FEN VEGETATION AND RARE PLANT POPULATION MONITORING IN COW CREEK MEADOWS AND SMITH CREEK RESEARCH NATURAL AREA, SELKIRK MOUNTAINS, IDAHO.

by

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ABSTRACT

Botanical exploration has revealed that Cow Creek Meadows, on the east slope of the Selkirk Mountains, Idaho, are of extraordinary biodiversity value. Seven rare plant populations are known from the meadows along with one rare animal. In addition, grizzly bear and woodland caribou are known to use the drainage during parts of the year.

Human activities in the form of cattle grazing, logging, and road building have had an impact on the meadows and are seen as a potential threat to the sensitive plant and animal populations that occur there. In 1992, Idaho Fish and Game's Conservation Data Center and Bonners Ferry Ranger District, Idaho Panhandle National Forests, entered into a cooperative agreement to establish monitoring plots in fen habitats of Cow Creek Meadows and Smith Creek RNA to ascertain whether logging and cattle grazing are having negative effects on the sensitive plant populations in Cow Creek Meadows. Smith Creek RNA is the control area for this study.

Nine ECODATA plots were placed in the Cow Creek Meadows and four were placed in Smith Creek RNA. An inventory of the vascular and bryophyte floras were made in each area. One hundred and one vascular and bryophyte species occur in the Cow Creek Meadows, making it one of the most floristically diverse peatland systems in Idaho.

Reanalysis of Cover Microplot data for each ECODATA plot is recommended at three- to four-year intervals over the next 20 years or more to assess population and habitat trends. Management recommendations are made, including a proposal to establish Cow Creek Meadows as a Special Interest Botanical Area.

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INTRODUCTION

Studies of the vascular peatland flora of the northwestern Rocky Mountains of the U.S., particularly in northern Idaho, indicate that it is unique compared with regional peatland floras elsewhere in North America (Bursik 1990). This is due to the commingling of a number of widespread western cordilleran species, distributed throughout peatlands in the Rocky Mountains, along with boreal species, which occur in peatlands throughout the Northern Hemisphere. It is the disjunct populations of the boreal species, whose ranges extend south only into the northern tier of the United States, that are of greatest conservation concern in Idaho.

Peatlands are distributed throughout much of Idaho, although their occurrence on the landscape is quite rare. Roughly 12% of Idaho's rare vascular flora is restricted to peatland habitats, as is one rare mammal, the bog lemming (Synaptomys borealis) (Moseley and Groves 1992).

Recent exploration of peatlands in northern Idaho has resulted in the discovery of new state records of vascular species and significant range extensions of others (Moseley 1989; Bursik 1990; 1992). The rarest of these newly discovered species are restricted to one or two sites in Idaho, and in some cases in the entire Pacific Northwest. Peatlands with high concentrations of rare species deserve special status in recognition of their biodiversity value. To date, only a few of the highest priority peatlands in Idaho have been recognized and protected through special land management designations (e.g., Kaniksu Marsh RNA, Bottle Lake RNA, Potholes RNA, and Smith Creek RNA).

During 1992, the Idaho Conservation Data Center (CDC) in cooperation with the Idaho Panhandle National Forest undertook two vegetation studies to reanalyze the flora, vegetation, and water chemistries of two peatlands on the Priest Lake Ranger District, Hager Lake Fen and Huff Lake Fen, which had previously been studied to varying degrees (Rumely 1956; Karg 1973). In both cases significant floristic changes were documented. Fourteen species disappeared from Hager Lake Fen during the last 40 years, including four state rare and Forest Service Sensitive species (Bursik and Moseley 1992a). Thirteen species, including two Forest Service Sensitive Species, disappeared from Huff Lake Fen during the last 20 years (Bursik and Moseley 1992b). Changes in the distribution and abundance of vascular species within Hager Lake Fen were also documented.

Human impacts have been profound in the areas surrounding the two fens. Hager Lake Fen has been directly impacted by illegal ditching and draining, which occurred as recently as 1988. Vegetation changes, however, were equally profound on the floating sphagnum mat, which is immune to slight hydrological fluctuations because it can adjust to changing water levels. Logging, road

building, and grazing in the basin surrounding the fens, particularly prior to 1950, have likely influenced changes on the floating mat. These activities increased nutrient runoff into the fen communities. Higher nutrient content of waters favored species adapted to minerotrophic conditions while peatland species adapted to nutrient-poor conditions were outcompeted (Bursik and Moseley 1992a).

Considering the changes documented at Hager Lake Fen and Huff Lake Fen over the last several decades, initiation of baseline monitoring of the Cow Creek Meadows (CCM) fen communities is timely. Cow Creek Meadows have been affected by the same suite of human impacts (grazing, logging, wildfire, and road building) during the last several decades. Although no previous data have been gathered for the CCM fen communities, over time, we will be able to ascertain any changes that might be attributed to the above activities or events.

Few vegetation classifications exist for peatland communities in the Pacific Northwest. Several regional wetland classifications, including one for northwestern Montana (Boggs et al. 1990), apply to the northern Idaho, but have failed to adequately classify peatland communities. The CDC is hoping to accomplish a state-wide comprehensive peatland classification during the next several years (Bursik and Moseley 1992c). Projects such as this monitoring study contribute toward accomplishing this goal.

STUDY OBJECTIVES

Botanical exploration in the Cow Creek drainage has revealed it to be of great biodiversity value. The peatland (fen) communities along the low-gradient, subalpine stream harbor numerous boreal species considered sensitive in Idaho (Moseley and Groves 1992; USDA Forest Service 1991). Recent botanical discoveries in CCM, including the location of the only population of Scirpus hudsonianus (Hudson's Bay bulrush) outside of Glacier National Park in the Pacific Northwest of the U.S., have raised concern over the potential impact of cattle grazing, road building, and logging on the fen communities and their sensitive plant populations.

In 1992, Idaho Fish and Game's Conservation Data Center and the Bonners Ferry Ranger District, Idaho Panhandle National Forest, entered into an agreement to establish a long-term monitoring program within fen communities in CCM to ascertain effects of cattle grazing and timber harvest on sensitive plant populations. This initial work also serves as a baseline inventory for an establishment report to designate CCM as a Special Interest Botanical Area.

The purposes of this study were to:

(1) inventory the vascular and bryophyte flora of fen communities in CCM;

(2) establish long-term, baseline vegetation monitoring plots in fen communities at CCM and at Smith Creek Research Natural Area, as a control;

(3) make management recommendations to the U.S. Forest Service based on preliminary data gathered in 1992, to assure the long-term viability of sensitive plant populations in CCM;

(4) provide a protocol for future data gathering in permanent vegetation plots for the purpose of effects-monitoring; and

(5) recommend appropriate designation of CCM in recognition of its unique phytogeographic attributes and biodiversity value.

STUDY AREA

The Selkirk Mountains run north-south, extending from Lake Pend Oreille in the Idaho panhandle, north well into British Columbia, Canada. Cow Creek Meadows lie on the eastern slope of the Selkirks, a few miles south of the Canadian border. The peaks of the Selkirks are primarily of granitic origin and rise to more than 7000 feet. Several low-gradient streams drain the glacial valleys between the peaks. Peat deposits greater than 16 inches deep (Histosols) are common along many of these streams, including Bog Creek, Grass Creek, Cow Creek, and Smith Creek. The peat deposits along the low-gradient, middle reaches of Cow Creek overlay sandy alluvial deposits. Some of the wetland communities described for CCM, notably the Deschampsia cespitosa/Danthonia intermedia/Calamagrostis canadensis meadows, occur on shallow peat deposits that constitute histic epipedons lying over what are classified as Entisols (Stevens and Bursik 1990). Most fen communities occur on Histosols and are dominated by sphagnum mosses and sedges. The sphagnum-dominated fens harbor all of the sensitive plant populations in the drainage.

The climate of extreme northern Idaho has been described as "inland maritime" due to the prevailing westerlies which carry maritime air masses from the northern Pacific Ocean to the northern Rocky Mountains during the winter and spring (Cooper et al. 1987). Most precipitation falls as snow in the winter, while summers are relatively dry, although summer precipitation increases with increasing elevation in the region.

Upland moist- to wet-forest habitats adjacent to CCM are dominated by subalpine fir (Abies lasiocarpa), Engelmann spruce (Picea engelmannii), and lodgepole pine (Pinus contorta) at the middle

and upper meadows with some cedar (Thuja plicata) and western hemlock (Tsuga heterophylla) in the lower portions of CCM, particularly in areas near the bridge over Cow Creek on FS Road 2545. The lush understories are characterized by huckleberry (Vaccinium membranaceum), fool's huckleberry (Menziesia ferruginea), queen-cup bead lily (Clintonia uniflora), and oakfern (Gymnocarpium dryopteris). Depending on the microclimate, these forests are either hemlock or subalpine fir habitat types (Cooper et al. 1987).

Fen meadows occur over a stretch of nearly 3 miles along Cow Creek (Figure 1). Scattered meadows are found near the bridge over Cow Creek on FS Road 2545 (Beaver Creek Road) in the SW 1/4, section 4, T64N, R3W, southwest to the extreme NE 1/4, section 13, T64N, R4W. The fen communities along Cow Creek Meadows range in elevation from 4100 to approximately 4300 feet. The majority of the permanent monitoring plots are located in the NE 1/4 of section 7, T64N, R3E, an area commonly referred to as the Cow Camp. The area around the Cow Camp has the greatest concentration of fen communities and rare plant populations and forms the heart of the CCM proposed Special Interest Botanical Area.

Similar fen and other wetland plant communities occur in Smith Creek Research Natural Area (SCRNA), which lies approximately two air miles south and east of Cow Creek. We placed permanent control plots within fen communities in the RNA (Figure 2). These plots are located just northwest of the West Fork Cabin. Most of the plots are at an elevation of 4750 feet above sea level, slightly higher than plots placed in CCM.

METHODS

Field work was carried out from June to September, 1992. Nine ECODATA (U.S. Forest Service 1992) plots were placed in fen communities in CCM and four were placed in fen communities in SCRNA. The General Form, Location Linkage, and the Cover Microplot forms were completed for each plot. Each macroplot measured 66 feet square. Thirty-five 10 x 20 inch (25 cm x 50 cm) microplots were located along five randomly located transects (seven microplots per transect) that ran upslope, perpendicular to the permanently marked baseline. The baseline for each macroplot ran perpendicular to the slope and was on the downslope side of the plot. Direction of the slope was estimated with a compass. This determined the upslope plot corner points

figure 1

figure 2

in the macroplot once one of the baseline corners was located. Two metal posts, spray-painted orange and pounded to within 30 inches of the substrate surface serve as permanent markers for each macroplot.

Ideally, ECODATA plots are placed within uniform stands of vegetation (USDA Forest Service 1992). This was generally not possible in this study, given the size of the macroplots and the microhabitat diversity in the fen communities. I intentionally left the macroplots the size recommended in the ECODATA manual for permanent monitoring plots, rather than decreasing the size, for several reasons. First, the temporal and spacial relationships of the various vegetation types observed within the fens of Cow Creek and Smith Creek have yet to be determined. Communities are likely separated spatially by hydrological, chemical, edaphic, and perhaps other identifiable environmental gradients. No research has been done locally to verify which of these gradients is most important. The relationship of the community types to one another temporally (successionally) is even less known. Given this, I thought it best to locate the macroplots primarily within a particular vegetation type, realizing that with the mosaic pattern of the different community types in the meadows at large, there would be inclusion of lobes of different "types" within each macroplot. This is particularly true of the majority of macroplots which were located within sphagnum-dominated fen communities. In the interest of future data gathering, keeping track of fewer, larger plots seemed far less daunting than numerous smaller plots. These plots may be less valuable for classification work because they are not entirely "uniform".

Rooted frequency and percent cover were measured according to updated ECODATA techniques (USDA Forest Service 1992). A full list of vascular and bryophyte species was compiled for each macroplot. Time restrictions and delays in updating ECODATA data entry techniques prevented me from entering ECODATA plot data into the Data General in 1992. The data forms are on file at the CDC office in Boise, with Jill Blake, Botanist for the Idaho Panhandle National Forest, and with me. By the end of 1993, copies will also be made and filed with the Bonners Ferry Ranger District. Photograph vouchers were taken of each plot for documentation. These photo vouchers, which will be used for future comparisons, are on file at Idaho Fish and Game's Conservation Data Center.

Voucher specimens were collected for vascular and bryophyte species in CCM and SCRNA. Vascular specimens are deposited in the University of Idaho Vascular Herbarium (ID). Bryophyte specimens were identified by John Christy of the Oregon Natural Heritage Program and are deposited in the Oregon State University Cryptogam Herbarium (OSU). I also plan to deposit duplicate specimens in the University of Idaho Cryptogam Herbarium (ID).

RESULTS AND DISCUSSION

FLORA

One hundred and one plant species were documented in CCM. This included 11 bryophyte and 90 vascular species (Table 1). This flora is nearly complete for vascular species and is surely incomplete for the bryophytes. Indeed, not all bryophytes collected during 1992 had been identified at the time of writing this document, so the bryophyte species list is sure to grow. The same can be said of the flora of fen communities in SCRNA where we documented 72 species, including 13 bryophytes and 59 vascular species (Table 1). The only upland species included in the list are those which occurred incidentally in ECODATA plots, usually on slightly raised "islands" associated with old stumps.

The fact that there are far more species in the CCM than in fen communities in SCRNA is likely due to the greater habitat diversity found in CCM. Several communities, such as the meadows dominated by Deschampsia cespitosa and Danthonia intermedia, both of which occur in more xeric habitats than fen communities, are found in CCM, but are found only in localized microsites in SCRNA. The Carex vesicaria/C. utriculata fen communities that thrive in the shallow standing water of ephemeral pools are not found in SCRNA, but occur extensively in CCM. There is also a unique phase of the Carex scopulorum sedge fen in CCM associated with formerly timbered areas burned during the Trapper Peak Fire of 1967. Elevation differences between the two areas may also contribute to differences in habitat and floristic diversity.

Both of these peatland systems would be somewhat transitional between the Valley Peatlands and the Subalpine Peatlands described by Bursik (1990) based on vascular floristics. SCRNA is a Subalpine Peatland according to a cluster analysis done to compare 32 peatlands throughout the northern Rocky Mountains based on their vascular floras (Bursik 1990). It was, however, clearly somewhat transitional, with more boreal species than the majority of Subalpine Peatlands.

CCM was not part of my thesis study. Given the vascular flora of CCM, it appears to be transitional and would possibly be more similar to Valley Peatlands due to the large number of boreal species, including those more typically restricted to Valley Peatlands (e.g., Carex leptalea, C. canescens, Drosera anglica, D. rotundifolia, Lycopodium inundatum).

table 1 pages 9, 10, 11, 12 - see back of this file for table

RARE VASCULAR FLORA

Seven vascular plant species, considered rare in Idaho, are present in CCM (U.S. Forest Service 1991; Moseley and Groves 1992). Four rare species occur in SCRNA, including three species that also occur in CCM. The following is a list of rare species, including their range in Idaho and the significance and status of populations in CCM and SCRNA. See Appendix 1 for line drawings of these species.

Carex buxbaumii Wahl. Buxbaum's sedge ranges throughout the boreal regions of the northern hemisphere where it commonly occurs in fen peatlands. It is known from four widely disjunct portions of Idaho: 1) Island Park (Fremont County), in the Henry's Lake and Yellowstone National Park region where seven populations are known; 2) the Sawtooth Valley (Blaine and Custer counties) where there are five small populations; 3) Tule Lake (Valley County) where one population is known; and 4) in Bonner and Boundary counties, mostly on the Priest Lake and Bonners Ferry RD of the Idaho Panhandle NF, where eight populations are known (Bursik 1992). The population of Buxbaum's sedge in CCM is relatively small, consisting of several (I have observed two) scattered rhizomatous clumps of less than 15 genetically different individuals (Plot 006 includes part of one of these rhizomatous patches; the other patch occurs just west of Plot 001).

Carex flava L. Yellow sedge is a boreal disjunct species usually found with common fen species (e.g., Carex lasiocarpa and Sphagnum spp.) in the northern Rocky Mountains, particularly in Valley Peatlands. Yellow sedge is rare in Idaho and Washington. It is known from 14 sites in six disjunct regions of Idaho: 1) five sites in the Moyie Springs area of extreme northeastern Idaho; 2) Fleming Creek in the Kootenai River Valley; 3) two sites in the Naples area in northern Idaho (Sand Lake and Beaver Lake); 4) Hoodoo Lake, southeast of Priest River; 5) along the northwest shore of Priest Lake in Tule Bay; 6) two sites in the Sawtooth Range in central Idaho; and 7) along low-gradient creeks in the Bog Creek and Cow Creek drainages in the Selkirk Mountains near the Canadian border (Bursik 1992). Most of these populations are very small, consisting of no more than 100 individuals. The CCM population was located by Craig Norris and Paul Sieracki in the late 1980's. We could not relocate it during 1992 despite rather extensive reconnaissance of meadows throughout the drainage. It is entirely possible that we missed it, but clearly, if extant the population of yellow sedge in CCM is very small and localized.

Carex leptalea Wahl. Bristle-stalked sedge is a boreal species of sphagnum bogs, swamps, lake shores, and wet, low ground from lowlands to moderate elevations. Prior to 1992, bristle-stalked sedge was known only from Valley Peatland ecosystems in the Priest River Valley and at Perkins Lake in the Moyie Springs area on the Bonners Ferry RD. Five populations are known from the Priest Lake

area on the Priest Lake RD (Bursik 1992). The CCM population of bristle-stalked sedge was found in two disjunct locations in fen habitats along the creek. It is found in several small fens surrounded by lodgepole pine and Engelmann spruce stands just upstream from the bridge over Cow Creek on the Beaver Creek Road 2545 (Plot 009). It is also located just south and east of the Cow Camp in a sloped fen meadow with Betula glandulosa, Carex scopulorum, and Eriophorum polystachion (Plot 004). The bristle-stalked sedge population covers a small area overall in CCM, but the plants have formed a rather dense rhizomatous patch where they occur, making it somewhat prominent locally. The CCM population of bristle-stalked sedge occurs at an elevation nearly 2000 ft higher than the other known populations in Idaho.

Carex paupercula Michx. Poor sedge is distributed in peatlands and swamps throughout the boreal regions of the Northern Hemisphere. Its occurrence is rare throughout the northern Rocky Mountains and it is considered rare in Idaho, Washington, and Montana (Bursik 1992). Ten populations of poor sedge are documented in Idaho; seven in the Priest River Valley, including six on the Priest Lake RD, and three populations on the Bonners Ferry RD. All populations in the Priest River Valley are at relatively low elevation Valley Peatland locations (2300 to 3000 ft) while the three Bonners Ferry RD populations are found in subalpine habitats along low-gradient streams in the adjacent Smith Creek (in SCRNA), Cow Creek, and Grass Creek drainages at elevations between 3800 and 4800 ft in the Selkirk Mountains. Poor sedge is found in fen habitats throughout CCM and SCRNA and is the most widespread and abundant rare species within these areas (Plots 001, 004, 005, 006, 007, 008, 009 in CCM and 010, 011, 012, 013 in SCRNA). The three Selkirk populations are the largest of the ten poor sedge populations in Idaho, both in terms of size and in terms of numbers of individuals.

Drosera intermedia Hayne Intermediate sundew is a boreal species of bogs and fens. Prior to 1992, it was not known from the Pacific Northwestern U.S. I found a rather dense but localized population of several hundred individuals in the SCRNA while doing this study. Two ECODATA plots were located partially within this population (011 and 012). Although I and other botanists had previously visited SCRNA, no one had recognized the individuals of intermediate sundew as being different than the individuals of long-leaf sundew (Drosera anglica), which also occurs in SCRNA. Both round-leaf sundew (Drosera rotundifolia) and long-leaf sundew occur in CCM. The discovery of intermediate sundew represents yet another recent state record in the vascular peatland flora in Idaho (see also Moseley 1989; Bursik 1990; Moseley et al. 1991; Bursik 1992).

Lycopodium inundatum L. Northern bog clubmoss is distributed throughout boreal and parts of temperate North America. In Idaho, northern bog clubmoss is known from seven sites in Bonner and Boundary counties and two sites in Yellowstone National Park in Idaho. Northern bog clubmoss is associated with sphagnum-dominated peatland habitats, usually on floating mats (Bursik 1992). The other eight populations of northern bog clubmoss occur at relatively low elevation Valley Peatlands. In 1992, I discovered a population of northern bog clubmoss in CCM (at 4250 ft). This population consists of about 50 individuals covering perhaps 200 ft^2. Nearly the entire population is contained within Plot 005. This is one of the smallest of the rare plant populations in CCM, both in area and number of individuals. Interestingly, the fen habitat containing northern bog clubmoss (Plot 005) was also the only place where round-leaf sundew was observed in CCM.

Lycopodium sitchense Rupr. Sitka clubmoss is a boreal species of moist woodland and wetland habitats. It is known from three recently documented sites in Boundary County on the Bonners Ferry RD and from one population in the Selway-Bitterroot Wilderness in Idaho County. A small population was discovered in SCRNA in 1992, during this study (Plot 010). This is a very small population of perhaps 15 rhizomatous individuals.

Scirpus hudsonianus (Michx.) Fern. Hudson's Bay bulrush is a circumboreal species common in sphagnum bogs in boreal North America. It also ranges south to the northern tier of the United States in the northeast and midwest. In the western U.S., populations of Hudson's Bay bulrush are known from Glacier National Park and from CCM in northern Idaho (the only known Idaho population). Jill Blake, botanist for the Idaho Panhandle National Forest, and I first found Hudson's Bay bulrush in CCM while doing sensitive plant clearance work in the area in 1991. The population consists of three small patches of plants occurring in sphagnum-dominated habitats in the vicinity of the Cow Camp on both sides of Cow Creek. Each of these subpopulations, which cover approximately 1000 ft^2 each, was included within ECODATA plots (001, 006, and 007). Plot 007 is on a slope of nearly 9%, fed by perennial springs just upslope. No more than 250 rhizomatous individuals of Hudson's Bay bulrush were observed within CCM. At least one of the subpopulations had been partially trampled by a troupe of cows during 1992 (Plot 007).

Trientalis arctica Fisch. Northern starflower is a western boreal species that ranges south into temperate latitudes in Washington, Oregon, and Idaho. Twenty-three populations of northern starflower are known from northern Idaho; 15 in the Priest River Valley and eight from low-gradient streams of the Selkirk crest on the Bonners Ferry RD. Northern starflower is found scattered throughout fen communities of CCM and SCRNA. Its constancy in appropriate habitats is second only to poor sedge in

these drainages. Although consistently found in sphagnum-dominated fen habitats in these meadows, it never occurs in high numbers or dense concentrations as I have occasionally observed at low-elevation locations in Idaho.

RARE, THREATENED AND ENDANGERED FAUNA

The CCM and SCRNA contain the only recently documented populations of the northern bog lemming (Synaptomys borealis), a state rare species, in Idaho (Groves and Yensen 1989; Johnson 1991). The federally threatened woodland caribou (Rangifer tarandus ssp. caribou) and the federally endangered grizzly bear (Ursus arctos) are also known to use CCM during part of the year. Although this study is focused on rare plant populations and wetland vegetation, the appropriate management of the plant resources within CCM will surely translate into appropriate management of rare, threatened, and endangered animal populations there as well.

PEATLAND AND WETLAND VEGETATION

Sphagnum-dominated Fen Communities. The sphagnum-dominated fen communities of the CCM and SCRNA contain all of the rare plant populations known to occur there. Although moss identification has not yet been completed, several moss species, including Sphagnum teres, S. subsecundum, S. centrale, S. russowii, Aulocomnium palustre, and Calliergon stramineum are prominent with high constancy in the plots (Table 1). Prominent vascular species in these communities include Eriophorum polystachion, Carex muricata, C. paupercula, C. scopulorum, Eleocharis pauciflora, Ligusticum canbyi, Agrostis scabra, and Calamagrostis canadensis. The shrubs, Kalmia microphylla, Vaccinium caespitosum, and Betula glandulosa, are also common in these communities, especially on slightly raised microhabitats. Most of the monitoring plots were placed within these communities, including Plots 001, 004, 005, 006, 007, and 009 in CCM (Figure 1) and Plots 010, 011, and 012 in SCRNA (Figure 2). There is some successional variation in these communities, although overall, there is a high level of constancy between fen habitats, particularly among the most prominent fen species (both bryophyte and vascular).

All of the sphagnum-dominated fen communities occur on histosols. They range from nearly flat ground to slopes of nearly 10% that have perennial sources of spring water coming from perched water tables.

The sphagnum-dominated fen communities in several areas appeared to be drier than normal (from my experience) by early August due to the effects of low precipitation levels in 1992, and the continued effects of prolonged drought during the last several years. Although cows generally seem to avoid these communities

because of the soft substrate and low forage value, it appeared that cow traffic increased as these habitats dried out. Several plots received cow traffic and grazing activity either before or after the plots were placed. In several instances we observed and photographed paths cut through sphagnum-dominated fens by a troupe of cattle that appeared to have passed through in single-file. This was enough to cut down to bare peat and to channelize water that otherwise moves through the sloped peatlands in sheet, rather than rill fashion, thus maintaining hydrological conditions suitable to peat forming species. It is unknown whether this path-cutting will have a long-term effect on the communities.

Carex scopulorum-dominated Sedge Fen Communities. Carex scopulorum (Holm's Rocky Mountain sedge) is probably the single most prominent plant taxon in CCM and SCRNA. It occurs in a wide range of habitats, including the Sphagnum-dominated fen communities. It is most prominent in wet areas with shallow standing water through much of the growing season which, for the most part, lack moss cover. In these areas, C. scopulorum forms a dense stand with Calamagrostis canadensis and other sedge species (e.g., Eriophorum polystachion, C. canescens, C. illota, and C. muricata). This community may be seral to the sphagnum-dominated fen communities described above. It occurs on shallower peat deposits (mostly Histosols), which are less isolated from nutrient-carrying ground water. As peat deposits accumulate, distance from ground water increases creating conditions suitable for the colonization of sphagnum mosses.

Each of the plots placed primarily in sphagnum fen communities had inclusions of Holm's Rocky Mountain sedge communities, particularly in shallow depressions. One plot was placed directly in one of these sedge fen communities (Plot 008). This plot was placed in an area formerly forested prior to the Trapper Peak Fire of 1967. The tree mortality apparently raised the water table creating conditions suitable for C. scopulorum and associated species. These areas contain scattered clumps of Alnus incana and Betula glandulosa. Extensive water tracts and ephemeral pools also dot this area around burned stumps. Prevailing drought conditions over the last decade have created conditions in this area suitable for the recolonization by Picea engelmannii and Abies lasiocarpa. Some areas dominated by Carex scopulorum that were once forested may therefore be seral to subalpine fir climax communities.

Foraging by cattle in these habitats was sparse, although traffic was rather heavy in some areas probably due to the stable, albeit wet, substrate.

Carex utriculata/Carex vesicaria Fen Communities. The beaked sedge/inflated sedge fen communities are scattered throughout CCM but do not occur in SCRNA. Plot 003 is located within a uniform community of this type. They generally occur in vernal or permanent shallow pools on mucky-peat substrate with little or no moss cover. These are uniform stands of rhizomatous sedges, including the two listed above as well as Carex arcta, C. aquatilis, C. canescens, C. lenticularis, and Eleocharis palustris. In deeper pools within these fens, Sparganium minimum and Nuphar variegatum may occur.

Due to the presence of shallow water through much of the growing season, along with soft, mucky substrates, coupled with the prevalence of coarse sedges of low palatability, the beaked sedge/inflated sedge communities are not frequented or walked through much by cattle.

Deschampsia cespitosa/Danthonia intermedia/Calamagrostis canadensis meadows. Large portions of the CCM are characterized by this wetland community. In drier margins, Danthonia intermedia is dominant and occurs with several introduced grasses that have historically been seeded in the meadows (including Dactylis glomerata, Phleum pratense, Poa pratensis, and Alopecurus pratensis). Deschampsia cespitosa and Calamagrostis canadensis are dominant in moister portions of the grass-dominated meadows near the creek. Several sedges, including Carex illota, C. arcta, and C. lenticularis are common in moister portions of these habitats. These are not fen communities because they do not occur on peat soils, although some have histic epipedons. They are, however, wetlands due to the high water table throughout the early growing season. The high water table and the presence of hydric soil characteristics apparently prevent tree growth. Plot 002 is an example of the moister end of the gradient for this community.

This wetland type is the hardest-hit by grazing. Use was well in excess of 50% (based on visual inspection and comparisons with exclosures) throughout much of this community by the middle of August 1992. It apparently offers the most appealing forage for the cattle in the allotment. It becomes stable and dried-out enough for easy access by mid-July. While we were putting in plots, this community type was clearly where the cattle were spending most of their time.

Potential impact on these grassland meadows is less of a concern than on the fens, mostly because they do not harbor any sensitive plant species. Cow Creek Meadows, however, is one of the only places on the Idaho Panhandle National Forests that I have seen grasslands like this. In fact, I have not seen more than small pockets of similar habitats in other low-gradient drainages in the northern Selkirks. No easily-defined analog for this community occurs in SCRNA, for instance. I also noticed several small patches of meadow hawkweed (Hieracium pratense), a rapidly

expanding noxious weed in northern Idaho, growing in the drier (Danthonia-dominated) portions of this community around the Cow Camp. The management plan put forth for this grazing allotment should address the protection of the grassland meadows from degradation due to overgrazing as well as the protection of sensitive plant populations.

PROTOCOL FOR FUTURE MONITORING

This study was intended to be a long term monitoring project to evaluate the effects of grazing and timber harvesting on sensitive plant populations in CCM. To ascertain both the short- and long-term effects of these activities on sensitive plant populations, the study and control plots should be reread for Cover Microplot (CM) data every three or four years over the next 20 years or more. The plots should not be particularly difficult to relocate because they are not widely distributed in either CCM or SCRNA, and they have been clearly marked and carefully mapped. Once located, it will not take long to gather CM data. Generally, after getting started, three to four plots can be read each day if two people are working together (it would likely take a single person more than twice as long to do this for various reasons). If the General Form (GF) is to be filled out again, at least 50% more time will be necessary. I think this is unnecessary because of time needed and the limited value of data gathered on the GF for the purposes and goals of this study.

Overall, field work for data gathering on the 13 ECODATA plots should take approximately one week for two people. An additional three to four weeks will be necessary for specimen identification, data entry and analysis, and report writing to summarize findings (for one person). Data analysis need not be with ECODATA techniques for future temporal comparisons of particular plot CM data. Any statistical program for such comparisons could be used. Persons gathering CCM data should be familiar with the vascular and bryophyte peatland floras of the Rocky Mountains.

I estimate the cost of reanalyzing the 13 ECODATA plots for CCM and SCRNA data to be approximately $4,000.00 each time it is done.

MANAGEMENT RECOMMENDATIONS

The National Forest Management Act and Forest Service policy 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.

The Forest Service, along with other Federal and State agencies, has recognized the need for special planning considerations in order to protect the flora and fauna on lands in public ownership. Species recognized by these agencies as needing such considerations are those that (1) are designated under the Endangered Species Act as endangered or threatened, (2) are under consideration for such designation, or (3) appear on a regional Forest Service sensitive species list.

Seven species that are rare in Idaho are found in CCM. From a global perspective all are relatively widespread boreal peatland species common in more northern latitudes, therefore, none are listed or considered for listing under the Endangered Species Act. All, however, have a limited distribution in Idaho, being known from between one and 23 occurrences in the state.

Cow Creek Meadows are a prime example of subalpine peatland communities occurring along a low-gradient stream. The view from the meadows to surrounding peaks offers a unique perspective on the effects of wildfire on the landscape. Easy access to the meadows coupled with broad vistas of the surrounding peaks made CCM a popular destination for recreationists (particularly hunters and fishermen) in the past. Since the Cow Creek Road (FS Road 655) was gated, traffic from recreationists has decreased and appears to pose little threat to sensitive plant populations. We met several small groups of fishermen while putting in monitoring plots, but not in any numbers that would make it a concern.

Timber harvesting was planned in the winter of 1992-93 for portions of the Cow Creek drainage between Road 655 and the creek, adjacent to some of the sphagnum-dominated fen communities (including Plot 009). The effects of this activity on sensitive plant populations and their habitat is unknown.

Cattle grazing has occurred since the early 1920s in the Cow Creek drainage. Four Allotment Management Plans have been prepared for the Cow Creek Allotment. In the range use report for the Smith Creek-Cow Creek Division for 1924, it was reported that some damage had been done to several meadows along Cow Creek due to overgrazing and trampling as a result of improper salting methods (USDA Forest Service 1924). The 1961 (Edinger 1961) report contained data about Animal Unit Months (AUM's) of usage and general range conditions during the period of 1932 to 1960. At various periods (1939, 1948, and 1960), heavy use on lower meadows was reported. The "lower meadows" refers to the area around the Cow Camp. Little information on range use and condition is available for the 1960's. There was no grazing in the Cow Creek Allotment during the period between 1968 and 1970, following the Trapper Peak Fire, according to the 1971 Allotment Management Plan (Righter 1972). Essentially no information was available on range use and condition in the 1983 report (Burnsfield 1983). According to the 1989 Allotment Management Plan (Klarich 1989), AUM's had

increased to the highest reported level of 417 for a grazing season of July 1 to October 7 (the previous high was 378 in 1953). In the 1989 Management Plan, use was reported to occasionally reach 50% in some portions of the allotment but that these areas were rare.

Clearly, grazing pressure and use of forage in the CCM have varied during the better part of the 20th century. The fact that the sensitive plant populations have persisted through grazing during the past 65 years tells us little about the effects that this activity might have on the long-term viability of these populations. We have no way of telling whether the rare plant populations are on a stable, upward, or downward trend because until now, no baseline data had been gathered. By monitoring the condition of these populations by rereading the permanent vegetation plots in CCM and SCRNA, we will, in time, be able to determine what, if any, effects both grazing and timber harvesting may be having.

Until we can gather some monitoring data, I recommend careful compliance with the objectives set forth in part II A. and B. of the 1989 Allotment Management Plan with the added concern of maintaining all sensitive plant and animal populations and associated habitats at current levels. If downward trends are observed, management of the allotment should be altered to protect these resources.

SPECIAL INTEREST AREA DESIGNATION

Cow Creek Meadows represent an extraordinarily significant peatland system in the state of Idaho. Seven rare plant species are found throughout the meadows in sphagnum-dominated fen habitats. One species, Hudson's Bay bulrush is known from nowhere else in Idaho and only one other site in the Pacific Northwest. Cow Creek Meadows are one of the most floristically diverse peatland systems in Idaho (101 vascular and bryophyte species) due to the habitat diversity and mixing of floristic groups more typically found in Valley Peatlands with groups more typically found in Subalpine Peatlands.

The National Environmental Policy Act of 1970, section 101(b)3 and 4, declares 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 historical, cultural, and natural aspects of our natural heritage, maintaining, wherever possible, an environment that supports biological diversity. Special Interest Areas (SIAs) can be 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. I believe that the botanical significance of Cow Creek Meadows qualifies it as a Special Interest Botanical Area and the Idaho Panhandle National Forests should pursue such a designation.

Generally, the goal of the Botanical Area designation, which is a recreation designation, is to acknowledge and highlight a special area of the National Forest. This, however, is only done "where appropriate" according to the FSM. In the case of CCM, it is our goal to get status recognition for the area so that management planning in the area take into consideration the sensitive plant populations that occur there. Clearly, with the occurrence of grizzly bears and woodland caribou in the drainage, it is not desirable to increase recreational traffic above current usage. Certain uses such as scientific research should be encouraged in this area.

The proposed Cow Creek Meadows Special Interest Botanical Area would extend from the bridge over Cow Creek on FS Road 2545 in the SE 1/4, section 4, T64N, R3W, to the upper extent of the open meadows in the extreme NE 1/4, section 13, T64N, R4W. The old Cow Creek Road (FS Road 655) can serve as the northern boundary of the SIA while the southern boundary could be the old logging road nearest Cow Creek on the south side of the creek. The boundaries could be modified somewhat, but the boundaries, as proposed, would encompass the majority of habitats of high biodiversity value.

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Table 1. Vascular and bryophyte species present in fen communities of Cow Creek Meadows and Smith Creek RNA in 1993. The "X's" indicate the presence of that species in the ECODATA plot numbered at the top. Plots 1-9 are from Cow Creek Meadows (see Figure 1 for precise locations) and plots 10-13 are from Smith Creek RNA (see Figure 2 for precise locations). (* = taxon documented from West Fork of Smith Creek RNA but not found within an ECODATA plot.

Taxon and Author	001	002	003	004	005	006	007	008	009	010	011	012	013
Division Bryophyta													
Aulocomnium palustre (Hedw.) Schwaegr.	X	-	-	?	?	-	-	X	-	X	X	X	X
Calliergon stramineum (Brid.) Kindb.	X	X	?	?	?	X	X	X	X	X	X	X	X
Marchantia sp.	-	-	-	X	X	X	X	-	-	-	X	-	X
Pohlia nutans (Hedw.) Lindb.	-	-	-	-	-	-	-	-	-	-	-	X	X
Polytrichum formosum Hedw.	-	-	-	-	X	-	-	-	-	X	-	X	X
Polytrichum juniperinum	-	X	X	-	-	-	-	X	-	-	-	-	X
Sphagnum centrale C. Jens.	-	-	-	-	X	X	-	-	X	X	X	X	X
Sphagnum fimbriatum Wils.	-	-	-	-	-	-	-	-	-	-	X	-	X
Sphagnum magellanicum Brid.	-	-	-	-	-	-	-	-	-	-	-	X	-
Sphagnum russowii Warnst.	X	-	-	?	X	X	-	X	X	X	X	X	X
Sphagnum squarosum Crome	-	-	-	-	-	-	-	-	X	-	-	-	-
Sphagnum subobesum Warnst.	-	-	-	-	-	-	-	-	-	X	X	X	X
Sphagnum subsecundum Nees	-	-	-	?	X	X	X	X	X	-	-	-	-
Sphagnum teres (Schimp.) Aongstr.	X	-	X	X	X	X	X	X	X	X	X	X	X
Warnstorfia exannulata (Schimp) Loeske	-	-	-	?	?	X	-	-	-	-	-	-	-
Division Anthophyta													
Apiaceae													
Ligusticum canbyi Coult. & Rose	X	-	-	X	X	X	X	X	X	X	X	X	X
Asteraceae													
Achillea millefolium L.	-	X	-	-	-	-	-	-	-	-	-	-	-
Anaphalis margaritacea (L.) B. & H.	X	-	-	-	-	-	-	X	-	-	-	-	-
Arnica sp.	-	-	-	-	-	-	-	X	-	-	-	-	-
Aster foliaceus Lindl.	X	X	-	X	X	X	X	X	-	-	-	-	-
Aster modestus Lindl.	-	-	-	-	-	-	-	-	X	-	-	-	-
Aster occidentalis (Nutt.) T. & G.	-	-	-	-	-	-	-	-	-	-	-	-	X
Erigeron peregrinus (Pursh) Greene	-	-	-	-	-	-	-	-	X	X	X	X	
Senecio foetidus Howell	-	X	-	-	-	-	-	-	-	-	-	-	-
Senecio triangularis Hook.	X	-	-	X	X	-	X	X	X	-	-	-	X
Betulaceae													
Alnus incana (L.) Moench	-	-	-	-	-	-	-	X	-	-	-	-	-
Betula glandulosa Michx.	X	-	-	X	X	X	-	X	-	X	-	X	X
Campanulaceae													
Campanula rotundifolia L.	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 1. Continued.

Taxon and Author	001	002	003	004	005	006	007	008	009	010	011	012	013
Caprifoliaceae													
Linnaea borealis L.	-	-	-	-	-	-	-	X	-	-	-	-	
Caryophyllaceae													
Stellaria calycantha (Ledeb.) Bong.	-	X	-	-	-	-	-	X	-	-	-	-	-
Stellaria longipes Goldie	-	-	-	-	-	-	-	-	-	-	-	-	-
Callitrichaceae													
Callitriche sp.	-	-	-	-	-	-	-	-	-	-	-	-	X
Cupressaceae													
Thuja plicata Donn.	X	-	-	-	-	-	-	X	-	-	-	-	
Cyperaceae													
Carex aquatilis Wahl.	-	-	X	-	-	-	-	-	-	-	-	-	
Carex arcta Boott	-	X	X	-	-	-	-	X	-	-	-	-	-
Carex brunnescens (Pers.) Poir.	-	-	-	-	-	-	-	X	-	-	-	-	-
Carex buxbaumii Wahl.	-	-	-	-	-	X	-	-	-	-	-	-	-
Carex canescens L. *	-	X	X	-	-	X	-	X	-	-	-	-	-
Carex flava L.	-	-	-	-	-	-	-	-	-	-	-	-	-
Carex illota Bailey *	-	X	-	-	-	-	-	X	-	-	-	-	-
Carex lenticularis Michx.	-	X	X	X	-	-	X	-	X	X	-	X	X
Carex leptalea Wahl.	-	-	-	X	-	-	-	-	X	-	-	-	-
Carex muricata L.	X	-	X	X	X	X	X	X	-	X	X	X	X
Carex paupercula Michx.	X	-	-	X	X	X	X	X	X	X	X	X	X
Carex scopulorum Holm.	X	-	-	X	X	X	X	X	X	X	X	X	X
Carex utriculata Boott in Hook.	-	X	X	-	-	-	-	-	-	-	-	-	-
Carex vesicaria L.	-	-	X	-	-	-	-	X	-	-	-	-	-
Eleocharis palustris (L.) R. & S.	-	-	X	X	-	-	-	-	-	-	-	-	-
Eleocharis pauciflora (Lightf.) Link.	X	-	-	X	X	X	X	-	X	X	X	X	-
Eriophorum polystachion L.	X	-	-	X	X	X	X	-	X	X	X	X	X
Scirpus hudsonianus (Michx.) Fern.	X	-	-	-	-	X	X	-	-	-	-	-	-
Droseraceae													
Drosera anglica Huds.	-	-	-	-	-	-	-	-	X	X	-	X	-
Drosera intermedia Hayne	-	-	-	-	-	-	-	-	-	-	X	X	-
Drosera rotundifolia L.	-	-	-	-	X	-	-	-	-	-	-	-	-
Equisetaceae													
Equisetum palustre L.	-	-	-	-	-	-	-	X	-	-	X	X	X

Table 1. Continued.

Taxon and Author	001	002	003	004	005	006	007	008	009	010	011	012	013
Ericaceae													
Kalmia microphylla (Hook.) Heller	X	-	-	-	X	X	-	-	X	X	X	-	X
Menziesia ferruginea Smith	X	-	-	-	-	X	-	-	X	X	-	X	X
Rhododendron albiflorum Hook.	-	-	-	-	-	X	-	-	-	-	-	-	X
Vaccinium caespitosum Michx.	X	-	-	X	X	X	X	X	X	X	-	X	X
Vaccinium membranaceum Dougl.	X	-	-	-	-	X	-	-	X	X	-	X	-
Hypericaceae													
Hypericum anagalloides C. & S.	-	-	-	-	-	-	-	-	X	X	-	-	X
Hypericum formosum H.B.K.	X	X	-	-	-	-	-	-	-	X	X	X	X
Isoetaceae													
Isoetes bolanderi Engelm.	-	-	-	-	-	-	-	-	-	-	-	-	X
Juncaceae													
Juncus drummondii E. Meyer *	-	-	-	-	-	-	-	-	-	-	-	-	-
Juncus ensifolius Wikst.	-	X	-	X	-	-	X	-	-	-	-	-	-
Luzula campestris (L.) DC.	-	X	-	-	-	-	-	-	-	-	-	-	-
Liliaceae													
Smilacina stellata (L.) Desf.	-	-	-	-	-	X	-	-	-	-	-	-	-
Veratrum viride Ait.	-	-	-	-	-	-	-	-	-	-	-	x	-
Xerophyllum tenax (Pursh) Nutt.	-	-	-	-	-	-	-	-	-	-	-	x	-
Lycopodiaceae													
Lycopodium annotinum L.	X	-	-	-	-	-	-	-	X	-	-	-	X
Lycopodium inundatum L.	-	-	-	-	X	-	-	-	-	-	-	-	-
Lycopodium sitchense Rupr.	-	-	-	-	-	-	-	-	-	X	-	-	-
Nymphaeaceae													
Nuphar variegatum Engelm.	-	-	-	-	-	-	-	-	-	-	X	-	X
Onagraceae													
Epilobium anagallidifolium Lam.	-	X	-	-	-	-	-	-	-	-	X	-	-
Epilobium angustifolium L.	-	-	-	-	-	-	-	X	X	X	-	-	-
Epilobium glaberrimum Barbey *	-	-	-	-	-	-	-	-	-	-	-	-	-
Epilobium glandulosum Lehm.	-	-	-	X	-	-	-	X	-	-	-	-	-
Orchidaceae													
Habenaria dilitata (Pursh) Hook.	X	-	-	X	-	-	-	-	X	-	-	-	-
Habenaria saccata Greene	-	-	-	-	-	X	X	X	X	-	-	-	-

Listera cordata (L.) R.Br. *	-	-	-	-	-	-	-	-	-	-	-	-	-
Spiranthes romanzoffiana Cham.	X	-	-	X	X	X	X	-	X	X	X	-	X

Table 1. Continued.

Taxon and Author	001	002	003	004	005	006	007	008	009	010	011	012	013
Pinaceae													
Abies lasiocarpa (Hook.) Nutt.	X	-	-	-	-	X	X	-	X	X	X	X	X
Picea engelmannii Parry	X	-	-	X	X	X	X	X	X	X	X	X	X
Pinus contorta Dougl.	X	-	-	X	X	X	X	-	X	-	-	-	-
Tsuga heterophylla (Raf.) Sarg.	-	-	-	-	-	-	-	X	X	-	-	-	-
Poaceae													
Agrostis exarata Trin.	-	-	-	-	-	-	-	X	-	-	-	-	-
Agrostis scabra Willd.	X	X	-	X	X	X	X	X	X	X	X	X	X
Agrostis thurberiana Hitchc.	X	X	-	-	X	X	X	-	-	X	X	X	X
Calamagrostis canadensis (Michx.) Beauv.	X	X	-	X	X	X	X	X	X	X	X	X	X
Danthonia intermedia Vasey	X	X	-	-	-	X	X	-	-	X	X	X	X
Deschampsia cespitosa (L.) Beauv.	X	X	-	X	X	-	X	-	X	X	-	-	X
Muhlenbergia richardsonis (Trin.) Rydb.	-	-	-	-	-	-	-	-	-	-	-	X	X
Phleum alpinum L.	-	X	-	-	-	-	-	-	-	-	-	-	-
Poa pratensis L.	-	X	-	-	-	-	-	-	-	-	-	-	-
Polypodiaceae													
Athyrium felix-femina (L.) Roth.	-	-	-	-	-	-	-	X	-	-	-	-	-
Primulaceae													
Trientalis arctica Fisch.	-	-	-	X	X	X	X	-	X	-	X	X	X
Ranunculaceae													
Trollius laxus Salisb.	X	-	-	-	-	-	-	-	-	-	-	-	-
Rosaceae													
Amelanchier alnifolia Nutt.	-	-	-	-	-	X	-	-	-	-	-	-	-
Fragaria virginiana Duchesne	-	X	-	-	X	-	X	-	-	-	-	-	-
Potentilla diversifolia Lehm.	-	X	-	-	X	-	X	-	-	-	-	-	-
Potentilla drummondii Lehm. *	-	-	-	X	-	X	X	-	-	-	-	-	-
Rubus pedatus J.E. Smith	X	-	-	-	X	X	-	X	X	X	-	X	-
Spiraea douglasii Hook.	X	-	-	-	-	-	-	-	-	-	-	-	-
Rubiaceae													
Galium trifidum L.	X	X	-	X	-	X	-	X	-	-	-	-	-
Salicaceae													

Salix commutata Bebb.	-	-	-	X	X	X	-	X	-	-	-	-	-	
Saxifragaceae														
Mitella breweri Gray	-	-	-	-	-	-	-	-	X	-	-	-	-	

Table 1. Continued.

Taxon and Author	001	002	003	004	005	006	007	008	009	010	011	012	013
Scrophulariaceae													
Pedicularis groenlandica Retz.	X	-	-	X	X	X	X	X	-	-	X	X	X
Veronica americana Schwein.	-	-	-	-	-	-	-	X	-	-	-	-	X
Veronica serpyllifolia L.	-	X	-	-	-	-	X	-	-	-	-	-	-
Veronica wormskjoldii Roem. & Schult.	-	X	-	-	-	-	X	-	-				
Sparganiaceae													
Sparganium minimum Fries	-	-	X	-	-	-	-	-	-	-	X	-	X
Violaceae													
Viola adunca Smith	-	X	-	-	-	-	-	-	-	-	-	-	-
Viola glabella Nutt.	-	-	-	X	-	X	X	X	X	-	-	-	X
Viola macloskeyi Lloyd	X	-	-	X	X	X	X	X	X	X	X	X	X
Viola palustris L. *	-	-	-	-	-	-	-	-	-	-	-	-	-