloviana</i>	<i>Carex subfusca?</i>	X					
Cyper	<i>Carex microglochin</i>		X					
Cyper	<i>Carex microptera</i> var. <i>microptera</i>	<i>Carex festivella</i> , var. <i>C.</i> <i>macloviana</i> var. <i>microptera</i>	X					
Cyper	<i>Carex pellita</i>	<i>Carex lanuginosa</i>	X					
Cyper	<i>Carex petasata</i>		X					
Cyper	<i>Carex rossii</i>		X					
Cyper	<i>Carex saxatilis</i>					X	X	
Cyper	<i>Carex scirpoidea</i> var. <i>scirpiformis</i>	<i>Carex scirpiformis</i> ; included in var. <i>scirpoidea</i> by some authors	X					
Cyper	<i>Carex scopulorum</i>	Includes var. <i>bracteosa</i> & var. <i>scopulorum</i>	?				X	X
Cyper	<i>Carex simulata</i>		X			X		
Cyper	<i>Carex utriculata</i>	<i>Carex rostrata</i> (sensu lato)	X	X	X	X	X	
Cyper	<i>Carex vesicaria</i>				X	X		
Cyper	<i>Eleocharis</i> <i>quinqueflora</i>	<i>Eleocharis pauciflora</i>	X	X		X		
Cyper	<i>Eleocharis rostellata</i>		X					
Cyper	<i>Eriophorum</i> <i>angustifolium</i>	<i>Eriophorum</i> <i>polystachion</i>		X	X	X	X	X
Cyper	<i>Eriophorum gracile</i>			X	X	X		
Cyper	<i>Eriophorum</i> <i>viridicarinatum</i>		X					
Cyper	<i>Kobresia myosuroides</i>	<i>Kobresia bellardii</i>				X		

Preliminary vascular checklist of Shoshone National Forest peatland sites

Family [_aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Cyper	<i>Kobresia simpliciuscula</i>		X					
Cyper	<i>Schoenoplectus acutus</i> var. <i>occidentalis</i>	<i>Scirpus acutus</i>	X					
Cyper	<i>Schoenoplectus tabernaemontani</i>	<i>Scirpus validus</i>	X					
Cyper	<i>Trichophorum pumilum</i>	<i>Scirpus pumilus</i> ; <i>S. rollandii</i>	X	X				
Droser	<i>Drosera anglica</i>			X	X			
Elaegn	<i>Shepherdia canadensis</i>		X	X				
Equiset	<i>Equisetum arvense</i>		X			X		
Equiset	<i>Equisetum hyemale</i> var. <i>affine</i>		X			X		
Equiset	<i>Equisetum variegatum</i>		X			X		
Eric	<i>Arctostaphylos uva-ursi</i>		X					
Eric	<i>Arctous rubra</i>	<i>Arctostaphylos rubra</i>	X					
Eric	<i>Chimaphila umbellata</i> var. <i>occidentalis</i>		X					
Eric	<i>Kalmia microphylla</i>						X	
Eric	<i>Ledum glandulosum</i> var. <i>glandulosum</i>					X		
Eric	<i>Moneses uniflora</i>	<i>Pyrola uniflora</i>	X					
Eric	<i>Orthilia secunda</i>	<i>Pyrola secunda</i>	X					
Eric	<i>Pyrola asarifolia</i>		X					
Eric	<i>Pyrola chlorantha</i>	<i>Pyrola virens</i>	X					
Eric	<i>Vaccinium scoparium</i>			X				X
Fab	<i>Astragalus eucosmus</i>		X					
Fab	<i>Astragalus miser</i>		X					
Fab	<i>Lupinus argenteus</i>		X					
Fab	<i>Medicago lupulina</i>		X					
Fab	<i>Medicago sativa</i>	<i>Medicago falcata</i>	X					
Fab	<i>Melilotus officinalis</i>		X					
Fab	<i>Oxytropis deflexa</i> var. <i>sericea</i>		X					
Fab	<i>Trifolium hybridum</i>		X					
Fab	<i>Trifolium pratense</i>		X					
Fab	<i>Trifolium repens</i>		X					
Gentian	<i>Frasera speciosa</i>	<i>Swertia radiata</i>	X					
Gentian	<i>Gentiana affinis</i> var. <i>affinis</i>	<i>Pneumonanthe affinis</i>	X					
Gentian	<i>Gentianella amarella</i> var. <i>amarella</i>	<i>Gentiana amarella</i> , <i>Gentianella amarella</i> ssp. <i>acuta</i>	X					
Gentian	<i>Gentianopsis detonsa</i> var. <i>elegans</i>	<i>Gentianella detonsa</i> var. <i>elegans</i> ; <i>Gentiana detonsa</i> ; & <i>Gentianopsis thermalis</i>	X	X	X	X		
Gentian	<i>Swertia perennis</i>		X					

Preliminary vascular checklist of Shoshone National Forest peatland sites

Family [aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Gerani	<i>Geranium viscosissimum</i>	<i>Geranium viscosissimum</i> var. <i>nervosum</i>	X					
Grossulari	<i>Ribes cereum</i> var. <i>pedicellare</i>	<i>Ribes cereum</i> var. <i>inebrians</i> ; includes var. <i>cereum</i>	X					
Halorag	<i>Myriophyllum sibiricum</i>	<i>Myriophyllum exalbescens</i> ; & <i>M. spicatum</i> var. <i>exalbescens</i>	X					
Hippurid	<i>Hippuris vulgaris</i>		X					
Irid	<i>Sisyrinchium idahoense</i> var. <i>occidentale</i>		X					
Junc	<i>Juncus balticus</i> var. <i>montanus</i>	<i>Juncus arcticus</i> var. <i>balticus</i>	X					
Junc	<i>Juncus longistylus</i>		X			X		
Junc	<i>Luzula spicata</i>							X
Juncagin	<i>Triglochin maritima</i> var. <i>elata</i>	Includes <i>T. concinnum</i>	X					
Juncagin	<i>Triglochin palustris</i>		X					
Lemn	<i>Lemna turionifera</i>	<i>Lemna minor</i>	X					
Lentibulari	<i>Utricularia macrorhiza</i>	<i>Utricularia vulgaris</i>	X					
Lentibulari	<i>Utricularia minor</i>		X					
Lili	<i>Fritillaria atropurpurea</i>		X					
Linnae	<i>Linnaea borealis</i> var. <i>longiflora</i>	<i>Linnaea borealis</i> ssp. <i>americana</i>	X	X				
Melanthi	<i>Zigadenus elegans</i>		X					
Menyanth	<i>Menyanthes trifoliata</i>		X	X		X		
Nymphae	<i>Nuphar polysepala</i>	<i>Nuphar lutea</i> ssp. <i>polysepala</i>				X		
Onagr	<i>Chamerion angustifolium</i> var. <i>angustifolium</i>	<i>Epilobium angustifolium</i> var. <i>angustifolium</i>	X			X		
Onagr	<i>Epilobium anagallidifolium</i>						X	X
Onagr	<i>Epilobium ciliatum</i> var. <i>ciliatum</i>	<i>Epilobium watsonii</i>	X					
Onagr	<i>Epilobium palustre</i> var. <i>palustre</i>		X	X	X			
Ophiogloss	<i>Botrychium virginianum</i>		X					
Orchid	<i>Amerorchis rotundifolia</i>	<i>Orchis rotundifolia</i>	X					
Orchid	<i>Calypso bulbosa</i>	<i>C. bulbosa</i> var. <i>americana</i>	X					
Orchid	<i>Goodyera oblongifolia</i>		X					
Orchid	<i>Listera cordata</i>	<i>L. cordata</i> var. <i>nephrophylla</i>	X					
Orchid	<i>Platanthera aquilonis</i> / or <i>huronensis</i>	Incl. in <i>Habenaria hyperborea</i>	X			X		
Orchid	<i>Platanthera obtusata</i>	<i>Habenaria obtusata</i>	X			X		
Orchid	<i>Spiranthes romanzoffiana</i>		X	X	X			
Parnassi	<i>Parnassia fimbriata</i> var. <i>fimbriata</i>		X					
Parnassi	<i>Parnassia palustris</i> var. <i>montanensis</i>	Includes var. <i>tenuis</i>	X					

Preliminary vascular checklist of Shoshone National Forest peatland sites

Family [_aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Pin	<i>Abies lasiocarpa</i>	<i>Abies bifolia</i>	X					
Pin	<i>Picea engelmannii</i>		X	X	X			
Pin	<i>Picea glauca</i>		X	X		X		
Pin	<i>Pinus contorta</i> var. <i>latifolia</i>		X	X	X			
Pin	<i>Pinus flexilis</i>		X					
Pin	<i>Pseudotsuga menziesii</i> var. <i>glauca</i>		X					
Plantagin	<i>Plantago major</i>	Incl. "native" var. <i>pachyphylla</i>	X					
Poa	<i>Achnatherum nelsonii</i>	<i>Stipa nelsonii</i> var. <i>dorei</i> ; & <i>S. occidentalis</i> var. <i>nelsonii</i>	X					
Poa	<i>Achnatherum richardsonii</i>	<i>Stipa richardsonii</i>	X					
Poa	<i>Agrostis scabra</i>	<i>Agrostis hiemalis</i>	X					
Poa	<i>Alopecurus pratensis</i>			X				
Poa	<i>Bromus carinatus</i>	<i>Bromus marginatus</i>	X					
Poa	<i>Bromus inermis</i> var. <i>inermis</i>		X					
Poa	<i>Calamagrostis canadensis</i>	Includes var. <i>canadensis</i> , var. <i>imberbis</i> , var. <i>macouniana</i> ; & <i>C. scribneri</i>	X	X	X	X		
Poa	<i>Calamagrostis inexpansa</i>	<i>Calamagrostis stricta</i> ssp. <i>inexpansa</i>	X					
Poa	<i>Calamagrostis rubescens</i>		X					
Poa	<i>Danthonia intermedia</i>					X		X
Poa	<i>Danthonia unispicata</i>		X					
Poa	<i>Deschampsia cespitosa</i>	<i>Deschampsia caespitosa</i>	X	X		X	X	X
Poa	<i>Elymus spicatus</i>	<i>Agropyron spicatum</i> ; & <i>Pseudoroegneria spicata</i> , includes ssp. <i>inermis</i> & ssp. <i>spicata</i>	X					
Poa	<i>Elymus trachycaulus</i> var. <i>trachycaulus</i>	<i>Agropyron caninum</i>	X					
Poa	<i>Festuca brachyphylla</i>							X
Poa	<i>Festuca idahoensis</i>	<i>Festuca ovina</i> var. <i>ingrata</i>	X					
Poa	<i>Glyceria striata</i>		X					
Poa	<i>Leucopoa kingii</i>	<i>Hesperochloa kingii</i>	X					
Poa	<i>Luzula spicata</i>							X
Poa	<i>Muhlenbergia andina</i>		X					
Poa	<i>Muhlenbergia glomerata</i>	Incl. in <i>Muhlenbergia racemosa</i> by some authors	X					
Poa	<i>Muhlenbergia richardsonis</i>		X					
Poa	<i>Oryzopsis asperifolia</i>		X					
Poa	<i>Phleum alpinum</i>						X	X
Poa	<i>Phleum pratense</i>		X			X		

Preliminary vascular checklist of Shoshone National Forest peatland sites

Family [aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Poa	<i>Poa glaucifolia</i>	Included in <i>Poa arida</i> by some authors	X	X				
Poa	<i>Poa pratensis</i>	<i>Poa agassizensis</i>	X					
Poa	<i>Trisetum spicatum</i>					X		
Polemoni	<i>Leptosiphon septentrionalis</i>	<i>Linanthus septentrionalis</i>	X					
Polygon	<i>Eriogonum umbellatum</i>	Included in var. <i>umbellatum</i> by Welsh et al. 1993	X					
Polygon	<i>Polygonum achoreum</i>	<i>Polygonum erectum</i> var. <i>achoreum</i>	X					
Polygon	<i>Polygonum amphibium</i>	<i>Polygonum coccineum</i> ; <i>Persicaria coccinea</i>	X					
Polygon	<i>Polygonum aviculare</i>	<i>Polygonum arenastrum</i>	X					
Polygon	<i>Polygonum douglasii</i> var. <i>douglasii</i>		X					
Polygon	<i>Polygonum bistortoides</i>						X	X
Polygon	<i>Polygonum viviparum</i>	<i>Bistorta vivipara</i>	X			X		X
Polygon	<i>Rumex crispus</i>		X					
Potamogeton	<i>Potamogeton amplifolius</i>				X			
Potamogeton	<i>Potamogeton praelongus</i>			X				
Potamogeton	<i>Potamogeton pusillus</i> var. <i>pusillus</i>		X					
Potamogeton	<i>Stuckenia filiformis</i>	<i>Coleogeton filiformis</i> ; & <i>Potamogeton filiformis</i>	X					
Primul	<i>Dodecatheon pulchellum</i>	<i>Dodecatheon pauciflorum</i>				X		
Primul	<i>Primula egaliksensis</i>		X					
Ranuncul	<i>Actaea rubra</i>	<i>A. rubra</i> ssp. <i>arguta</i>	X					
Ranuncul	<i>Anemone multifida</i> var. <i>multifida</i>	Includes var. <i>hudsoniana</i> , var. <i>sansonii</i> , & var. <i>saxicola</i>	X					
Ranuncul	<i>Anemone parviflora</i>		X			X		
Ranuncul	<i>Aquilegia coreulea</i>	Includes var. <i>alpina</i> , var. <i>cerulea</i> , var. <i>ochroleuca</i> ; & <i>A. caerulea</i>	X					
Ranuncul	<i>Caltha leptosepala</i>						X	X
Ranuncul	<i>Ranunculus cymbalaria</i>		X					
Ranuncul	<i>Ranunculus sceleratus</i> var. <i>multifidus</i>	<i>Hecatonia scelerata</i>	X					
Ranuncul	<i>Thalictrum alpinum</i>		X	X				
Ranuncul	<i>Thalictrum occidentale</i>		X			X		
Ranuncul	<i>Trollius albiflorus</i>	<i>Trollius laxus</i> var. <i>albiflorus</i>						X
Ros	<i>Fragaria vesca</i>	<i>F. vesca</i> ssp. <i>bracteata</i>	X			X		
Ros	<i>Fragaria virginiana</i>	Includes ssp. <i>glauca</i> & ssp. <i>platypetala</i>	X	X				
Ros	<i>Geum macrophyllum</i> var. <i>perincisum</i>		X	X				
Ros	<i>Pentaphylloides floribunda</i>	<i>Potentilla fruticosa</i> , & <i>Dasiphora fruticosa</i> ssp. <i>floribunda</i>	X		X			

Preliminary vascular checklist of Shoshone National Forest peatland sites

Family [_aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Ros	<i>Potentilla diversifolia</i>					X		X
Ros	<i>Potentilla gracilis</i>	<i>Potentilla gracilis</i> var. <i>nuttallii</i>	X	X		X		
Ros	<i>Potentilla hippiana</i>	<i>Potentilla effusa</i>	X					
Ros	<i>Potentilla palustris</i>	<i>Comarum palustre</i>	X	X	X			
Ros	<i>Rosa woodsii</i>		X					
Ros	<i>Rubus idaeus</i> var. <i>strigosus</i>	<i>Rubus idaeus</i> var. <i>aculeatissimus</i>	X					
Ros	<i>Rubus parviflorus</i>		X					
Ros	<i>Sibbaldia procumbens</i>							X
Ros	<i>Sorbus scopulina</i> var. <i>scopulina</i>		X					
Ros	<i>Spiraea betulifolia</i> var. <i>lucida</i>		X					
Rubi	<i>Galium boreale</i>		X					
Rubi	<i>Galium trifidum</i>	Includes ssp <i>columbianum</i> , ssp. <i>trifidum</i> & ssp. <i>subbiflorum</i>	X		X			
Salic	<i>Populus tremuloides</i>		X					
Salic	<i>Salix bebbiana</i>		X					
Salic	<i>Salix boothii</i>		X					
Salic	<i>Salix brachycarpa</i>		X					
Salic	<i>Salix candida</i>		X					
Salic	<i>Salix drummondiana</i>					X		
Salic	<i>Salix eastwoodiae</i>					X		
Salic	<i>Salix exigua</i> var. <i>sericans</i>	<i>Salix exigua</i> var <i>interior</i> , <i>S. e.</i> var. <i>pedicellata</i> , <i>S.</i> <i>interior</i>	X					
Salic	<i>Salix farriae</i>			X		X		
Salic	<i>Salix glauca</i>						X	
Salic	<i>Salix geyeriana</i>		X					
Salic	<i>Salix myrtilifolia</i> var. <i>myrtilifolia</i>		X	X		X		
Salic	<i>Salix planifolia</i>	<i>Salix phlycifolia</i> , incl. var. <i>minca</i> and var. <i>planifolia</i>	X		X	X		X
Salic	<i>Salix pseudomonticola</i>		X					
Salic	<i>Salix wolfii</i> var <i>wolfii</i>		X					
Saxifrag	<i>Heuchera cylindrica</i> var. <i>suksdorfii</i>		X					
Saxifrag	<i>Mitella pentandra</i>		X					
Saxifrag	<i>Mitella stauropetala</i>		X					
Scrophulari	<i>Pedicularis groenlandica</i>		X	X	X	X	X	X
Scrophulari	<i>Penstemon fruticosus</i>		X					
Scrophulari	<i>Penstemon procerus</i> var. <i>procerus</i>		X					
Scrophulari	<i>Verbascum thapsus</i>		X					
Scrophulari	<i>Veronica americana</i>		X					
Scrophulari	<i>Veronica wormskoldii</i>							X

Preliminary vascular checklist of Shoshone National Forest peatland sites

Family [_aceae]	Species	Synonym	Swamp Lake	Little Moose Lake	Lily Lake	Clay Butte Fen	Little Bear Lake	Saw- tooth Peatb
Selaginell	<i>Selaginella densa</i>	Includes var. <i>standleyi</i> , var. <i>densa</i> , & var. <i>scopulorum</i>	X					
Spargani	<i>Sparganium natans</i>	<i>Sparganium minimum</i>	X				X	
Typh	<i>Typha latifolia</i>		X					
Valerian	<i>Valeriana edulis</i>			X				
Viol	<i>Viola macloskeyi</i> var. <i>pallens</i>		X					
Viol	<i>Viola</i> spp.				X	X		X
Visc	<i>Arceuthobium americanum</i>		X					