PEATLANDS OF THE SAWTOOTH VALLEY, CUSTER AND BLAINE COUNTIES, IDAHO

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ABSTRACT

During August through and October, 1993, ecologists from the Idaho Department of Fish and Game's Conservation Data Center and the University of Idaho inventoried the flora and vegetation of peatlands in the Sawtooth Valley, as well as aquatic macroinvertebrates at selected sites. Our survey included lands administered largely by the Sawtooth National Recreation Area, Sawtooth National Forest, and a small part of the Challis National Forest. This investigation was a cooperative Challenge Cost Share project between the Department and the Sawtooth National Forest.

We focused on peatland substrates, which are wetlands with a peat or organic substrate, because they are the known sites of many rare plant species and rare wetland communities, much more so than wetlands with mineral substrates. We encountered four rare plants in 14 peatlands of the study area. All species are widespread in boreal regions of the continent, but are disjunct or at the southern edge of their range in Idaho, and are rare here. Our discovery of two populations of spoon-leaved sundew (*Drosera intermedia*) was surprising; this species was just discovered in Idaho in 1992, from one site in the Selkirk Mountains. We discuss the taxonomy and identification, distribution, abundance, habitat relationships, and management suggestions for each species, as well as make recommendations concerning its conservation status in Idaho.

Results of our floristic inventory and associated natural community data suggest that four peatlands deserve special recognition over and above the fact that they are habitat for rare plants. These relatively undisturbed sites are important to the maintenance of wetland and aquatic diversity in Idaho and the region. We recommend three of these sites be established by the Sawtooth National Forest as the Sawtooth Valley Peatlands Research Natural Area. Two of the three areas had been previously recommended for this designation by the Forest. The fourth site is recommended for establishment as a Special Interest Botanical Area.

We established six long-term monitoring plots in four wetlands in the study area. Four of these plots include rare plants and rare plant communities. Baseline water chemistry data was also collected in association with the permanent vegetation plots, as was information on the aquatic macroinvertebrate communities of the rivulets and streams. We discuss our peatland monitoring methodology and present the baseline data.

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INTRODUCTION

Peatlands are generally defined as wetlands with waterlogged substrates and at least 30 cm of peat accumulation. Bursik (1990) recognized two types of peatlands in Idaho based on vascular floristic composition: (1) Valley Peatlands, which generally occur around lakes and ponds at relatively low elevations in major river valleys, from near Bonners Ferry, in the panhandle, to near Driggs, in eastern Idaho; and (2) Subalpine Peatlands, which are more common throughout the same portion of Idaho, but generally form along low-gradient, subalpine streams. Subalpine peatlands are generally characterized by plant species common throughout the western cordillera, while valley peatlands are characterized by numerous boreal species whose Idaho populations are disjunct by hundreds of miles from the main portion of their range in boreal regions of Canada.

The biodiversity value of Idaho's valley peatlands is high. Although wide-ranging across the state, the occurrence of valley peatlands is very rare on the landscape as a whole and they contain some of the highest concentrations of rare species found in Idaho. Approximately 12% of Idaho's rare vascular flora is more or less restricted to peatland habitats, as is one rare mammal. The narrow suite of environmental conditions that lead to the formation of peatlands create conditions suitable only for species specifically adapted to these sites.

Peatlands are an important terrestrial habitat worldwide where they cover an estimated one percent of ice-free continental land masses. As much as 15% of Canada is covered by peatlands where they are not only important from a biodiversity perspective, but also economically important from an industrial and energy perspective (in the form of peat mining). Peatlands contain a record of the postglacial landscape in the form of pollen and plant macrofossils that make up the peat substrates.
Paleoecologists have analyzed pollen and plant macrofossil spectra to infer climatic and vegetational history of the landscape.

Aside from containing a unique biota and being an archive of Pleistocene and Holocene vegetational and climatic history, peatlands also apparently exert a tremendous influence on the earth's climate. Peatlands act as immense sinks of carbon dioxide, the most important greenhouse gas. In fact, it is estimated that peatlands store 15 to 20 percent of terrestrial carbon reserves, more than twice the amount in all living northern latitude forests (Breining 1992). Methanogenic anaerobic bacteria inhabiting peat soils, on the other hand, produce as much as 40 percent of the methane (an important "greenhouse gas") released into the atmosphere annually (Breining 1992).

Globally, peatlands have long been looked at as worthless, forbidding land. Every effort was made to drain them for forestry or to mine them for peat fuels. Northern European countries, with once immense peat reserves, are now scrambling to preserve their last remaining tracts of pristine peatland habitat. Finland has drained more than half of its 25 million acres of peatlands for forestry. Only five percent of Ireland's 3 million acres of peatlands remain untouched (Breining 1992). Although North American peatlands have fared far better, the continued threat of development exists, particularly if conventional sources of fuel and electricity generation become limiting or expensive.

Peatlands are relatively stable ecosystems, taking many centuries to recover from disturbances. It is estimated that in boreal and temperate climates, peat accumulates at the rate of approximately 2 cm/century. Mechanical disturbances are highly disruptive to native biota due to the soft nature of peat substrates.

Many peatland taxa are sensitive to subtle changes in water table level and nutrient concentrations of the ground water (Vitt and Slack 1975; Glaser 1987). Consequently, activities such as filling, draining, and peat mining, which directly impact hydrological regimes are a constant threat to the stability of peatland communities. Drainage ditches have significantly altered the vegetation of Hager Lake fen (Bursik and Moseley 1992a) and portions of Lee Lake fen, both in Bonner County, and Vat Creek in Blaine County (Ecosystems Research Institute and Flo Engineering, Inc. 1992), by changing water levels. Additionally, logging or ground disturbances within the watershed of a given peatland can effect the peatland plant communities by increasing nutrient runoff. Vegetative changes in Hager Lake fen that have occurred during the last 40 years may be attributed to the amelioration of increased nutrient runoff resultant of logging immediately around the lake during the 1940's (Bursik and Moseley 1992a).

The Forest Service manages a high proportion of valley peatlands in Idaho, including several in the Sawtooth Valley. Several laws, including the National Forest Management Act, and Forest Service policy apply to the management of these ecosystems having high biodiversity value. For instance, these laws and policies require that Forest Service land be managed to maintain populations of all existing native animal and plant species at or above the minimum viable population level. A minimum viable population consists of the number of individuals, adequately distributed throughout their range, necessary to perpetuate the existence of the species in natural, genetically stable, self-sustaining populations.

Special management areas, such as Research Natural Areas (RNA) and Special Interest Botanical Areas (SIA), also provide National Forests with a mechanism of recognizing and protecting special ecological features. Research Natural Areas have the following objectives: (1) preserve and maintain biological diversity; (2) form a network of reference areas containing a wide range of ecological conditions in the U.S.; (3) monitoring baseline conditions for determining the effects of management practices on terrestrial and aquatic ecosystems; and (4) educational purposes (Federal Committee on Ecological Reserves 1977). Somewhat lesser known, the Special Interest Botanical Area is a recreation designation with the goal of acknowledging and highlighting a special area of the National Forest. The unique botanical features of an area are protected, yet the purpose is also to provide appropriate access and interpretation of these features for public appreciation and enjoyment of the area. The area should have some public access, including a road or trail, and should lend itself to interpretation to the public (Shevok 1988).

OBJECTIVES

Two rare plant species and several rare communities were known to occur in peatlands of the Sawtooth Valley. One plant, *Carex buxbaumii*, is on the USFS Region 4 Sensitive Species list and, in recognition of their high biodiversity value, two peatlands had been recommended for Research Natural Area designation by Lynn Burton, former Range Conservationist with the Sawtooth National Recreation Area (SNRA). In light of this evidence, the Idaho Department of Fish and Game's Conservation Data Center (CDC) conducted a survey of peatlands in the Sawtooth Valley (Figure 1) during August, September, and October, 1993, as a cooperative project with the Sawtooth NF. The primary objectives of this investigation are as follows:

Figure 1. Sawtooth Valley study area.

1) Survey peatland habitats in the Sawtooth Valley for rare plant species and wetland communities.

2) Determine the distribution, habitat and population levels for rare taxa encountered. Assess population trends and threats to existing populations and make management recommendations to the Forest Service based on these assessments.

3) Identify high quality sites that have state and regional significance to the maintenance and protection of rare wetland plants and natural communities.

4) Evaluate past Research Natural Area proposals in light of the thorough peatland inventory.

5) Establish long-term ecological monitoring sites within significant peatlands, including vegetation, water chemistry, and aquatic macroinvertebrate data.

Our results are discussed in three sections. Section 1 covers the rare flora with an overview and detailed status reviews of each rare species encountered. Section 2 discusses peatland communities and specific areas having high biodiversity value, including proposed Research Natural Areas and Special Interest Botanical areas. The final section documents our baseline monitoring procedures and results.

SECTION 1

Rare Vascular Flora

RESULTS

Four vascular plants considered rare in Idaho, were discovered at 13 wetland sites in the study area: *Carex buxbaumii, Carex livida, Drosera intermedia* and *Epilobium palustre.* Later in this section, each species is discussed in detail, including information on their taxonomy and identification, range and habitat, conservation status, and recommendations concerning their status in Idaho. Both *Carices* were known from the Sawtooth Valley prior to our investigation, however, the discovery of two populations of *Drosera intermedia* (intermediate sundew) was surprising. This species was not known in Idaho prior to 1992, when Bursik discovered a population in the Selkirk Mountains near the Canadian border. *Epilobium palustre* was not known from the valley prior to our discovery. Two other rare *Carices, Carex californica* and *C. flava,* had been recorded from the study area. We believe that these reports were based on misidentifications, as follows:

> *Carex californica* - Bob Josaitis, formerly SNRA, made a collection from Blind Summit Fen; the collection was deposited in the SNRA Herbarium in Stanley. We believe this is a misidentification because *C. californica* is an upland species growing on exposed, subalpine ridges. In Idaho, it is known only from the northern part of the state. The specimen is no longer in the correct folder at the Stanley herbarium and may have been correctly identified and refiled.
>
> *Carex flava* - Howard Hudak, Sawtooth NF, reported this from a peatland along Stanley Lake Creek. We revisited this site and found *C. oederi,* a species that is very similar to *C. flava* and can easily be confused. During our survey of the study area, we encountered only *C. oederi*.

Scirpus caespitosus is another peatland species that has a limited distribution in Idaho, occurring only in our Sawtooth Valley study area. It was described by Tuhy (1981) as a codominant with *Carex livida* in peatland communities along Mays and Hell Roaring creeks. We treat it in this study as a rare community instead of a rare species (Section 2) and, although there are no policies specific to the management of rare communities, the Forest Service should be aware of its distribution and the potential for finding new sites with this community. A line drawing of this species is included in Appendix 1, and a map of its distribution in Idaho is shown in Appendix 2.

Carex buxbaumii Wahl.

TAXONOMY

Full bibliographic citation: Svenska Vet.-Akad. Handl. 24:163. 1803.

Type specimen: Sweden and Lapland.

Pertinent synonym(s): None.

Common name: Buxbaum's sedge.

Size of genus: More than 1,000 species occurring in all parts of the world, most abundantly in moist regions of the North Temperate Zone and the Arctic (Cronquist 1969).

Family name: Cyperaceae

Common name for family: Sedge

History of knowledge of taxon in Idaho: Early collections for Buxbaum's sedge were from the Sawtooth Valley and the Priest River Valley of northern Idaho. Recent investigations by the CDC have elucidated its distribution in the state (Caicco 1987; 1988; Moseley 1989; Moseley et al. 1991; Bursik 1992a).

Alternative taxonomic treatments: None.

LEGAL OR OTHER FORMAL STATUS

National:

U.S. Fish and Wildlife Service: Buxbaum's sedge is not a federal candidate.

U.S. Forest Service: Buxbaum's sedge is currently a Forest Service Sensitive Species for the Sawtooth and Targhee NFs in Region 4 (Spahr et al. 1991; U.S. Forest Service no date), and the Idaho Panhandle NFs in Region 1 (U.S. Forest Service 1993).

Bureau of Land Management: Buxbaum's sedge is also a BLM Sensitive Species in Idaho (Moseley and Groves 1992).

Other current formal status recommendations: It is given a global rank of 5 (Moseley and Groves 1992) by the Biodiversity Information Network (the International Association of Natural Heritage Programs and Conservation Data Centers). The G5 rank (on a scale of 1-5) indicates that Buxbaum's sedge is demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

State:

Idaho

Idaho Native Plant Society: The Idaho Native Plant Society considers Buxbaum's sedge a Sensitive species (Idaho Native Plant Society 1993). The Sensitive category of the Idaho Native Plant Society list refers to species with small populations or localized distributions within Idaho that presently do not meet the criteria for classification as Priority 1 or 2, but whose populations and habitats may be jeopardized if current land use practices continue.

Conservation Data Center: The Biodiversity Information Network state ranking for Buxbaum's sedge is S3, indicating that it is very rare and local in Idaho (Moseley and Groves 1992).

Review of past status: In his evaluation of Buxbaum's sedge for the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council, Henderson (1981) recommended a State Watch List status, due to its apparent rarity; threats were unknown to him at the time.

Montana

Considered for listing but rejected (Lesica et al. 1984; Lesica and Shelly 1991).

Washington

Sensitive = Taxon that is vulnerable or declining, and could become endangered or threatened in the state without active management or removal of threats (Washington Natural Heritage Program 1990).

Wyoming

It is on the Wyoming Natural Diversity Database's Plant Species of Special Concern - List 2 (Wyoming Natural Diversity Data Base 1991). List 2 includes species on designated or recommended Watch Lists for Federal lands in Wyoming, or other species that are moderately rare and/or threatened globally or regionally.

DESCRIPTION

General nontechnical description: Stems arising singly or few together from well-developed creeping rhizomes, mostly 1-3 feet in height, lowest leaves strongly reduced to scales; new stems are not surrounded by old sheaths from previous years (though old sheaths can be found separately from the new stems). Leaves are smooth and 2-4 mm in width. Spikes mostly 2-5, borne erect or closely ascending, and loosely sessile on the stem. Terminal spike, pistillate flowers are borne above the staminate flowers; the lateral spikes are entirely pistillate. Bract which subtends the spike is sheathless, and will sometimes exceed the inflorescence (Caicco 1988).

Technical description: Culms arising singly or few together from well-developed creeping rhizomes, mostly 3-10 dm tall, strongly aphyllopodic, not surrounded by old sheaths from previous years; leaves glabrous, elongate, mostly 2-4 mm wide; spikes mostly 2-5, approximate or somewhat remote, erect or closely ascending, sessile or (especially the lower) with more or less well-developed peduncle, the terminal spike gynaecandrous, 1-3 cm long, the lateral ones pistillate, about the same length or somewhat shorter; bract subtending the lowest spike sheathless or nearly so, from distinctly shorter to somewhat

longer than the inflorescence; pistillate scales lanceolate to lance-ovate, brown to purplish black with a usually paler midrib, surpassing the perigynia, tapering to an awn-tip 0.5-3 mm long; perigynia 2.7-4.3 mm long, beakless or very shortly beaked, rather narrowly elliptic to sometimes elliptic-obovate or elliptic-ovate, up to barely over half as wide as long, firm-walled, not strongly flattened, light gray-green, densely papillate all over, with prominent marginal nerves and 6-8 inconspicuous or obscure nerves on each face; stigmas 3; achene trigonous, 1.4-1.9 mm long, somewhat narrower and much shorter that the perigynial cavity (Cronquist 1969).

Local field characters: Buxbaum's sedge is a well-marked and distinct species. The light-gray green, densely-papillate perigynia give the inflorescence a distinctive coloration that makes field inventory for flowering stems rather easy. The plants retain this distinctive aspect until the perigynia cure to a pale straw color, which makes them more difficult to spot at a distance. The awned-tipped scales are also quite distinguishing.

Photos and line drawings: A line drawing of Buxbaum's sedge by Jeanne Janish appears in Cronquist (1969), Spahr et al. (1991), U.S. Forest Service (no date), and Appendix 1. Photos appear in U.S. Forest Service (no date). The CDC has an extensive slide file for the species and its habitat, a few of which are reproduced in Appendix 7.

DISTRIBUTION

Global distribution: Buxbaum's sedge is distributed throughout the boreal regions of the Northern Hemisphere; although it is widespread, it is relatively uncommon and infrequently collected. In the western United States it reaches as far south as Colorado, Utah, and central California, but is not recorded for Nevada. In Washington, it is known only from seven recent sightings in widely scattered locations.

Idaho distribution: Buxbaum's sedge is known from five widely disjunct areas of Idaho: 1) Island Park and the Teton Valley (Fremont and Teton counties), where seven populations are known; 2) the Sawtooth Valley (Blaine and Custer counties), discussed below; 3) Tule Lake (Valley Co), where one population is known; 4) Kaniksu NF (Bonner and Boundary counties) where eight populations are known from the Priest River Valley and Selkirk Mountains; and (5) The Lake Fork valley east of McCall (Valley County), where one population is known.

Precise occurrences in the Sawtooth Valley: Eleven populations are now known from the Sawtooth Valley, as follows (the three digit code associated with the site name is the Conservation Data Center occurrence number used as a reference number for that population):

001 Along Pettit Lake Creek below Pettit Lake
002 Hell Roaring Creek, from Hell Roaring Lake downstream for ca. four miles
003 Redfish Lake Creek, from Redfish Lake to confluence with Salmon River
005 Stanley Lake Creek, above and below Stanley Lake
010 Blind Summit Fen, on divide between Marsh and Valley creeks
022 Around shore of Alturas Lake and downstream along Alturas Lake Creek
024 Shore of McDonald Lake
025 Yellow Belly Lake, from outlet downstream for ca. 1 mile
026 Trap Creek Fen, near N boundary of SNRA

027 Mays Creek Fen, south of Hell Roaring Creek
028 Huckleberry Creek Fen, between Hell Roaring and Decker creeks

Six of the eleven populations were known prior to 1993; we discovered five (024-028) this year. All these sites occur along the east slope of the Sawtooth Range.

See Appendix 2 for the mapped locations of Buxbaum's sedge in the study area and the occurrence records from the CDC data base in Appendix 3 for further location information for each population. Also see Appendix 4 for a list of sites in the Sawtooth Valley searched during 1993.

Historical sites: None.

Unverified/undocumented reports: We visited all populations except the one at Blind Summit Fen 010 during the 1993 survey. The Blind Summit population is documented with a 1982 collection, but we were not able to relocate the population in this extensive peatland area. It probably still exists in the area.

HABITAT

General habitat description: Throughout its range Buxbaum's sedge can be found in peat bogs, marshes, wet meadows, and other wet places (Cronquist 1969). Buxbaum's sedge has been classified as a minor community type in the Sawtooth Valley (Tuhy 1981), as well as in Montana (Hansen et al. 1988a), Utah (Padgett et al. 1989), and Wyoming (Mattson 1984). Many times it shares dominance with one to several other sedges, usually *Carex aquatilis*.

Tuhy (1981) described the *Carex buxbaumii - Carex saxatilis* community type from the Sawtooth Valley; refer to this source for a more detailed discussion of the habitat of Buxbaum's sedge. This community is also treated in Section 2. Several other sedges can codominate stands with Buxbaum's sedge, especially *Carex aquatilis*. All other associated species occur in low cover. There are no trees rooted in this community, but *Pinus contorta* can occur on adjacent mounds. Buxbaum's sedge occurs in wide valley bottoms, along low gradient streams or on lakeshores. The communities in which Buxbaum's sedge occurs are relatively stable, although there is some disturbance due to flooding and alluvial deposition. See Appendix 3 for further information on the specific habitat attributes of each occurrence.

Geology and Soils: Soils in Buxbaum's sedge populations are generally alluvial in origin, composed primarily of mineral materials with various amounts of organic matter incorporated into the muck. It can occur within peatlands, on shallow peat or usually along rivulets of streams where some mineral materials have been deposited. Soils remain saturated to the surface for most of the growing season and may have standing water above the soil surface. Soils are restricted to granitic parent materials, which originate from the Idaho and Sawtooth batholiths.

Associated species: Several sedges, including *Carex rostrata, C. oederi, C. aquatilis, C. muricata, C. saxatilis, C. aperta, C. livida*, and *C. simulata*, can occur with Buxbaum's sedge. Other associates include *Calamagrostis canadensis, Scirpus caespitosus, Potentilla fruticosa, Betula glandulosa, Agrostis scabra, Pedicularis groenlandica, Eleocharis palustris, Senecio cymbalarioides.*

Other rare species: In the Sawtooth Valley, Buxbaum's sedge can occur in close proximity to *Carex*

livida. *Drosera intermedia* and *Epilobium palustre* occur in adjacent portions of some peatlands but are not sympatric with it.

POPULATION BIOLOGY

Phenology: Inflorescences begin to develop during July in the Sawtooth Valley and are well formed by August. The achenes are mature in August and September and disperse soon after, although we've observed some achenes still on the plants in late October.

Population size and condition: Most populations are extensive, having several thousand ramets each. They range in size from Trap Creek Fen 026 and Mays Creek Fen 027, which have several hundred ramets each, to the Yellow Belly Lake (025) population with many tens of thousands. Refer to Appendix 3 for further information.

Reproductive Biology: Buxbaum's sedge is wind pollinated and reproduces by seed. It is also rhizomatous and can vegetatively produce new stems (ramets) in this manner.

Biological Interactions: Unknown

Competition: Tuhy (1981) considered Buxbaum's sedge to be an initial invader on recently formed alluvial bars or in stream channels that have been recently abandoned. This would indicate that it lacks competitive ability.

Herbivory: We observed no herbivory on Buxbaum's sedge.

Land ownership: Although its exact location is unknown, the Blind Summit Fen 010 population may occur on either the SNRA or the Challis NF. All other occurrences in the Sawtooth Valley are on the SNRA.

Land use: Most populations are undisturbed or traversed by a hiking or fishing trail along the creek or lake. Cattle grazing takes place adjacent to several populations, however, it does not appear that cows enter the peat area, probably due to unstable substrates and unpalatable forage. The Alturas Lake Creek 022 population has probably had the greatest loss of habitat due to picnic area construction at the inlet and the draining of a small pothole adjacent to Smokey Bear Campground. Two ditches were dug many years ago, presumably in an attempt to drain the pothole into the lake. This probably resulted in lowering the water table; we suspect that Buxbaum's sedge was more common prior to ditching. A portion of the Hell Roaring Creek 002 population is in the Sawtooth Wilderness and Mays Creek Fen 027 and Huckleberry Creek Fen 028 are within the proposed Sawtooth Valley Peatlands Research Natural Area.

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Threats to currently known populations: Most of the anthropogenic disturbances taking place in Buxbaum's sedge populations are relatively minor and probably not a threat to overall species viability in the SNRA.

Recommendations:

- Buxbaum's sedge should remain a Forest Service Sensitive Species in Idaho due to its relative rarity.

- Most of the populations of Buxbaum's sedge in the study area are extensive and appear viable. The SNRA should protect the wetlands inhabited by it to the fullest degree, paying special attention to the maintenance of natural processes operating to perpetuate these wetlands.

- Three populations of pale sedge in the Sawtooth Valley are in a proposed RNA or SIA (see Section 2). The SNRA and Challis NF should move toward establishing these as soon as practicable. We will be preparing a draft establishment record for the Sawtooth Valley Peatlands RNA during early 1994.

NOTE: We feel that our survey was rather thorough (see Appendix 4 for a list of wetlands visited during the survey), but additional Buxbaum's sedge populations may be found in the area. Land managers and field personnel working in the Sawtooth Valley should be informed of the possible occurrence of this species in their areas. Possible sightings of this plant should be documented by specimens (if the size of the population warrants collecting), and should include both mature fruits and roots. Specimens should be sent to the University of Idaho Herbarium (Department of Biological Sciences, University of Idaho, Moscow 83843) for verification of their identity. Confirmed sightings of this species should be reported to the Idaho CDC for entry into their permanent data base on sensitive species.

Carex livida (Wahl.) Willd.

TAXONOMY

Full bibliographic citation: Species Plantarum 4:285. 1805.

Type specimen: Lapland

Pertinent synonym(s): None.

Common name: Pale sedge.

Size of genus: More than 1,000 species occurring in all parts of the world, most abundantly in moist regions of the North Temperate Zone and the Arctic (Cronquist 1969).

Family name: Cyperaceae

Common name for family: Sedge

History of knowledge of taxon in Idaho: The possibility of pale sedge being of conservation concern in Idaho was first brought to our attention in about 1985 by Joel Tuhy. He described a community type dominated, in part, by pale sedge in the Sawtooth Valley (Tuhy 1981), which at the time was only "reputedly in northern Idaho" (Cronquist 1969). It is now known from two sites in northern Idaho (Caicco 1987; 1988). Rob Bursik first noticed pale sedge at Robinson Lake, Yellowstone National Park (Fremont County), in 1987, while conducting research at the University of Idaho (Bursik 1990). Two additonal sites were found in the Park, during a CDC investigation in 1991 (Moseley et al. 1991). Bob Moseley and Michael Mancuso discovered a large pale sedge population along Texas Creek in the Lemhi River drainage in September 1991, and Moseley discovered a population in Boise County in 1992.

Alternative taxonomic treatments: None.

LEGAL OR OTHER FORMAL STATUS

National:

U.S. Fish and Wildlife Service: Pale sedge is not a federal candidate.

U.S. Forest Service: Pale sedge is not currently a Forest Service Sensitive Species in Region 4, but is sensitive in Region 1 (U.S. Forest Service 1993).

Other current formal status recommendations: It is given a global rank of 5 (Moseley and Groves 1992) by the Biodiversity Information Network (the International Association of Natural Heritage Programs and Conservation Data Centers). The G5 rank (on a scale of 1-5) indicates that pale sedge is demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

State:

Idaho

Idaho Native Plant Society: The Idaho Native Plant Society considers pale sedge a Sensitive species (Idaho Native Plant Society 1993). The Sensitive category of the Idaho Native Plant Society list refers to species with small populations or localized distributions within Idaho that presently do not meet the criteria for classification as Priority 1 or 2, but whose populations and habitats may be jeopardized if current land use practices continue.

Conservation Data Center: The Biodiversity Information Network state ranking for pale sedge is S2, indicating that it is imperiled in Idaho because of rarity or because of other factors demonstrably making it vulnerable to extinction (Moseley and Groves 1992).

Review of past status: Pale sedge was previously considered a priority 1 species by the Idaho Native Plant Society, but was downlisted to a Sensitive species because new, large populations were discovered.

California

On List 1A of the California Native Plant Society's list of rare plants in the state. List 1A contains those plants presumed extinct in California; it was last seen there in 1866 (Smith and Berg 1988).

Montana

Pale sedge is sensitive in Montana, were the Montana Natural Heritage Program also gives it a state rank of S2 (Lesica and Shelly 1991).

Oregon

The Oregon Natural Heritage Program places pale sedge on List 2 for Oregon, that is, those species which are threatened, endangered or possibly extirpated in Oregon, but are more common or stable elsewhere (Oregon Natural Heritage Program 1991).

Wyoming

It is on the Wyoming Natural Diversity Database's Plant Species of Special Concern - List 1 (Wyoming Natural Diversity Data Base 1991), a category containing the highest priority species in the state.

DESCRIPTION

General nontechnical description: Stems arising singly or few together from slender, creeping rhizomes, mostly 1-4 dm in height, with well-developed lower leaves; some new stems may be surrounded by basal sheaths from previous years. Leaves are mainly basal, firm and narrow, channeled, and from 1-3.5 mm in width. Terminal spike has only staminate flowers and is 1-2.5 cm in length; 1-3 lateral spikes are slender and bear 5-15 pistillate (only) flowers. The bract which subtends the lowest spike is narrow and bristle-like, but is green and may be up to 7 cm in length; it also has a well-developed sheath 5-15 mm.

Technical description: Stems arising singly or few together from slender, creeping rhizomes, 1-4 dm tall,

phyllopodic and with some old basal sheaths persistent; leaves mainly basal, firm, narrow, often channeled, 1-3.5 mm wide; terminal spike staminate, 1-2.5 cm long; lateral spikes 1-3, approximate or somewhat remote, slender, pistillate, 1-2.5 cm long, 5- to 15-flowered, erect, the short peduncle not much if at all exceeding the sheath; bract subtending the lowest spike with a fairly well-developed sheath mostly 5-15 mm long and a narrow setaceous but green blade seldom as much as 7 cm long; pistillate scales equaling or somewhat shorter than the perigynia, with a broad, pale green midstripe which seldom reaches the usually rather blunt tip, and with broad, hyaline-scarious, brown or dark brown margins; perigynia elliptic or rather narrowly rhombic, short-stipitate, less than twice as long as wide, tapering to the beakless or very shortly (to 0.2 mm) beaked tip, 3.5-4.5 mm long, distended by the achene but empty distally, scarcely compressed, light green, densely papillate-glaucous, with 2 marginal nerves, otherwise obscurely few-nerved or nerveless; stigmas 3; achene trigonous 2.2-2.5 mm long, jointed to the style (Cronquist 1969).

Local field characters: Pale sedge is quite distinctive with its relatively short, basal leaves that are pale-green in color, falcate in shape, and stiff and channeled. It is somewhat similar to the taller, more robust *Carex aquatilis*. Water sedge, however, has larger, more lax leaves that are folded but do not have a prominent, stiff central groove. The inflorescence is also considerably larger.

Photos and line drawings: A line drawing of pale sedge by Jeanne Janish appears in Cronquist (1969) and Appendix 1. The CDC has an extensive slide file for the species and its habitat, a few of which are reproduced in Appendix 7.

DISTRIBUTION

Global distribution: Pale sedge is distributed interruptedly throughout the boreal regions of the Northern Hemisphere. In the western part of the North American continent, it reaches south along the coast to Oregon and California. In the northern Rocky Mountains, it is known from Oregon, Idaho, Montana, and Wyoming.

Idaho distribution: It is known from four widely disjunct areas in Idaho: 1) the Priest Lake area (Bonner County); 2) Sawtooth Valley (Custer and Blaine counties) and Bull Trout Lake (Boise County); 3) upper Lemhi River (Lemhi County); and 4) Yellowstone NP (Fremont County). Currently, there are 15 occurrences known in Idaho.

Precise occurrences in the Sawtooth Valley: A majority of the known populations of pale sedge in Idaho occur in the study area. Eight populations are now known from the Sawtooth Valley, as follows (the three digit code associated with the site name is the Conservation Data Center occurrence number used as a reference number for that population):

001 Mays Creek Fen, south of Hell Roaring Creek
002 Stanley Lake Creek, below lake
004 Blind Summit Fen, on divide between Marsh and Valley creeks
005 Hell Roaring Creek, from lake downstream for ca. four miles
006 Along Meadow Creek, near N boundary of SNRA
012 Yellow Belly Lake, from outlet downstream for ca. 1 mile
014 Huckleberry Creek Fen, between Hell Roaring and Decker creeks

015 Iron Creek Campground, W of Stanley

Only three (001, 004, 005) of the eight populations were known from the Sawtooth Valley prior to 1993. All these sites occur along the east slope of the Sawtooth Range.

See Appendix 2 for the mapped locations of pale sedge in the study area and the occurrence records from the CDC data base in Appendix 3 for further location information for each population. Also see Appendix 4 for a list of sites in the Sawtooth Valley searched during 1993.

Historical sites: None.

Unverified/undocumented reports: None.

Erroneous or ambiguous reports: Initial inventories of peatlands of the Sawtooth Valley in the mid-1980's indicated that the *Carex livida-Scirpus caespitosus* community type described by Tuhy (1981) occurred at Vat Creek, an extensive fen area between Petit Lake and Alturas Lake. Various correspondence concerning the significance of Vat Creek and its potential designation as a Research Natural Area all mention this community as being a significant component. Ecosystems Research Institute and Flo Engineering, Inc. (1992) also mention the presence of this rare community in their mitigation plan for the Grouse Creek Project. We conducted an extensive inventory of the Vat Creek wetland and found no populations of either pale sedge or *Scirpus caespitosus*.

HABITAT

General habitat description: Pale sedge generally occurs in areas of deep peat subirrigated by springs, but can sometimes occur on mineral substrates adjacent to slow moving, low gradient streams. On the peat substrates it is almost always associated with *Eleocharis pauciflora* and/or *Scirpus caespitosus*. Tuhy (1981) described the *Scirpus caespitosus - Carex livida* community type from the Sawtooth Valley, which encompasses the peatland habitats. This community was later lumped into a broader *Eleocharis pauciflora* community type (Tuhy and Jensen 1982; Mutz and Queiroz 1983).

Pale sedge habitat is characterized by open turf mats of pale sedge, *Scirpus caespitosus* and *Eleocharis pauciflora*. Similar to Buxbaum's sedge habitat, all other associated species occur in low cover and no trees are rooted in the community. The communities in which pale sedge occurs are relatively stable, although the areas underlain by mineral substrate has some disturbance due to flooding and alluvial deposition. Refer to Tuhy (1981) for a more detailed discussion of the habitat of pale sedge. This community is also treated in Section 2. See Appendix 3 for further information on the specific habitat attributes of each occurrence.

Geology and Soils: Portions of some populations occur on mineral alluvium consisting of granitic sands. Most populations occur on peat, the wettest being organic mats floating on water or muck. Slightly drier sites have organic mats overlying saturated mineral layers.

Associated species: Several sedges, including *Carex rostrata, C. oederi, C. saxatilis, C. luzulina, C. buxbaumii,* and *C. muricata* can occur with pale sedge. Other associates include *Swertia perennis, Deschampsia cespitosa, Ligusticum tenuifolium, Agrostis scabra, Caltha leptosepala, Pedicularis*

groenlandica, Senecio cymbalarioides, Spiranthes romanzoffiana, Gentiana calycosa.

Other rare species: In the Sawtooth Valley, pale sedge occurs with *Drosera intermedia* and can occur in close proximity to *Carex buxbaumii*. *Epilobium palustre* occurs in adjacent portions of some peatlands but is not sympatric with it.

POPULATION BIOLOGY

Phenology: Inflorescences begin to develop during July in the Sawtooth Valley and are well formed by August. The achenes are mature in August and September and disperse soon after.

Population size and condition: Most populations are extensive, having many tens of thousands ramets each. They range in size from Iron Creek Campground 015, which has only a few hundred ramets in a small area, to the Blind Summit Meadow 004 population which has a continuous population of greater than 100,000 ramets spread over two miles. Refer to Appendix 3 for further information.

Reproductive Biology: Pale sedge is wind pollinated and reproduces by seed. It is also rhizomatous and can vegetatively produce new stems (ramets) in this manner.

Biological Interactions: Unknown

Competition: Pale sedge tends to form monocultures, with a low abundance of associated species. Adjacent stands of *Scirpus caespitosus* or *Eleocharis pauciflora* have a similar habit of forming monocultures. Only in a few places along Hell Roaring Creek 005 did we observe pale sedge becoming established on fresh alluvial surfaces, which lack significant competition.

Herbivory: We observed only infrequent herbivory on pale sedge by cattle, with the Meadow Creek 006 and Blind Summit 004 populations being the most affected.

Land ownership: All populations in the study area occur on National Forest land. Most of the Blind Summit Fen 004 occurs on the Challis NF, with a small portion at the southern end occurring on the SNRA. The remaining populations are all on the SNRA.

Land use: Two populations, Mays Creek 001 and Huckleberry Creek 014, are in the proposed Sawtooth Valley Peatlands Research Natural Area (see Section 2) and the upper portion of Hell Roaring Creek 005 is in the Sawtooth Wilderness. Hiking trails occasionally cross part of the Hell Roaring population, but these impacts are minimal in the study area due to the generally unstable nature of the peat substrate. Meadows containing the Blind Summit Fen 004 and the nearby Meadow Creek 006 populations are heavily grazed by cattle. The grazing, however, appears to be restricted to the mesic and upland portion of the meadow at the periphery of the peat. There was little evidence that cattle wandered into the peat areas, probably due to the quaking nature of these floating mats and the low forage values in terms of biomass production and palatable species. A road crosses the wetland in the Iron Creek Campground 015, below the pale sedge population. The fill through the wetland does not appear to be affecting upstream groundwater hydrology.

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Threats to currently known populations: Most of the anthropogenic disturbances taking place in pale sedge populations are relatively minor and probably not a threat to overall species viability of the Sawtooth Valley populations.

Recommendations:

- Pale sedge should remain a Forest Service Sensitive Species in Idaho in Region 1, and be added to the Region 4 list due to its relative rarity.

- Most of the populations of pale sedge in the study area are extensive and appear viable. The SNRA should protect the unique wetlands inhabited by it to the fullest degree, paying special attention to the maintenance of natural processes operating to perpetuate these wetlands.

NOTE: We feel that our survey was rather thorough (see Appendix 4 for a list of wetlands visited during the survey), but additional pale sedge populations may be found in the area. Land managers and field personnel working in the Sawtooth Valley should be informed of the possible occurrence of this species in their areas. Possible sightings of this plant should be documented by specimens (if the size of the population warrants collecting), and should include both mature fruits and roots. Specimens should be sent to the University of Idaho Herbarium (Department of Biological Sciences, University of Idaho, Moscow 83843) for verification of their identity. Confirmed sightings of this species should be reported to the Idaho CDC for entry into their permanent data base on sensitive species.

Drosera intermedia Hayne in Schrad.

TAXONOMY

Full bibliographic citation: Journal of Botany Part I, 37. 1800.

Type specimen: Unknown, probably Europe.

Pertinent synonym(s): *D. longifolia* Michx., *D. americana* Willd., *D. intermedia* var. *americana* DC.

Common name: Spoon-leaved sundew.

Size of genus: About 90 species on all continents, but primarily in Australia and S. Africa (Hitchcock 1964)

Family name: Droseraceae

Common name for family: Sundew

History of knowledge of taxon in Idaho: It was discovered in Idaho by Rob Bursik in 1992 in Smith Creek Research Natural Area, Selkirk Mountains, Boundary County (Bursik 1992b). The two Sawtooth Valley populations, discovered in 1993, represent the only other known sites in the state.

Alternative taxonomic treatments: None, although it should be mentioned that the Idaho stations represent a major disjunction from eastern North America, and none of the Idaho collections have yet been verified by an expert. Specimens key very well to *D. intermedia* in the eastern floras, but its identification should be considered tentative until verified. However, it is clearly a different plant from the two common Idaho sundews, *D. rotundifolia* and *D. anglica*.

The sundew in Mays Creek Fen had been erroneously identified as *Drosera rotundifolia* for many years. *Drosera intermedia* is the only sundew known from the Sawtooth Valley.

LEGAL OR OTHER FORMAL STATUS

National:

U.S. Fish and Wildlife Service: Spoon-leaved sundew is not a federal candidate.

U.S. Forest Service: Spoon-leaved sundew is not currently a Forest Service Sensitive Species in Region 4 or in Region 1.

Other current formal status recommendations: None at this time.

State:

Idaho

Idaho Native Plant Society: The Idaho Native Plant Society added spoon-leaved sundew to the Priority 1 list in 1993 (Idaho Native Plant Society 1993). The Priority 1 category of the Idaho Native Plant Society list refers to species in danger of becoming extirpated from Idaho in the foreseeable future.

Conservation Data Center: The Biodiversity Information Network state ranking for spoon-leaved sundew is S1, indicating that it is critically imperiled in Idaho because of extreme rarity or because of some factor of its biology making especially vulnerable to extirpation (Moseley and Groves 1992).

Review of past status: Spoon-leaved sundew was only recently added to the state rare plant list in 1993.

DESCRIPTION

General nontechnical description: Plants 5-30 cm tall; leaves 2-6 cm long; blades linear-spatulate, with long glabrous petioles; sepals becoming 5-5.5 mm long; corolla white, 10-12 mm wide; capsule scarcely as long as the sepals (Small 1972).

Technical description: None available.

Local field characters: Spoon-leaved sundew is a very distinctive carnivorous plant. It is a small low-growing plant, with a basal rosette of leaves that are covered with long, reddish glandular hairs. The glandular hairs capture small insects, which triggers the leaf to roll up and digest the animal. A few white flowers occur on a short flowering stem, however, they bloom very early and the plants are most often found in fruit.

Photos and line drawings: Line drawings of spoon-leaved sundew appear in Britton and Brown (1947) and Crum (1988); the former is reproduced in Appendix 1. A photograph appears in Crum (1988). The CDC has an extensive slide file for the species and its habitat, a few of which are reproduced in Appendix 7.

DISTRIBUTION

Global distribution: North America, Europe, Asia Minor, and Cuba. In North America its main distribution occurs between Minnesota and Labrador, south to eastern Texas and Florida, with isolated stations in northern British Columbia, and now possibly Idaho (Britton and Brown 1947; Scoggan 1978).

Idaho distribution: In Idaho, spoon-leaved sundew occurs in two widely disjunct areas: the Selkirk Mountains of Boundary County, and the Sawtooth Valley of Custer County. About 340 miles separate these two areas.

Precise occurrences in the Sawtooth National Recreation Area: Two populations are known from the SNRA, both from within the proposed Sawtooth Valley Peatlands Research Natural Area at Mays Creek 002 and Huckleberry Creek 003 fens. See Appendix 2 for the mapped locations of spoon-leaved sundew in the Sawtooth Valley and the occurrence record from the CDC data base in Appendix 3 for further location information. Also see Appendix 4 for a list of sites in the Sawtooth Valley searched during 1993.

Historical sites: None.

Unverified/undocumented reports: None.

Erroneous or ambiguous reports: None.

HABITAT

General habitat description: The two Sawtooth Valley sites both occur in the *Scirpus caespitosus* - *Carex livida* community type. The substrate is saturated peat, sometimes with standing water, on flat to gently sloping topography.

At the Smith Creek Research Natural Area, spoon-leaved sundew occurs on *Sphagnum* peat with several sedges and another sundew species, *D. anglica* (Bursik 1992b). No other sundews occur in the Sawtooth Valley, where spoon-leaved sundew occurs on a sedge-derived peat.

Geology and Soils: Deep saturated peat.

Associated species: *Eleocharis pauciflora* is a prominent associate in the community, as is another carnivorous plant, *Utricularia intermedia*. *Swertia perennis* is one of the few other plants growing in this habitat.

Other rare species: In the Sawtooth Valley, spoon-leaved sundew occurs in the same wetland as *Epilobium palustre* and *C. buxbaumii*, although they are not sympatric. *Carex livida* is closely associated with the sundew at both sites.

POPULATION BIOLOGY

Phenology: We're unsure when it begins growth and flowers, but spoon-leaved sundew probably flowers in late spring or early summer. Fruits are well developed by mid-July and seeds probably disperse by September.

Population size and condition: Both populations in the study area contain many thousands of individuals occurring in very localized areas. Most of the plants were vegetative, with only about 5% of the populations with fruits in 1993. Refer to Appendix 3 for further information on the two Sawtooth Valley occurrences.

Reproductive Biology: Spoon-leaved sundew sexually reproduces by seed. Nothing is known about

seed dispersal and viability.

Biological Interactions: Unknown.

Competition: Nothing is known about the effects of inter- and intraspecific specific competition in this species. It usually grows in rather open sedge stands, however, the sundew stands can become quite dense in the openings.

Herbivory: No herbivory was observed.

Land ownership: All populations in the study area occur on National Forest land managed by the SNRA.

Land use: Both populations are little disturbed and within the proposed Sawtooth Valley Peatlands Research Natural Area (see Section 2).

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Threats to currently known populations: No external threats exist to overall viability of the Sawtooth Valley populations. Stochastic population and environmental variables probably have a greater probability of affecting the viability of these small populations. Although we have never known it to be a problem in Idaho, carnivorous plants are sought after by some plant collectors and dealers and could become a problem in the future.

Recommendations:

- Pending verification, spoon-leaved sundew should be added to the Forest Service Sensitive Species list in Idaho, for both Regions 1 and 4 due to its rarity.

- The populations of spoon-leaved sundew in the Sawtooth Valley are in a proposed RNA. The SNRA should move toward establishing this RNA as soon as practicable. We will be preparing a draft establishment record for the Sawtooth Valley Peatlands RNA during early 1994.

NOTE: We feel that our survey was rather thorough (see Appendix 4 for a list of wetlands visited during the survey), but additional spoon-leaved sundew populations may be found in the area. Land managers and field personnel working in the Sawtooth Valley should be informed of the possible occurrence of this species in their areas. Possible sightings of this plant should be documented by specimens (if the size of the population warrants collecting), and should include both mature fruits and roots. Specimens should be sent to the University of Idaho Herbarium (Department of Biological Sciences, University of Idaho, Moscow 83843) for verification of their identity. Confirmed sightings of this species should be reported to the Idaho CDC for entry into their permanent data base on sensitive species.

Epilobium palustre L.

TAXONOMY

Full bibliographic citation: Species Plantarum 348. 1753.

Type specimen: Europe

Pertinent synonym(s): See below.

Common name: Swamp willow-weed

Size of genus: Perhaps 150 species of cosmopolitan distribution (Hitchcock 1959).

Family name: Onagraceae

Common name for family: Evening-primrose

History of knowledge of taxon in Idaho: All known collections of swamp willow-weed in Idaho are from between 1987 and 1993.

Alternative taxonomic treatments: This taxon is often treated, chiefly on the basis of flower color and degree of pubescence, as three species: *E. densum* the densely hairy phase, *E. palustre* often with leaves glabrous but with the stems strigillose, and *E. davuricum* with even less pubescence, that of the stems occurring chiefly in decurrent lines. It has been reported the *E. davuricum* lacks the filiform rhizomes of the other two, but this apparently is not the case (Hitchcock 1961). Hitchcock (1961) suggests that *E. densum* and *E. davuricum* could more consistently be recognized as varieties of *E. palustre*, if their minor peculiarities were to be emphasized.

LEGAL OR OTHER FORMAL STATUS

National:

U.S. Fish and Wildlife Service: Swamp willow-weed is not a federal candidate.

U.S. Forest Service: Swamp willow-weed is not currently a Forest Service Sensitive Species in Region 4, but is sensitive in Region 1 (U.S. Forest Service 1993).

Other current formal status recommendations: It is given a global rank of 5 (Moseley and Groves 1992) by the Biodiversity Information Network (the International Association of Natural Heritage Programs and Conservation Data Centers). The G5 rank (on a scale of 1-5) indicates that swamp willow-weed is demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

State:

Idaho

Idaho Native Plant Society: The Idaho Native Plant Society considers swamp willow-weed a Priority 2 species (Idaho Native Plant Society 1993). The Priority 2 category of the Idaho Native Plant Society list refers to species likely to be classified as Priority 1 in the foreseeable future in Idaho, if factors contributing to their population decline or habitat degradation or loss continue.

Conservation Data Center: The Biodiversity Information Network state ranking for swamp willow-weed is S2, indicating that it is imperiled in Idaho because of rarity or because of other factors demonstrably making it vulnerable to extinction (Moseley and Groves 1992).

Review of past status: Swamp willow-weed was only recently added to the state rare plant list in 1990.

DESCRIPTION

General nontechnical description: Swamp willow-weed has an erect, simple to few-branched stem that is approximately 1 to 1.5 feet tall. Turions (small white bulbs) are present at the lower stem/upper root interface. The flowers are small, generally light pink to white, and are borne on the end of the branches and stem. The leaves are narrow and somewhat revolute (margins rolled downward). The entire plant has a pale appearance due to a fine covering of small, straight, appressed hairs all pointing in the same direction (strigillose).

Technical description: Simple to branched perennial 1-4 (8) dm tall, from slender rhizomes which often end in small turions, finely canescent-strigillose throughout or only sparsely so below; leaves mainly opposite, sessile or subsessile, entire to slightly denticulate, obtuse, linear to lanceolate or narrowly oblong, (1) 2-6 cm long, mostly 4 (8) mm broad; inflorescence loosely racemose to paniculate; pedicels slender, 1-4 cm long; free hypanthium 1-1.5 mm long, the sepals about twice as long; petals white to pinkish, notched, 3-5 mm long; styles shorter than the petals; stigma about 1 mm long, 4-lobed, but the lobes usually completely coalescent; capsule linear, 3-6 cm long, usually canescent; seeds minutely papillate, the coma white to tawny (Hitchcock 1961).

Local field characters: Swamp willow-weed is readily distinguished from other willow-weeds occurring in wetlands of the study area by its grayish-strigillose appearance in combination with the presence of turions.

Photos and line drawings: A line drawing of swamp willow-weed by Jeanne Janish appears in Cronquist (1961) and Appendix 1. The CDC has an extensive slide file for the species and its habitat, a few of which are reproduced in Appendix 7.

DISTRIBUTION

Global distribution: Swamp willow-weed is distributed from Alaska to the Cascades of central Washington, east to the Atlantic coast and south in the Rockies to Colorado. In the northern Rockies it occurs in Idaho, Montana, and South Dakota.

Idaho distribution: In Idaho, swamp willow-weed is known from 17 occurrences in three, widely disjunct areas: 1) 12 populations in the panhandle, in Bonner and Boundary counties; 2) two populations in the Sawtooth Valley, and in the East Fork of the Salmon River valley in Custer County; and 3) three populations in the Island Park - Henrys Lake area in Fremont County. Prior to 1990, it was only known from the panhandle (Moseley 1989). The three Fremont County populations were discovered during a CDC investigation in 1991 (Moseley et al. 1991).

Precise occurrences in the Sawtooth National Recreation Area: Two populations are known from the SNRA. Michael Mancuso and Bob Moseley discovered a population at the hot springs near Bowery Guard Station 005 in 1990. The second was discovered in 1993 in the Sawtooth Valley at Mays Creek Fen 017.

See Appendix 2 for the mapped locations of swamp willow-weed in the Sawtooth Valley and the occurrence record from the CDC data base in Appendix 3 for further location information. Also see Appendix 4 for a list of sites in the Sawtooth Valley searched during 1993.

Historical sites: None.

Unverified/undocumented reports: None.

Erroneous or ambiguous reports: None.

HABITAT

General habitat description: The Sawtooth Valley population at Mays Creek Fen occurs in a dense *Carex rostrata* community with shallow standing water over a deep peat substrate. This area lies near the spring-fed source of Mays Creek and is extensively subirrigated. The few associated species include *Carex nebraskensis, C. aquatilis,* and *Saxifraga oregana*.

The Bowery Hot Springs population on the East Fork occurs at a similar elevation but in a much different habitat. Although the surface horizon is organic, it is not a deep peat. It occurs near the source of a hot spring in a small patch of *Carex nebraskensis* that occurs within an *Eleocharis rostellata* community. The only other associates are *Epilobium watsonii* and *Primula incana.*

Geology and Soils: The substrate at Mays Creek Fen is deep, *Carex* peat that is saturated by spring water. The Bowery Hot Spring population is underlain by calcareous deposits from the spring.

Associated species: See above.

Other rare species: In the Sawtooth Valley, swamp willow-weed occurs in the same wetland as *Drosera intermedia, Carex livida,* and *C. buxbaumii,* although they are not sympatric. In the East Fork, one of two Idaho occurrences of Jones' primrose, *Primula incana,* occurs in the *Eleocharis rostellata* community with swamp willow-weed.

POPULATION BIOLOGY

Phenology: We're unsure when it begins growth, but swamp willow-weed begins flowering in July and was still flowering in mid-August of 1993. Fruits probably mature and the seeds dehisce during August and September.

Population size and condition: We observed only about 10 flowering plants occupying a 300 $ft.^2$ area at Mays Creek Fen. In 1990, the last time we visited the Bowery Hot Spring population, there was around 50 flowering individuals occurring at very low densities. This pattern is typical of all populations in the state, most being low in number occupying a small area at low density. Refer to Appendix 3 for further information on the Sawtooth Valley occurrence.

Reproductive Biology: Swamp willow-weed sexually reproduces by seed and vegetatively propagates by slender rhizomes. Nothing is known about seed dispersal and viability; no pollinators were observed.

Biological Interactions: Unknown.

Competition: Nothing is known about the effects of inter- and intraspecific competition in this species. It always grows within very dense stands of sedges or other rhizomatous graminoids, which may limit the population size and density.

Herbivory: No wild mammal herbivory was observed. The Mays Creek Fen population is well away from cattle grazing, however, the edges of the community containing the Bowery Hot Springs population is heavily grazed by cattle.

Land ownership: All populations in the study area occur on National Forest land managed by the SNRA.

Land use: Land use in and around the two SNRA populations is as follows: Mays Creek Fen is little disturbed and within the proposed Sawtooth Valley Peatlands Research Natural Area (see Section 2); the Bowery Hot Springs population is grazed by cattle.

ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

Threats to currently known populations: No external threats exist to overall viability in the Sawtooth Valley population. Stochastic population and environmental variables probably have a greater probability of affecting the viability of this small population. We're not sure what affect cattle grazing is having on the *Eleocharis rostellata* community at Bowery Hot Springs.

Recommendations:

- Swamp willow-weed should remain a Forest Service Sensitive Species in Idaho in Region 1 and be added to the Region 4 list due to its rarity.

- The small population of swamp willow-weed in the Sawtooth Valley is in a proposed RNA. The SNRA should move toward establishing this RNA as soon as practicable. We will be preparing a draft establishment record for the Sawtooth Valley Peatlands RNA during early 1994.

- More inventories should be conducted in the East Fork of the Salmon to determine the extent of the swamp willow-weed and especially Jones' primrose in that valley.

NOTE: We feel that our survey was rather thorough (see Appendix 4 for a list of wetlands visited during the survey), but additional swamp willow-weed populations may be found in the area. Land managers and field personnel working in the Sawtooth Valley should be informed of the possible occurrence of this species in their areas. Possible sightings of this plant should be documented by specimens (if the size of the population warrants collecting), and should include both mature fruits and roots. Specimens should be sent to the University of Idaho Herbarium (Department of Biological Sciences, University of Idaho, Moscow 83843) for verification of their identity. Confirmed sightings of this species should be reported to the Idaho CDC for entry into their permanent data base on sensitive species.

SECTION 2

Sawtooth Valley Peatlands

PHYSIOGRAPHIC AND BIOGEOGRAPHIC CONSIDERATIONS

All peatlands found during our 1993 inventory occur along the west side of the Sawtooth Valley (the east base of the Sawtooth Range). None were found on the east side of the valley. This distribution was caused by different patterns of Pleistocene glaciation in the ranges east and west of the valley. The Sawtooth Range was more intensely glaciated, having both extensive alpine glaciers in the mountains as well as piedmont glaciers that came out into the Sawtooth Valley and left behind extensive till deposits. The portion of the White Clouds adjacent to the Sawtooth Valley was not as extensively glaciated and only two drainages originating at high elevations in the core of the White Clouds, Fourth of July Creek and Champion Creek, contained glaciers large enough to reach into the Sawtooth Valley (Williams 1962).

The piedmont moraine belt, that deep mantle of glacial till deposited along the east base of the Sawtooth Range, is the most important physical factor determining the distribution of peatlands in the Sawtooth Valley. We found that valley peatlands occur in two types of landscape positions in this moraine belt. The first is in low-gradient, glacial valleys formed in till of the more recent Pinedale glaciation and containing a creek that originates high in the Sawtooths. Older, Bull Lake-aged glaciers probably also followed these valleys (Williams 1962). Peatlands containing *Carex buxbaumii* and/or *C. livida* near Yellow Belly Lake and between Redfish Lake and Little Redfish Lake are examples of this. The second landscape position is in spring-fed areas on alluvial gravels of Pinedale age or on older Bull Lake moraine deposits. All of these sites are extensively subirrigated by springs, with the groundwater presumably originating as precipitation on the very porous glacial till upslope. These sites generally occur between major valleys formed by the piedmont glaciers. For example, Mays Creek Fen occurs at the source springs for Mays Creek, which lies between the large valleys of Hell Roaring and Yellow Belly creeks.

As mentioned in the introduction, Bursik distinguished two types of peatlands in Idaho, valley peatlands and subalpine peatlands (Bursik 1990). Valley peatlands generally occur around relatively low-elevation lakes and ponds formed by large valley glaciers and icecaps (e.g., Yellowstone Plateau icecap; continental icesheet of the panhandle; and large valley glaciers of the upper South Fork of the Salmon River in the Warm Lake area). Valley peatlands have a high concentration of species with boreal affinities, including many that are rare in Idaho. The subalpine peatlands form in glacial cirques at relatively high elevations in the mountains. They contain predominantly species that are widespread in the western North American cordillera. Few rare plants or rare communities are known from subalpine peatlands in Idaho. Although we place peatlands of the study area in the valley peatland category due to the presence of many boreal species and rare plants, they have a higher proportion of cordilleran species than valley peatlands in Bursik's (1990) study. In other words, they are somewhat intermediate. Boreal species present in the Sawtooth Valley peatlands include *Carex livida, C. buxbaumii, Eleocharis pauciflora, Drosera intermedia, Epilobium palustre, Scirpus caespitosus, Carex aquatilis,* and *Swertia perennis*. Many of these are community dominants. Western cordilleran species include *Gentiana calycosa, Carex cusickii, C. luzulina, Lonicera caerulea, Senecio cymbalarioides,* and *Vaccinium occidentale*.

PEATLAND COMMUNITIES

Habitat classifications based on vegetation can provide land managers with a means to effectively identify, manage, and conserve important habitats (Ferguson et al. 1989). They have been used widely in the terrestrial ecosystems of western North America for the last fifty years (Wellner 1989) and more recently for wetlands and riparian sites (Winward and Padgett 1989). Regional wetland community classifications that include some peatland habitats exist for particular regions of Idaho, Montana, Utah, and Wyoming. Some of the plant associations occurring in valley peatlands in Idaho are treated in these classifications (Tuhy 1981; Tuhy and Jensen 1982; Mutz and Queiroz 1983; Mattson 1984; Youngblood et al. 1985; Hansen et al. 1988b; Padgett et al. 1989; Boggs et al. 1990). These studies, however, were not focused on peatland habitats, and consequently cover only a few of the ecological situations known to occur in valley peatlands of Idaho. Further, all of these studies failed to consider one of the most important components of the community, the structure and composition of bryophyte species.

When the CDC began inventory and research in Idaho's valley peatlands in 1987, we tried to discern repeating patterns of vegetation that could be used in a classification of habitats. This habitat classification was to form the basis for our peatland ecosystem conservation effort (Bursik and Moseley 1992b). We have since come to the conclusion that the only vegetation pattern in the state's valley peatland habitats is that there is no pattern. Typical classification methods would yield a large number of community types of small size occurring in a fine-grained mosaic. Classifications of other wetland systems can yield similar results (Winward and Padgett 1989). In addition, few repeatable units occur over more than just a localized area of the state. Others have also observed that peatland classifications based exclusively on vegetation dominance can be relatively meaningless except in a localized context (Gore 1983; Crum 1988).

Problems with a traditional, vegetation-based classification may result from the relative isolation of valley peatlands in the state. Historical factors relating to initial colonization, and subsequent immigration and local extirpation events caused by landscape processes, result in a valley peatland flora that is highly disjunct, with large inter-peatland variability. We have observed this pattern throughout Idaho, and it was again evident in the Sawtooth Valley. For example, the Mays Creek, Huckleberry Creek, and Bull Moose fens are relatively close together and each contain an extensive subirrigated peat where *Eleocharis pauciflora* is prominent. In Mays and Huckleberry creeks, *Carex livida, C. buxbaumii, Drosera intermedia,* and *Scirpus caespitosus* are prominent members of the community. At Bull Moose Fen, however, only the *Scirpus* is present. The sites appear to be very similar and the reason for this distribution pattern is not clear to us.

Worldwide, peatland classifications appear to be more useful if they are based on a combination of hydrology, water chemistry and nutrient status, and floristics. Peatland classifications in the western United States are based largely on vascular plant floristics, ignoring bryophytes, hydrology, water chemistry, and water nutrient status as classification variables. Worldwide, current classification terminology divides peatlands into two main categories: bogs and fens (Gore 1983). Bogs are peatlands that develop under ombrotrophic conditions in which the water and nutrients are supplied only from precipitation. Water from the mineral soil cannot reach the peat surface either because it is impermeable or because it is above capillary movement. Fens, on the other hand, are peatlands under the influence of mineral-rich ground or surface water. This is termed minerotrophic conditions. Fens are further classified into one of two types based on nutrient status: rich fens and poor fens. Rich fens are high in pH and ion concentrations, while poor fens have low values in both areas.

This scheme conforms well to differences in vegetation and chemistry readily observable in the valley peatlands of Idaho. Idaho has no true bogs, largely because of our relatively arid climate. Small portions of some peatlands in the Priest River valley, Bonner County, may approach being true bogs, but they are relatively minor occurrences. We do, however, have both rich and poor fens. Idaho's rich fens occur only in east-central and eastern Idaho, where calcareous bedrock produces water that is both rich in nutrients and high in pH. Most fens in the state are poor fens because they are underlain by granite or other crystalline rocks that produce water low in nutrients and has either a low or circumneutral pH. All peatlands in the Sawtooth Valley are poor fens.

Within this context, it is still useful to characterize peatland communities at a local level (e.g., Vitt and Bayley 1984; Motzkin and Patterson 1991). Using the floristic classification of Tuhy (1981) and Tuhy and Jensen (1982) the following communities occur in Sawtooth Valley peatlands:

Carex buxbaumii This is a minor peatland type. Many of the characteristics of this community were described in the status review of Buxbaum's sedge in section 1. Its distribution in the study area is shown in Appendix 2. This community can occur either on mineral or peat substrates. Tuhy (1981) described the *Carex buxbaumii-Carex saxatilis* community type from mineral substrates. The community on peat is better described by Mattson (1984) from Yellowstone NP. On peat, *Carex buxbaumii* is usually the dominant with a low cover of other sedges such as *Carex muricata, C. aquatilis, C. oederi* and *C. rostrata*. In the Sawtooth Valley, this community occurs on sedge peat.

Carex rostrata This community is rare in Sawtooth Valley peatlands, occurring as small patches of near monotypic *Carex rostrata*. A few other species occur at low densities in this community. The *Carex rostrata* community is common throughout the northern Rockies and Intermountain region (e.g., Tuhy and Jensen 1982; Youngblood et al. 1985; Padgett et al. 1989; Boggs et al. 1990).

Carex simulata Another uncommon peatland type in the study area, *Carex simulata* dominates this community that is low in species diversity (Tuhy and Jensen 1982). This community is widely distributed in the northern Rocky Mountains and Intermountain regions.

Eleocharis pauciflora A common community in Sawtooth Valley peatlands, *Eleocharis pauciflora* dominates monotypic stands in a mosaic with other turf-forming members of the Cyperaceae, such as *Carex livida* and *Scirpus caespitosus*. This dominance type usually occurs as mats floating on water or muck that tremble when walked on. Few other species are directly associated with *Eleocharis* stands, although the rare sundew, *Drosera intermedia*, is most common in this habitat. See Tuhy and Jensen (1982) for a more detailed description.

Scirpus caespitosus Tuhy (1981) described this as a codominant with *Carex livida* in peatlands of the study area. To be consistent, we are treating it as a separate dominance type that occurs in a mosaic with *Eleocharis pauciflora* and *Carex livida*. *Scirpus caespitosus* forms dense turfs to the exclusion of almost all other species. The distribution of this community is limited in Idaho, occurring only in the Sawtooth Valley (Appendix 2).

Carex livida As mentioned above, Tuhy (1981) described a community in which *Carex livida* is closely associated with *Scirpus caespitosus*. It occurs as a dominance type in a mosaic with *Scirpus* and/or *Eleocharis pauciflora* and is locally common in the study area (Appendix 2).

Betula glandulosa/Lonicera caerulea/Senecio pseudaureus This is not a true peatland community because the organic surface layer is rarely (ever?) greater than 30 cm thick (Tuhy 1981). It is included here because it is the community type for two of our monitoring plots (Section 3) and comprises almost the entire area of the Vat Creek wetland (see below). This community has a characteristically hummocky microtopography, with a brown moss making up a high percentage of the ground cover. Other prominent species include *Salix wolfii, Carex rostrata, Swertia perennis,* and *Potentilla fruticosa*.

Pinus contorta/Vaccinium occidentale This community is characterized by an open stand of *Pinus contorta* with a layer of low shrubs underneath. *Pinus contorta* appears to be regenerating in this community, as evidenced by small saplings, but there are also many standing dead trees keeping the stands relatively open in appearance. *Vaccinium occidentale* is the dominant shrub, but several other shrubs are prominent, including *Ledum glandulosum, Lonicera caerulea, Potentilla fruticosa* and *Betula glandulosa*. *Calamagrostis canadensis* and *Swertia perennis* are frequent herbaceous associates occurring at low density. In some cases *Sphagnum* spp. comprise the peat substrate of this community; the only community in which *Sphagnum* are prominent.

PEATLAND SITES OF HIGH BIODIVERSITY VALUE

The results of our floristic and community inventory of Sawtooth Valley peatlands suggest that several sites are especially significant from a state and regional perspective and deserve special recognition (Bursik and Moseley 1992b). Three sites on the SNRA are recommended for Research Natural Area status, Mays Creek Fen, Huckleberry Creek Fen, and Bull Moose Fen, while Blind Summit Fen on both the SNRA and Challis NF, is recommended as a Special Interest Botanical Area. These proposals are discussed beginning on page 33.

Five other important wetlands sites also deserve recognition as being high quality peatlands containing above average populations of one or more rare plants. Management decisions affecting these areas should be consistent with maintaining the ecological integrity of the sites. Human-caused disturbances to these areas should be minimal. See Appendix 2 for mapped locations of these sites and Appendix 3 for rare plant occurrence records with further information on location, habitat, and population data.

Little Redfish Lake Inlet - One of Tuhy's (1981) study sites for his description of the *Carex buxbaumii-Carex saxatilis* community type. The site contains extensive stands of *Carex buxbaumii* and is included in occurrence 003.

Fen above Stanley Lake - An extensive wetland occurs southwest (upvalley) of Stanley Lake, although it is not directly connected to the main Stanley Lake Creek channel. A portion of the *Carex buxbaumii* 005 population occurs at this site. The fen has high community (beta) diversity.

Hell Roaring Creek - This site encompasses the broad, low-gradient valley bottom of lower Hell Roaring Creek, downstream from Hell Roaring Lake for about 4 mile to where the creek increases in gradient in its last drop before hitting the Salmon River. Extensive populations of *Carex livida* 005 and *Carex buxbaumii* 002 occur in this area, as well as the largest occurrence of the *Scirpus caespitosus* community in Idaho.

Yellow Belly Lake Outlet - An extensive wetland occurs from the outlet of Yellow Belly Lake,

downstream for about 0.5 mile. This broad, shallow-water area roughly follows the channel of the outlet creek. This site contains extensive populations of *Carex livida* 012 and *Carex buxbaumii* 025. A small occurrence of the *Scirpus caespitosus* community also occurs here, which appears to be the southernmost site in the state.

Trap Creek Fen - Located near the northern boundary of the SNRA, Trap Creek Fen contains a small, quaking peatland dominated by *Eleocharis pauciflora* and *Scirpus caespitosus*. *Carex buxbaumii* 026 also occurs here.

Sawtooth Valley Peatlands Research Natural Area - A Proposal

Several wetlands in the Sawtooth Valley have been proposed as Research Natural Areas (RNA) over the years. Chuck Wellner of the Idaho Natural Areas Coordinating Committee, recommended two areas in the Sawtooth Valley for RNA status in the early 1980's. He recommended a small enclosure associated with the old ranger station on Pole Creek and a small area along Alturas Lake Creek. Both recommendations were accepted by the Sawtooth NF and treated in their Forest Plan in 1987. The proposed RNA at Alturas Lake Creek was later dropped due to extensive disturbance to the area from firewood cutting. The Pole Creek Enclosure proposed RNA, which is still viable, contains a small section of the Pole Creek riparian zone that is not grazed by livestock (Hilty and Moseley 1991). No peatland types occur in this area. In the mid-1980's, ecologists began to focus on the unique peatlands of the valley and in 1987, wetlands at Vat Creek and Mays Creek were recommended as RNAs by Lynn Burton, then Range Conservationist for the SNRA. Further inventories in 1989, by Wellner, Susan Bernatas, The Nature Conservancy, and Jenny Carson, SNRA, added the fen at Huckleberry Creek to the list of potential peatland RNAs.

Our inventory is the first to evaluate all the peatlands of the Sawtooth Valley at once. This study, combined with numerous other investigations of Idaho peatlands (Rabe et al. 1986; 1990; Caicco 1987; 1988; Moseley 1989; 1990; 1992; Bursik 1990; 1992a; 1992b; 1993; Moseley et al. 1991; 1992; Bursik and Moseley 1992a; 1992b; 1992c), give us an excellent perspective on the regional and state significance of the Sawtooth Valley sites. We propose a Sawtooth Valley Peatlands RNA comprised of three units: Mays Creek Fen, Huckleberry Creek Fen, and Bull Moose Fen (Appendix 5 and 8). These three sites all represent relatively undisturbed examples of peatlands that occur nowhere else in Idaho. Although they are all peatlands containing some of the same communities, each of the three is different from one another and together encompass much of the range of diversity of peatland habitats in the Sawtooth Valley. Our proposal combines them into one unit for the following reasons: (1) they are all peatlands and fundamentally require similar management considerations; (2) the units are close to each other, all within four miles; and (3) the establishment process will be considerably more efficient, in terms of time and money, if we treat the units as one RNA.

An extensive wetland that forms the headwaters of Vat Creek was one of the original areas recommended for RNA designation in the mid-1980's by Lynn Burton, Chuck Wellner, and others. They recommended it largely because it was a peatland of large size containing a rare community and rare plants (*Scirpus caespitosus* and *Carex livida*). Our inventory found that Vat Creek did not contain any rare plants or rare communities and, in fact, was probably not a peatland. The soil pits we dug had only a shallow organic surface layer. It is still a large area, however. A majority of the wetland supports a continuous expanse of the *Betula glandulosa/Lonicera caerulea/Senecio pseudaureus* community, with minor amounts of *Pinus contorta/Vaccinium occidentale, Carex rostrata, Salix drummondii/Carex rostrata,* and

Deschampsia cespitosa. The *Betula* community is widely scattered throughout the Sawtooth Valley (Tuhy 1981). Extensive past and ongoing disturbances occur within and adjacent to the wetland. Over 13,000 feet of ditches were dug in the 1961 and 1962 to drain the Vat Creek wetland and it has been estimated that at least 100 acres were lost from the wetland because of this (Ecosystem Research Institute and Flo Engineering, Inc. 1992). These ditches were filled in with heavy equipment in the fall of 1992, as part of off-site mitigation for the Grouse Creek Project. A small dam on Vat Creek has been proposed in the past to enhance duck habitat. Roads, timber harvest, firewood cutting, and cattle grazing all occur immediately adjacent to the wetland.

Because of all these factors, we are not recommending that Vat Creek be included in the proposed RNA. We arrived at this decision late in the inventory, after placing a permanent plot in the Vat Creek wetland. Our original study plan called for putting monitoring plots in all three sites that had been proposed as an RNA (Mays Creek, Huckleberry Creek, and Vat Creek) and in The Nature Conservancy easement on Crooked Creek. We later determined that Vat Creek was not as significant as previously thought and that Bull Moose Fen had been overlooked and is, therefore, plotless.

Following is a brief overview of the three proposed RNA units and their significance (see Appendix 5 for maps of the proposed RNA and Appendix 8 for slides of the areas):

MAYS CREEK FEN

Location: Between moraines of Yellow Belly Lake and Hell Roaring Creek, this is the southern and largest unit of the proposed RNA. The Hell Roaring Creek road parallels the northern boundary so access is convenient.

Size: ca. 120 acres

Community/Dominance Types: High community diversity; mosaic of types, replacing each other over relatively short distances. Excellent and extensive examples of the rare *Scirpus caespitosus* and *Carex livida* types and somewhat less of the *Carex buxbaumii*. Other types include *Pinus contorta/Vaccinium occidentale, Carex rostrata* and *Eleocharis pauciflora*.

This fen contains two permanent monitoring plots, 93RM001 and 93RM002, established in 1993 (see Section 3 for further explanation). Plot 93RM001 occurs in a mosaic of *Carex livida, Eleocharis pauciflora,* and *Scirpus caespitosus* types and contains *Drosera intermedia*. Plot 93RM002 is in a nearby hummocky mosaic of *Vaccinium occidentale* and *Betula glandulosa* with some *Pinus contorta*. Physical and chemical attributes of the water and the aquatic macroinvertebrate community were also sampled near the headwater springs and where the creek exits the fen.

Rare Plants: One of three Idaho populations of *Drosera intermedia* 002. Extensive population of *Carex livida* 001 and a somewhat smaller population of *Carex buxbaumii* 027.

Boundary Explanation: On the north, west, and south the boundary follows the edge of the fen; it does not include any upland habitats. On the east it follows the boundary between private land and the National Forest.

Management Comments: The fen is largely undisturbed, although of the three areas, Mays Creek Fen

has the most human activity going on around it. Because the unstable nature of the substrate makes movement into the peatland by livestock and people less than fun, the proposed area is little disturbed. Cattle graze in the vicinity, mostly on the uplands and in the wetland communities with a mineral substrate. We saw little evidence of use in the proposed area. Firewood cutting is extensive along the northern boundary and some dead trees have been hauled out of the peatland a short distance. Again, the unstable nature of the substrate discourages much of this activity and relegates it to near a couple of spur roads along the northern boundary. Some camping in vicinity; none in the proposed RNA.

HUCKLEBERRY CREEK FEN

Location: Between moraines of Hell Roaring and Decker creeks, this is the middle unit of the proposed RNA. It lies about 2.5 miles north of Mays Creek Fen and one mile south of Bull Moose Fen. A road traversing Decker Flat ends within 100 m of the eastern boundary.

Size: ca. 83 acres

Community/Dominance Types: High community diversity; mosaic of types, replacing each other over relatively short distances. Excellent examples of the rare *Scirpus caespitosus*, *Carex livida* and *Carex buxbaumii* types. The area covered by the *Carex buxbaumii* type is similar in size to Mays Creek, while the other two cover less area. What is unique about Huckleberry Creek, however, is that the *Scirpus caespitosus*, *Carex livida*, and *Eleocharis pauciflora* communities occur on steeper slopes and have deeper peat deposits than at Mays Creek, a situation that intuitively seems like it should be reversed. Other types include *Pinus contorta/Vaccinium occidentale, Carex rostrata, Salix drummondii/Carex rostrata, Betula glandulosa, Deschampsia cespitosa,* and *Carex simulata*.

This fen contains two permanent monitoring plots, 93RM003 and 93RM004, established in 1993 (see Section 3 for further explanation). Plot 93RM003 occurs in a mosaic of *Carex livida, Eleocharis pauciflora*, and *Scirpus caespitosus* types and contains *Drosera intermedia*. Plot 93RM004 is in a nearby hummocky mosaic of *Pinus contorta/Vaccinium occidentale* and *Betula glandulosa*. Physical and chemical attributes of the water and the aquatic macroinvertebrate community were also sampled where the creek enters and exits the fen.

Unlike Mays Creek and Bull Moose fens, Huckleberry Creek Fen has a creek that originates above the peatland and traverses the proposed area. Springs occurring within Bull Moose and Mays Creek fens form the source of those two creeks (contrary to what is indicated on the USGS topo quads). It should be noted, however, that Huckleberry Creek is a spring creek and is not directly linked to the high elevation snowpack of the Sawtooth Range. In other words, it is not a dynamic hydrologic system.

Rare Plants: One of three Idaho populations of *Drosera intermedia* 003. Populations of *Carex livida* 014 and *Carex buxbaumii* 028.

Boundary Explanation: Follows the edge of the fen. Does not include any upland habitats.

Management Comments: The fen is largely undisturbed. Cattle graze on Decker Flat, along the eastern boundary, but appear not to wander into the fen. A very old, unmaintained trail parallels the northwest edge of the fen in the forest; it is little used.

BULL MOOSE FEN

Location: Between moraines of Decker and Redfish Lake creeks, this is the northern unit of the proposed RNA. We've named this fen after the Bull Moose Trail, which crosses the head of the area; the creek is unnamed on the topo maps. It lies about one mile north of Huckleberry Creek Fen. The easiest access is via an informal trail (not the Bull Moose Trail) that begins where the Decker Flat Road crosses Decker Creek. The trail goes west, upstream along the creek that drains Bull Moose Fen for about 0.25 mile before exiting the trees into the fen.

Size: ca. 70 acres

Community/Dominance Types: High community diversity. Community types each cover more continuous areas than the other two units. There is an extensive, continuous area containing a mosaic of *Scirpus caespitosus* and *Eleocharis pauciflora* on moderate slopes. A unique feature of this fen is the peat terrace that occurs along the southern boundary. The terrace is 20-30 feet higher than the adjacent part of the fen and contains the source of several spring-fed rivulets that cascade down the face. Other types include *Pinus contorta/Vaccinium occidentale, Carex rostrata, Salix drummondii/Carex rostrata, Betula glandulosa, Deschampsia cespitosa,* and *Carex simulata.*

No permanent monitoring plots were placed in the unit. We discovered this area in September, after our work on permanent plots was finished. Physical and chemical attributes of the water and the aquatic macroinvertebrate community were sampled, however, at the headwater springs and where the creek exits the fen.

Rare Plants: We found no rare plants in this unit, however, the presence of *Scirpus caespitosus* is notable.

Boundary Explanation: Follows the edge of the fen. Does not include any upland habitats.

Management Comments: The fen is largely undisturbed. Cattle graze around the periphery but use there is light and they don't appear to wander into the fen. The Bull Moose Trail traverses the northern extension of the fen for a short distance. This trail is little used, apparently only by hikers and horses.

Blind Summit Fen Special Interest Botanical Area - A Proposal

The largest continuous expanse of peat lies at the headwaters of Marsh and Valley creeks, an area known as Blind Summit. It gets this name because the hydrologic divide between the two creeks is nearly imperceptible. This is an important divide, however, not only because it separates the Middle Fork from the main Salmon River drainage, but because it also is the boundary between the SNRA and the Challis NF. The proposed area is about two miles long and up to 0.3 mile wide and covers about 180 acres. Only a small portion on the eastern end is on the SNRA (20 acres; 11%). Most of the area is covered by the *Eleocharis pauciflora* and *Carex livida* turfs and to a lesser extent by *Scirpus caespitosus*. A majority of the turf is quaking, i.e., it is floating on water or muck and in some places is very unnerving to

walk across. Grounded *Carex simulata* and *Salix wolfii/Carex rostrata* communities cover small areas. *Deschampsia cespitosa* and *Pinus contorta/Vaccinium occidentale* occur at the periphery.

The water that surfaces in this extensive area probably originates in the morainal and glacial outwash features southwest of the fen. The ground water flows downgradient, northeast, through the glacial till until it hits impermeable bedrock and surfaces. The quaking mat of Blind Summit fen, is subirrigated by numerous springs, and parallels the granitic bedrock slopes at the northeastern edge.

Cattle heavily graze the periphery of the peatland, generally in upland areas with a firm mineral substrate. We saw no evidence that they wander much onto the unstable peat substrate. A well-used dirt road follows the northeast side of the fen and impinges on it in a few places. White PCV pipes have been planted in the middle of the fen in at least two places. They looked like a typical mining claim marker, although there was no markings boundary map. Gold mining has taken place nearby in Valley Creek, where there are two patented claims.

Blind Summit Fen is a valley peatland of high biological significance in the state of Idaho. The National Environmental Policy Act of 1970, section 101(b) 3 and 4, declares that it is the responsibility of federal agencies to attain the widest range of beneficial uses of the environment without degradation, risk to health and safety, or other undesirable or unintended consequences, and to preserve important historic, cultural, and natural aspects of our national heritage, maintaining, wherever possible, an environment that supports biological diversity. Special Interest Areas (SIAs) are established on National Forests by the Regional Forester to preserve historically, culturally, and biologically significant areas pursuant to 36 CFR 294.1a. SIAs are addressed in section 2360 of the Forest Service Manual (FSM). The objectives of SIAs, as identified in the FSM, are to protect and, where appropriate, foster public use and enjoyment of areas with scenic, historical, geological, botanical, zoological, paleontological, or other special characteristics. The definition of a Botanical Area, found in FSM 2362.43 and 2372.05 is as follows: a unit of land that contains plant specimens, plant groups, or plant communities that are significant because of their occurrence, habitat, location, life history, ecology, rarity, or other features. FSM 2362.43 also states that an inventory of National Forest land and waters that have such characteristics will be maintained. FSM 2670 also gives direction to National Forests to protect and maintain the habitats of Sensitive Species. We believe that the botanical significance of Blind Summit Fen qualifies it for designation as a Special Interest Botanical Area and that the SNRA and Challis NF should pursue such a designation.

The goal of a Botanical Area designation, which is a recreation designation, is to acknowledge and highlight a special area of the National Forest. The unique botanical features of an area are protected, yet the purpose is also to provide appropriate access and interpretation of these features for public appreciation and enjoyment of the area. The area should have some public access, including a road or trail, and should lend itself to interpretation to the public. Blind Summit Fen fits these goals well (see Appendix 5 for a map of the proposed SIA and Appendix 8 for slides of the area).

REFERENCES FOR SECTIONS 1 & 2

Boggs, K., P. Hansen, R. Pfister, and J. Joy. 1990. Classification and management of riparian and wetland sites in northwestern Montana. Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, MT. 217 p.

Bursik, R.J. 1990. Floristic and phytogeographic analysis of northwestern Rocky Mountain peatlands, U.S.A. Unpublished M.S. Thesis. University of Idaho, Moscow. 37 p.

Bursik, R.J. 1992a. Field investigations of sensitive plant taxa occurring on the Priest Lake Ranger District, Kaniksu National Forest, Idaho Panhandle National Forests. Unpublished report prepared for the Idaho Panhandle National Forests on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise. 141 p., plus appendices.

Bursik, R.J. 1992b. Fen vegetation and rare plant population monitoring in Cow Creek Meadows and Smith Creek Research Natural Area, Selkirk Mountains, Idaho. Unpublished report prepared for the Idaho Panhandle National Forests on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise. 25 p., plus appendices.

Bursik, R.J. 1993. Fen vegetation and rare plant population monitoring in Cow Creek Meadows and Smith Creek Research Natural Area, Selkirk Mountains, Idaho. Prepared for the Bonners Ferry Ranger District, Idaho Panhandle National Forests. 25 p., plus appendix.

Bursik, R. and R.K. Moseley. 1992a. Forty-year changes in Hager Lake Fen, Bonner County, Idaho. Unpublished report for the Idaho Panhandle National Forests on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 31 p., plus appendices.

Bursik, R. and R.K. Moseley. 1992b. Prospectus - Valley peatlands ecosystem project, Idaho. Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 16 p.

Bursik, R. and R.K. Moseley. 1992c. Vegetation and water chemistry monitoring and twenty-year floristic changes at Huff Lake Fen, Kaniksu National Forest. Unpublished report for the Idaho Panhandle National Forests on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 36 p., plus appendices.

Breining, G. 1992. Rising from the bogs. Nature Conservancy (July/August) 24-29.

Britton, N.L., and A. Brown. 1947. An illustrated flora of the northern United States, Canada, and the British possessions. The New York Botanical Garden, Bronx, NY.

Caicco, S.L. 1987. Field investigations of selected sensitive plant species on the Idaho Panhandle National Forest. Unpublished report prepared for the Idaho Panhandle National Forests on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 44 p., plus appendices.

Caicco, S.L. 1988. Studies in the genus *Carex* on the Idaho Panhandle National Forests. Unpublished report for the Idaho Panhandle National Forests on file at: Idaho Department of Fish and Game,

Conservation Data Center, Boise, ID. 31 p., plus appendices.

Cronquist, A. 1969. *Carex*. Pages 220-345 *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.

Crum, H. 1988. A focus on peatlands and peat mosses. University of Michigan Press, Ann Arbor MI. 306 p.

Ecosystems Research Institute and Flo Engineering, Inc. 1992. Proposed wetland mitigation plan for Grouse Creek Project, Custer County, Idaho. Part II. Pinyon Basin Wetlands. Unpublished report prepared for Hecla Mining Company, Stanley, Idaho. Included as pages K-43 through K-63 in Final Supplement Environmental Impact Statement - Volume 2, Appendices, Grouse Creek Project, Challis National Forest, Challis ID.

Federal Committee on Ecological Reserves. 1977. A directory of Research Natural Areas on federal lands of the United States of America. U.S. Forest Service, Washington, DC. 280 p.

Ferguson, D.E., P. Morgan, and F.D. Johnson, compilers. 1989. Proceedings - Land classification based on vegetation: Applications for resource management. General Technical Report INT-257. USDA Forest Service, Intermountain Research Station, Odgen, UT. 315 p.

Glaser, P. 1987. The ecology of patterned boreal peatlands of northern Minnesota: a community profile. U.S. Fish and Wildlife Service Report 85(7.14). 98 p.

Gore, A.J.P. 1983. Introduction. Pages 1-34 *in* A.J.P. Gore (ed.), Ecosystems of the World, Part 4A, Mire: Swamp, Bog, Fen, and Moor. Elsevier, Amsterdam.

Hansen, P.L., S.W. Chadde, and R.D. Pfister. 1988a. Riparian dominance types of Montana. Miscellaneous Publication No. 49, Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, MT. 411 p.

Hansen, P., S. Chadde, R. Pfister, J. Joy, D. Svoboda, J. Pierce, and L. Meyers. 1988b. Riparian site types, habitat types, and community types of southwestern Montana. Montana Riparian Association, School of Forestry, University of Montana, Missoula, MT. 140 p.

Henderson, D.M. 1981. *Carex buxbaumii*. Page 96 *In*: Vascular plant species of concern in Idaho, by the Rare and Endangered Plants Technical Committee of the Idaho Natural Areas Council, Bull. No. 34, Forest, Wildlife and Range Experiment Station, University of Idaho, Moscow.

Hilty, J., and B. Moseley. 1991. Idaho Natural Areas Directory. Idaho Department of Fish and Game, Conservation Data Center, Boise, ID.

Hitchcock, C.L. 1961. *Epilobium*. Pages 473-485 *In*: Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson; Vascular Plants of the Pacific Northwest, Part 3; University of Washington Press, Seattle.

Hitchcock, C.L. 1964. *Drosera*. Page 565 *In*: Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson; Vascular Plants of the Pacific Northwest, Part 2; University of Washington Press, Seattle.

Idaho Native Plant Society. 1993. Results of ninth annual Idaho Rare Plant Conference. Unpublished manuscript; on file at Idaho Department of Fish and Game, Conservation Data Center, Boise.

Lesica, P., G. Moore, K.M. Peterson, and J.H. Rumely. 1984. Vascular plants of limited distribution in Montana. Monograph No. 2, Montana Academy of Sciences, Supplement to the Proceedings, Vol 43. 61 p.

Lesica, P., and J.S. Shelly. 1991. Sensitive, threatened and endangered plants of Montana. Montana Natural Heritage Program, Occasional Publication No. 1. Helena, MT. 88 p.

Mattson, D.J. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park, Wyoming. Unpublished M.S. thesis, University of Idaho, Moscow, ID. 326 p.

Moseley, R.K. 1989. Field investigations of 16 rare plant taxa occurring in wetlands on the Bonners Ferry Ranger District, Idaho Panhandle National Forests. Unpublished report prepared for the Idaho Panhandle National Forests on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise. 75 p., plus appendices.

Moseley, R.K. 1990. Field investigations of eight rare plant taxa occurring in wetlands on the Sandpoint Ranger District, Idaho Panhandle National Forests. Unpublished report prepared for the Idaho Panhandle National Forests on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise. 42 p., plus appendices.

Moseley, R.K. 1992. Ecological and floristic inventory of Birch Creek Fen, Lemhi and Clark counties, Idaho. Unpublished report prepared for the Targhee National Forest on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise. 29 p., plus appendices.

Moseley, R.K., R. Bursik, and M. Mancuso. 1991. Floristic inventory of wetlands in Fremont and Teton counties, Idaho. Unpublished report prepared for the Targhee National Forest on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise. 60 p., plus appendices.

Moseley, R.K., R. Bursik, and P.J. Mehringer. 1992. Paleoecology of peatlands at Huff and Hager lakes, Idaho Panhandle National Forests. Unpublished report prepared for the U.S. Forest Service Intermountain Research Station on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise. 5 p., plus appendix.

Moseley, R.K., and C.G. Groves. 1992. Rare, threatened and endangered plants and animals of Idaho. Idaho Department of Fish and Game, Conservation Data Center, Boise. 38 p.

Motzkin, G.H., and W.A. Patterson. 1991. Vegetation patterns and basin morphometry of a New England moat bog. Rhodora 93:307-321.

Mutz, K.M., and J. Queiroz. 1983. Riparian community classification for the Centennial Mountains and South Fork Salmon River, Idaho. Meiiji Resource Consultants, Layton, UT. 106 p.

Oregon Natural Heritage Program. 1991. Rare, threatened and endangered plants and animals of Oregon. Oregon Natural Heritage Program, Portland, OR. 64 p.

Padgett, W.G., A.P. Youngblood, and A.W. Winward. 1989. Riparian community classification of Utah and southeastern Idaho. R4-Ecol-89-01. USDA, Forest Service, Intermountain Region, Ogden, UT. 191 p.

Rabe, F.W., R.C. Biggam, R.M. Breckenridge, and R.J. Naskali. 1986. A limnological description of selected peatland lakes in Idaho. Journal of the Idaho Academy of Science 22(2):63-90.

Rabe, F.W., R.J. Bursik, and E.B. Cantor. 1990. Classification and monitoring of wetlands in established and proposed Natural Areas. Unpublished report prepared by the University of Idaho for the U.S. Forest Service; on file at Idaho Department of Fish and Game, Conservation Data Center, Boise. 209 p.

Scoggan, H.J. 1978. The Flora of Canada, Part 3. National Museums Natural Sciences Publication in Botany No. 7. National Museums of Canada, Ottawa, Ontario.

Shevok, J.R. 1988. Native plant diversity and special area designations on the National Forests in California. Fremontia 16:21-27.

Small, J.K. 1972. Manual of the Southeastern Flora, Part 1. Hafner Publishing Co., NY.

Smith, J.P., and K. Berg. 1988. Inventory of rare and endangered vascular plants of California, fourth edition. Special Publication No. 1. California Native Plant Society, Sacramento, CA. 168 p.

Spahr, R., L. Armstrong, D. Atwood, and M. Rath. 1991. Threatened, endangered, and sensitive species of the Intermountain Region. USDA Forest Service, Intermountain Region, Ogden, UT.

Tuhy, J.S. 1981. Stream bottom community classification for the Sawtooth Valley, Idaho. Unpublished M.S. Thesis. University of Idaho, Moscow. 230 p.

Tuhy, J.S., S. Jensen. 1982. Riparian classification for the Upper Salmon/Middle Fork Salmon River drainages, Idaho. Smithfield, UT, White Horse Associates. 183 p.

U.S. Forest Service. 1993. Updated Northern Region sensitive species list. Northern Region, Missoula, MT.

U.S. Forest Service. No date. Idaho and Wyoming endangered and sensitive plant field guide. USDA Forest Service, Intermountain Region, Ogden, UT.

Vitt, D.H. and N.G. Slack. 1975. An analysis of the vegetation of *Sphagnum*-dominated kettle-hole bogs in relation to environmental gradients. Canadian Journal of Botany 53:332-359.

Vitt, D.H., and S Bayley. 1984. The vegetation and water chemistry of four oligotrophic basin mires in northwestern Ontario. Canadian Journal of Botany 62:1485-1500.

Washington Natural Heritage Program. 1990. Endangered, threatened and sensitive vascular plants of Washington. Department of Natural Resources, Olympia, WA.

Wellner, C.A. 1989. Classification of habitat types in the western United States. Pages 7-21, *in* D.E. Ferguson, P. Morgan, and F.D. Johnson (compilers); Proceedings - Land classification based on vegetation: Applications for resource management. General Technical Report INT-257. USDA Forest Service, Intermountain Research Station, Odgen, UT.

Williams, P.L. 1962. Glacial geology of Stanley Basin. Pamphlet No. 123. Idaho Bureau of Mines and Geology, Moscow, ID. 29 p.

Winward, A.H., and W.G. Padgett. 1989. Special considerations when classifying riparian areas. Pages 176-179, *in* D.E. Ferguson, P. Morgan, and F.D. Johnson (compilers); Proceedings - Land classification based on vegetation: Applications for resource management. General Technical Report INT-257. USDA Forest Service, Intermountain Research Station, Odgen, UT.

Wyoming Natural Diversity Data Base. 1991. Plant species of special concern. Unpublished manuscript; on file at Idaho Department of Fish and Game, Conservation Data Center, Boise.

Youngblood, A.P., W.G. Padgett, and A.W. Winward. 1985. Riparian community type classification of eastern Idaho - western Wyoming. R4-Ecol-85-01. USDA Forest Service, Intermountain Region, Ogden, UT. 78 p.

SECTION 3

Peatland Monitoring

This section contains a manuscript for submission as a short note to the journal *Wetlands*, the peer-reviewed journal of the Society of Wetland Scientists. The form and style differ from the rest of the report in order to conform with editorial guidelines of the journal. Tables and figures referred to in the text appear at the end of the manuscript.

Copies of the field forms for the six plots are in Appendix 6, as are maps of plot locations. Appendix 8 contains slides of the six plots.

Plot 6, located in The Nature Conservancy easement on Crooked Creek (Appendix 6), is left out of the following discussion because water chemistry and macroinvertebrate samples were not taken. The *Betula glandulosa* community containing the plot at Crooked Creek is not a peatland and had no surface water.

SUMMARY OF RECOMMENDATIONS

Results of our 1993 survey of Sawtooth Valley peatlands have provided a relatively complete regional picture of the distribution, abundance, and habitat relationships of rare peatland plants. Additional populations of some species will certainly be discovered, but existing data provide the basis for, what we believe are informed recommendations on the status and management of the species and their habitats. Our data also suggest that four peatlands of the study area are especially important to the maintenance of regional community diversity and deserve special consideration over and above being rare plant habitats.

Summary of Protection Status of Peatlands of High Biodiversity Value

1. Proposed Sawtooth Valley Peatlands Research Natural Area, with three units (Sawtooth NF):

   Mays Creek Fen
   Huckleberry Creek Fen
   Bull Moose Fen

2. Proposed Blind Summit Fen Special Interest Botanical Area (Sawtooth NF and mostly Challis NF)

3. Five other important wetlands sites deserve recognition as being high quality peatlands containing above average populations of one or more rare plants:

   Little Redfish Lake Inlet
   Fen above Stanley Lake
   Hell Roaring Creek
   Yellow Belly Lake Outlet
   Trap Creek Fen

Summary of Conservation Status Recommendations for Rare Species

1. Currently Intermountain Region Sensitive - No Change.

   a. *Carex buxbaumii*

2. Recommended additions to the Intermountain Region Sensitive List.

   a. *Carex livida* (known from Sawtooth and Boise NFs; within 1 mile of Targhee NF)
   b. *Drosera intermedia* (known from Sawtooth NF)
   c. *Epilobium palustre* (known from Sawtooth and Targhee NFs)

3. *Scirpus caespitosus* is not treated as a rare plant, but its entire Idaho distribution in within the Sawtooth Valley.

Other General Recommendations

1. The inventory of Idaho's valley peatlands is nearly complete. Only three areas of the state remain:

    a. The upper Middle Fork Salmon valleys of the Challis and Boise NFs (Marsh Creek - Cape Horn - Bull Trout Lake - Bear Valley area)

    b. The upper South Fork Salmon drainage of the Boise NF (Warm Lake area).

    c. Upper North Fork of the Payette River drainage, especially in the vicinity of the Lake Fork *Carex buxbaumii* population. Possibly also in the upper Secesh River in the Burgdorf area. Both of these areas are on the Payette NF.

2. Collect new vegetation, water chemistry, and aquatic macroinvertebrate data from permanently marked monitoring stations on a 10-year basis.

APPENDIX 1

Line drawings of *Carex buxbaumii*[*], *Carex livida*[*], *Drosera intermedia*[**], *Epilobium palustre*[*], and *Scirpus caespitosus*[*].

[*]From: C.L. Hitchcock, A. Cronquist, M. Ownbey, and J.W. Thompson. 1959-1969. Vascular Plants of the Pacific Northwest: Parts 1-4. University of Washington Press, Seattle.

[**] From Britton and Brown (1947)

APPENDIX 2

Distribution of *Carex buxbaumii*, *Carex livida*, *Drosera intermedia*, *Epilobium palustre*, and *Scirpus caespitosus* in the Sawtooth Valley.

Map 1. *Carex buxbaumii* 022, Alturas Lake Creek. Portions of the Alturas Lake 1963 and Snowyside Peak 1964 7.5' USGS quadrangles.

Map 2. *Carex buxbaumii* 001, Pettit Lake Creek. Portion of the Alturas Lake 1963 7.5' USGS quadrangle.

Map 3. *Carex buxbaumii* 024, McDonald Lake. Portion of the Snowyside Peak 1964 7.5' USGS quadrangle.

Map 4. *Carex buxbaumii* 025, *Scirpus caespitosus*, *Carex livida* 012 at Yellow Belly Lake; *Carex buxbaumii* 027, *Scirpus caespitosus*, *Carex livida* 001, *Drosera intermedia* 002, *Epilobium palustre* 017 at Mays Creek; *Carex buxbaumii* 002, *Scirpus caespitosus*, *Carex livida* 005 along Hell Roaring Creek, which is continued on Map 5. Portion of the Obsidian 1963 7.5' USGS quadrangle.

Map 5. *Carex buxbaumii* 002, *Scirpus caespitosus*, *Carex livida* 005 along Hell Roaring Creek, which is a continuation of Map 4. Portion of the Mt. Cramer 1963 7.5' USGS quadrangle.

Map 6. *Scirpus caespitosus* at Bull Moose Fen; *Carex buxbaumii* 028, *Scirpus caespitosus*, *Carex livida* 014, *Drosera intermedia* 003 at Huckleberry Creek. Portion of the Mt. Cramer 1963 7.5' USGS quadrangle.

Map 7. *Scirpus caespitosus* along upper Redfish Lake Creek and "Saddleback" Creek. Portion of the Mt. Cramer 1963 7.5' USGS quadrangle.

Map 8. *Carex buxbaumii* 003 along lower Redfish Lake Creek. Portion of the Stanley 1963 7.5' USGS quadrangle.

Map 9. *Carex livida* 015 at Iron Creek Campground. Portion of the Stanley Lake 1972 7.5' USGS quadrangle.

Map 10. *Carex buxbaumii* 005, *Carex livida* 002 in the Stanley Lake area. Portions of the Stanley Lake 1972 and Elk Meadow 1972 7.5' USGS quadrangles.

Map 11. *Carex buxbaumii* 010, *Carex livida* 004, *Scirpus caespitosus* at Blind Summit Fen; *Carex buxbaumii* 026, *Scirpus caespitosus* at Trap Creek Fen; *Carex livida* 006 at Meadow Creek. Portion of the Elk Meadow 1972 7.5' USGS quadrangle.

APPENDIX 3

Occurrence records from the Conservation Data Center for *Carex buxbaumii*, *Carex livida*, *Drosera intermedia*, and *Epilobium palustre*.

NOT INCLUDED IN THE CDC HOME PAGE VERSION OF THIS REPORT

APPENDIX 4

List of wetlands inventoried in the Sawtooth Valley
during August, September, and October, 1993
(roughly arranged from south to north).

Alturas Lake Creek/Alturas Lake/Perkins Lake
Vat Creek
Pettit Lake Creek/Pettit Lake
Yellow Belly Lake Creek/Yellow Belly Lake/McDonald Lake
Mays Creek
Hell Roaring Creek
Huckleberry Creek
Bull Moose "Creek"
Elk Meadow (between Bull Moose Trail and Redfish Lake Creek)
Upper Redfish Lake Creek (above Redfish Lake)
Lower Redfish Lake Creek (below Redfish Lake)
Iron Creek
Crooked Creek
Stanley Lake Creek (above and below lake)
Dry Creek
Park Creek
Elk Creek/Elk Meadow
Meadow Creek
Trap Creek
Blind Summit

APPENDIX 5

Maps of proposed Sawtooth Valley Peatlands RNA and Blind Summit Fen SIA.

Map 1. Mays Creek Fen unit. Portion of the Obsidian 1963 7.5' USGS quadrangle.
Map 2. Huckleberry Creek Fen and Bull Moose Fen units. Portion of the Obsidian 1963 and Mt. Cramer 1963 7.5' USGS quadrangle.
Map 3. Blind Summit Fen SIA. Portion of the Elk Meadow 1972 7.5' USGS quadrangle.

APPENDIX 6

Location maps and plot forms
from six permanent plots in the Sawtooth Valley.

PLOT FORMS AND LOCATION MAPS NOT INCLUDED IN ALL COPIES
(saving paper)

APPENDIX 7

Slides of rare plants and their habitats.

Slide 1. Close-up of the inflorescence of *Carex buxbaumii*.
Slide 2. Early-season view of habitat of *Carex buxbaumii* along Hell Roaring Creek.
Slide 3. Close-up of *Carex livida*.
Slide 4. *Carex livida* habitat below Yellow Belly Lake.
Slide 5. Close-up of *Drosera intermedia*; note red glandular hairs and developing fruit.
Slide 6. Habitat of *Drosera intermedia*; the reddish ground cover among the *Scirpus caespitosus* is the sundew.
Slide 7. Close-up of *Epilobium palustre*; note grayish cast and in-rolled leaf margins.
Slide 8. *Epilobium palustre* in *Carex nebraskensis* patch at Bowery Hot Spring.
Slide 9. *Scirpus caespitosus*, characteristically growing in dense tufts.

APPENDIX 8

Slides of the proposed Sawtooth Valley Peatlands RNA and
Blind Summit Fen SIA and the six permanent monitoring plots.

Slide 1. Overview of Mays Creek Fen from air looking southeast. Permanent plots are in the center of the photo.
Slide 2. Mays Creek Fen - Plot 1 (93RM001) in *Scirpus caespitosus - Carex livida* mosaic; looking northwest across the plot.
Slide 3. Mays Creek Fen - Plot 2 (93RM002) in *Vaccinium occidentale-Betula glandulosa* mosaic; looking northwest across the plot.
Slide 4. Overview of Huckleberry Creek Fen from air looking west; Decker Flat is in bottom of photo. Permanent plots are in lobe of fen in upper center of the photo.
Slide 5. Huckleberry Creek Fen - Plot 3 (93RM003) in *Scirpus caespitosus - Vaccinium occidentale* mosaic; looking northwest across the plot.
Slide 6. Huckleberry Creek Fen - Plot 4 (93RM004) in *Scirpus caespitosus - Carex livida* mosaic; looking northwest across the plot.
Slide 7. Overview of Bull Moose Fen from air looking south; Decker Flat is on left in distance.
Slide 8. Face of peat terrace in upper part of Bull Moose Fen; looking east.
Slide 9. Overview of Blind Summit Fen from air looking south; Highway 21 is in upper right corner.
Slide 10. Extensive quaking peat mat in the middle of Blind Summit Fen.
Slide 11. Vat Creek - Plot 5 (93RM005) in *Betula glandulosa-Lonicera caerulea- Senecio pseudaureus* community; looking west across plot.
Slide 12. Crooked Creek Fen - Plot 6 (93RM006) in *Betula glandulosa* community; looking northeast across the plot.