Appendix 29

See Also: Ecologically Significant Wetlands in the Flathead, Stillwater, & Swan River Valleys

Ecologically Significant Wetlands in the North Fork Flathead River Watershed

Prepared for the
Montana Department of
Environmental Quality

by
Stephen Cooper, Jack Greenlee
and Catherine Jean

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MONTANA
Natural Heritage
Program

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■ Executive Summary

The Montana Natural Heritage Program (MTNHP), in partnership with the Montana Department of Environmental Quality, has completed an inventory to identify, document and evaluate the diversity, integrity and significance of wetlands in the North Fork Flathead River watershed in northwestern Montana. This work builds on previous watershed inventories and creates a consistent and comprehensive source of wetland information forming a basis for effectively prioritizing wetlands for protection, mitigation and restoration.

Twenty-four significant wetlands were identified and inventoried in 1999. Initial wetland selection criteria were the absence of significant hydrological modification and the presence of intact representative native plant communities, outstanding wildlife values or rare plant and animal species. Important sources for locating significant wetlands were local expert opinion, National Wetland Inventory maps and aerial photographs. We gave lower perennial riverine and depressional wetlands on private lands greater attention because of the potential for development. Wetlands were inventoried using standard heritage program methodology to assess site condition, catalog community types and document rare plant and animal occurrences. The inventoried areas are summarized in ten wetland site descriptions. At two sites, clusters of separate wetlands were grouped into wetland complexes for reporting purposes. Each site was evaluated for significance using the following factors: presence of rare plant or animal species or uncommon natural vegetation types, the diversity of vegetation types, the condition or functional integrity of the wetland, the landscape context and the size of the wetland.

The North Fork has abundant wetland and riparian habitat and stands out as having the least impacted wetland and riparian systems among the Flathead River watersheds that have been inventoried by the MTNHP to date. Riverine and depressional wetlands are the most widespread wetland types due to previous glaciation, high precipitation and the development of floodplain landforms along the river corridor. These systems are important for two threatened species, grizzly bear (*Ursus arctos horribilis*) and a resident population of bull trout (*Salvelinus confluentus*).

Tepee Lake Complex, Mud Lake Complex and Hay Creek-North Fork Floodplain wetlands represent the most ecologically significant sites inventoried in the North Fork. These sites contain a complex of physical features which contribute to an outstanding diversity of plant communities that are in excellent condition. We documented a sizeable uncommon peatland community dominated by mud sedge (*Carex limosa*) and excellent examples of a common carr type, Drummond's willow / beaked sedge (*Salix drummondiana / Carex utriculata*) Shrubland. Rare plant species found at these sites include Hudson's Bay bulrush (*Scirpus hudsonianus*), English sundew (*Drosera anglica*) and slender cottongrass (*Eriophorum gracile*). Three rare mosses were also documented. Schnaus Creek, Coal Creek-North Fork Floodplain and Coal Creek Complex have very high significance due to their large size and high diversity of wetland habitats which include black cottonwood (*Populus balsamifera* spp. *trichocarpa*) forest communities along terraces and floodplains adjacent to the river. Nearby land use activities and presence of noxious weeds at two of these sites reduce the significance ranks from outstanding to a rank of very high significance. The remaining four sites are ranked as highly significant or moderately significant. These sites are all in excellent condition and have no noxious weeds. Abbotts Flat, Hay Creek Fen and Red Meadow Lake are smaller in size with fewer wetland features. The wetlands at Cyclone Lake consist of a narrow fringe around the perimeter of the lake. In all four of these sites, the lack of diverse wetland features result in a less diverse biotic environment and influence the overall significance rank.

Wetlands in the North Fork are threatened by increased recreational and housing development, incompatible land use activities and the spread of noxious weeds. Fortunately many opportunities exist to conserve and protect wetlands in the watershed. Leaving larger timber harvest buffers around wetlands and following best management practice guidelines could mitigate hydrologic changes and reduce potential inputs of sediments. Control of noxious weeds and prevention of new infestations would protect the integrity of the natural plant communities. Since these important sites are under mixed ownership, conservation will require collaborative efforts between private parties, land trusts and public agencies.

This project completes our first wetland inventory in the North Fork watershed. Although the project is meant to be comprehensive, there are a number of wetlands in the watershed that were not surveyed as part of this inventory project. Since we focused, where possible, on large, fairly discrete wetlands, some types of wetlands, especially small seeps and springs were under-emphasized during the inventory. We did not inventory private property without permission, nor did we consider significant wetlands inside Glacier National Park as these wetlands are already in highly protected status. As opportunities present themselves or as resources become available, additional inventory may be warranted.

Contents

Introduction

As awareness of the cumulative loss and damage to wetlands in North America has grown, so has an increased awareness of the importance of wetland ecosystems. This recognition has expanded opportunities to prevent wetland loss and improve the quality of remaining wetlands. Inventory provides an important first step toward conserving wetlands, offering the means to identify and protect the most biologically significant wetland sites.

In 1998 the Montana Natural Heritage Program (MTNHP), in partnership with the Montana Department of Environmental Quality, began a systematic ecological wetland inventory to identify, document and evaluate the diversity, integrity and significance of Montana wetlands. The first phase included inventory in the Stillwater, Swan and Flathead Lake watersheds; those results were summarized in a 1999 report by Greenlee. This report summarizes results of similar inventory work for the North Fork Flathead River watershed, simply referred to as the North Fork. The North Fork wetland inventory builds on our previous inventories in the Swan, Stillwater and Flathead Lake watersheds and contributes to our overall understanding of wetland biological diversity in the greater Flathead system. Figure 1 displays the status of MTNHP wetland inventories in the greater Flathead River watershed.

The North Fork has abundant wetland and riparian habitat due to previous glaciation, high precipitation and the development of floodplain landforms along the North Fork Flathead River. The importance of these wetlands has long been recognized both locally and regionally. The Flathead drainage supports one of the greatest and most diverse concentrations of wetlands in the Rocky Mountains, including peatlands, oxbow ponds, springs and seeps, complexes of pothole ponds, vernal pools, and beaver ponds. In the North Fork, riverine and depressional wetlands are the most widespread wetland types due to glaciation and fluvial processes.

The Heritage Program inventory uses standard methods both to identify ecologically significant wetlands at a watershed scale and to prioritize their importance for wetland conservation. This approach considers biological composition and condition as well as the functional integrity of wetland sites with respect to hydrology and landscape setting. The conservation significance of a wetland is evaluated against other wetland sites within the watershed and the relative significance of watersheds can be evaluated.

The inventory goal is to produce a consistent and comprehensive source of wetland information to help ensure that protection, mitigation, and restoration efforts target the full range of wetland diversity, including those wetlands that are outstanding, irreplaceable, or which contribute most to watershed integrity. It provides local landowners, county planners, land trusts, conservation districts, government agencies, and others with access to reliable information on the diversity of wetland types, their location and relative significance. This creates a basis for effectively prioritizing wetland protection and restoration efforts.

This inventory did not include wetlands within Glacier National Park. Since wetland resources within the park enjoy the highest level of protection, we decided to focus current inventory work on wetlands outside the Park, even though the Park's wetlands contribute significantly to the overall importance of the North Fork watershed. Two sources provide information on wetland locations, but not the biological significance of wetlands within the park: the FWS National Wetland Inventory maps and a vegetation map currently being completed by the Biological Resource Division of the U.S. Geological Survey (USGS). Our inventory work is also incomplete for private lands, where in some cases we were unable to obtain permission for access.

The wetland sites examined in this inventory fall within the wetland definition used by Cowardin et al. (1979) because they all had at

Figure 1. Status of Montana Natural Heritage Program wetland inventory in the Flathead Watershed.

least one of the following attributes: hydrophytic vegetation, hydric soils, and/or wetland hydrology. This definition includes riparian areas, wet meadows, and vernal pools. Wetland terminology in this report follows the definitions set forth in our 1999 report on the Flathead Watershed, and they are provided again here for clarity (Greenlee 1999).

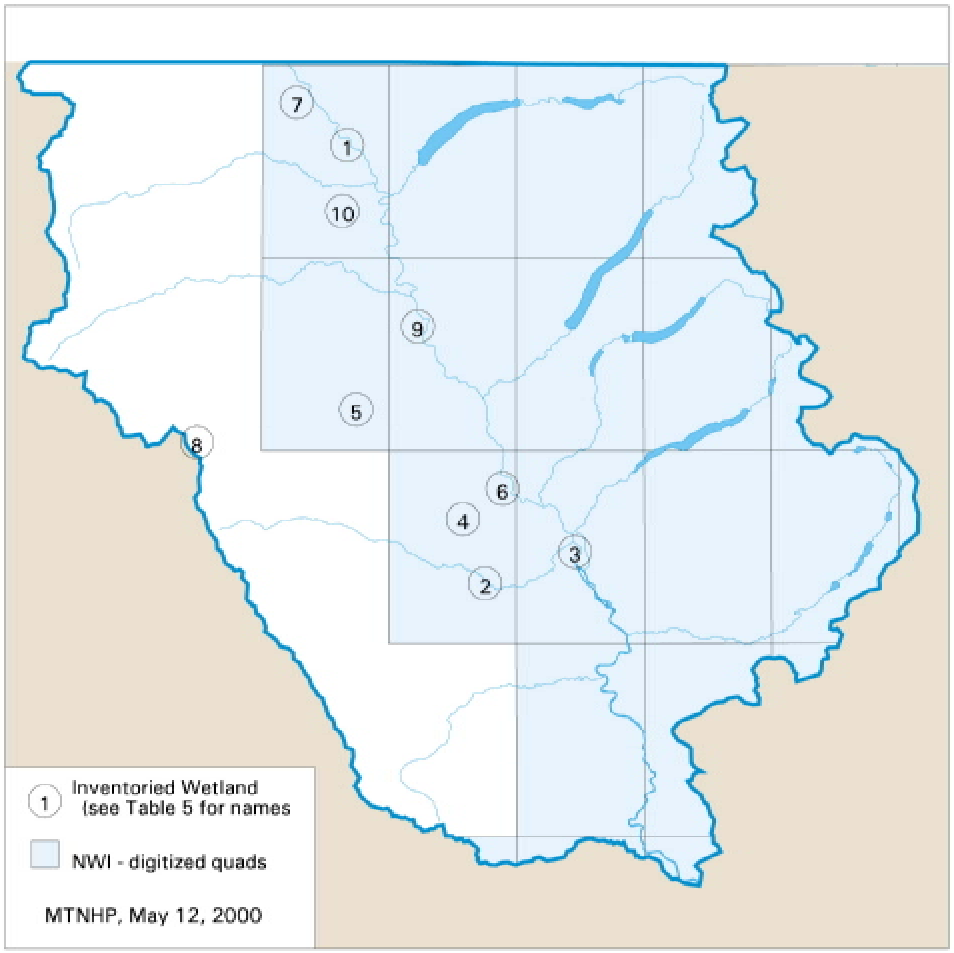
> "**Marshes** are seasonally to permanently flooded wetlands dominated by emergent herbaceous vegetation. Marshes generally form on mineral soil, but some peat accumulation can occur because of the tremendous productivity of marsh vegetation; a **swamp** differs from a marsh only in that woody plant are dominant. In contrast, **peatlands** are wetlands that accumulate peat, or partially decomposed plant matter. All the peatlands in Montana are herb-dominated **fens** or shrub-dominated **carrs**, whose water source is predominantly groundwater that has been in contact with mineral soil (consequently high in nutrients), as opposed to **bogs**, whose water source is predominantly precipitation (hence nutrient poor). Floristically, bogs tend to be more impoverished than fens. The shrub-dominated peatlands (carrs) are sometimes best developed in the **lagg**, or moat-like ring sometimes found as the outer margin of the peatland. **Sedge meadows** occur in shallow basins and have limited peat development because they usually dry down for part of the growing season; in Montana, they are frequently dominated by *Carex lasiocarpa* (slender sedge), which is also common in fens. The terms **slope**, **riverine**, **depressional**, and **lacustrine fringe** wetlands are all used as defined by Smith et al. (1995)."

Study Area

The North Fork Flathead watershed is located in northwest Montana (Figure 2) and southeastern British Columbia, Canada. The Canadians refer to this area as the Flathead Valley. The watershed lies within Northern Rockies Section of the Northern Rocky Mountains Steppe-Coniferous Forest-Alpine Meadow Province (M333; Bailey 1995) and is split down the middle into the Whitefish/Swan Mountains Subsection (M333Cb) to the west and the Livingston Mountains Subsection (M333Ca) to the east (Nesser et al. 1997). The USGS 4th Code Hydrologic Unit number is 17010206. The aerial extent of the North Fork watershed in the U.S. is 613,000 acres.

The North Fork Flathead River is situated in a deep, wide trench between two northwest-southeast trending mountain ranges. The Livingston Range lies to the east and is part of the Continental Divide that separates the Missouri from the Columbia River drainage systems. The Whitefish Range lies to the west. Mountain elevations reach 8,000 to 10,000 feet. The valley floor at Polebridge lies at 3560 feet elevation.

Figure 2. North Fork Flathead watershed in Northwest Montana.



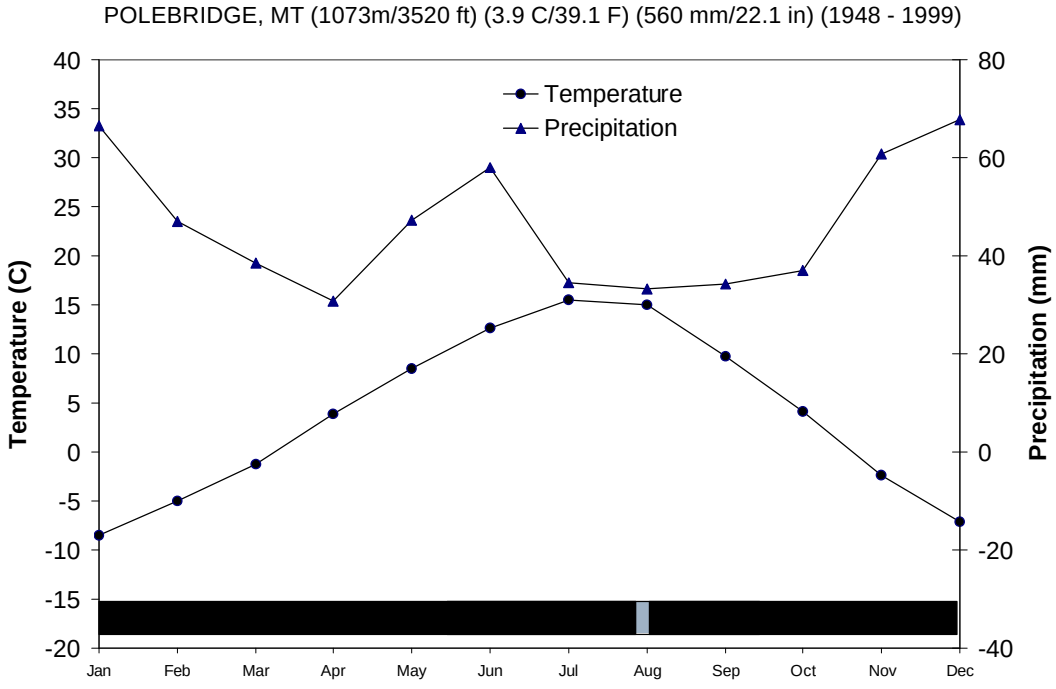
Broad regional uplift combined with faulting has resulted in a broad river basin, up to 8 miles wide in places. The North Fork valley was scoured by continental glaciers during the Pleistocene. Since the retreat of the glaciers, valley bottoms have been subjected to alluvial processes, making glacial evidence more subdued. Glacial outwash deposits reworked and re-sorted by glacial melt-water underlie the majority of the area. Flowing water generated floodplains and terraces adjacent to the North Fork River and its tributaries.

Many lakes and wetlands were formed by glacially influenced landforms like kettle ponds (created by melting iceblocks), outwash plains, and foothills moraines (Alt and Hyndman 1986). Alpine glaciers in the higher mountains flanking the valley created U-shaped valleys and cirque basins, both conducive to wetland development.

The climate of the study area reflects a balance between pacific maritime influences and drier continental air masses. Winters are cool, cloudy, and wet, and summers are warm and dry. June is the wettest single month. (Figure 3).

Coniferous forest potentially covers nearly all of the upper North Fork drainage; only in areas of recent burns or timber harvest or within the comparatively limited alpine and wetland environments does one find non-forested communities. The lower elevations in the study area are predominantly seral conifer forests dominated by Douglas-fir (*Pseudotsuga menziesii*), western larch (*Larix occidentalis*) and lodgepole pine (*Pinus contorta*); on the warmest exposures ponderosa pine (*Pinus ponderosa*) can be an important stand component. White pine (*Pinus monticola*) was an important seral conifer before the advent of white pine blister rust (*Cronartium rubicola*). The most mesic of the lower to mid elevation sites are potentially dominant in grand fir (*Abies grandis*), western redcedar (*Thuja plicata*) and to a very limited extent western hemlock (*Tsuga heterophylla*); however, there is a strong stochastic component to the distribution of these mesic tree species and they are often absent from drainages or watersheds where the climatic conditions would favor their presence.

Figure 3. Walter climate diagram (Walter 1973) from Polebridge, Montana. The diagonal strips on the lower bar represent the 90% probability that the temperature will not fall below 32.5 F.



Douglas fir, western larch, lodgepole pine, Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*) are dominant at mid-elevations, and the latter three species with the addition of whitebark pine (*Pinus albicaulis*) and subalpine larch (*Larix lyallii*) are dominant at the highest elevations (Sirucek and Bachurski 1995). Recently, whitebark pine stands have undergone massive mortality, which will cause restructuring of numerous high subalpine plant communities. Of the above listed coniferous tree species, only Engelmann spruce or Engelmann spruce x white spruce (*Picea glauca*) hybrids are strongly associated with wetland conditions and prevalent within the landscape. Western redcedar often occurs in wetlands, but has a very limited presence within this hydrologic unit.

Deciduous tree species, predominantly black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) and to a limited extent quaking aspen (*Populus tremuloides*), are prominent components of floodplain gallery forests, beaver-generated wetlands, and other wetland environments. Both species may range upslope, however black cottonwood does so only where subirrigation is present. Of the two *Populus* species, it is much more strongly associated with moist to wet soil moisture regimes.

The largest landowner in the watershed is the American public. The western slope of the Livingston Range in Glacier National Park is managed by the National Park Service; the eastern slope of the Whitefish Range is managed by the Flathead National Forest. There are several sections of state land managed by the Montana Department of Natural Resources Conservation. The North Fork is part of the Flathead Wild & Scenic River designated in 1976. Private land is confined to the valley bottom.

Methods

Identifying And Selecting Wetlands For Inventory

The principle criteria for initially selecting wetland sites in this inventory were ecological significance and functional integrity. Our pre-inventory evaluation considered whether a site had undergone major hydrologic or geomorphic modifications, whether it had intact, representative native plant communities or rare plant or animal species, and whether the site had outstanding wildlife habitat values. Several sources of information were consulted to identify wetlands for field inventory. "Expert opinion" from local resource managers, field biologists and hydrologists provided the best site-specific information and most promising leads for follow-up. In all, nearly three dozen sites were identified through public and private sector interviews. We also identified potentially important wetlands by inspecting USGS topographic quad maps, National Wetland Inventory maps, aerial photographs and the Flathead National Forest map. As previously noted, wetlands in Glacier National Park were not included in the field inventory even though many are biologically significant and would be useful as reference sites.

We then prioritized the sites for inventory, emphasizing the following:

- Larger wetlands over smaller wetlands
- Sites without geomorphic and/or hydrologic modification
- Intact native plant communities, both in the wetland and in the surrounding uplands
- Known populations of rare plants and animals

We also considered landscape context and management emphasis. For example, lower perennial riverine and depressional wetlands along the North Fork received greater inventory attention than upper perennial wetlands because of the potential for development on private lands.

We found few pre-existing references to high quality wetlands in the watershed, except for McGee Meadow in Glacier National Park, which has been well documented as a significant wetland. However, we choose not to include this site in the ranking list because of its existing, highly protected status and because we did not evaluate any other wetlands within the Park. Where potential inventory sites were partly or wholly in private ownership, we requested landowner permission for access. In cases where permission was denied, the site was dropped from the priority list. In the course of the 1999 field season 24 individual wetlands were inventoried at ten sites (presented in Table 5). Two sites, Tepee Lake and Mud Lake, consisted of tightly grouped although spatially separate wetlands, which we chose to call a wetland complex. We found four wetlands too small, degraded, or lacking in true wetland characteristics to meet our criteria for ecological significance.

Data Collection

Wetlands were surveyed during the summer of 1999 using standard methodology to assess site condition, catalog community types and document rare plant and animal occurrences (Bourgeron et al. 1992). Specifically, we attempted to walk through all wetland plant communities at any given site, except where prevented by deep water or denial of landowner permission. We noted dominant species in each stratum, made ocular estimates of their canopy coverage, and estimated the acreage of each community. We classified each wetland plant community using Hansen et al. (1995) and assessed the condition of each community, including presence of exotic species, evidence of logging, hummocking or pugging, presence of ditches, dikes, riprap, and other geomorphic and hydrologic modifications, as well as presence of old growth conditions in forests, depth of standing water, and beaver

activity. For plant communities not previously described in Hansen et al. (1995) or which were deemed uncommon, we collected detailed plot data.

At each site elevation, aspect, slope and the hydrogeomorphic (HGM) class and subclass (Smith et al. 1995) were noted, as were the Cowardin system/subsystem, class/subclass, and hydrologic regime (Cowardin et al. 1979). We also recorded offsite landuses and spoke to landowners/ managers about landuse history whenever possible. A cursory search for rare plants was conducted during the walk-through of each wetland. Bryophytes were collected at a few sites and identified by J.C. Elliott.

Montana Natural Heritage Program zoologists conducted faunal surveys of selected wetlands. These surveys focussed on animal groups that are ecologically important in wetlands, but inconspicuous and not well documented. Zoological surveys emphasized amphibians and snails.

This inventory does not delineate jurisdictional wetlands nor is the inventory a formal wetland functional assessment. Heritage Program ecologists did use two regional HGM models developed by researchers at the Flathead Lake Biological Station (Hauer et al. 1999, Hauer 1998). For instance, at some sites we measured the depth of two soil horizons, the O horizon and A horizon, in some plant communities. This variable is measured in the intermontane pothole HGM model; it represents the long-term store of nutrients in the soil and acts as an index of the characteristic decomposer community in the wetland (Hauer et al. 1999). This and other soil data was gathered for some wetlands.

Half of the inventoried wetland sites included lands under private ownership. Landowners were contacted for permission to gain access to their property prior to site visits. Users of this report should note that they, too, would need to obtain landowner permission before entering private lands.

Data Management

The Montana Natural Heritage Program maintains four types of database records for the data gathered in the wetland inventory: community **plot** records, community and species **occurrence** records, **site** records, and community **abstracts**. Wetland community plot information (i.e., species composition, cover and environmental data) was entered into a database, structurally very similar to the ECADS database developed by the U.S. Forest Service for managing ecological data (Jensen et al. 1993).

We created a community occurrence record for each wetland community ranked as having outstanding quality or considered rare or imperiled. Community occurrence information (e.g., HGM class, Cowardin class/subclass, dominant species, hydrology, landscape setting) was summarized and entered in the Biological and Conservation Data System (BCD), a database developed by The Nature Conservancy and used by programs throughout the Natural Heritage Network.

Summary information about each site as a whole (e.g., general site descriptions, ecological diversity, on- and offsite landuses, and management needs) was also entered into a site file in BCD. Detailed plant community abstracts were created to characterize both common and uncommon wetland plant communities. These include information from a variety of sources documenting community range, typical landscape setting, typical species composition, successional patterns, and management considerations. This information is being stored temporarily in a word processing template, for later uploading into a BCD file under development. The boundaries of each wetland site were digitized as polygons and stored in a Geographic Information System.

Taxonomic Considerations

We generally used Hitchcock et al. (1955-1969) to identify plant species in the study area. However, in keeping with The Nature Conservancy's National Vegetation Classification (Anderson et al. 1998), we followed the synonymy presented by Kartesz (1994). There were two exceptions to this usage: for bog birch (*Betula glandulosa*), we used Flora of North America (1997), which provides a more recent treatment of the genus *Betula.* The other exception was a common wetland sedge, usually referred to as beaked sedge, which has been erroneously called *Carex rostrata* in previous studies. While *Carex rostrata* does occur in the state, it is very rare. In this report, the common wetland sedge, also known by the common name of beaked sedge, goes by the Latin binomial *Carex utriculata* (Griffiths 1989). Also, *Picea engelmannii* (Engelmann spruce) is used to include *Picea engelmannii*, *Picea glauca* (white spruce) and their hybrids (Daubenmire 1974).

Ranking Of Communities And Sites

We ranked the rarity and conservation significance of individual plant community types using criteria analogous to those used for ranking plant and animal species. This ranking system is intended to help managers identify elements at risk and determine management and conservation priorities. Community ranks are based primarily on the total number of occurrences and area occupied by the community type, either rangewide (for global or G ranks) or statewide (for state or S ranks). In addition, information on condition, threats, trend, and fragility are considered when known. The ranks are scaled from 1 to 5, with G1 indicating that the community is critically imperiled rangewide, and a G5 indicating no risk of extinction. Guidelines used to assign community ranks are included in Appendix A.

A list of wetland and riparian plant communities found in the North Fork watershed was generated using the list assembled for the Swan,

Table 1. Definitions and criteria for ranking sites according to degree of ecological significance.

CRITERIA		DEFINITION	INDICATORS	RANKING SCORES
Richness		Habitat diversity within site	• Assemblage of numerous plant communities within single unit of Cowardin's classification • Assemblage of plant communities or ecological features (e.g. beaver ponds, peatlands, lakes) within several units of Cowardin's classification (= high structural diversity)	3. Site has high diversity of vegetation types or wetland features. 2. Site has a moderate diversity of vegetation types or wetland features. 1. Site has low diversity of vegetation types or wetland features.
Rarity		Presence of state rare plant community, plant or animal species, and degree of rarity	• High concentration of state rare plant or animal species • Presence of globally rare species or communities	3. Site has high concentration of rare species or communities. 2. Site has moderate concentration of rare species or communities. 1. Site has low concentration of rare species or communities 0. Site has no rare species or communities
Viability	Condition	Extent to which site conditions (e.g. processes, communities) depart from range of natural variation	Presence of on-site impacts (e.g. exotics, grazing, roads, ditching, irrigation withdrawal, recreational use, timber harvest)	3. Site in excellent condition; human impacts absent or minimal. 2. Site in good condition; some impacts apparent. 1. Site in poor condition; many impacts present.
	Size	Areal extent of wetland	Acreage	3. Site is large (>40 acres). 2. Site is moderately large (≤40 acres) 1. Site is small (≤20 acres) 0. Site is very small (≤5 acres)
	Uplands	Landuse in surrounding uplands	Presence of off-site impacts (e.g. timber harvest, roads, homes, non-native vegetation)	3. Site with minimal off-site impacts. 2. Site with moderate level of off-site impacts. 1. Site with high level of off-site impacts.

Stillwater and Flathead Lake watersheds (Greenlee 1999), along with new community types documented in this inventory. Global and state community ranks were obtained from The Nature Conservancy's Western Conservation Science (WCS) staff (Reid et al. 1999). Western state heritage programs work with the WCS in a continuous process to review, document and update global ranks.

Each individual wetland community occurrence was also quality-ranked using criteria developed by The Nature Conservancy and the Natural Heritage Network (The Nature Conservancy 1998). We evaluated community size, condition and landscape context for each community occurrence and then averaged for a final community occurrence rank of A – D, or excellent to poor. Community occurrence ranks were considered during the site ranking process, explained below.

We evaluated the overall significance of individual wetland sites using methods similar to those used in Idaho and Washington (Washington Department of Ecology 1991, Jankovsky-Jones 1997, Chadde et al. 1998). Each wetland site was evaluated for five factors (Table 1). Presence of rare species as well as their degree of rarity influenced the rarity score; for example, presence of a globally rare species was rated higher than presence of a state rare species. The condition and landscape context (quality rank) of all the community occurrences at a site were considered when assigning the site condition and uplands scores. Each factor at each site was scored from 0 (lowest) to 3 (highest) and then all scores at a site were summed for a total score ranging from 0 to 15. Each of the five factors was equally weighted in the composite score. The scores of all the sites were then arranged from highest to lowest, and the distribution of scores was divided into four uneven quartiles. Each of these quartiles defined a category of site significance, described below.

Outstanding significance

These sites represent the most ecologically significant wetlands in the survey area. They are large and support a diverse array of plant communities and other important wetland features such as peatlands, beaver ponds and springs, which provide a diversity of habitats. These sites are pristine, or nearly so, and typically provide habitat for numerous state and/or globally rare plant and animal species. The wetland plant communities at these sites are generally in excellent condition. There are minimal anthropogenic influences at these sites, so the wetland functions are largely intact and most likely fall within the range of natural variation. Finally, the uplands surrounding these sites tend to be largely intact, thus maintaining the sites' hydrologic regime. Impacts to these sites cannot be fully mitigated, and any alterations could lead to significant loss of their distinctive characteristics and value.

Very high significance

Wetland sites in this category generally support diverse, high quality plant communities, but they are distinguished from those of Outstanding Significance by having a greater degree of anthropogenic disturbance either on- or off-site (e.g., logging in the uplands near the site, grazing on a portion of the site, etc.). They may support a number of state rare plant or animal species, and they tend to be large. Most of the wetland plant communities at these sites are in excellent condition, but a few may have moderate impacts. Improvement in resource management at these sites, such as changing grazing management plans or reducing trapping pressure on beaver, would improve the overall suite of wetland functions and could move them toward Outstanding significance.

High significance

Wetland sites of High Significance are generally large and tend to have a moderate diversity of wetland plant community types, compared to the two previous categories. These sites may support some populations of rare plants and animals. The

degree of anthropogenic disturbance at these sites tends to be similar to those in the previous category. Most of the wetland plant communities at these sites are in excellent condition, but a few may have moderate impacts. These sites, with less diverse plant communities, may be appropriate models for wetland restoration, since they exemplify the distribution and composition of common native wetland communities. They could also serve as seed sources for plant material used in restoration projects

Moderate significance

Sites of Moderate Significance have a moderate diversity of plant communities and harbor some rare species. However, they are generally more impacted than sites of High significance. For instance, they include more communities influenced by exotic species, such as reed canarygrass (*Phalaris arundinacea*) or redtop (*Agrostis stolonifera*), or that have a simple vegetation structure, such as cattail monocultures. Although these sites tend to have relatively high levels of current or historic on- and offsite impacts, their large size still makes them good habitat for waterfowl and certain wildlife. In addition, they still provide important wetland functions, such as moderation of peak flows or removal of compounds and particulates. Restoration of degraded wetlands near or adjacent to these sites would add to the total wetland acreage.

Results And Discussion

Communities

The North Fork valley stands out as having the least impacted wetland and riparian system among the Flathead River subwatersheds that we have inventoried (Figure 1). The riverine fluvial processes are intact and support the development of early and late seral cottonwood stands. Mature cottonwood gallery forests have an intact native shrub understory. There are significant wetland complexes with communities that are in outstanding condition and represent the natural diversity of the North Fork watershed.

Table 2 displays 35 wetland and riparian plant communities documented from this study and another 25 that are known or suspected to occur in the North Fork watershed. Community names are based on the National Vegetation Classification System (Reid et al. 1999), and state and global ranks are listed. More complete descriptions of community types are found in Appendix B.

Since there are no unique environments in the watershed (e.g., hot springs, serpentine substrates, etc.), few if any of the wetland community types are intrinsically rare. However, two Montana rare communities associated with maritime influences, Engelmann spruce / skunk cabbage (*Picea engelmannii* / *Lysichiton americanus*) and western redcedar / skunk cabbage (*Thuja plicata* / *Lysichiton americanus*), are present in the greater Flathead watershed and could exist in the North Fork. Neither were found in our 1999 inventory.

In identifying community types, we followed the classification developed by Hansen et al. (1995), with some exceptions summarized by Greenlee's (1999) report for the Swan, Stillwater and Flathead Lake watershed. Hansen et al. (1995) was designed as a management tool and not specifically to assess biodiversity. We subdivided a few of Hansen et al.'s (1995) habitat and community types in order to describe the vegetation diversity at each site more precisely. For instance, we split the beaked sedge (*Carex utriculata*) (formerly *Carex rostrata*) habitat type (Hansen et al. 1995) into three plant associations: beaked sedge, inflated sedge (*Carex vesicaria*) and awned sedge (*Carex atherodes*) Herbaceous Vegetation. We also split the bog birch / beaked sedge habitat type into three plant associations as well: bog birch / beaked sedge, bog birch / Cusick's sedge (*Carex cusickii*) and bog birch / slender sedge (*Carex lasiocarpa*) Shrublands. Plot data describing these plant associations are on file at MTNHP.

We treated unpublished or otherwise undescribed communities that were encountered repeatedly (e.g., bog birch / Cusick's sedge, bog birch / slender sedge) as plant associations. We named these associations and placed them into an alliance, but have not yet assigned global ranks. Finally, for undescribed communities that were rarely encountered, we are maintaining a working list and treating them as dominance types. Community plot data supporting all communities not described by Hansen et al. (1995) is on file at MTNHP.

The following paragraphs provide general descriptions of major wetland plant communities in the study area, organized by the Palustrine classes of Cowardin et al. (1979).

Forest and woodland vegetation

Riparian and wetland forests and woodlands in the study area are dominated by both needle-leaved evergreen and broad-leaved deciduous vegetation. Islands and alluvial terraces along North Fork are dominated by stands of black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) and Engelmann spruce (*Picea engelmannii*). We did not sample communities dominated by western redcedar (*Thuja plicata*) or grand fir (*Abies grandis*), but noted them occasionally in the watershed.

The low gradient streams at higher elevations often have riparian forest canopies dominated by subalpine fir (*Abies lasiocarpa*), while higher gradient streams frequently have narrow, poorly

Table. 2 Wetland plant communities and their conservation ranks for North Fork Flathead wetlands arranged by Cowardin system, class, and subclass

Scientific Name	Common Name	Rank
PALUSTRINE FORESTED COMMUNITIES, NEEDLE-LEAVED EVERGREEN		
Abies lasiocarpa / Calamagrostis canadensis	Subalpine fir / Bluejoint reedgrass	G5S5
Abies lasiocarpa / Ledum glandulosum	Subalpine fir / Labrador tea	G4S4
Abies lasiocarpa / Oplopanax horridum	Subalpine fir / Devil's club	G3S2
Abies lasiocarpa / Streptopus amplexifolius	Subalpine fir / Claspleaf twisted stalk	G4?S3
Picea engelmannii / Calamagrostis canadensis	Spruce / Bluejoint reedgrass	G3S3
Picea engelmannii / Clintonia uniflora	Spruce / Beadlily	G4S4
Picea engelmannii / Cornus sericea	Spruce / Red-osier dogwood	G3G4S3S4
Picea engelmannii / Equisetum arvense	Spruce / Field horsetail	G4S3
Picea engelmannii / Galium triflorum	Spruce / Sweet scented bedstraw	G4S4
Thuja plicata / Athyrium filix-femina	Western redcedar / Ladyfern	G3G4S3
Thuja plicata / Gymnocarpium dryopteris	Western redcedar / Oakfern	G3S3
Thuja plicata / Oplopanax horridum	Western redcedar / Devil's club	G3S3
PALUSTRINE FORESTED COMMUNITIES, BROAD-LEAVED DECIDUOUS		
Betula papyrifera	Paper birch	*G4QS3*
Populus balsamifera ssp. *trichocarpa / Cornus sericea*	Black cottonwood / Red-osier dogwood	G3?S3
Populus balsamifera ssp. *trichocarpa* / Herbaceous	Black cottonwood / Herbaceous	G?S?
Populus balsamifera ssp. *trichocarpa* / Recent alluvial bar	Black cottonwood / Recent alluvial bar	G?S?
Populus balsamifera ssp. *trichocarpa / Symphoricarpos albus*	Black cottonwood / Common snowberry	G4S4
Populus tremuloides / Calamagrostis canadensis	Quaking aspen / Bluejoint reedgrass	G3S2
Populus tremuloides / Cornus sericea	Quaking aspen / Red-osier dogwood	G4S3
Populus tremuloides / Osmorhiza occidentalis	Quaking aspen / Western sweet cicely	G3?S3?
P. tremuloides - P. balsamifera ssp. *trichocarpa / Osmorhiza occidentalis*	Quaking aspen - black cottonwood / Western sweet cicely	G2QS2Q
Populus tremuloides /Symphoricarpos albus	Quaking aspen / Common snowberry	G3?S3?
PALUSTRINE SCRUB-SHRUB COMMUNITIES, BROAD-LEAVED DECIDUOUS		
Alnus incana	Mountain alder	G5S5
Alnus incana / Carex spp.	Mountain alder / sedge	G3S?
Alnus viridis ssp. *sinuata*	Sitka alder	G5S5
Betula glandulosa / Carex cusickii	Bog birch / Cusick's sedge	G?S3
Betula glandulosa / Carex lasiocarpa	Bog birch / Slender sedge	G4S4
Betula glandulosa / Carex utriculata	Bog birch / Beaked sedge	G4?S4
Cornus sericea	Red osier dogwood	G4S3
Kalmia microphylla / Carex scopulorum	Alpine laurel / Holm's Rocky Mountain sedge	G3G4S3
Rhamnus alnifolia	Alder-leaved buckthorn	G5S5
Salix bebbiana	Bebb's willow	G5S5
Salix boothii / Calamagrostis canadensis	Booth's willow / Bluejoint reedgrass	G3G4QSR
Salix candida / Carex lasiocarpa	Hoary willow / Slender sedge	G?S?
Salix drummondiana	Drummond's willow	G5S5
Salix drummondiana / Calamagrostis canadensis	Drummond's willow / Bluejoint reedgrass	G5S

CONTINUED ON NEXT PAGE

Table. 2 continued from previous page

Scientific Name	Common Name	Rank
PALUSTRINE SCRUB-SHRUB COMMUNITIES, BROAD-LEAVED DECIDUOUS		
Salix drummondiana / *Carex utriculata*	Drummond's willow / Beaked sedge	G5S5
Salix drummondiana / Mesic forb	Drummond's willow / Mesic forb	G4S?
Salix exigua / Mesic graminoid	Sandbar willow / Mesic graminoid	G5S5
Salix exigua / Temporary flooded	Sandbar willow / Temporary flooded	G5S5
Salix geyeriana / *Carex utriculata*	Geyer's willow / beaked sedge	G5S5
Salix geyeriana / Mesic graminoid	Geyer's willow / Mesic graminoid	G2G3?
PALUSTRINE EMERGENT COMMUNITIES, PERSISTENT		
Agrostis stolonifera	Redtop	G5SE
Bromus inermis	Smooth brome	G5SE
Calamagrostis canadensis	Bluejoint reedgrass	G4QS4
Carex aperta	Columbia sedge	G2?S2
Carex aquatilis	Water sedge	G5S4
Carex aquatilis – Carex utriculata	Water sedge – Beaked sedge	G3G4
Carex atherodes	Awned sedge	G5S5
Carex buxbaumii	Buxbaum's sedge	G3S3
Carex lasiocarpa	Slender sedge	G5S5
Carex limosa	Mud sedge	G3S3
Carex nebrascensis	Nebraska sedge	G5S5
Carex scopulorum	Holm's Rocky Mountain sedge	G5S4
Carex utriculata	Beaked sedge	G5S5
Carex vesicaria	Inflated sedge	G5S5
Deschampsia cespitosa	Tufted hairgrass	G4S3S4
Dulichium arundinaceum	Dulichium	G3?S2
Eleocharis palustris	Common spikerush	G5S5
Eleocharis rostellata	Beaked spikerush	G?S1
Elymus glaucus	Blue wildrye	G2S?
Equisetum fluviatile	Water horsetail	G5S5
Glyceria borealis	Northern mannagrass	G4S3
Hordeum jubatum	Foxtail barley	G5S5
Juncus balticus	Baltic rush	G5S5
Poa pratensis	Kentucky bluegrass	G5SE
Poa palustris	Fowl meadow-grass	G5SE
Phalaris arundinacea	Reed canarygrass	G5S5
Scirpus acutus	Hardstem bulrush	G5S5
Typha latifolia	Broadleaf cattail	G5S5

developed riparian areas. Poorly drained sites on the margins of fens, beaver ponds, or toe slope seeps are usually dominated by wet Engelmann spruce forests, or by black cottonwood and smaller amounts of spruce, which eventually replaces the black cottonwood at such sites. Pothole lakes often have a narrow fringe of black cottonwood and quaking aspen (*Populus tremuloides*) that quickly gives way to upland forest because of the steep slope gradients around these sites. We also observed black cottonwood stands on upslope, subirrigated burn sites; this occurs on a large scale in Glacier National Park.

Fluvial processes that lead to the development of cottonwood bottoms, such as flooding and sediment deposition, are intact in the North Fork watershed. Mature black cottonwood forests with intact native shrub understory species are common compared to other Flathead subwatersheds, where many of the mature cottonwood communities that remain have shifted from more palatable understory species such as red-osier dogwood (*Cornus sericea*), to less palatable species such as common snowberry (*Symphoricarpos albus*). Intact valley bottom cottonwood forests have declined regionally, from conversion to agricultural uses, rural expansion, bank stabilization, and dams.

Scrub-shrub vegetation

Riparian and wetland shrublands in the study area occur on terraces, active floodplain zones of low- and high-gradient streams and rivers, around beaver ponds, in peatlands, and on the edge of marshes, potholes, and lakes. Drummond's willow (*Salix drummondiana*) is the most common willow in the study area; stands of Drummond's willow occur on terraces of low gradient streams and rivers at mid-elevations and higher, and as a mosaic with marsh vegetation in wet meadow complexes (often with some beaver influence). Bebb's willow (*Salix bebbiana*) and Geyer's willow (*Salix geyeriana*) are much less common as dominants. Sandbar willow (*Salix exigua*) stands dominate active and recently stabilized gravel and sandbars. Mountain alder (*Alnus incana*) and red-osier dogwood dominate communities along higher gradient streams, and both mountain alder and alder leaved-buckthorn (*Rhamnus alnifolia*) form communities on the fringes of fens and lakes. Bog birch (*Betula glandulosa*) is a common shrub community on peatlands.

Peatland development is uncommon in the Northern Rocky Mountains. However when peatlands do develop, they occur as fens and carrs, sometimes associated with beaver activity. Although not common, they probably have not decreased markedly in acreage (Chadde et al. 1998). Chadde et al. (1998) provides a detailed description of the ecology and conservation of peatlands in Montana.

Emergent (herbaceous) vegetation

Native herbaceous emergent vegetation was typical in a variety of settings, including peatlands, marshes, potholes, beaver ponds, wet meadows, lake-edges, oxbows, and sloughs. Herbaceous wetland vegetation is usually a complex mosaic of monocultures, due to the rhizomatous habit of many of the constituent species. Slender sedge (*Carex lasiocarpa*), Buxbaum's sedge (*Carex buxbaumii*), and mud sedge (*Carex limosa*) can dominate portions of fens and sedge meadows. Common cattail (*Typha latifolia*), hardstem bulrush (*Scirpus acutus*), beaked sedge (*Carex utriculata*), inflated sedge (*Carex vesicaria*), water sedge (*Carex aquatilis*) and awned sedge (*Carex atherodes*) typically dominate marshes in the watershed. Hardstem bulrush, beaked and water sedges and cattail are also relatively common. Cattail increases with nutrient inputs, especially nitrogen (Neill 1990); fertilizer run-off and discharge of septic effluent to water bodies can cause rapid nutrient increases.

Most of the native herbaceous wetland and riparian communities in the North Fork watershed are locally and regionally common. Although intact wet meadow communities are still relatively common at higher elevations, many valley bottom wet meadows that once supported tufted hairgrass (*Deschampsia cespitosa*) and bluejoint reedgrass (*Calamagrostis canadensis*) communities have

been converted to exotics like redtop (*Agrostis stolonifera*), Kentucky bluegrass (*Poa pratensis*), meadow foxtail (*Alopecurus pratensis*), common timothy (*Phleum pratensis*) and reed canarygrass (*Phalaris arundinacea*). Merigliano and Lesica (1998) hypothesize that both native and exotic genotypes of reed canarygrass exist in Montana, with the exotic genotypes being responsible for the dense monocultures of this grass in some wetlands. Populations of exotic origin may be responsible for the aggressive spread of reed canarygrass in Montana habitats.

Herbaceous wet meadows that have been converted from native vegetation represent a major restoration challenge. Noxious weeds are most common in herbaceous vegetation types. Among the most widespread are Canada thistle (*Cirsium arvense*), spotted knapweed (*Centaurea maculosa*), oxeye-daisy (*Leucanthemum vulgare*), and leafy spurge (*Euphorbia esula*). Traces of butter & eggs (*Linaria vulgaris*) were found at Schnaus Cabin Wetlands and should be eradicated immediately.

Aquatic bed vegetation

Palustrine, Lacustrine and Riverine aquatic bed vegetation occurs in littoral (< 2m deep) and limnetic (> 2m) zones of ponds and lakes, or on the bed of slow-moving perennial streams. Pierce's (1999) classification of aquatic vegetation in western Montana and northern Idaho provides the foundation for the following aquatic dominance types observed in the study area. Yellow pond lily (*Nuphar polysepalum*), a floating-leaved species, is a common dominant aquatic species. Water milfoil (*Myriophyllum verticillatum*) and mare's tail (*Hippuris vulgaris*) dominate some aquatic communities and are usually completely submersed or partly emersed. Coontail (*Ceratophyllum demersum*), fennel-leaved pondweed (*Potamogeton pectinatus*), Illinois pondweed (*Potamogeton illinoensis*), and *Chara* sp. (an algae) are dominant in other aquatic communities and are most often completely submersed.

Plant Species Of Special Concern

Thirty-six plant species in the watershed are recognized as Montana species of special concern (Table 3; Heidel 1999). Six of those are globally significant and vulnerable throughout their range (G3/T3), including all of the moonworts (*Botrychium* spp.) and Goose-grass Sedge (*Carex lenticularis* var. *dolia*). The moonworts tend to be facultative wetland species, occurring in valley and montane riparian forests and thickets, as well as in wet meadows. The Goose-grass Sedge is one of six special concern plants in the watershed that are known in Montana only from Glacier National Park; we collected no new information on them in this study. Of the remaining species, many are boreal or circumboreal plants that are restricted to peatlands (Chadde et al. 1998). They include Hudson's Bay Bulrush (*Scirpus hudsonianus*), English Sundew (*Drosera anglica*), Slender Cottongrass (*Eriophorum gracile*) and three peatland mosses. The rest are associated with a variety of wetland habitats that are at risk from development and introduced species introductions including low elevation riparian forest types, springs and seeps, and open water habitats.

Animal Species Of Special Concern

The North Fork provides wetland habitat for 24 animal species of concern and three "watch list" species for which more information is being sought (Table 4). One of the special concern species, Montana arctic grayling (*Thymallus arcticus montanus*), has been stocked in mountain lakes and is not native to the drainage. The remaining 26 use wetland habitats for breeding and foraging to various degrees, or pass through them during migration or during local movements.

Many vertebrates are relatively widespread in this watershed, but several are apparently limited in distribution. There are few records of boreal toad (*Bufo boreas*) in the drainage in Glacier National Park (Marnell 1997); breeding was documented at only one of five wetland sites

Table 3. Plant Species of Special Concern and their conservation rank: North Fork Flathead wetlands

Scientific Name	Common Name	Global Rank	State Rank
Vascular Plants			
Botrychium ascendens	Upward-lobed Moonwort	*G3*	S1
Botrychium campestre	Prairie Dunewort	G3	S1
Botrychium crenulatum	Wavy Moonwort	G3	S2
Botrychium hesperium	Western Moonwort	G3	S1
Botrychium paradoxum	Peculiar Moonwort	G2	S1
Carex chordorrhiza	Creeping Sedge	G5	S2
Carex lenticularis var. *dolia*	Goose-grass Sedge	G5T3Q	S1
Carex livida	Pale Sedge	G5	S3
Carex paupercula	Poor Sedge	G5	S3
Carex rostrata	Beaked Sedge	G5	S1
Carex tenuiflora	Thin-flowered Sedge	G5	S1
Cypripedium passerinum	Sparrow's-egg Lady's-slipper	G4G5	S2
Drosera anglica	English Sundew	G5	S2
Dryopteris cristata	Buckler Fern	G5	S2
Eriophorum gracile	Slender Cottongrass	G5	S2
Festuca vivipara	Viviparous Fescue	G4G5Q	S2
Goodyera repens	Northern Rattlesnake-plantain	G5	S3
Kalmia polifolia	Pale Laurel	G5	S1
Ophioglossum pusillum	Adder's Tongue	G5	S2
Petasites frigidus var nivalis	Palmate-leaved Coltsfoot	G5T?	S1
Potamogeton obtusifolius	Blunt-leaved Pondweed	G5	S2
Ranunculus verecundus	Timberline Buttercup	G5	S2
Scheuchzeria palustris	Pod Grass	G5	S2
Scirpus cespitosus	Tufted Club-rush	G5	S2
Scirpus hudsonianus	Hudson's Bay Bulrush	G5	S1
Scirpus subterminalis	Water Bulrush	G4G5	S2
Senecio pauciflorus	Few-flowered Butterweed	G4G5	S1
Viola renifolia	Kidney-leaf White Violet	G5	S3
Non-Vascular Plants			
Calliergonella cuspidata		G5	S1
Meesia triquetra		G5	S1
Scorpidium scopidioides		G4G5	S1
Sphagnum centrale		G5	S1
Sphagnum magellanicum		G1	S1

surveyed for amphibians in 1999. Tailed frog (*Ascaphus truei*) has been documented in only a few streams of the drainage in Glacier National Park (Marnell 1997) and the Flathead National Forest, possibly reflecting a paucity of surveys. Harlequin duck (*Histrionicus histrionicus*) regularly breeds on Trail Creek. Surveys on other streams within and neighboring watersheds have revealed few additional harlequins (Reichel et al. 1997), but routine surveys of other North Fork tributaries have not been conducted. LeConte's sparrow (*Ammodramus leconteii*) has been found at Camas Creek and several other wet meadows in the watershed inside Glacier National Park (Wright 1996), but has not been documented elsewhere in the drainage. Northern bog lemming (*Synaptomys borealis*) has been documented at five fens and wet-meadow complexes in Glacier National Park (Reichel and Beckstrom 1994); several potential sites suitable for this small mammal remain to be surveyed.

Invertebrate distributions and abundance are poorly documented, and each species listed in Table 4 is known from only one or a few sites. The aquatic amphipod (*Stygobromus* sp.) is a new species whose formal description is soon to be submitted for publication (J.Holsinger pers. comm.). It is currently known from just one subterranean spring along Trail Creek. The Kintla Lake mountainshell (*Oreohelix* sp.), an undescribed species of land snail (Frest and Johannes 1995), has been reported from near Upper Kintla Lake from uncharacterized habitat; other locations outside the watershed indicate it may be associated with drier habitats. The validity of this taxon awaits verification.

The subarctic bluet (*Coenagrion interrogatum*) has been found at Howe Lake in Glacier National Park. This lake drains into McDonald Lake, which is not in the North Fork drainage. However, other suitable sites for this species are present in and near McGee Meadows, and the species likely is present in the North Fork drainage. Gillette's checkerspot (*Euphydryas gillettii*) is found in a few early-successional wet meadow sites in Glacier National Park where its host plant black twinberry (*Lonicera involucrata*) is available (Debinski 1993).

A number of Montana's special concern animals use the watershed's wetlands for foraging or during migration (and more local movements), but have not been documented breeding there. These include great blue heron (*Ardea herodias*), trumpeter swan (*Cygnus buccinator*), northern goshawk (*Accipiter gentilis*), northern hawk-owl (*Sernia ulula*), great gray owl (*Strix nebulosa*), black-backed woodpecker (*Picoides arcticus*), and all special concern mammals except northern bog lemming. The former bird species have been know to breed in wetland or non-wetland sites within the drainage. Predators like the gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos horribilis*), North American wolverine (*Gulo gulo luscus*), and Lynx (*Lynx canadensis*) may use riparian areas and wet or mesic meadows during seasonal and annual movements but are not particularly dependent upon them. Townsend's big-eared bat (*Corynorhinus townsendii*) breeds and hibernates in caves and abandoned mines, but often forages in forest clearings over streams and ponds where insects are abundant.

Conservation Priorities For Ecologically Significant Wetlands

We identified 24 significant wetlands, represented by ten groupings or "sites", in the course of this study (summarized in Table 5). Four others that we visited did not qualify as significant and are not reported here. One other significant wetland site, McGee Meadows in Glacier NP, was previously documented in the MTNHP database. This wetland already has a high level of protection, and is not included in our wetland site ranking for the watershed, though information is available upon request from MTNHP.

Two other wetland inventories have been conducted, both of which partially overlap the present study area and emphasize wetlands with significant waterfowl production values (King 1975, Wittmier 1986). Though these studies identified priority wetlands for acquisition and conservation easements, they differ from our

Table 4. Animal species of concern associated with North Fork Flathead River wetlands and watershed, and their TNC conservation rank (as of 1999). "Watch List" species are indicated with a (W), species introduced in the watershed are indicated with an (I).

Common Name	Scientific Name	Global Rank	State Rank
Fish			
Shorthead Sculpin[1]	*Cottus confusus*	G5	S3
Westslope Cutthroat Trout	*Onchorynchus clarki lewisi*	G4T3	S3
Bull Trout	*Salvelinus confluentus*	G3	S3
Montana Arctic Grayling (I)	*Thymallus arcticus montanus*	G5T2Q	S1
Amphibians			
Tailed Frog (W)	*Ascaphus truei*	G4	S4
Western Toad	*Bufo boreas*	G4	S3S4
Birds			
Common Loon	*Gavia immer*	G5	S1S2B
Great Blue Heron (W)	*Ardea herodias*	G5	S4B
Trumpeter Swan	*Cygnus buccinator*	G4	S2B
Harlequin Duck	*Histrionicus histrionicus*	G4	S2B
Bald Eagle	*Haliaeetus leucocephalus*	G4	S3B
Northern Goshawk	*Accipiter gentilis*	G5	S3S4B
Northern Hawk-Owl (W)	*Surnia ulula*	G5	S1B
Great Gray Owl	*Strix nebulosa*	G5	S3
Black-backed Woodpecker	*Picoides arcticus*	G5	S3
LeConte's Sparrow	*Ammodramus leconteii*	G4	S1S2B
Mammals			
Townsend's Big-eared Bat	*Corynorhinus townsendii*	G4	S2S3
Northern Bog Lemming	*Synaptomys borealis*	G4	S2
Gray Wolf	*Canis lupus*	G4	S1
Grizzly Bear	*Ursus arctos horribilis*	G4T3	S1S2
Fisher	*Martes pennanti*	G5	S2
North American Wolverine	*Gulo gulo luscus*	G5T4	S2
Lynx	*Lynx canadensis*	G5T?Q	S2
Crustaceans			
"Glacier" amphipod[2]	*Stygobromus "glacialis"*	[G1]	[S1]
Damselflies			
Subarctic Bluet	*Coenagrion interrogatum*	G5	S1S2
Butterflies			
Gillette's Checkerspot	*Euphydryas gillettii*	G3	S3
Mollusks			
Kintla Lake Mountainshell[3]	*Oreohelix* sp. 6	G1	S1

[1]Species systematics uncertain; state rank change proposed to SU.
[2] New species; description not yet published (J. Holsinger pers. comm.) and rank not yet assigned.
[3] Proposed new species not yet described (Frest and Johannes 1995).

current inventory in their narrower focus and because they did not emphasize intact native wetland communities and landscapes.

Highlights of the significant wetland sites identified are summarized below, and Appendix C provides detailed information. General locations of these sites are mapped in Figure 2, with more precise locations shown in Figure 4. Users of this report should note that half of the wetlands described are on private land, and permission from landowners is needed for access.

Wetlands of Outstanding Significance

Tepee Lake Complex, Mud Lake Complex and Hay Creek-North Fork Floodplain represent the most ecologically significant wetlands in the survey area. All of these sites have an outstanding diversity of wetland plant communities and wetland features. They are generally in excellent condition, have no or only minor weed populations, and the surrounding uplands are generally intact with minimal human impacts. All three Outstanding sites encompass a broad array of physical environments and hence contain a greater diversity of communities than smaller or environmentally constrained wetlands. For example, the Tepee Lake Complex has sizable examples of uncommon peatland communities dominated by mud sedge; high quality examples of the most common carr type, Drummond's willow / beaked sedge; forested and woodland wetlands dominated respectively by black cottonwood and Engelmann spruce in both seral and old-growth condition; aquatic communities; and rare vascular plants and bryophytes.

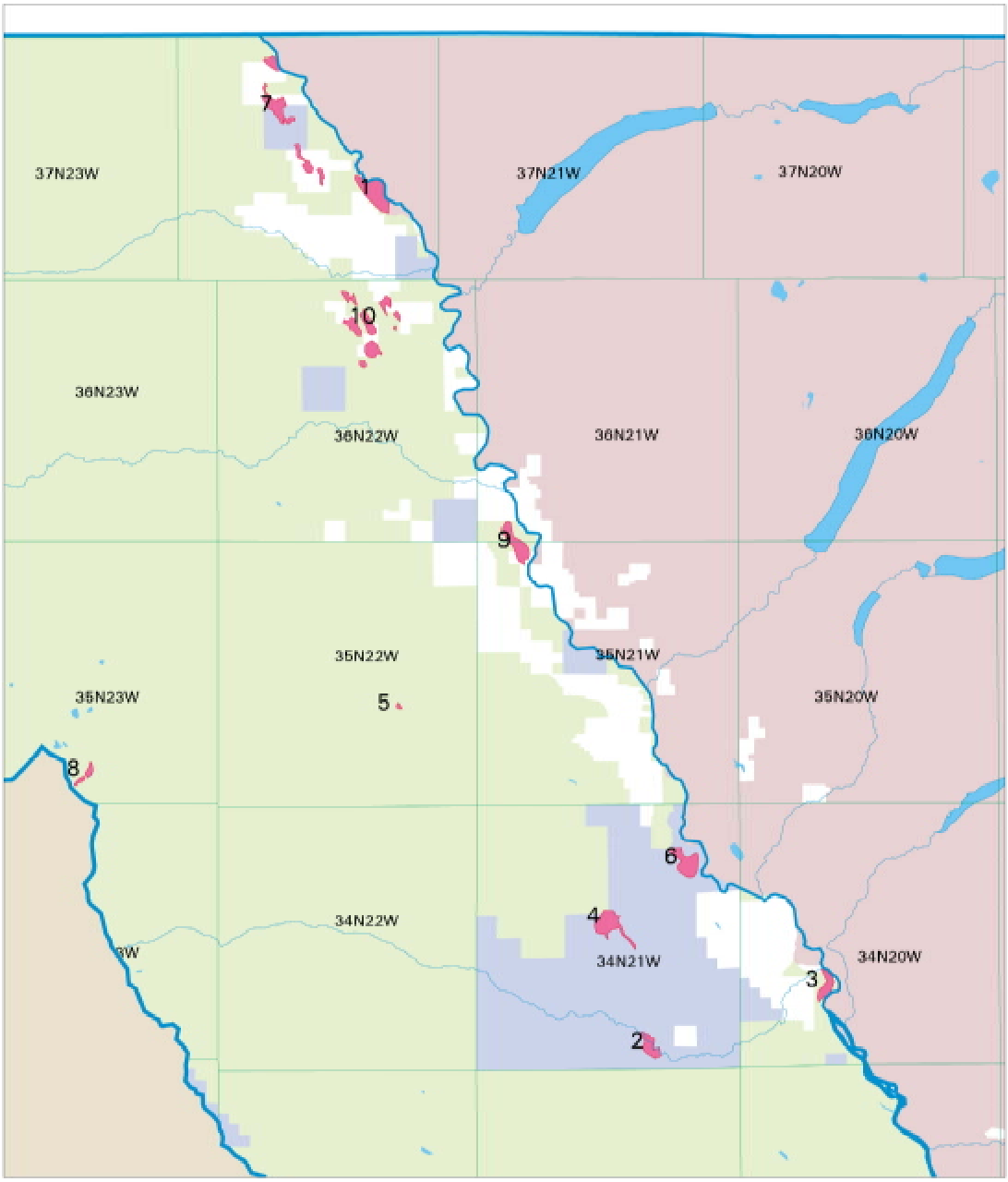
The Hay Creek-North Fork Floodplain site supports less diversity than the Tepee Lake Complex but the landscape is comparably intact and includes some early seral conditions typified by common spikesedge (*Eleocharis palustris*)- and water horsetail (*Equisetum fluviatile*)-dominated communities that are not present in the other

Table 5. Site rankings, management status, and ownership of North Fork Flathead wetlands inventoried in 1999.

	Ownership*			
Site Name	Federal	State	Private	Management Status
WETLANDS WITH OUTSTANDING SIGNIFICANCE				
Mud Lake Complex	USFS	DNRC	PVT	
Tepee Lake Complex	USFS		PVT	
Hay Creek-North Fork Floodplain		DNRC		
WETLANDS WITH VERY HIGH SIGNIFICANCE				
Coal Creek Complex		DNRC		
Coal Creek-North Fork Floodplain	USFS		PVT	
Schnaus Cabin Wetland	USFS		PVT	Wild & Scenic River
WETLANDS WITH HIGH SIGNIFICANCE				
Abbotts Flats	USFS		PVT	Wild & Scenic River
Hay Creek Fen	USFS			
WETLANDS WITH MODERATE SIGNIFICANCE				
Cyclone Lake		DNRC		
Red Meadow Lake	USFS			

* DNRC = Montana Department of Natural Resources; USFS = U.S. Forest Service; PVT = Private

Figure 4. Ecologically significant wetlands in the North Fork Flathead watershed



wetlands of Outstanding Significance within the watershed.

These three wetland sites of Outstanding Significance are in mixed ownership. Conservation of these sites will require collaborative efforts between the private parties, land trusts, and/or public agencies.

Very high significance

Three wetland sites, Schnaus Creek, Coal Creek-North Fork Floodplain and Coal Creek Complex were rated as having Very High Significance due to their large size and diversity of wetland habitats that include forest, shrub and herbaceous communities. The site boundaries of Coal Creek-North Fork Floodplain and Coal Creek Complex include bull trout (*Salvelinus confluentus*) habitat. All three of these sites reflect greater human impacts than the sites of Outstanding Significance. For example, Schnaus Creek, Coal Creek-North Fork Floodplain and Coal Creek Complex have all been impacted by thinning, harvest and haul road construction in the adjacent forests or have roads immediately adjacent or cutting through the wetland. In addition, two of the above sites have small populations of noxious weeds that have not yet burgeoned into serious infestations.

Minor changes in management practices in and around some of these wetlands could improve their quality and move them toward Outstanding Significance. Schnaus Creek and Coal Creek-North Fork Floodplain both have a diversity of wetland plant communities that are in good condition (e.g., few exotics, no grazing impacts). However, road building and timber harvest have affected the conditions in the uplands next to the two sites. Similarly, Schnaus Creek Wetland, which has some of the best-developed examples of valley bottom riparian forest in the study area, is slowly being encroached upon by recreational development and housing.

Leaving larger buffers between timber harvest units and wetland, or simply following best management practice guidelines, would mitigate changes to the hydrology of such sites and reduce potential inputs of sediments.

High significance

Abbotts Flat and Hay Creek Fen were both identified as wetlands of High Significance based on their excellent condition and the absence of noxious weeds. Abbotts Flat is located on a complex of floodplain terraces which include an excellent example of black cottonwood / red-osier dogwood Forest. Although this site is made up exclusively of forested and shrubland types, it is structurally very diverse, having a range of successional cottonwood forests present. Although in excellent condition and lacking weeds, Hay Creek Fen is small and as a result has a relatively low diversity of wetland plant communities, structural diversity, and wetland features.

Both these sites are located entirely or partially on the Flathead National Forest. Abbotts Flat is within the Wild & Scenic River corridor and lies partly on private land. Although these sites have less diverse plant communities, they may be the optimal places for wetland restoration projects, since they exemplify the distribution and composition of common native wetland communities. They could also serve as seed sources for restoration of wetland plants at other sites.

Moderate significance

Two sites, Red Meadow Lake and Cyclone Lake, were ranked as Moderately Significant. Both sites are in excellent condition, with minimal human impacts, though they are less diverse and have fewer plant communities than the more highly significant wetlands identified. Although Cyclone Lake is large, its wetland consists of a narrow fringe around the perimeter of the lake. The lake supports a breeding pair of common loons (*Gavia immer*) which nest on floating vegetation mats. The road and trail leading to Cyclone Lake goes to an extensive well-developed floating mat where anglers and boaters have trailed across the widest portion, denuding the mat

in patches. Relocating the trail to facilitate put-in and take-out would mitigate wetland impacts. Red Meadow Lake has an excellent example of water sedge - beaked sedge Herbaceous Vegetation. At the National Forest campground at Red Meadow Lake, efforts should be taken to minimize the impacts of road and campground activities on the adjacent wetlands.

Wetlands not inventoried

There are a number of wetlands in the North Fork watershed that were not surveyed as part of this inventory project. Readers should not infer that these uninventoried wetlands are in poor condition or have low functional integrity. This project's goal was very specific: to identify the most ecologically significant wetlands in the study area and prioritize them for conservation, restoration and mitigation. Many wetlands did not meet our initial selection criteria and were not prioritized for inventory. However, many of these do provide important wetland functions and are valuable for that reason alone.

Except for the wetlands within Glacier National Park, we are relatively confident that most wetlands of Outstanding Significance have been identified. Our confidence is based on 1) the depth and breadth of local knowledge that was tapped during the inventory, and 2) our use of NWI maps and aerial photos to identify and survey any large wetlands not been mentioned by the locally knowledgeable individuals.

We expect that most wetlands not inventoried as part of this project would rate at best as High or Moderate Significance. Many wetlands in the watershed have been fragmented by roads or have had their native wetland plant communities degraded by a variety of landuses. Others are pristine, but very small and dominated by just one or two plant communities. We believe that the High and Moderately Significant sites that we inventoried and described represent a fairly representative sample of these types of wetlands.

Plant community diversity, wetland size and condition of unsurveyed or data-poor wetlands can be evaluated by consulting NWI maps and evaluating impacts on-site. Information on known rare species occurrences at these wetlands is on file and can be obtained from MTNHP.

Because we focused where possible on large, fairly discrete wetlands, some types of wetlands and processes were likely under-emphasized during the inventory. Examples include small spring/seeps or just smaller wetlands that by chance could have harbored rare species. In addition, some fluvial processes (like deposition, channel migration, and flooding) occur at a larger scale than our assessments methods were designed to address. Riparian cottonwood communities are inextricably tied to such processes, and simply protecting existing patches of mature cottonwood forest cannot conserve these communities. Areas where deposition is occurring (where future cottonwood stands will be recruited) need to be conserved as well (Merigliano 1996).

How This Information Can Be Used

The purpose of this wetland inventory is to provide information that will assist in the conservation of wetland diversity and quality. The resulting information can be used to:

- **Prioritize wetlands for conservation**

This inventory provides a list of wetland sites ranked by ecological significance. This list can be used to efficiently prioritize how limited wetland protection funds are spent by land trusts considering conservation easements, or by state/federal agencies and corporate owners considering easements or land exchanges.

- **Identify irreplaceable wetlands**

This list of significant wetland sites identifies resources that are essentially irreplaceable. Some sites of Outstanding and Very High Significance contain wetland features like peatlands, spruce swamps, and rare plants which could not realistically be mitigated if lost.

■ **Identify potential Research Natural Areas and Botanical Special Interest Areas**

High ranking sites on Forest Service lands may be good candidates for designation as Research Natural Areas or Botanical Special Interest Areas. Likewise, similar sites on state land merit management to maintain significant natural values.

■ **Identify reference wetlands**

These results can be used by consultants, wetland scientists, watershed groups, and government agencies to identify reference wetlands. Such sites can serve as models of wetland plant community structure/composition for comparison/evaluation of other sites, for restoration projects, or as seed sources for plant materials. Reference wetlands are also extremely useful for inferring the impacts of certain landuse activities.

■ **Identify potential mitigation sites**

Some wetlands identified in this report could serve as mitigation sites to help offset losses of wetlands at other locations, in compliance with Section 404 of the Clean Water Act. At some sites, restoring hydrology by blocking peripheral drainage would improve wetland function.

■ **Provide context for wetland permit review**

This list of significant wetlands and wetland communities can help regulators ascertain the relative scarcity of a particular wetland type or community within a watershed or region, and provide perspective on the biological importance of wetlands resources that may be impacted.

■ **Provide information for landuse decisions**

This list can be used as a tool by county planners, regulators, and others to help inform decisions about planning, growth, and development.

■ **Assist HGM modeling efforts**

Some of these wetlands identified by this inventory could serve as reference sites for the regional guidebook being developed for slope wetlands.

Future Needs

This report completes our wetland inventory in the North Fork, Stillwater, Swan, and Flathead Lake drainages. However, tremendous needs remain for better information on Montana wetlands. One of these is to complete the National Wetland Inventory for Montana. NWI provides valuable basic information on the distribution, size, and types of wetlands found across the state. Another priority is to continue the inventory of ecologically significant wetlands on a watershed basis throughout the state. Appendix E provides a list of Montana watersheds with a preliminary prioritization by biodiversity value and level of threat, to help direct future wetland inventory efforts.

How To Request Additional Information

Additional wetland data is available for watershed-wide or site specific projects. Digitized National Wetland Inventory maps for some USGS quads in Montana can be viewed on the web at the Natural Resource Information System's Wetland Clearinghouse web page (http://www.nris.state.mt.us/wis/wis1.html). Hard copy maps are available for inspection at U.S.Fish and Wildlife Service offices or for purchase from the NWI Regional Distribution Center (605-688-5890).

The following wetland information is available from MTNHP:

- Occurrence information for rare plants, animals, and natural communities
- Site-specific community information for wetland sites surveyed

- Information on ecologically significant wetland sites currently not under conservation management
- Information on ecologically significant wetland sites currently protected

This report and previous wetland inventory reports are also available on the MTNHP website. Requests for additional information can be submitted through The Montana Natural Heritage Program website at http://www.nris.state.mt.us/mtnhp/, or by contacting the MTNHP Information Manager.

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References

Alt, D. and D.W. Hyndman. 1986. Roadside geology of Montana. Mountain Press Publishing Company, Missoula, Montana. 427 pp.

Anderson, M., P. Bourgeron, M.T. Bryer, R. Crawford, L. Engelking, D. Faber-Langendoen, M. Gallyoun, K. Goodin, D.H. Grossman, S. Landaal, K. Metzler, K.D. Patterson, M. Pyne, M. Reid, L. Sneddon, and A.S. Weakley. 1998. International classification of ecological communities: Terrestrial vegetation of the United States. Volume II. The National Vegetation Classification System: List of types. The Nature Conservancy, Arlington, Virginia.

Baker, W. L. 1989. Classification of the riparian vegetation of the montane and subalpine zones in western Colorado. Great Basin Naturalist 49(2): 214-228.

Boggs, K., P. Hansen, R. Pfister, and J. Joy. 1990. Classification and management of riparian and wetland sites in northwestern Montana. Draft version 1. Montana Riparian Association, Montana School of Forestry and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, Montana. 217 pp.

Bourgeron, P.S., L.D. Engelking eds. 1994. A preliminary vegetation classification of the Western United States. Unpublished report prepared by the Western Heritage Task Force for the Nature Conservancy, Boulder, Colorado.

Bourgeron, P.S., R.L. DeVelice, L.D. Engelking, G. Jones, and E. Muldavin. 1992. WHTF site and community manual, version 92B. Western Heritage Task Force, The Nature Conservancy, Boulder, Colorado. 24 pp.

Bursik, R.J. and R.K. Moseley. 1995. Ecosystem conservation strategy for Idaho panhandle peatlands. Unpublished report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 28pp.

Chadde, S.W., J.S. Shelly, R.J. Bursik, R. K. Moseley, A.G. Evenden, M. Mantas, F. Rabe, and B. Heidel. 1998. Peatlands on national forests of the northern Rocky Mountains: ecology and conservation. Gen. Tech. Rep. RMRS-GTR-11. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 75 pp.

Cole, N. K. 1995. Factors affecting the distribution of plant species within the riparian zone of the Hagerman study area. Technical appendix E.3.3-C for new license application: Upper Salmon Falls (FERC no. 2777), Lower Salmon Falls (FERC no. 2061), Bliss (FERC no. 1975). Volume 4. Idaho Power Company, Boise ID. 122 pp.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington D.C. 103 pp.

Crowe, E.A. and R.R. Clausnitzer. 1997. Mid-montane wetlands classification of the Malheur, Umatilla, and Wallowa-Whitman National Forests. Tech. Pap. R6-NR-ECOL-TP-22-97. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest. 299 pp.

Daubenmire, R. 1974. Taxonomic and ecological relationships between Picea glauca and Picea engelmannii. Canadian Journal of Botany 52: 1545-1560.

Debinski, D. 1993. Butterflies of Glacier National Park, Montana. Occasional Papers of the Museum of Natural History The University of Kansas, Lawrence, Kansas. Number 159: 1-13.

Evenden, A.G. 1989. Ecology and distribution of riparian vegetation in the Trout Creek Mountains of southeastern Oregon. Corvallis, OR: Oregon State University. 128 pp. Thesis.

Flora of North America Editorial Committee. 1997. Flora of North America north of Mexico, volume 3. Oxford University Press, New York, New York. 590 pp.

Frest, T. J. and E. J. Johannes. 1995. Interior Columbia Basin mollusk species of special concern. Final report to the Interior Columbia Basin Ecosystem Management Project, Walla Walla, WA. Contract #43-0E00-4-9112. 274 pp. plus

Greenlee, J.T. 1999. Ecologically significant wetlands in the Flathead, Stillwater, and Swan River valleys. Unpublished report to the Montana Department of Environmental Quality. Montana Natural Heritage Program. Helena, MT. 192 pp.

Griffiths, G.C.D. 1989. The true *Carex* rostrata in Alberta. Alberta Naturalist 19: 105-108.

Hall, J.B. and P.L. Hansen. 1997. A preliminary riparian habitat type classification system for the Bureau of Land Management Districts in southern and eastern Idaho. Tech. Bull. 97-11. Boise, ID: U.S. Department of Interior, Bureau of Land Management. 381 pp. In cooperation with: University of Montana, School of Forestry, Riparian and Wetland Research Program.

Hansen, P., K. Boggs, R. Pfister, and J. Joy. 1990. Classification and management of riparian and wetland sites in central and eastern Montana. Unpublished draft prepared for Montana Riparian Association, Montana Forest and Conservation Experiment Station, School of Forestry, University of Montana, Missoula, MT. 279 pp.

Hansen, P.L., R.D. Pfister, K. Boggs, B.J. Cook, J. Joy, and D.K. Hinckley. 1995. Classification and management of Montana's riparian and wetland sites. Montana Forest and Conservation Experiment Station, School of Forestry, Miscellaneous Publication No. 54. University of Montana, Missoula, Montana. 646 pp.

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

Hauer, F.R. 1998. A regional guidebook: The hydrogeomorphic (HGM) approach to assessing wetland functions for riverine wetlands in the Northern Rockies. Training session handout. Kalispell, Montana, September 14-18. Pages various.

Hauer, F.R., B.J. Cook, M.C. Gilbert, E.C. Clairain, and R.D. Smith. 1999. A regional guidebook: assessing the functions of intermontane prairie pothole wetlands in the northern Rocky Mountains, [Online]. Available FTP: www.umt.edu. Directory: biology/flbs/wetlands. File: default.htm.

Heidel, B. 1999. Montana plant species of special concern. [Unpublished list]. Montana Natural Heritage Program, Helena. 26 pp.

Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. 1955, 1959, 1961, 1964, 1969. Vascular plants of the Pacific Northwest. 5 vols. University of Washington Press, Seattle, Washington.

Jankovsky-Jones, M. 1997. Conservation strategy for northern Idaho wetlands. Unpublished report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 35 pp.

Jensen, M.E., W. Hann, R.E. Keane, J. Caratti, and P.S. Bourgeron. 1993. ECODATA – a multiresource database and analysis system for ecosystem description and evaluation. In: Jensen, M.E. and P.S. Bourgeron, eds. Eastside Forest Ecosystem Health Assessment, vol. II. U.S. Department of Agriculture, Forest Service, Forest Service Research. Pp. 203-218.

Kartesz, J.T. 1994. A synonomyzed checklist of the vascular flora of the United States, Canada, and Greenland, volume 1. Timber Press, Portland, Oregon. 622 pp.

King, R. 1975. Wetlands delineation of Montana – 1974-1975. U.S. Fish and Wildlife Service, Billings, MT.

Kittel, G., E. VanWie, and M. Damm. 1998. A classification of the riparian vegetation of the South Platte and Republican River basins, Colorado. 1998. Unpublished report on file at: Colorado Natural Heritage Program, Colorado State University, Ft. Collins, Colorado. 337pp.

Kovalchik, B. 1987. Riparian zone associations: Deschutes, Ochoco, Fremont, and Winema National Forest. Tech. Pap. R6-ECOL-TP-279-87. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 171 pp.

Kovalchik, B.L. 1993. Riparian plant associations on the national forests of eastern Washington. Colville, WA: U.S. Department of Agriculture, Forest Service. 203 p. Draft version 1.

Kufeld, R.C. 1973. Foods eaten by the Rocky Mountain elk. Journal of Range Management 26(2): 106-113.

Kunze, L.M. 1994. Preliminary classification of native, low elevation, freshwater wetland vegetation in western Washington. Washington Natural Heritage Program, Department of Natural Resources, Olympia, Washington. 120 pp.

Lesica, P. 1990. Vegetation and sensitive plant species of wetlands associated with geothermal areas in the Greater Yellowstone Ecosystem in Montana. Unpublished report on file at: Montana Field Office of The Nature Conservancy, Helena, Montana. 12pp.

Lesica, P. 1991. The importance of the Line Creek Plateau in protecting biological diversity in the Greater Yellowstone Ecosystem. Unpublished report on file at: Montana Field Office of The Nature Conservancy, Helena, Montana. 25pp.

Lesica, P. 1994. The distribution of plant community diversity associated with glacial wetlands in the Ovando Valley, Montana. Unpublished report on file at: Montana Field Office of The Nature Conservancy, Helena, Montana. 26 pp.

Lesica, P. 1986. Vegetation and flora of Pine Butte Fen, Teton County, Montana. Great Basin Naturalist 46:22-32.

Manning, M.E. and W.G. Padgett. 1995. Riparian community type classification of the Humboldt and Toiyabe National Forests, Nevada and eastern California. Ecol. Rep. 95-01. Ogden, UT: US. Department of Agriculture, Forest Service, Intermountain Region Ecology and Classification Program. 274 pp.

Marnell, L.F. 1997. Herpetofauna of Glacier National Park. Northwest Naturalist 78: 17-33.

Mattson, J.D. 1984. Classification and environmental relationships of wetland vegetation in central Yellowstone National Park. Moscow, ID: University of Idaho. 409 pp. Thesis.

Mauk, R.L. and J.A. Henderson. 1984. Coniferous forest habitat types of northern Utah. General Technical Report INT-170. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Region. 89 pp.

Merigliano, M.F. 1996. Ecology and management of the South Fork Snake River cottonwood forest. Tech. Bull. 96-9. Boise, ID: U.S. Department of Interior, Bureau of Land Management. 79 pp. In cooperation with: University of Montana, School of Forestry, Riparian and Wetland Research Program.

Merigliano, M.F. and P. Lesica. 1998. The native status of reed canarygrass (Phalaris arundinacea L.) in the inland northwest, USA. Natural Areas Journal 18: 223-230.

Mitsch, W.J., and J.G. Gosselink. 1993. Wetlands. Van Nostrand Reinhold, New York, New York. 722 pp.

Moseley, R. K. 1998. Riparian and wetland community inventory of 14 reference areas in southwestern Idaho. Technical Bulletin 98-5. U.S. Department of the Interior, Bureau of Land Management, Boise State Office, Boise, ID. 52 pp.

Moseley, R.K. and C.A. Wellner. 1991. Establishment record for Aquarius Research Natural Area within Clearwater National Forest, Clearwater County, Idaho. USDA Forest Service. 39 pp.

Moseley, R. K., R. J. Bursik, F. W. Rabe, and L. D. Cazier. 1994. Peatlands of the Sawtooth Valley, Custer and Blaine Counties, Idaho. Cooperative Cost Share Project, Sawtooth National Forest, The Nature Conservancy, and Idaho Conservation Data Center, Idaho Department of Fish and Game. SNF Purchase Order No. 40-0267-3-0233. 64 pp. plus appendices.

Moseley, R.K. 1995. The ecology of geothermal springs in southcentral Idaho. Unpublished report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 47pp.

Moseley, R.K., R.J. Bursik, M. Mancuso. 1991. Floristic inventory of wetlands in Fremont and Teton Counties, Idaho. Unpublished report on file at: Idaho Department of Fish and Game, Conservation Data Center, Boise, ID. 60pp.

Mutz, K.M. and J. Queiroz. 1983. Riparian community classification for the Centennial Mountains and South Fork Salmon River, Idaho. Layton, UT: Meiiji Resource Consultants. 170 pp.

Neill, C. 1990. Effects of nutrients and water levels on emergent macrophyte biomass in a prairie marsh. Canadian Journal of Botany 68: 1007-1014.

Nesser, J.A., G.L. Ford, C.L. Maynard, D.S. Page-Dumrose. 1997. Ecological units of the Northern Region: subsections. Gen. Tech. Rep. INT-GTR-369. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 88 pp.

Padgett, W.G., A.P. Youngblood, and A.H. Winward. 1989. Riparian community type classification of Utah and southeastern Idaho. Ecol. Rep. R4-Ecol-89-01. Ogden, UT: US. Department of Agriculture, Forest Service, Intermountain Region. 191 pp.

Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby. 1977. Forest habitat types of Montana. Gen. Tech. Rep. INT-34. Ogden, Utah: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 174 pp.

Pierce, J. 1986. Wetland community type classification of west-central Montana. Review draft on file with the Ecosystem Management Program. U.S. Department of Agriculture, Forest Service, Northern Region. Missoula, Montana. 157 pp.

Reichel, J.D. and S.G. Beckstrom. 1994. Northern bog lemming survey. Unpublished report on file at: Montana Natural Heritage Program, Helena, Montana. 87 pp.

Reichel, J.D. et al. 1997. Harlequin Duck Research and Monitoring in Montana: 1996. Unpublished report on file at: Montana Natural Heritage Program, Helena, Montana. 77 pp.

Reid, M., K. Schulz, M. Schindel, P. Comer, G. Kittel, and others (compilers). 1999. International classification of ecological communities: Terrestrial vegetation of the Western United States. Report from Biological Conservation Datasystem and Working Draft of July 1999. Association for Biodiversity Information/The Nature Conservancy, Western Resource Office, Community Ecology Group, Boulder, Colorado.

Sirucek, D.A. and V.C. Bachurski. 1995. Riparian land-type survey of the Flathead National Forest area, Montana. U.S. Department of Agriculture, Forest Service, Flathead National Forest, Kalispell, Montana. Pages various.

Smith, R.D., A. Ammann, C. Bartoldus, M.M. Brinson. 1995. An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices. Wetlands Research Program Technical Report WR-DE-9. U.S. Army Corps of Engineers, Waterways Experiment Station. 88 pp.

Steele, R., R.D. Pfister, R.A. Ryker, and J.A. Kittams. 1981. Forest habitat types of central Idaho. General Technical Report INT-114. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Region. 138 pp.

The Nature Conservancy. 1998. Core heritage methodology training: October 19-23 1998 training binder. Arlington, VA. The Nature Conservancy. Unpaginated.

Tuhy, J.S. 1981. Stream bottom community classification for the Sawtooth Valley, Idaho. Moscow, ID: University of Idaho. 230 pp. Thesis.

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

Utzig, G.F. et al. 1986. A field guide for identification and interpretation of ecosystems in the Nelson Forest Region, second revision. Province of British Columbia, Ministry of Forests. 83 pp.

Viereck, L. A., C. T. Dyrness, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska vegetation classification. USDA Forest Service General Technical Report PNW-GTR-286. Pacific Northwest Research Station. 278 pp.

Walford, G., G. Jones, W. Fertig, and K. Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Unpublished draft report prepared by Wyoming Natural Diversity Database, The Nature Conservancy, and the USDA Forest Service. 120 pp.

Walter, H. 1973. Vegetation of the earth in relation to climate and the eco-physiological conditions. New York: Springer-Verlag; 237 pg.

Washington State Department of Ecology. 1991. Washington state wetland rating system for eastern Washington. Publication No. 91-58. Washington State Department of Ecology, Olympia, Washington. 58 pp.

Wellner, C. A. 1989. Establishment record for Potholes Research Natural Area within Kaniksu National Forest, Bonner County, Idaho. USDA Forest Service. 23 pp.

Wittmier, H. 1986. Land acquisition and development plan. Flathead and Lake Counties. October, 1986.

Wright, P.L. 1996. Status of Rare Birds in Montana, With Comments on Known Hybrids. Northwestern Naturalist, 77: 57-85.

Youngblood, A.P., W.G. Padgett, and A.H. Winward. 1985. Riparian community type classification of eastern Idaho-western Wyoming. Ecol. Rep. R4-Ecol-85-01. Ogden, UT: US. Department of Agriculture, Forest Service, Intermountain Region. 78 pp.

■ Appendix A.
Global and state rank guidelines

■ For state ranks, substitute S for G in these definitions

G1 = Critically imperiled globally because of extreme rarity (typically five or fewer occurrences or very few remaining acres) or because of some factor(s) making it extremely vulnerable to exptirpation.

G2 = Imperiled globally because of extreme rarity (typically six to 20 occurrences or few remaining acres) or because of some factor(s) making it very vulnerable to extirpation.

G3 = Vulnerable; either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single Great Plains state, a single physiographic or ecoregional unit) or because of other factors making it vulnerable to extirpation throughout it's range.

G4 = Apparently Secure; Uncommon, but not rare (although it may be quite rare in parts of its range, especially at the periphery). Apparently not vulnerable in most of its range.

G5 = Secure; Common, widespread, and abundant (though it may be quite rare in parts of its range, especially at the periphery). Not vulnerable in most of its range.

GU = Unrankable; Status cannot be determined at this time.

G? = Unranked; Status has not yet been assessed.

■ **Modifiers and Rank Ranges**

? A question mark added to a rank expresses an uncertainty about the rank in the range of 1 either way on the 1-5 scale.

G#G# Greater uncertainty about a rank is expressed by indicating the full range of ranks which may be appropriate.

Q A "Q" added to a rank denotes questionable taxonomy. It modifies the degree of imperilment and is only used in cases where the type would have a less imperiled rank if it were not recognized as a valid name (i.e. if it were combined with a more common type).

■ Critera Used For Ranking

The criteria for ranking are based on a set of quantitative and qualitative factors. These factors are listed below in order of their general importance:

a. Number of Element Occurrences (EOs):
the estimated number of EOs throughout the Element's global range;

CONTINUED ON NEXT PAGE

b. Abundance:
the estimated global abundance of the Element (measured by number of individuals, or area, or stream length covered);

c. Size of Range:
the estimated size of the Element's global range;

d. Distribution trend:
the trend in the Element's distribution over it's global range;

e. Number of protected EOs:
the estimated number of adequately protected EOs throughout the Element's global range;

f. Degree of threat:
the degree to which the Element is threatened globally;

g. Fragility:
the fragility or susceptibility of the Element to intrusion;

h. Other global considerations:
for example, the quality or condition of EOs that affect or may affect endangerment status; unexplained population fluctuations; reproductive strategies that are dependent on specific habitat; etc.

■ Appendix B

Wetland community type descriptions

BETULA GLANDULOSA / CAREX UTRICULATA *Shrubland*

Similar Communities

The *Betula glandulosa / Carex utriculata* habitat type is equivalent to *Betula glandulosa / Carex rostrata* (Hansen *et al.* 1995), which had been previously described in an unpublished study by Pierce (1986). It should be noted that this is a default type in Hansen *et al.*. (1995), that is, this is the only *Betula glandulosa*-dominated type recognized for Montana and *Carex utriculata* is merely a name placeholder as its constancy is only 60% (in the association name *C. utriculata* should be placed in parentheses). *Carex utriculata* was erroneously referred to as *Carex rostrata* in earlier taxonomic and ecological studies (Griffiths 1989). Pierce (1986) described a similar community with an understory dominated by *Deschampsia cespitosa*. Other communities with *Betula glandulosa* overstories and *Carex lasiocarpa* understories exist in northern Idaho and northwest Montana (Jankovsky-Jones 1997, Chadde *et al.* 1998, and Greenlee 1999). The *Betula glandulosa / Carex cusickii* plant association ia a closely allied community from northwest Montana (Greenlee 1999).

PHOTO BY JACK GREENLEE

Range

Betula glandulosa / Carex utriculata is a minor type at mid elevations in western Montana (Hansen *et al.* 1995), and throughout Idaho (Moseley *et al.* 1991, Bursik and Moseley 1995).

Environmental Description

This community type occurs adjacent to beaver ponds, lakes, or marshes, and on seeps, swales and w*et al.*luvial terraces adjacent to low gradient, meandering streams (Hansen *et al.* 1995). This community occurs on fairly wet sites with peat accumulation, indicating a predominance of anaerobic processes. In contrast, some willow stands, like *Salix drummondiana* stands, commonly occur on soils that are better aerated, and hence are not usually found in peatlands. Soils are commonly flooded until mid summer, and are saturated year round on wetter sites. Redox concentrations are present in some mineral soils; redox depletions (gleyed soil) occur rarely. Organic matter accumulations may form floating, quaking mats as this type encroaches onto open water. Drier extremes have shallow organic horizons overlying deeper mineral soil (Hansen *et al.* 1995).

Range Description

Betula glandulosa contributes an average of 35% to the overstory. Minor amounts of *Potentilla fruticosa* and *Salix* species are usually present. The canopy cover provided by the various shrubs is sparse to moderate, but the herbaceous layer cover is high. Associated shrubs include *Rhamnus alnifolia* and various willows. Understory species composition is dependent on water levels. The wettest sites support *Carex utriculata* and

C. aquatilus. *Geum macrophyllum* and the graminoids *Poa pratensis and Agrostis stolonifera* are often present in drier micro-sites and/or disturbed sites (Hansen *et al.* 1995).

Wildlife Values

Betula glandulosa is a valuable browse species for elk (Kufeld 1973). Communities dominated by *Betula glandulosa* may function to stabilize channel banks (frequently creating overhanging banks) and provide shade creating quality fish habitat.

Succession

The *Betula glandulosa / Carex utriculata* community type represents a fairly stable type. Grazing my decrease the vigor of bog birch and increase the presence of species tolerant of grazing including *Agrostis stolonifera, Poa pratensis, Poa palustris,* and *Juncus balticus.* Management

Saturated soils are highly susceptible to soil compaction and streambank sloughing when used by livestock and heavy machinery. Overuse may result in reduced vigor or eventual elimination of shrubs from the site. Burning of this type can temporarily increase productivity of *Carex* species. However, care should be taken when burning along streambanks because of the excellent erosion protection provided by *Betula glandulosa / Carex utriculata* habitat type (Hansen *et al.* 1995).

Adjacent Communities

Adjacent, wetter sites may be dominated by *Salix drummondiana, S. geyeriana, Carex utriculata* or *C. lasiocarpa* types. Drier wetland communities support *Poa pratensis, Populus trichocarpa,* and *Potentilla fruticosa*. At higher elevations, adjacent, wetland forests are often dominated by *Picea engelmannii* or *Abies lasiocarpa*. Adjacent uplands support habitat types from the *Abies lasiocarpa, Pseudotsuga menziesii,* and *Pinus ponderosa* series, depending on elevation and aspect (Hansen *et al.* 1995).

Conservation Rank

G4? / S4

Element Code

CEGL001079

EDITION / AUTHOR

95-09-05 / L. Williams

CALAMAGROSTIS CANADENSIS *Herbaceous Vegetation*

Similar Communities

PHOTO BY JACK GREENLEE

Similar communities have been described by Mattson (1984) for Yellowstone National Park, Padgett *et al.*. (1989) for Utah and southeastern Idaho, Jankovsky-Jones (1997) for northern Idaho, and Kovalchik (1987) for eastern Oregon. Similar communities dominated by *Calamagrostis stricta* have been observed in Montana and Hansen *et al.*. (1995) have placed these in the *Calamagrostis canadensis* association because of similarities in management concerns; in general *C. stricta* is more associated with plains environments and *C. canadensis* with mountainous and forested landscapes. Other studies have documented *Calamagrostis canadensis* as the dominant understory species growing with a variety of other overstory species, including *Picea* sp. (Hansen *et al.* 1995), *Abies lasiocarpa* (Pfister *et al.* 1977), *Salix drummondiana, Salix geyeriana,* and *Salix lutea* (Hansen *et al.* 1995).

Range

This community is found in Montana, Wyoming, Idaho, Utah, and eastern Oregon.

Environmental Description

The *Calamagrostis canadensis* association is found in montane to subalpine habitats in the mountains of Montana. It is typically found in a variety of settings: in depressional landforms as one of the outer bands (i.e. the drawdown zone) of vegetation, in wet meadows, adjacent to streamcourses and on alluvial terraces, and in moist forest openings. Soils in basin settings are generally loamy mineral soils, while those along low gradient streams are usually coarse textured alluviums. *Calamagrostis canadensis* communities usually flood in the spring and dry down by mid-summer. Adjacent wetter communities are often dominated by *Carex aquatilis* or *Carex utriculata* and adjacent drier vegetation is usually upland coniferous forest (Hansen *et al.* 1988, Hansen *et al.* 1995).

Range Description

Calamagrostis canadensis is the dominant species in this community, with canopy coverage averaging 70% (Hansen *et al.*. 1995). Though this association is apparently most abundantly documented for Montana (38 stands), one must be cautious when interpreting the data of Hansen *et al.*. (1995). They show *C. canadensis* and *C. stricta* to be mutually exclusive (their respective constancy values sum to 100%) and thus one cannot determine if some of the associated species are more aligned with one or the other of the *Calamagrostis* spp. Traces of conifers and of shrubs can be found in this association. *Deschampsia cespitosa* and *Carex utriculata* are the most frequently associated graminoids with the greatest cover values. Forbs usually occur at low coverage but in wide variety, including most commonly *Senecio triangularis, Viola* spp. and *Epilobium ciliatum*.

Succession

Successional dynamics of this community are poorly understood. Padgett *et al.* (1989) describe expansion of *Calamagrostis canadensis* into the moist borders of *Pinus contorta* stands dying from bark beetles, and ascribe this to increases in the water table due to less transpiration by the conifers. Hansen *et al.* (1995) suggest that *Picea* sp. / *Calamagrostis canadensis* communities are late seral stages of the *Abies lasiocarpa* / *Calamagrostis canadensis* community, with shrub overstories dominating where disturbance removes the tree overstory. However, it is not clear whether the *Calamagrostis canadensis* community should be considered an early seral community that is ultimately invaded by conifers and/or shrubs. Changes in the composition of the *Calamagrostis canadensis* community can take place when there are changes in the hydrologic regime.

Management

Palatability of *Calamagrostis canadensis* varies from moderate to high. Heavy grazing can reduce the vigor of this grass and lead to an increase of exotic graminoids, including *Poa pratensis*, *Poa palustris*, *Agrostis stolonifera*, *Phalaris arundinacea* and the native *Juncus balticus*. Heavily grazed wetter sites can be converted to dominance by *Juncus balticus* or *Carex nebrascensis*. Hansen *et al.*. (1995) also state that moderate late-season grazing of *Calamagrostis canadensis* limits the impact on stands, especially when soils are dry.

Conservation Rank

G4Q / S4

Element Code

CEGL001559

EDITION / AUTHOR

9-10-12 / Jack Greenlee

Water sedge Herbaceous Vegetation

CAREX AQUATILIS *Herbaceous Vegetation*

Similar Communities

Two phases of this association, the *Carex aquatilis* and *Deschampsia cespitosa* phase, have been described for Montana and define respectively the wet and dry extremes of the association (Hansen *et al.*. 1995). *Carex aquatilis* has also been described as a co-dominant or indicator species throughout the west (and midwest to a limited extent) in combination with *Carex utriculata*, *Carex* spp., *Carex praegracilis*, and *Phleum alpinum. Carex aquatilis* in combination with all the forgoing graminoids defines four plant associations; *C. aquatilis* also constitutes the principal undergrowth species in *Salix planifolia*- and *Salix wolfii*-dominated associations (Hansen *et al.*. 1995). It should be noted that Hansen *et al.*. (1995) considered *Carex lenticularis* and *C. aperta* as ecologically analogous to *C. aquatilis*, though only 12% of their 78 plots used to define the type had either of these other *Carex* spp. as dominants.

Range Communities

Similar plant communities have been documented by other studies in eastern Oregon (Kovalchik 1987), Idaho (Hall and Hansen 1997), Utah (Padgett *et al.* 1989), Nevada (Manning and Padgett 1995), Wyoming (Youngblood *et al.* 1985), and Colorado (Kittel *et al.* 1998).

Environmental Description

Carex aquatilis communities can be found at mid (2,300 feet) to high elevations (8,200 feet, plus) throughout Montana. It is typically found in depressional landforms, old channels along streams, fens, and in silted in beaver ponds. This community occurs on both mineral and organic soils, though more commonly on the latter. Soil reactions are usually acidic, and water levels in *Carex aquatilis* communities usually remain high throughout the growing season, occasionally dropping below the rooting zone in dry years. Adjacent wetter communities include *Carex utriculata* and *Carex lasiocarpa* stands, while drier communities could include *Juncus balticus*, *Calamagrostis canadensis*, or meadows dominated by *Deschampsia cespitosa* (Hansen *et al.* 1988).

Range Description

Carex aquatilis is clearly the dominant species in this plant association, although it can be found growing with significant coverage of other graminoids, particularly *Carex utriculata* and *Carex simulata* in the wetter environments or *Deschampsia cespitosa* in the somewhat drier phase of the same name. Hansen *et al.*. (1995) have arbitrarily established that 25% or greater canopy cover of *C. utriculata* denotes a shift from the *C. aquatilis* to the wetter *C. utriculata* association. Low coverage of shrubs such as *Salix* sp. or *Pentaphylloides floribunda* may also be found growing in this association. Low coverage of a variety of forbs may be found in this community; these forbs may include *Mentha arvensis, Galium trifidum, Aster occidentalis*, and *Epilobium* ssp. (Hansen *et al.* 1995, Hansen *et al.* 1988).

Succession

Carex aquatilis communities probably represent a fairly stable plant association, although the successional pathways for this community are poorly understood. It can colonize expanses of mineral soil, such as dried out beaver ponds (Hansen *et al.* 1995), but it can also occupy sites on organic soils, which typically experience more anaerobic conditions.

Management

Carex aquatilis is considered moderately palatable to livestock, and poor grazing management practices can impact this plant community by causing decreases in *Deschampsia cespitosa* and increases in *Juncus balticus* and exotic grasses and through trampling damage to organic soils. However, due to the rhizomatous habit of this sedge, disturbed sites do stand a chance of improving rapidly once the disturbance level is reduced (Kovalchik 1987). This species' rhizomes can also strongly anchor and stabilize streambanks.

Conservation Rank

G5 / S4

Element Code

CEGL 001802

EDITION / AUTHOR

99-10-05 / Jack Greenlee

CAREX BUXBAUMII *Herbaceous Vegetation*

Similar Communities

Includes the *Carex buxbaumii-Carex saxatilis* (Tuhy 1981) c.t. and the *Carex buxbaumii-Carex aquatilis* (Mattson 1984) h.t. and phases. Hansen *et al.* (1995) groups this community with *Carex lasiocarpa* and *Carex lanuginosa* for management purposes. Pierce (1986) and Padgett *et al.* (1989) also describe this community type.

Range

Carex buxbaumii is a minor community type in the Uinta Mountains of Utah, western and south-central Montana, Yellowstone National Park, and four disjunct areas of Idaho.

Environmental Description

This community type occurs in moderately broad valley bottoms, in depressional wetlands like glacial potholes, in peatlands, and on lake plains. Saturated soil conditions persist in the surface peat from mid spring to mid summer. Water levels may then drop to the soil surface or, on drier stands, to several decimeters below the surface.

Range Description

Carex buxbaumii is always dominant in this community, with 25% or greater cover. *Carex aquatilis* and/or *Carex saxatilis* are sometimes present and occasionally are co-dominant. Other associates include *Deschampsia cespitosa, Caltha leptosepala, Eleocharis pauciflora, Senecio cymbalaroides, Pedicularis groenlandica, Ligusticum tenuifolium, Carex lanuginosa, C. utriculata, C. lasiocarpa, C. muricata, C. livida, C. nebraskensis, C. praegracilis,* and *C. simulata* (Padgett *et al.* 1989).

Management

Herbage production varies from low to moderate. Saturated soils are a natural deterrent to livestock grazing. Alteration of hydrology and subsequent dewatering may result in communities dominated by *Carex buxbaumii* being accessible to cattle. Fencing of these relatively small communities is a practical management method for restoration when the hydrologic regime is intact.

Adjacent Communities

In Montana, adjacent wetter sites include *Scirpus acutus, Carex lasiocarpa, and Carex utriculata,* and adjacent drier sites include *Deschampsia cespitosa* and *Juncus balticus* communities (Pierce 1986).

Conservation Rank

G3 / S3

Element Code

CEGL001806

EDITION / AUTHOR

95-06-09 / L. Williams

CAREX LANUGINOSA *Herbaceous Vegetation*

Similar Communities

Hansen *et al.* (1995) included the *Carex lanuginosa* plant association in the *Carex lasiocarpa* habitat type perceiving they had similar management considerations. However, the two communities differ in that *Carex lasiocarpa* tends to occur on slightly acidic, organic soils that are permanently wet, whereas *Carex lanuginosa* communities are often found in mildly brackish marshes that dry down seasonally (Lesica 1994). The *Carex lanuginosa – Calamagrostis stricta* association of the Dakotas and western mid-west may have a similarity that is stronger than expressed in the name alone (considering that *Calamagrostis sticta* is a major component of the *Carex lanuginosa* association, as found in Montana, about 30% of the time).

Range

In addition to Montana, *Carex lanuginosa* dominated communities have also been documented for Idaho (Hall and Hansen 1997, Jankovsky-Jones 1997) and eastern Oregon (Kovalchik 1987) and reported from Colorado, Washington, Utah and British Columbia.

Environmental Description

Carex lanuginosa communities can be found at low to mid elevations in western and central Montana. These marsh communities are usually found in depressions, older riverine sloughs, wet meadow areas along creeks, and in wetlands formed by springs and seeps. Stands primarily occur on mildly brackish mineral soils that are seasonally flooded but, which usually dry down by late summer. Adjacent wetter communities include shallow marsh communities dominated by *Carex utriculata, Carex aquatilis, Carex nebrascensis* or *Scirpus maritimus*, while adjacent drier, less frequently flooded communities may be dominated by *Deschampsia cespitosa, Juncus balticus, Distichlis stricta,* or stands of exotic pasture grasses like *Phleum pratense* and *Poa palustris*. Upland communities are often dominated by *Artemesia cana* or *Artemesia tridentata* at lower elevtions and by the *Abies lasiocarpa* and *Pseudotsuga menziesii* series at higher elevations.

Range Description

The general impression of this association is of a graminoid-dominated marsh where shrubs and forbs are a minor component. *Carex lanuginosa* typically dominates these communities and due to its rhizomatous habit often forms dense stands with heavy cover. This association is best documented for Montana (32 plots from just Hansen *et al.*. 1995), at least as it is broadly conceived of. Accepting that high coverages of *Carex lasiocarpa and Carex buxbaumii* define separate plant associations then the only graminoids of even moderate constancy (>20%) for this association (as it occurs in Montana) are *Calamagrostis stricta, Carex utriculata, Deschampsia cespitosa* and *Juncus balticus*. Commonly associated forbs include *Mentha arvensis, Potentilla anserina, Potentilla palustris* and *Triglochin maritimum*; a number of forbs, including *Equisetum* spp., occasionally attain high cover values (>30%)

Succession

Carex lanuginosa communities probably represent a fairly stable plant association, given a relatively stable hydrologic regime. Moderate disturbance could cause increases in *Juncus balticus* or any pasture grasses present, like *Poa pratensis* or *Phleum pratense* (Hansen *et al.*. 1995).

Management

Carex lanuginosa is highly palatable and communities can be adversely impacted by season-long grazing, particularly when grazing management practices cause increased downcutting of stream channels, which in tern alters the hydrology of *Carex lanuginosa* communities located in floodplain settings. However, due to the rhizomatous habit of this sedge, disturbed sites do stand a chance of improving rapidly once the disturbance is removed and if the disturbance level isn't too high (Kovalchik 1987).

Conservation Rank

G3? / SP

Element Code

CEGL001809

EDITION / AUTHOR

99-10-05 / Jack Greenlee

Slender Sedge Herbaceous Vegetation

CAREX LASIOCARPA *Herbaceous Vegetation*

Similar Communities

Some classifications include stands dominated by *Carex lanuginosa* in the *Carex lasiocarpa* plant association (Pierce 1986, Hansen *et al.* 1995), due to similarities in structure and management concerns. *Carex lanuginosa* tends to occur on mineral soils, while *Carex lasiocarpa* is most often found on organic soils (Hansen *et al.* 1988, Lesica 1994). *Carex buxbaumii* stands are also included in the *Carex lasiocarpa* habitat type by some classifications due to similarities in management concerns (Kovalchik 1987, Hansen *et al.* 1995).

PHOTO BY JACK GREENLEE

Range

The *Carex lasiocarpa* community type is distributed globally throughout the northern hemisphere; in the western United States it is a minor type in eastern Washington, the Uinta Mountains of Utah, southeastern Idaho, throughout much of Montana, and in central Yellowstone National Park.

Environmental Description

The *Carex lasiocarpa* plant association usually occupies former lake basins, long-abandoned beaver ponds, potholes, and lake and stream margins that favor the accumulation of peat. Occasionally this community

occurs as floating or quaking mats on fluid peat subsoil. This association can often be found in intermediate to rich fens. The soils are usually organic, with accumulations of sedge peat. This type is typically an indicator of a stable hydrologic regime with yearlong saturated soil conditions in the root zone at minimum. This community can tolerate yearlong flooded conditions.

Range Description

Carex lasiocarpa dominates the community with 30-80% cover. It often forms monocultures in sedge meadows in Montana. *Carex utriculata* and *C. lanuginosa* are often the only other species with high constancy.

Wildlife Values

Otters, beaver, sand hill cranes, and waterfowl use this habitat type for bedding and foraging areas. It is important habitat for raptors, deer, and elk. Deer use the type for fawning (Hansen *et al.* 1995).

Succession

Moderate disturbance will increase *Carex aquatilus, Juncus balticus* and associated forbs. Severe disturbance (resulting in dewatering) may lower the water table and cause the site to be dominated by *Poa pratensis, P. palustris, Potentilla anserina,* or *Agrostis stolonifera.*

Management

Drought years may make EO accessible to both domestic and wild grazing animals that could cause rutted and hummock soils on margins. These sites are generally so wet as to preclude most types of recreational uses except fishing. Heavy disturbance such as from ORV use should be avoided because the organic soils are slow to recover from mechanical damage. High water tables make burning difficult, but fire can be used on sites adjacent to floodplains. Dominant sedges of this h.t. are resistant to damage by fire except where hot fires penetrate the peat soil. It has often been the policy of land managers to trap and kill beaver because they can be a nuisance. However, because beavers produce such desirable habitat and provide many beneficial stream functions, their removal from a riparian system needs to be closely evaluated (Hansen *et al.* 1995).

Adjacent Communities

Adjacent, wetter sites may be dominated by *Carex utriculata, C. aquatilis,* or *C. nebrascensis* communities. Drier sites may be dominated by *Deschampsia cespitosa, Artemisiacana / Festuca idahoensis,* or *Juncus balticus* communities. Adjacent, uplands can be dominated by *Artemisia tridentata,* or a variety of conifer communities (Hansen *et al.* 1995).

Conservation Rank

G5 / S5

Element Code

CEGL001810

EDITION / AUTHOR

95-07-11 / L. Williams

CAREX LIMOSA *Herbaceous Vegetation*

Similar Communities

In Utah, *Carex limosa* appears closely related to the *C. aquatilis* community type with which it is commonly associated (Padgett *et al.* 1989). This association includes Mattson's (1984) *C. limosa* series and phases described for the central portion of Yellowstone National Park.

PHOTO BY JACK GREENLEE

Range

In addition to Montana, the *Carex limosa* community type is distributed throughout the northern hemisphere; in the western United States it is a minor type in the Uinta Mountains of Utah, southeastern Idaho, throughout much of Montana, and has been documented from Woming's Yellowstone National Park, as well as California.

Environmental Description

This community type is associated with pond and lake margins, and typically develops on floating or quaking mats. It may also occur on low gradient inflows or outflows of ponds or lakes (Hansen *et al.* 1995). Sites are usually very poorly drained with persistently saturated with standing water in spring.

Range Description

Carex limosa cover ranges from 20-90% (Hansen *et al.* 1995). In Montana, *Carex utriculata* and *Menyanthes trifoliata* are commonly associated species.

Wildlife Values

Otters, beaver, sand hill cranes, and waterfowl use this community type for bedding and foraging areas (Mattson 1984).

Succession

Carex limosa is considered a stable, long lived community type, however, dewatering and subsequent decomposition of organic soils may result in a shift in species composition due to invasion by exotic species or an increase in species such as *Carex aquatilis* (Padgett *et al.* 1989).

Management

These sites are generally so wet as to preclude most types of livestock and recreational uses.

Adjacent Communities

Adjacent, wetter sites include the *Eleocharis pauciflora* habitat type or open water. Adjacent, drier sites include the *Carex utriculata, C. aquatilis, C. lasiocarpa,* or *Scirpus acutus* h.t.(Hansen *et al.* 1995).

Conservation Rank

G3 / S3

Element Code

CEGL001811

EDITION / AUTHOR

95-07-10 / L. Williams

Beaked Sedge Herbaceous Vegetation

CAREX UTRICULATA *Herbaceous Vegetation*

Similar Communities

PHOTO BY S. V. COOPER

This sedge species was previously thought to be *Carex rostrata*, which was included in many community type names throughout the west. We now know that *C. utriculata* had been misidentified as *C. rostrata* (Griffiths 1989). This is a well-documented community type. Hansen *et al.*. (1995) places *Carex utriculata, C. vesicaria*, and C. *atherodes* together within the *C. rostrata* h.t. for management purposes. Hansen *et al.*. (1995) also recognize several vegetation-denoted phases of the *C. rostrata* habitat type (plant association) that bear examination for elevation to the association level, given the environmental extremes over which this association now occurs.

Range

This community occurs in the following states: Washington, Oregon, Nevada, Idaho, Montana, Wyoming, Utah, New Mexico, and Colorado.

Environmental Description

This community is widespread at moderate to high elevations in the mountains, rarely the low-elevation valleys or on volcanic plains. It occurs in a wide variety of landscape settings, such as in narrow to broad valley bottoms on meadows, seeps, stream terraces and is commonly associated with ponds and sloughs that have silted in. It can occur in standing water or on sites that become relatively dry during the latter part of he

growing season. Valley bottom gradients are low (Padgett *et al.* 1989; Hall and Hansen 1997). Soils are classified as Histisols, Mollisols, and Inceptisols, and Entisols. Mineral soils are generally very organic-matter rich and often have an incipient histic epipedon forming at the surface. These soils may eventually become Histisols. Most of he mineral soils are fine-textured and have high water holding capacity. The soils are saturated to the surface well into the summer and the water table is usually within 2 feet of the surface late into the growing season (Crowe and Clausnitzer 1997).

Range Description

Carex utriculata typically exhibits monospecific dominance in this community, with dense cover. *Carex nebraskensis, C. simulata, C. aquatilis,* and/or *Juncus balticus* may be abundant in this species-poor community. Litter often accumulates and few species can establish on these organic, permanently saturated or inundated soils. This is why willows are rarely present in this community (Hansen *et al.* 1995; Manning and Padgett 1995; Crowe and Clausnitzer 1997).

Wildlife Values

This community performs a vital role in maintaining water quality and aquatic health in headwater streams. Past beaver activity is often evident in this community type, and *Carex utriculata* is one of the species likely to pioneer newly flooded beaver ponds. Palatability appears to be lower than for other sedges such as *Carex nebraskensis* or *C. aquatilis* (Padgett *et al.* 1989). *Carex utriculata* provides valuable breeding and feeding grounds for waterfowl and snipe. Common yellowthroats, red-winged blackbirds, song sparrows, and tree swallows are commonly associated with this community (Crowe and Clausnitzer 1997).

Succession

Carex utriculata is a widespread species that occupies mineral or organic soils with seasonally high water tables. This community typically colonizes recently formed ponds and/or sites in or adjacent to low-gradient stream channels. It has been observed that *C. utriculata* has higher cover on sites that are seasonally flooded; continually inundated sites had decreased shoot density. It can colonize permanently flooded sites, often doing so from the outer edge. As soil and litter build up, these sites are more conducive to increased *C. utriculata* dominance. This species is relatively long-lived and maintains dominance with high soil moisture; communities are at potential for these sites. As soil moisture decreases, other species such as *C. nebraskensis, C. simulata,* or *Deschampsia cespitosa* may replace *C. utriculat*a (Manning and Padgett 1995).

Management

Though *C. utriculata* produces large amounts of herbage every year, it apparently is relatively unpalatable to livestock, especially as it matures. It is coarse sedge with high amounts of silica in its leaf cells. The dense network of rhizomes and roots provides excellent streambank stabilization.

Adjacent Communities

Because of the wide elevation and geographical distribution, adjacent upland communities can range from sagebrush-steppe at the lower elevations (rare) to a diversity of montane and subalpine coniferous forest types. Adjacent drier wetland communities include various willow communities, and wetter sites include *Typha latifolia* and *Scirpus acutus* communities (Hansen *et al.* 1995).

Conservation Rank

G5 / S5

Element Code

CEGL001562

EDITION / AUTHOR

1998-01-02 / B. Moseley

Inflated Sedge Herbaceous Vegetation

CAREX VESICARIA *Herbaceous Vegetation*

Similar Communities

The *Carex vesicaria* community type is sometimes included within the *Carex utriculata* [erroneously called *Carex rostrata*] community (Kovalchik 1993; Hansen *et al.*. 1995; Hall and Hansen 1997). Reasons for lumping are that *Carex rostrata* and *Carex vesicaria* are sometimes difficult to distinguish and are ecological analogues. They may form mixed stands, share similar ecological requirements, and stands of each may form a complex mosaic of small patches (Kovalchik 1993; Hansen *et al.* 1995; Manning and Padgett 1995; Crowe and Clausnitzer 1997; Hall and Hansen 1997). More often, however, the two communities are easily distinguished by their monospecific stands. Mattson (1984) sub-divided the *Carex vesicaria* community into phases based on co-dominance by other species: *Aster foliaceus, Deschampsia cespitosa*, and *Carex aquatilis*. Other classifications have not recognized these phases or have grouped them with other community types.

Range

Carex vesicaria is a major community type with a widespread range. It is known from the following areas; central and northeastern Oregon (Kovalchik 1987; Crowe and Clausnitzer 1997); Yellowstone National Park and elsewhere in western Wyoming (Mattson 1984; Youngblood *et al.* 1985); Uinta Mountains of Utah (Padgett *et al.* 1989); most of Montana (Hansen *et al.* 1988); the Henry's Fork basin of eastern Idaho (Youngblood *et al.* 1985; Jankovsky-Jones 1996) and northern Idaho (Jankovsky-Jones 1997; Jankovsky-Jones [in preparation]); both sides of the Cascade Mountains in Washington (Mattson 1984; Crowe and Clausnitzer 1997); and the eastside of the Sierra Nevada along the California-Nevada border (Manning and Padgett 1995). The *Carex vesicaria* community is probably circumboreal in distribution (Mattson 1984).

Environmental Description

The *Carex vesicaria* community occurs in very low gradient and wide wet meadows, floodplains, basins, and forest openings. The *Carex vesicaria* community is most commonly found in swales, fens, glacially formed kettle ponds, potholes, silted-in beaver ponds or ponds with blown-out dams, and other closed drainage concavities (Mattson 1984; Manning and Padgett 1995; Crowe and Clausnitzer 1997; Jankovsky-Jones [in preparation]). It is also found on poorly drained shorelines of ponds, lakes, reservoirs, springs, overflow channels, and streamside alluvial terraces that are flooded in the spring and have standing water through most of the summer growing season (Youngblood *et al.* 1985; Kovalchik 1987; Hansen *et al.* 1988; Padgett *et al.* 1989; Jankovsky-Jones 1996; Crowe and Clausnitzer 1997; Jankovsky-Jones 1997; Jankovsky-Jones [in preparation]). The spring and early summer water depth varies from 12 to over 50 cm (occasionally less, especially during drought) but drops by late summer or fall in most years (Mattson 1984; Youngblood *et al.* 1985; Kovalchik 1987; Jankovsky-Jones [in preparation]). After a site dries the water

table drops below the surface over 30 cm, though the soil usually remains moist all year (Mattson 1984; Kovalchik 1987). This moisture flux creates pronounced mottling and gleying of deeper mineral soil. Soils are usually deep, fine-textured mineral or organic silt loams with high organic matter accumulation and water holding capacity.

Range Description

Species diversity is relatively low in the *Carex vesicaria* community. *Carex vesicaria* is clearly dominant, forming dense stands 35 to 60 cm tall, with 40 to 80% cover and 100% constancy (Mattson 1984; Kovalchik 1987; Crowe and Clausnitzer 1997; Jankovsky-Jones [in preparation]). Shrub or tree species are rarely present with negligible cover. The importance of other associated species varies due to the moisture characteristics (e.g. permanently flooded versus seasonally flooded) of each *Carex vesicaria* stand (Mattson 1984). For example, the wettest phase of the *Carex vesicaria* community, where standing water is over 30 cm in the spring, has low diversity and is composed of mainly *Carex vesicaria* with low cover of other species such as *Carex utriculata* (Mattson 1984; Kovalchik 1987). Sites with less spring standing water, which may dry only in the fall, have higher cover of *Carex aquatilis* (less than 7% cover and 23% constancy) with low cover of *Deschampsia cespitosa, Calamagrostis canadensis,* and *Galium* species (Mattson 1984; Crowe and Clausnitzer 1997). Other species associated with *Carex vesicaria* on sites with long periods of standing water include: *Eleocharis palustris* (less than 18% cover and 45% constancy), *Juncus balticus* (less than 8%cover and 42% constancy), *Glyceria borealis, Sparganium* species *(*e.g. *Sparganium emersum, S. eurycarpum), Equisetum fluviatile, Zizania aquatica, Carex atherodes, Polygonum species, Phalaris arundinacea,* and *Utricularia* species (Mattson 1984; Kovalchik 1987; Hansen *et al.* 1988; Crowe and Clausnitzer 1997; Jankovsky-Jones 1998). Better drained sites, which are flooded in spring but dry in summer, are co-dominated by *Deschampsia cespitosa* (less than 12% cover and 75% constancy) or *Aster foliaceus* (less than 12% cover and 23% constancy) (Mattson 1984; Kovalchik 1987; Crowe and Clausnitzer 1997). Other species commonly associated with *Carex vesicaria* in these stands include *Carex nebrascensis* (less than 31% cover and 42% constancy), *Carex aquatilis, Epilobium watsonii, Antennaria corymbosa, Galium* species, *Camassia quamash, Mentha* a*rvensis, Senecio* species, and others (Mattson 1984; Kovalchik 1987; Hansen *et al.* 1988; Crowe and Clausnitzer 1997; Jankovsky-Jones [in preparation]). Due to long periods of flooding, the cover of mosses, lichens, and liverworts is low. In contrast, the ground is either bare or deep litter (forming a peat layer).

Wildlife Values

The *Carex vesicaria* community is commonly browsed by elk and moose, especially in mid or late summer, whose hooves deeply churn the soil (Mattson 1984; Kovalchik 1987; Hansen *et al.* 1995; Jankovsky-Jones [in preparation]). Grizzly bear also forage for roots in this community (Mattson 1984). Depending on water levels, *Carex vesicaria* stands are important feeding and nesting areas for waterfowl, small mammals, and other birds (Kovalchik 1987; Crowe and Clausnitzer 1997). *Carex vesicaria* root mats form a thick sod which stabilizes undercut streambanks and creates deep, narrow channels with overhanging cover for fish (Kovalchik 1987; Hanson *et al.* 1988).

Succession

Little is known about the successional dynamics of the *Carex vesicaria* community. The origins of the community are not clear but it forms on sites with long periods of standing water which *Salix* or other *Carex* species do not tolerate. It is a stable, long-lived community as indicated by deep peat formation on some sites (Kovalchik 1987; Hansen *et al.* 1988). Thus, it is doubtful that succession to other *Carex species,* willow/sedge, or other shrub or forest communities will occur unless the hydrologic conditions that promote *Carex vesicaria* are altered. For example, if the ponding is eliminated and the water table lowered by fluvial

changes, wetland draining, removal of beaver and their dams, or filling of wetlands with sediment, the soils will dry promoting *Carex utriculata, Salix* species, or (with more drying) *mesic* forbs and graminoids (Youngblood *et al.* 1985; Kovalchik 1987; Hansen *et al.* 1995). If drier phases of *Carex vesicaria* are overgrazed, the community may move toward dominance by mesic forbs, *Carex nebrascensis, Poa pratensis, Phalaris arundinacea, Phleum pratense,* or other graminoids (Kovalchik 1987; Crowe and Clausnitzer 1997).

Management

The semi-permanently flooded *Carex vesicaria* stands are not usually grazed or impacted by recreation and other uses. However, if wetlands are drained or filled, or the hydrology otherwise altered (such as removal of beaver and their dams), the community will disappear (Hansen *et al.* 1995). Livestock usually avoid extremely wet organic soils, but on sites, which dry by late summer, grazing of *Carex vesicaria* can occur (Kovalchik 1987; Crowe and Clausnitzer 1997). *Carex vesicaria* is moderately too highly palatable and can be important in late summer when other forage is less available. It is more palatable than *Carex utriculata* and may be selected for (Hansen *et al.* 1995; Hall and Hansen 1997). Though the dense sod of *Carex vesicaria* resists grazing and trampling damage (Hansen *et al.* 1988), overuse can damage soils, reduce *Carex vesicaria* cover, and promote dominance by other mesic graminoids and grazing tolerant forbs (Kovalchik 1987; Crowe and Clausnitzer 1997). Associated species, such as *Deschampsia cespitosa,* will also decrease under heavy grazing and less palatable species, such as *Juncus balticus* will increase (Hansen *et al.* 1995; Hall and Hansen 1997). Eventually the community may convert to *Carex nebrascensis* or exotic species such as *Phalaris arundinacea*. The community should not be grazed too low so that the vegetation can not function as a sediment filter. *Carex vesicaria* is effective in reducing erosion and stabilizing streambanks due to its sod forming rhizomes. It is also of high value for wetland revegetation (Hansen *et al.* 1995; Hall and Hansen 1997). The *Carex vesicaria* community will burn only in late summer or fall then dry. Fire will reduce litter and increase productivity for several years. However, if peat soils are dry enough they will burn hot and kill *Carex vesicaria* rhizomes (Kovalchik 1987; Crowe and Clausnitzer 1997).

Adjacent Communities

On sites with long periods of standing water, adjacent wetland communities are nearly pure stands of semi-aquatic, often floating leafed, plants. These communities include, *Alopecurus aequalis-Ranunculus flammula, Carex atherodes, Glyceria* species, *Polygonum* species, *Sparganium* species, and *Utricularia* species (Mattson 1984; Kovalchik 1987; Hansen *et al.* 1988). Where water levels drop in late summer, adjacent wetter communities may form on the shoreline below *Carex vesicaria*, such as stands of *Eleocharis bella* and *Equisetum arvense* (Crowe and Clausnitzer 1997). Adjacent communities on sites that dry in late summer with a similar or slightly drier moisture regime as *Carex vesicaria,* include *Carex utriculata, Phalaris arundinacea, Eleocharis palustris, Carex aquatilis, Juncus nevadensis, Carex lasiocarpa,* and *Deschampsia cespitosa* (Mattson 1984; Kovalchik 1987; Hansen *et al.* 1988; Crowe and Clausnitzer 1997; Jankovsky-Jones [in preparation]). Neighboring communities on drier mineral soil, include *Salix* species types (e.g. *Salix / Poa pratensis*), *Populus tremuloides / Elymus glaucus, Alnus* species, *Poa pratensis, Deschampsia cespitosa-Antennaria corymbosa, Carex aquatilis-Deschampsia cespitosa, Phleum alpinum-Carex aquatilis, Vaccinium occidentale / Calamagrostis canadensis*, and *Calamagrostis canadensis* (Mattson 1984; Kovalchik 1987;Hansen *et al.* 1988; Jankovsky-Jones [in preparation]). Adjacent dry terraces and uplands are dominated by *Artemisia tridentata / Poa cusickii* and conifers such as *Pinus contorta, Picea engelmannii*, and *Abies lasiocarpa* (Mattson 1984; Kovalchik 1987; Crowe and Clausnitzer 1997).

Conservation Rank

G4Q / S4

Element Code

CEGL002661

EDITION / AUTHOR

1998-01-09 / Chris Murphy

Red - Osier Dogwood Shrubland

CORNUS SERICEA Shrubland

Similar Communities

Cornus sericea is a community dominant in several associations. This community, however, lacks the structural diversity of the other types, for example the *Alnus incana / Cornus sericea* and *Cornus sericea-Salix* sp. types from Nevada (Manning and Padgett 1995). The relationship of this community with the *Cornus sericea / Heracleum lanatum* and *C. sericea / Galium triflorum* types from Utah and eastern Idaho (Youngblood *et al.* 1985; Padgett *et al.* 1989) is unclear.

Range

This is a widespread type known from Washington, Oregon, Idaho, Nevada, and Montana.

Environmental Description

This type is typically adjacent to stream and river channels, but it can occupy a diversity of landforms. It may appear as dense linear bands on alluvial benches in narrow canyons or broad thickets on islands and floodplains of major streams and rivers. It may also occur on well-watered sites below beaver dams. Most occurrences have evidence of annual or near-annual flooding (Manning and Padgett 1995; Hall and Hansen 1997). Soils of this community are classified as Inceptisols, Entisols, or Mollisols. Where sites are located outside of the active floodplain, a litter/duff layer 2 inches or more thick may accumulate. Surface horizons are comprised of a wide range of alluvial materials with textures ranging from silt clays to sandy loams. These layers may be relatively shallow or as deep as 5 feet. Underlying layers are typically coarse sands, gravel, and cobbles that facilitate the movement of aerated groundwater through the subsurface layers which may be important for the longevity of stands. Water availability ranges from high, where this type occupies floodplains immediately adjacent to active channels, to low on upper, remote floodplain sites. Mottled and gleyed soils may occur (Manning and Padgett 1995; Hall and Hansen 1997; Crowe and Clausnitzer 1997).

Range Description

Cornus sericea forms a dense, closed canopy, often excluding understory shrub and herbaceous species. *Cornus sericea* is usually the only species with high cover values. Associated species vary with geographic location and elevation, but commonly associated shrubs include *Rosa woodsii, Ribes hudsonianum, Acer glabrum, Salix exigua, S. lutea,* and *Clematis ligusticifolia*. Because of its wide range, a great diversity of herbaceous species is associated with this community, usually in low cover (Manning and Padgett 1995; Hansen *et al.* 1995; Hall and Hansen 1997; Crowe and Clausnitzer 1997).

Wildlife Values

Red-osier dogwood provides food and cover for mule deer, moose, elk, cottontail rabbits, snowshoe hares, and many birds. The fruits are an important back bear food and are also eaten by songbirds, grouse, quail, partridge, cutthroat trout, ducks, crows, mice, and other mammals. Deer mice, meadow voles, and other small rodents eat the young stems and bark. Red-osier dogwood often grows in dense thickets because of its layering ability. These thickets provide good mule deer fawning and rearing areas and nesting habitat for many songbirds (Hansen *et al.* 1995; Crowe and Clausnitzer 1997).

Succession

This is considered an early seral community, typically colonizing sites adjacent to streams. The herbaceous cover is often sparse, probably due to the dense overstory canopy and regular flooding, scouring, and deposition. The latter factor is probably responsible for maintaining this as a persistent community type on the landscape. The presence of tall shrubs or trees in some stands may represent succession toward *Alnus incana, Populus trichocarpa, P. tremuloides, P. angustifolia, Picea engelmannii, Pseudotsuga menziesii,* or other communities.

Management

The herbaceous biomass varies widely and is largely dependent on the density of the dogwood canopy (Crowe and Clausnitzer 1997). Ratings for red-osier dogwood palatability for livestock range from low (Manning and Padgett 1995; Crowe and Clausnitzer 1997) to “ice cream” (Hansen *et al.* 1995; Hall and Hansen 1997), but the stands are often so dense that they limit grazing in many cases. This community functions in a variety of ways to promote stream health. Red-osier dogwood forms dense root networks that stabilize streambanks against lateral cutting and erosion, provides cover in the form of overhanging branches and banks, and shades channels, effectively moderating extreme summer temperature fluctuations (Hall and Hansen 1997). Dogwood sprouts vigorously after a fire and germination of it’s seed-bank is stimulated by fire (Crowe and Clausnitzer 1997).

Adjacent Communities

Because of the wide geographic range for this type, communities of adjacent uplands can be coniferous forest, aspen, sagebrush-steppe, and pinyon-juniper types.

Conservation Rank

G4 / S3

Element Code

CEGL001165

EDITION / AUTHOR

98-01-02 / B. Moseley

DULICHIUM ARUNDINACEUM *Herbaceous Vegetation*

Similar Communities

The community is easily recognized by the abundance of *Dulichium arundinaceum*, which is either monospecific or is growing with only a few other species (Bursik and Moseley 1995, Hansen *et al.*. 1988).

Range

Minor type in Montana, Idaho, Oregon, Washington and possibly Wyoming.

Environmental Description

The community occurs over mineral soils, fibrous peat, or muck on areas that are seasonally or permanently flooded with shallow water. In a few places it occurs adjacent to sphagnum peat (Kunze 1994). In Montana this community occurs in depressional wetlands (frequently glacial potholes) and on lake margins (Hansen *et al.* 1988).

Range Description

The *Dulichium arundinaceum* community type is of rare occurrence and poorly described. Dulichium arundinaceum typically occurs as a monoculture with few associated species. Minor amounts of the *Eleocharis palustris, Carex aquatilis, C. limosa,* or *C. lasiocarpa* may be present. The community occurs on organic soils, on lake margins and may occur on fixed or floating mats (Hansen *et al.* 1988).

Wildlife Values

Information not available

Succession

Dulichium arundinaceum is considered a stable, long lived community type, however, dewatering and subsequent decomposition of organic soils may result in a shift in species composition due to invasion by exotic species or an increase in species such as *Carex aquatilis.*

Management

Drought years may make occurrences accessible to both domestic and wild grazing animals that could cause rutted and hummock soils on margins. These sites are generally so wet as to preclude most types of recreational uses except fishing.

Adjacent Communities

The *Dulichium arundinaceum* community type frequently occurs in a mosaic of monocultures dominated by *Carex aquatilis, Carex utriculata, Carex limosa* and/or *Sphagnum* species. Conifers dominate adjacent uplands.

Conservation Rank

G3? / S2

Element Code

CEGL001831

EDITION / AUTHOR

97-01-06 / Mabel Jankovsky-Jones

Common Spikerush Herbaceous Vegetation

■ ELEOCHARIS PALUSTRIS *Herbaceous Vegetation*

Similar Communities

In some cases, the *Eleocharis palustris* may be confused with *E. rostellata*, especially if the stolons of *E. rostellata* are not present or not obvious. Be sure of the plant's true identity. A misidentification will result in the wrong community type and the sites on which they occur are very different ecologically.

PHOTO BY JACK GREENLEE

Range

Eleocharis palustris is a common type in California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming, and Saskatchewan. Essentially it has been documented from every western state except Arizona and New Mexico (Bourgeron and Engelking 1994; Anderson *et al.* 1998).

Environmental Description

The *Eleocharis palustris* community type is found at low to moderate elevations, generally in wide, low gradient valleys of all shapes. Sites are wet basins, floodplains, meadows, gravel bars, and lake edges. It is typically in sites that are prone to yearly flooding or persistent surface water. Where streams are present, they are Rosgen's C and E stream types. Elevations range from 2,200 to at least 8,700 feet, depending on latitude (Hansen *et al.* 1995; Manning and Padgett 1995; Crowe and Clausnitzer 1997; Hall and Hansen 1997). Soils of this community type are classified as Mollisols, Entisols, Histisols, and Inseptisols. Textures are variable, ranging from sites that are very coarse-fragment rich to others that are deep and fine-textured. The surface is usually rich in organic matter and the litter accumulation may blend into rich, black organic muck soils. The fine-textured upper horizons often arise from alluvial deposition. Sands, gravel, and cobbles usually constitute the main body of deeper subsurface materials (Manning and Padgett 1995; Crowe and Clausnitzer 1997; Hall and Hansen 1997).

Range Description

Eleocharis palustris is an aggressive, rhizomatous species that nearly excludes all other species from establishing any significant cover. Common associates in high quality sites include *Alopecurus aequalis*,

Mentha arvense, Rumex crispus, Eleocharis acicularis, Cares utriculata, Glyceria ssp., and *Phalaris arundinacea*. On some sites aquatic species, such as *Hippuris vulgaris, Utriculata vulgaris,* and *Potamogeton natans,* have high cover.

Wildlife Values

Broad zones of this type along streams, rivers, lakes, and reservoirs provide valuable feeding and nesting areas for waterfowl. *Eleocharis palustris* and associated plants are a valuable source of food and cover for waterfowl. Wild ungulates seldom browse this habitat type due to its low palatability (Hall and Hansen 1997).

Succession

Padgett at al. (1989) suggest that *Eleocharis palustris* can represent an early seral species on ponds and streambanks where water is at or above the ground surface. As siltation occurs over time, other communities, such as *Carex rostrata,* may replace it. However, due to the continual saturated conditions and dense growth of *Eleocharis palustris*, once formed, stands appear difficult to displace and may persist as climax vegetation. If water levels rise, *Scirpus* ssp. and *Typha latifolia* may be able to supplant *E. palustris.* Hansen *et al.* (1995) have observed that disturbance can drastically shift the vegetative composition of this type toward increase or invader species such as *Hordeum jubatum*.

Management

Seasonally wet conditions and low palatability of *Eleocharis palustris* limit the grazing value of this type for livestock, even during drought years when upland forage dries early and dies back (Kovalchik 1987). Sites occupied by this type are typically inundated or at least saturated for much of the year so as to preclude most development. Trampling damage and soil churning occurs readily with livestock use and may result in a shift toward more disturbance tolerant species such as *Hordeum jubatum, Carex nebrascensis*, and *Juncus balticus* (Hall and Hansen 1997).

Adjacent Communities

Due to the wide geographic distribution of this type adjacent upland communities are varied, including shrub-steppe, woodland, and coniferous forest types. Adjacent riparian communities may be dominated by an equally varied assortment of types including deciduous forest, tall shrub, low shrub, and herbaceous communities

Conservation Rank

G5 / S5

Element Code

CEGL001833

EDITION / AUTHOR

98-12-08 / B. Moseley

■ ELEOCHARIS ROSTELLATA *Herbaceous Vegetation*

Similar Communities

In Montana, Hansen *et al.* (1995) grouped all combinations of *E. rostellata* and *E. pauciflora* into an *E. pauciflora* habitat type due to similarities in environmental conditions and management concerns. Observations in Montana by Lesica (1990), indicate that the *E. rostellata* association is distinct, and at least partially thermophilic, unlike the *E. pauciflora* type. In some cases, the *Eleocharis rostellata* may be confused with *E. palustris*, especially if the stolons of *E. rostellata* are not present or not obvious. Be sure of the plant's true identity. A misidentification will result in the wrong community type and the sites on which they occur are very different ecologically.

PHOTO BY JACK GREENLEE

Range

Eleocharis rostellata is a minor type in Idaho, Montana, and Yellowstone National Park, Wyoming, and may occur in Washington, British Columbia, and other parts of Wyoming.

Environmental Description

This community is restricted to thermal areas or areas with alkaline or calcareous soils, especially at the northern edge of it's distribution. It is also found around cold springs in desert canyons. It occurs in intermontane valleys (Lesica 1990), in wet basins and adjacent to streams, rivers, and ponds (Hansen *et al.* 1995). This community type is known to occur in a variety of soils from relatively deep organic, to alkaline and calcareous soils, to coarse wet mineral soils that are directly in contact with thermal waters. It occurs in spring fed wetlands that are saturated throughout the year, often with water running over the ground surface through the stands (Moseley 1995).

Range Description

The community type forms near monocultures, and may occur as a quaking mat, or may be more open with considerable areas of bare soil, gravel, rock, and open water (Moseley 1995). Hansen *et al.* (1995), state that *E. rostellata* dominates a low (less than 30 cm) herbaceous layer.

Wildlife Values

This community is a source of green forage early in the spring and attracts wildlife (especially elk and deer). Waterfowl also use this type (Hansen *et al.* 1995).

Succession

Little is known about the successional dynamics of this community type.

Management

This community type is threatened by development of thermal areas for recreation (Lesica 1991). Because of the wet, often-unstable nature of the substrate, soil disturbance and grazing by livestock is probably minimal. Yet trampling damage of the wet, organic soils of this association occurs readily with any livestock utilization. Livestock may graze forage plants in this association, but overgrazing can cause compositional changes to species of lower palatability (Hansen *et al.* 1995).

Adjacent Communities

Adjacent upland communities are often sagebrush-steppe or coniferous forest types. *Carex* ssp., *Pentaphylloides floribunda* and *Deschampsia cespitosa* may dominate adjacent riparian communities.

Conservation Rank

G? / S1

Element Code

CEGLMTHP32

EDITION / AUTHOR

95-12-20 / L. Williams

Water horsetail Herbaceous Vegetation

EQUISETUM FLUVIATILE *Herbaceous Vegetation*

Similar Communities

This community has been documented in northern Idaho (Jankovsky-Jones 1997) and Alberta (Dirschl *et al.*.1974).

Range Communities

This community is reported from the northwest (Montana, Idaho, Oregon, Washington) and the mid-west (Minnesota), including Alberta, Manitoba, and Ontario.

PHOTO BY JACK GREENLEE

Environmental Description

Equisetum fluviatile communities can be found at low to mid elevations in the mountains of central and southwestern Montana, and it occurs more consistently in the mountains and valleys of western Montana. Habitat includes glacial potholes and lakes, old oxbows, and backwaters of rivers and streams. Soils are variable, and they frequently encompass Mollisols, Entisols, and Histosols. The mineral soils usually have some degree of organic matter accumulation. This community is usually flooded year-round. Wetter sites are typified by deeper water emergent vegetation dominated by *Typha latifolia*, *Scirpus* spp. or aquatic communities dominated by various species of *Nuphar*

and *Potamogeton* or open water. A variety of drier communities can occur adjacent to *Equisetum fluviatile* communities, and these can include stands of *Carex* sp., *Salix* spp., *Phragmites australis,* or *Phalaris arundinacea* (Hansen *et al.* 1988, Hansen *et al.* 1995).

Range Description

This community is usually dominated by a dense, monotypic stand of *Equisetum fluviatile*. Scattered forbs may occur in the community, and these include *Polygonum amphibium, Potamogeton gramineus,* and *Comarum palustre*. *Carex lasiocarpa* and *Carex utriculata* can also occur in these stands in low amounts (Hansen *et al.* 1988, Hansen *et al.* 1995).

Succession

The successional dynamics of this community are poorly understood. If the hydrologic regime remains unchanged, it is likely that community composition will be fairly stable.

Management

This community is generally so wet that it receives very little livestock use.

Conservation Rank

G4 / S4

Element Code

CEGL001960

EDITION / AUTHOR

99-10-18 / Jack Greenlee

Baltic Rush Herbaceous Vegetation

■ JUNCUS BALTICUS *Herbaceous Vegetation*

Similar Communities

This community has been quantitatively defined and described by many studies throughout the western United States. This appears to be a distinctive type. *Eleocharis palustris - Juncus balticus* and *J. balticus - Carex rossii* community types have been described from central and southern Utah (Bourgeron and Engelking 1994), that may related to the *J. balticus* community type described here. Similarly, Mattson's (1984) *Deschampsia cespitosa – Juncus balticus* from the Yellowstone Plateau is rich in *J. balticus.*

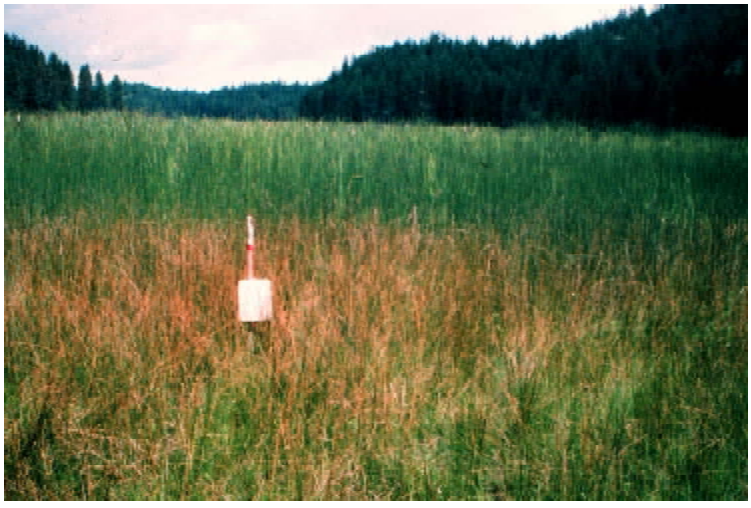

PHOTO BY JACK GREENLEE

Range

The *Juncus balticus* community type has been documented from every state in the western United States, with the exception of Arizona (Bourgeron and Engelking 1994; Manning and Padgett 1995; Anderson *et al.* 1998).

Environmental Description

Throughout its range it occurs near seeps, in meadows, and on alluvial terraces. Surface topography is usually level or sometimes undulating or hummock. Valley bottom characteristics are equally diverse, with widths ranging from very narrow to very broad and gradients from low to high (Padgett *et al.* 1989; Hansen *et al.* 1995; Manning and Padgett 1995; Crowe and Clausnitzer 1997). This community type typically occurs on fine-textured surface soils. Textures range from silt to sandy-loam. The water table ranged from the surface to ca. 50 cm below the surface, occasionally falling below 1 m by the end of the summer. Estimated available water-holding capacity ranged from low to high. Soils have been classified as Mollisols, Inceptisols, and Histisols. Soil reaction ranges from neutral to mildly alkaline, pH 7.0 to 8.0 (Padgett *et al.* 1989; Hansen *et al.* 1995; Manning and Padgett 1995; Crowe and Clausnitzer 1997).

Range Description

Juncus balticus dominates the stands with canopy cover generally exceeding 50%. Cover by other graminoids is usually low, although *Poa pratensis* appears to be a common associate over the range of this type as do a number of other exotic pature grasses. *Hordeum jubatum* has high constancy in Montana stands. There is a wide diversity of other graminoids and forbs, both native and exotic, that occur in *Juncus balticus* stands throughout its range, generally at low cover (Padgett *et al.* 1989; Hansen *et al.* 1995; Manning and Padgett 1995; Crowe and Clausnitzer 1997; Walford *et al.* 1997).

Wildlife Values

This type provides early season forage for wildlife (Hansen *et al.* 1995).

Succession

Some studies state unequivocally that the *Juncus balticus* community type is a livestock grazing-induced type (e.g., Evenden 1989; Hansen *et al.*. 1995; Manning and Padgett 1989; Hall and Hansen 1997; Crowe and Clausnitzer 1997). While others hedge somewhat stating that many or most occurrences are grazing induced (e.g. Padgett *et al.* 1989; Walford *et al.*. 1997). There is evidence for the latter view. Two stands in central Idaho occur at sites that were never grazed by livestock, being protected by insurmountable cliff bands. They contain extensive near-monocultures of *Juncus balticus* and have significant hummocking (Jankovsky-Jones, IDCDC, unpublished data). Observations in Montana and elsewhere indicate that *J. balticus* acts as an increaser and/or invader, occurring over a wide range of environmental conditions. It can increase after intensive grazing on sites occupied by the *Carex nebrascensis, Deschampsia cespitosa, Calamagrostis canadensis,* and possibly others. It is an increaser because it has a high tolerance for grazing. Once established *J. balticus* will maintain community dominance until site conditions are radically changed, either through a severe drop in water table depth or season-long flooding (Evenden 1989; Padgett *et al.*. 1989; Hansen *et al.*. 1995; Manning and Padgett 1995).

Management

Grazing value ratings for *Juncus balticus* are moderate for cattle and low (except in the spring when rated medium) for sheep, horses, mule deer, and elk. *Juncus balticus* has vigorous rhizomes with wide ecological

amplitude. It is an excellent streambank stabilizer with dense fibrous roots that not only bind horizontally in the soil, but also grow to a greater depth that other rhizomatous graminoids. It has high erosion control potential. Because of its tenacious nature and relatively low palatability to livestock, this species is very important as a soil binder and streambank stabilizer. Planting *J. balticus* plugs in the flood plain of an incised but a-grading stream will enhance bank building by binding soils and trapping sediment (Manning and Padgett 1995).

Adjacent Communities

As would be expected with a community distributed over the western United States and having at least a 6,000-foot elevation range, the adjacent upland and riparian communities are diverse. Upland communities range from steppe and shrub-steppe at the lower elevations to alpine communities at the higher.

Conservation Rank

G5 / S5

Element Code

CEGL001838

EDITION / AUTHOR

98-12-09 / B. Moseley

Engelmann Spruce / Red - Osier Dogwood Woodland

■ PICEA ENGELMANNII / CORNUS SERICEA *Woodland*

Similar Communities

The *Picea engelmannii / Cornus sericea* Woodland plant association is often treated as *Picea* (*engelmannii* X *glauca, engelmannii) / Cornus stolonifera* [syn. *Cornus sericea*]. In Montana and Idaho, *Picea glauca* and *Picea engelmannii* hybrids are common, thus, lumping both species together is practical (Hall and Hansen 1997; Hansen *et al.* 1995). A more steamlined and practically conveyed approach and one that retains the information on composition with regard to hybrids is achieved by referring to this compositional condition as simply *Picea engelmannii / Cornus sericea*. However, pure stands of *Picea glauca* are of conservation concern in Idaho and should be treated within the *Picea glauca* alliance. In Utah (and Wyoming, southeastern Idaho, and elsewhere) either *Picea pungens* or *Picea engelmannii* (or hybrids) may dominate, with similar undergrowth composition; this supports these conditions being grouped under *Picea / Cornus stolonifera* or *Conifer / Cornus sericea* (Padgett *et al.* 1989). *Picea engelmannii* is also occasionally present in similar communities such as *Alnus incana-Cornus stolonifera, Populus trichocarpa / Alnus incana-Cornus stolonifera, Populus trichocarpa / Cornus stolonifera,* and *Populus tremuloides / Cornus stolonifera,* and other *Cornus stolonifera* types (Crowe and Clausnitzer 1997, Hansen *et al.* 1995, Kovalchik 1993). The *Picea engelmannii / Cornus sericea* type is possibly a successional intermediate between *Cornus stolonifera / Galium triflorum* and the climax *Picea / Galium triflorum* (Youngblood *et al.*.1985). *Picea engelmannii* is also occasionally present in similar communities such as *Alnus incana-Cornus stolonifera, Populus trichocarpa / Alnus incana-Cornus stolonifera, Populus trichocarpa / Cornus stolonifera,* and *Populus tremuloides / Cornus stolonifera,* and other *Cornus stolonifera* types (Crowe and Clausnitzer 1997, Hansen *et al.* 1995, Kovalchik 1993). It should also be well noted that for Montana Hansen *et al.*.

(1995) have considerably broadened the concept of this association (habitat type in their lexicon) by including *Alnus incana* and any riparian/wetland *Salix* spp. as indicators; these defining parameters follow from their "management oriented" approach to classification.

Range

The *Picea engelmannii / Cornus sericea* association (included in *Picea / Cornus stolonifera*) is a major type known from eastern Idaho, western Wyoming, northeastern Washington (Okanogan Highlands; Kovalchik 1993), northeastern Oregon (Blue Mountains; Crowe and Clausnitzer 1997), Montana, Utah, and possibly Colorado.

Environmental Description

The *Picea engelmannii / Cornus sericea* plant association is found at elevations ranging from as low as 820 m in Montana (Hansen *et al.*. 1995), to around 1,400 to 1,700 m in Oregon (Crowe and Clausnitzer 1997) to as high as 2,300 m elsewhere. Though it is the driest of the riparian *Picea*-dominated types, it is restricted to alluvial terraces, benches, or moist toeslopes immediately adjacent to high gradient streams in narrow V or trough shaped valleys. The topography ranges from flat to 5 percent slope and may be undulating (Crowe and Clausnitzer 1997, Hall and Hansen 1997, Hansen *et al.* 1995, Youngblood *et al.* 1985). In narrow valleys, this community may occupy the whole floodplain (Moseley 1997, Jankovsky-Jones and Mancuso 1995). The water table is usually shallow (50 to 100 cm deep) and stands are often affected by seasonally high water (Hansen *et al.*. 1995, Youngblood *et al.*. 1985). The soils are derived from alluvium with coarse rock fragments (to 35%) and sometimes decaying woody debris (Hall and Hansen 1997, Youngblood *et al.* 1985). Soils are coarse loam, loamy silts, sandy, or clayey. They are gleyed and mottled, up to 60 cm deep, and have moderate available water capacity. Soil sub-groups are usually Cryoborolls (Aquic and Cumulic) and Cryaquolls (Cumulic, Histic, and Typic) but sometimes Cryofluvents and Cryorthents (Hansen *et al.* 1995, Youngblood *et al.* 1985).

Range Description

The *Picea engelmannii / Cornus sericea* (including *Picea / Cornus stolonifera*) community type has a mostly open overstory dominated by mature *Picea* (including *Picea engelmannii* and *P. englmannii* X *P. glauca* hybrids, some of which approach pure *P. glauca*. Within this association average *Picea* cover reported from various studies ranges from 23 to 50%, with extremes to 10 and 90% (Crowe and Clausnitzer 1997, Hall and Hansen 1997, Hansen *et al.* 1995, Kovalchik 1993, Youngblood *et al.* 1985). Mixed conifer species are common in both the overstory and the sub-canopy/tree understory resulting in high structural diversity (Youngblood *et al.* 1985). Snags and high levels of woody debris may be present (Crowe and Clausnitzer 1997, Jankovsky-Jones and Mancuso 1995). However, within the mixed conifer component, the species cover of mature, sapling, and seedlings is usually less than 20%. Species vary across the community's range, though *Abies lasiocarpa* and *Pseudotsuga menziesii* are most commonly encountered throughout. The shrub layer is usually dense with a mix of species represented. Usually the dominant species, *Cornus sericea* constancy reported from various studies ranges from 67 to 100% and average cover ranges from 10 to 58% (though Hall and Hansen (1997) found less than 3% cover) (Crowe and Clausnitzer 1997, Hansen *et al.* 1995, Kovalchik 1993, and Youngblood *et al.* 1985). The fact that *Cornus sericea* is not found in all occurrences of the association should occasion placing it in parentheses in the association name. Co-dominant shrubs, often with high constancy but lower cover than *Cornus sericea*, are *Alnus incana, Salix boothii*, and *Ribes lacustre. Salix drummondiana, Symphoricarpos albus, Linnaea borealis, Rubus parviflora,* and *Lonicera involucrata* are occasionally prominent. Graminoid cover is usually less than 50% with *Elymus glaucus* (29 to 38% constancy; 3 to 30% cover) the most common species. *Calamagrostis* species (usually *C. canadensis*), *Carex* species, *Bromus* species, and *Cinna latifolia* exhibit moderate constancy and low

cover. Forb species richness is high but cover is low. Common forbs, all with less than 10% cover, though sometimes constancy greater than 50%, are *Actaea rubra, Thalictrum occidentale, Smilacina stellata,* and *Galium triflorum.* Other commonly associated forbs are *Fragaria virginiana, Aster* species, *Equisetum arvense, Osmorhiza* species, and *Senecio triangularis* (Crowe and Clausnitzer 1997, Hall and Hansen 1997, Hansen *et al.* 1995, Jankovsky-Jones and Mancuso 1995, Kovalchik 1993, Youngblood *et al.* 1985).

Wildlife Values

The *Picea engelmannii / Cornus sericea* community type provides good winter thermal cover for deer (especially white-tailed deer), bear, and elk (Crowe and Clausnitzer 1997, Hansen *et al.*. 1995, Hansen *et al.*. 1988). In addition, moose, elk, and other wildlife browse this community as *Cornus sericea* is highly desirable forage; it is in fact so preferred as browse as to be almost eliminated from some communities or localities. *Cornus sericea* also overhangs streams forming hiding and thermal cover for fish. The diverse forest structure provides habitat and food for small mammals and birds (Crowe and Clausnitzer 1997, Youngblood *et al.* 1995).

Succession

Overall, the successional dynamics of this community are poorly known. Based on ecological similarities, Youngblood *et al.* (1985) hypothesize that *Picea/Cornus stolonifera* is a persistent successional intermediate between *Cornus stolonifera/Galium triflorum* and *Picea/Galium triflorum*. Alternatively, *Picea engelmannii* (or other *Picea*) may be a late seral invader of many different related communities including: *Populus angustifolia* or *P. trichocarpa* or *P. tremuloides / Cornus stolonifera, Populus trichocarpa / Alnus incana-Cornus stolonifera, Alnus incana-Cornus stolonifera, Pseudotsuga menziesii* stands, *Salix* species communities, or other *Cornus stolonifera* community types (Crowe and Clausnitzer 1997, Hall and Hansen 1997, Hansen *et al.* 1995, Kovalchik 1993, Youngblood *et al.* 1985). Succession is probably multiple pathed, the result of interacting soil, site moisture, disturbance, and microclimate factors. For example, *Picea engelmannii* quickly re-establishes after fire or other disturbance. However, it is slow in dominating stands which explains the remnant conifer and deciduous trees in the overstory. Though located in cold-air draining valleys, which are not fire prone, disturbance has a role in late seral *Picea engelmannii / Cornus stolonifer* dynamics. *Picea engelmannii* is easily killed by fire and susceptible to windfall and spruce beetle or spruce budworm infestation. These disturbances may help maintain *Picea* dominance by promoting reproduction (Crowe and Clausnitzer 1997, Hall and Hansen 1997).

Management

Due to easily compacted soils, high water tables, and streamside locations many activities are usually incompatible. Road construction and recreation sites like campgrounds are not recommended (Hansen *et al.* 1995, Hansen *et al.* 1988). Windthrow and rising water tables are often associated with timber harvest. Partial cutting does favor dominance by *Picea* while clearcutting promotes mixed conifer regeneration (Hall and Hansen 1997). Livestock grazing is not very practical because of fragile soils and low forage amounts. *Picea engelmannii* provides good erosion control but is easily killed by fire. However, it quickly re-establishes on disturbed ground but not in areas of thick shrub, herbaceous, or duff cover. Also, its slow growth makes it a moderate revegetation option only in the long-term. By contrast, *Cornus sericea* provides excellent, long-term erosion control by stabilizing banks and recruiting debris. It also readily re-sprouts after fire (Hansen *et al.* 1995, Hansen *et al.* 1988).

Adjacent Communities

Adjacent communities may be other *Picea* types such as the wetter *Picea / Equisetum arvense* or the drier *Picea engelmannii / Galium triflorum* (Hall and Hansen 1997, Kovalchik 1993). *Alnus incana*, *Populus* species, *Salix* species (e.g. *Salix exigua*), *Carex* species, or other *Cornus sericea* types (Crowe and Clausnitzer 1997, Hall and Hansen 1997, Hansen *et al.* 1995, Youngblood *et al.* 1985) dominate other adjacent wet communities. *Pseudotsuga menziesii*, *Pinus contorta*, or *Abies lasiocarpa* and occasionally *Abies grandis* (Crowe and Clausnitzer 1997, Hall and Hansen 1997, Hansen *et al.* 1995, Youngblood *et al.* 1985) often dominate adjacent uplands.

Conservation Rank

G3G4 / S3S4

Element Code

CEGL000892

EDITION / AUTHOR

1998-11-16 / Chris Murphy

Spruce / Bluejoint reedgrass forest

PICEA ENGELMANNII / CALAMOGROSTIS CANADENSIS Forest

Classification Communities

In Montana,Idaho and northwestern Wyoming, *Picea glauca* and *Picea engelmannii* hybrid swarms are common, thus, lumping both species together is practical for classification purposes (Hall and Hansen 1997; Hansen *et al.* 1995). The type here represents stands dominated by *P. engelmannii* or *Picea* hybrids as described by Pfister *et al.* (1977), Steele *et al.* (1981) and Mauk and Henderson (1984). It should be noted the Montana representation of this association structurally resembles a woodland and not a forest, having an average tree canopy cover of slightly more than 30%, though total cover can range as high as 80% in seral stands.

PHOTO BY JACK GREENLEE

Similar Communities

This community was described for western Wyoming by Youngblood *et al.* (1985), and southeastern Idaho by Jankovsky-Jones (1997). Some Utah stands in Padgett *et al.* (1989) which is classified as *Conifer* / *Calamagrostis canadensis* have a *Picea engelmannii* – dominated overstory.

Range

This community is present in Montana, Idaho, Utah, and Wyoming.

Environmental Description

The *Picea engelmannii* / *Calamagrostis canadensis* plant association occurs as a minor type at low to high elevations in the mountains throughout Montana. It is generally restricted to flat to gently sloping sites with poor drainage, such as fen and lake margins, toeslopes, and low stream and river terraces. Soil texture varies from silt to sandy loam with some redox concentrations present. This community is usually temporarily flooded in the spring, and stands have a high water table year round. Stands are characterized by a conspicuous amount of microtopography stemming from windthrown spruce. Adjacent wetter communities include *Salix drummondiana* or *Betula glandulosa* shrublands, or *Carex* sp. dominated flats. Adjacent drier communities are usually upland conifer forests dominated by *Abies lasiocarpa, Pinus contorta,* or *Pseudotsuga menziesii* (Hansen *et al.* 1995).

Range Description

The overstory of these typically small stands (several acres at most, frequently a fraction of an acre) is dominated by spruce (*Picea engelmannii* or hybrids of *Picea engelmanni* and *Picea glauca*, though pure *Picea glauca* would be diagnostic of a separate alliance) and scattered individuals of *Pinus contorta* and *Abies lasiocarpa* may also be present, typically as unthrifty specimens. There is low coverage of shrubs, although the diversity of shrub species present is fairly high. Hansen *et al.*(1995) specify just 5% or greater cover of *Calamagrostis canadensis* or *Calamagrostis stricta* as equivalently diagnostic for this type; usually the cover of either of these species is in excess of 30%. In western Montana we have noted only *Calamagrostis canandensis* associated with this community. In the Hansen *et al.*. (1995) dataset 30% of the stands have as much as 40% *Carex utriculata*; this condition may warrant separation as a distinctly wetter site (different plant association). Associated forb species include *Aster occidentalis, Geum macrophyllum, Geranium richardsonii, Solidago canadensis* and *Equisetum arvense* (Hansen *et al.*. 1995).

Succession

Hansen *et al.* (1995) suggests that the *Picea* engelmannii / *Calamagrostis canadensis* community is a late seral phase of the *Abies lasiocarpa* / *Calamagrostis canadensis* habitat type described by Pfister *et al.* (1977). However, the population structure documented in their appendices presents no data that would substantiate this conclusion. Shrubs such as *Alnus incana* and *Salix drummondiana* dominate gaps in the forest that are created by disturbances such as windthrow.

Management

Timber productivity in this type is moderate to high. Because of high water tables, windthrow following harvest is a significant problem, as is soil damage during harvest and site preparation; timing of management activities is important to avoid damage.

Palatability of *Calamagrostis canadensis* is moderate to high and foliage is most palatable when young. However, wet conditions during this time period make soil susceptible to damage from livestock. If levels of utilization of *Calamagrostis canadensis* stay high for long periods, production of *Calamagrostis canadensis* can decline (Hansen *et al.*1995) and sites can be invaded by exotic graminoids.

Conservation Rank

G4 / S3

Element Code

CEGL000356

EDITION / AUTHOR

99-10-18 / Jack Greenlee

Spruce / field Horsetail Forest

PICEA SP. / EQUISETUM ARVENSE Forest

Similar Communities

In Montana and Idaho, *Picea glauca* and *Picea engelmannii* hybrids are common, thus, lumping both species together is practical for classification purposes (Hall and Hansen 1997; Hansen *et al.* 1995). Stands with mixed conifers have previously been grouped as *Picea* and *Conifer* in Padgett *et al.* (1989) and Youngblood *et al.* (1985). The *PICENG/EQUARV* type here represents stands dominated by *P. engelmannii* or *Picea* hybrids as described by Pfister *et al.* (1977), Steele *et al.* (1981) and Mauk and Henderson (1984).

PHOTO BY JACK GREENLEE

Range

The *Picea engelmannii / Equisetum arvense* is a widely scattered minor type which extends eastward in Wyoming along the Wind River Range and northwestward into central Idaho and Montana and into eastern Oregon.

Environmental Description

The community type is usually restricted to flat sites with poor drainage, such as gentle toeslopes, seeps, stream terraces, and fen and lake margins. Typically there is a large amount of microtopographic relief due to windthrow mounds and root crown hummocks (Padgett *et al.* 1989, Hansen *et al.* 1995). Soils are usually derived from coarse textured alluvium. Textures are highly variable with a moderate water holding capacity. Soils are often wet through out the year with standing water. Water tables are usually less than 50 cm deep (Padgett *et al.* 1989, Hansen *et al.* 1995).

Range Description

Picea engelmannii dominates an overstory that is generally sufficiently open that many of the stands would qualify as woodland (60% or less cover; P. engelmannii averages 59% in this association). *Abies lasiocarpa* and *Pinus contorta* are occasionally present on drier microsites such as windthrow hummocks. Shrub cover is usually negligible, with *Alnus incana, Betula occidentalis, Lonicera involucrata, Rosa* ssp., and *Amelanchier alnifolia* occasionally present. These species normally indicate drier ecotonal or microsite conditions. A dense carpet of the diagnostic herb *Equisetum arvense* characterizes the undergrowth. Other associates include *Carex aquatilis, Carex disperma, Carex rostrata, Glyceria* ssp., *Calamagrostis canadensis, Elymus glaucus, Geranium richardsonii, Senecio triangularis,* and *Smilacina stellata* (Padgett *et al.* 1989).

Wildlife Values

This association provides habitat for *Parus gambeli* (mountain chickadee), *Regulus calendula* (ruby-crowned kinglet), *Dendroica coronata* (yellow-rumped warbler), *Piranga ludoviciana* (western tanager), *Coccothraustes vespertinus* (evening grosbeak), and *Carduelis pinus* (pine siskin). *Equisetum arvense* is of documented importance as a food source for grizzly bear (Knight and Blanchard 1983) and black bear use these sites for wallows (Hansen *et al.* 1990).

Succession

The type is considered stable and represents a climax sere (Pfister *et al.* 1977, Padgett *et al.*). The *Populus tremuloides / Equisetum arvense* community described by Youngblood and Mueggler (1981) is considered to be seral to *Picea engelmannii / Equisetum arvense*. Shrubs tend to dominate forest openings created by disturbance such as windthrow.

Management

Windthrow following timber harvest limits the potential for timber management in this type, as do concerns over easily compacted wet soils. A rise in the water table following timber harvest could interfere with forest regeneration (Hansen *et al.* 1995).

Adjacent Communities

Adjacent upland vegetation is usually dominated by a variety of conifers across the range of this community. *Carex* ssp., *Salix* ssp., or *Betula glandulosa* (Padgett *et al.* 1989, Hansen *et al.* 1995) frequently dominates adjacent wetter communities.

Conservation Rank

G4 / S4

Element Code

CEGL000408

EDITION / AUTHOR

95-04-04 / Mabel Jankovsky-Jones

■ PICEA SP. / LYSICHITON AMERICANUS *Forest*

Similar Communities

This type was originally included within the range of variation of the *Picea / Equisetum arvense* community (Pfister *et al.* 1977). It was described by Hansen *et al.* (1995).

PHOTO BY JACK GREENLEE

Range

Picea sp. / *Lysichiton americancus* communities are found in northwest Montana.

Environmental Description

This community type occurs in valley bottoms adjacent to beaver ponds, lakes, or marshes, and on toe slopes seeps, swales and where low gradient stream channels break up into diffuse surface flows. The ground surface has a great deal of microtopographic relief because the shallow-rooted spruce often blow down, creating hummocks (upturned rootwads) and small swales (root wells). This community type is found only in northwest Montana where the Pacific maritime climate influence is strongest (Hansen *et al.* 1995). Surface horizons have accumulations of organic material, and redox depletions are found in mineral soils. The water table is typically within 50 cm of the soil surface during any time of year, and sites usually have standing water during the spring and early summer (Hansen *et al.* 1995).

Range Description

Picea sp. is the dominant overstory species, usually with moderate cover. Large diameter trees are uncommon, and coarse woody debris levels are usually moderate. *Betula papyrifera* may also be present. Shrub cover is low, but shrub diversity is high. Common species include *Cornus sericea* and *Alnus* sp. Graminoid diversity is usually fairly low, and the dominant forb is *Lysichiton americanus*, which usually grows in depressions with standing water. *Equisetum arvense, Athyrium filix-femina, Rubus pubescens,* and *Cornus canadensis* are often present.

Wildlife Values

This community probably provides valuable cover for a variety of wildlife species, based on personal observations of wildlife in this community.

Succession

This community probably represents a late seral condition. Openings created by blowdown usually have higher shrub cover (pers. obs.). Unless the water regime changes markedly, this is most likely a fairly stable community. This community is the wettest of the spruce types. It probably only experiences infrequent stand replacing fires due to the usually wet ground conditions.

Management

Windthrow following timber harvest limits the potential for timber management in this type, as do concerns over easily compacted wet soils. A rise in the water table following timber harvest could interfere with forest regeneration (Hansen *et al.* 1995). Saturated soils are highly susceptible to soil compaction or disturbance by livestock or heavy machinery.

Adjacent Communities

Adjacent wetter sites may be dominated by *Carex* ssp. communities or *Betula glandulosa* communities, and adjacent drier sites may be dominated by *Picea / Equisetum arvense* communities or upland communities (Hansen *et al.* 1995).

Conservation Rank

G2 / S2

Element Code

CEGL000412

EDITION / AUTHOR

99-04-14 / J. Greenlee

Black Cottonwood / Red – Osier Dogwood Forest

POPULUS BALSAMIFERA *SSP.* TRICHOCARPA / CORNUS SERICEA *Forest*

Similar Communities

This community is synonymous with the *Populus trichocarpa / Cornus stolonifera* community type described by Hansen *et al.* (1995). It may be the same as *the Populus trichocarpa / Cornus stolonifera-Salix* described in Oregon. Similar communities dominated by different *Populus* overstory species include *Populus / Cornus sericea*, *Populus angustifolia / Cornus stolonifera*, and *Populus deltoides / Cornus stolonifera* (Manning and Padgett 1995, Youngblood *et al.* 1985, Hansen *et al.* 1995).

Range

Populus balsamifera ssp. *Trichocarpa / Cornus sericea* community type occurs in Montana, Washington, Idaho, and Oregon.

Environmental Description

Sites occur on alluvial terraces of major streams and rivers, point bars, side bars, mid channel bars, delta bars, islands, and occasionally around lakes and ponds. Soil textures vary from loam to coarse sand, and are generally well drained with a low available water holding capacity. These sites are often flooded in the spring with water tables lowering to 3 or more feet below the soil surface at the end of summer; upper soil profiles remain moist due to capillary action. Coarse textured soils, moderate stream gradients, and high coarse fragment contents throughout the soil profile provide an environment that produces a rapid movement

of highly aerated groundwater. Redox concentrations (mottles) are common as evidence of a fluctuating water table (Kovalchik *et al.* 1993, and Hansen *et al.* 1995).

Range Description

Populus balsamifera ssp. *Trichocarpa / Cornus sericea* community type is characterized by an overstory dominated by, *Populus balsamifera* ssp. *trichocarpa* (25-85% cover) with *Populus angustifolia,* sometimes occurring as subordinates in the eastern portion of the range. *Betula papyrifera* and *Populus tremuloides* occurr as subordinates in the western portion of the range. The dense shrub layer is diverse and dominated by *Cornus sericea* (20-90% cover). *Amelanchier alnifolia, Symphoricarpos oreophilus, Alnus incana, Rosa woodsii, Salix exigua* and other *Salix* species are often present. *Smilacina stellata* and *Equisetum arvense* are often present along with graminoids, none of which have high constancy.

Wildlife Values

This community type provides valuable cover, shade, and food for a variety of species. Big game use may be high, depending upon the time of year. The spreading crown of *Populus trichocarpa* provides nesting sites for *Haliaetus leucocephalus* (bald eagles), *Pandion haliaetus* (osprey), and *Ardea herodias* (great blue heron). Woodpeckers, great horned owls, wood ducks, and raccoons nest in trunk cavities. Beavers use both the cottonwood and dogwood vegetation for food and building material. Understory species provide food and cover for a variety of waterfowl, small birds, and mammals. The streamside location of this community type is very important in providing thermal cover, debris recruitment, and streambank stability for fish habitat (Hansen *et al.* 1995).

Succession

Populus balsamifera ssp. *trichocarpa* is a pioneering species that requires moist, barren newly deposited alluvium exposed to full sunlight for regeneration. In the absence of fluvial disturbance, succession continues to a variety of conifer dominated habitat types such *as Pinus ponderosa, Pseudotsuga menziesii, Abies grandis, Picea, Thuja plicata, Tsuga heterophylla, Abies lasiocarpa,* or *Juniperus scopulorum*. If conifers are absent, shrubs and herbaceous species that formed the former undergrowth may persist. In other instances, this community type may be successional to the *Salix geyeriana / Calamagrostis canadensis* habitat type or the *Salix lutea / Calamagrostis canadensis* habitat type, depending upon elevation. If disturbance is severe enough, all shrubs can be eliminated and the understory will be converted to a herbaceous one dominated by species such as *Poa pratensis, Phleum pratensis, Bromus inermis*, and *Centaurea maculosa* (Hansen *et al.* 1995).

Environmental Description

The erosion and depositional pattern of a river helps maintain diversity of plant communities on the floodplain. The distribution of communities depends on the way the river meanders. In turn, the rate of meandering determines the seral stage of the communities. Where the river meanders frequently, few stands progress to later successional stages. Near the outer edges of the floodplain, the effect of the river is less pronounced, allowing later successional stages to develop (Hansen *et al.* 1995 and Boggs *et al.* 1990).

Management

Because of its close proximity to streams and rivers and the flat topography, recreational developments and transportation corridors are common within this type; care must be taken when locating structures in the floodplain to avoid damage or loss by floods. Dams that limit peak flows, can lead to the gradual disappearance of mature cottonwood forest. Due to the lack of sediment deposition for seedbeds, periodic floods are

necessary for continued cottonwood recruitment (Merigliano 1996). Although streambank erosion is a naturally occurring process, attempts to stabilize streambanks using riprap can lead to increased erosion downstream, thus speeding the loss of cottonwood forest in some cases. Poorly managed livestock grazing can lead to loss of understory shrubs and decreased recruitment of cottonwoods. Management should emphasize the importance of the understory shrub layer in streambank stabilization; a buffer strip of the *Populus trichocarpa* dominated community types should be maintained adjacent to rivers and streams. Under certain conditions, fire may be used as a tool to extend the life span or rehabilitate a stand (Hansen *et al.* 1995 and Boggs *et al.* 1990).

Adjacent Communities

Adjacent wetter communities may be dominated by *Salix exigua, S.lasiandra, S. drummondiana, S. geyeriana, Carex utriculata, C. buxbaumii,* or a variety of *Alnus incana* or *Typha latifolia* dominated community types. Adjacent drier communities may be dominated by *Populus trichocarpa* types, or habitat types from the *Pseudotsuga menziesii, Pinus ponderosa, Thuja plicata* and *Juniperus scopulorum* series (Hansen *et al.* 1995, Kovalchik *et al.* 1993, and Boggs *et al.* 1990).

Conservation Rank

G3? / S3?

Element Code

CEGL000672

EDITION / AUTHOR

95-08-07 / L. Williams

Booth's willow / Bluejoint reedgrass Shrubland

SALIX BOOTHII / CALAMAGROSTIS CANADENSIS *Shrubland*

Similar Communities

This community has also been documented in Utah (Padgett *et al.* 1989), Idaho and western Wyoming (Youngblood *et al.*. 1985). Other studies (Hansen *et al.* 1995, Hall and Hansen 1997) include *Salix boothii*-dominated stands within a *Salix geyeriana* habitat type for management purposes, since *Salix boothii* and *Salix geyeriana* are often co-dominant within a stand. Other authors (e.g. Padgett *et al.* 1989) separate *Salix boothii*-dominated stands as a separate plant association due to structural differences between *Salix boothii* and *Salix geyeriana* stands, although based on the descriptions in Padgett *et al.*. (1989), there is some degree of overlap between the two plant associations.

Range

The *Salix boothii* / *Calamagrostis canadensis* association is found in Colorado, Montana, Utah, Idaho, Nevada and western Wyoming.

Environmental Description

The *Salix boothii* / *Calamagrostis canadensis* association can be found in montane habitats in western Montana (from valley bottoms to mid-elevations in the mountains) and in the mountains of central and eastern Montana. It is frequently found on alluvial terraces where beaver activity has created a series of dams that raise the local water table, along streams, and near seeps or springs. It is also found on streamside sites of major drainages and their tributaries, as well as springs and seeps. Soils are usually deep silt or sand overlying more sand, gravel, or cobbles. This community almost invariably floods during spring and the groundwater level remains within 1m of the surface the rest of the year. Adjacent wetter plant associations could include *Carex utriculata*, *Carex aquatilis*, *Salix geyeriana* / *Carex utriculata, Typha latifolia*, or open water, and nearby drier communities could include *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea*, *Calamagrostis canadensis*, *Deschampsia cespitosa*, or *Juncus balticus*. A variety of adjacent uplands could occur nearby, ranging from conifer dominated communities to dry shrublands such as *Artemesia tridentata* associations (Hansen *et al.*. 1988, Hansen *et al.*. 1995).

Range Description

The *Salix boothii* / *Calamagrostis canadensis* association has no typical canopy structure, it ranges from predominantly open to a dense canopy (90% plus cover) clearly dominated by *Salix boothii* (24% average cover); other shubs with at least 20% constancy include *Salix geyeriana*, *Salix drummondiana*, *Salix bebbiana*, *Salix geyeriana*, *Ribes* spp. and *Pentaphylloides floribunda*. In the Montana representation of this association the undergrowth is dominated by *Calamagrostis canadensis* or *Calamagrostis stricta*, though apparently they do not co-occur (Hansen *et al.* 1995; personal observation members MTNHP ecology staff). In contrast to *Salix geyeriana* – dominated communities, these stands are more often closed and less easily accessible by large ungulates, while *Salix geyeriana* stands have a more open corridor aspect (Padgett *et al.* 1989). Commonly associated graminoids (at least 20% constant) are *Carex utriculata*, *Carex microptera*, *Deschampsia cespitosa*, *Glyceria striata* and *Juncus balticus* and virtually the complete panoply of exotic grasses (testimony to these sites as prime draws for domestic stock). *Aster occidentalis*, *Fragaria virginiana*, *Epilobium angustifolium*, *Geum macrophyllum*, *Heracleum lanatum*, *Maianthemum stellatum*, *Solidago canadensis*, and *Equisetum arvense* comprise the native forbs with greater than 20% constancy (Hansen *et al.*. 1995).

Succession

Salix boothii / *Calamagrostis canadensis* stands are fairly stable if the hydrologic regime remains unchanged. Kittel *et al.*. (1998) suggest that flooding events in *Salix boothii* / *Carex utriculata* communities can result in sediment deposition, which raises the floodplain surface higher above the water table. As the floodplain aggrades, the site could become less saturated, which could cause the graminoid undergrowth to shift toward *Calamagrostis canadensis* preeminence. Similarly, Kittel (1994) states that distance from the stream channel can change the degree of soil saturation, and thereby influence the undegrowth composition. Removal of beaver from a *Salix boothii* / *Carex utriculata* stand could also cause compositional changes. Unmaintained beaver dams could break, and cause a lowering of the water table, which could cause a shift in the dominant understory graminoid towards *Calamagrostis canadensis* (Hansen *et al.* 1995).

Management

Calamagrostis canadensis is moderately to highly palatable, and with high grazing pressure, the vigor, reproductive success, and competitive ability of this grass will decrease. Exotic pasture grasses such as *Poa pratensis* or *Agrostis stolonifera* may then increase. Livestock grazing in this association should be avoided when the soils are wet to avoid churning of the soil surface. *Salix boothii* / *Calamagrostis canadensis* stands

exposed to heavy browsing pressure usually show reduced vigor of the willow species, such as highlining, clubbing, or dead clumps, with eventual decrease in willow coverage (Hansen *et al.* 1995).

Conservation Rank

G3G4Q / SR

Element Code

CEGL001175

EDITION / AUTHOR

99-10-18 / Jack Greenlee

Hoary willow / Beaked sedge Shrubland

SALIX CANDIDA / CAREX UTRICULATA Shrubland

Similar Communities

Chadde *et al.* (1998) mention a *Salix candida* / *Carex lasiocarpa* peatland community for western Montana which is similar to *Salix candida* / *Carex utriculata*, except that the understory is dominated by *Carex lasiocarpa*; this type is also supported by unpublished plot data on file at MTNHP. Lesica (1986) also notes *Salix candida* as an important shrub component in dwarf carr vegetation at the Pine Butte Fen on the Rocky Mountain Front. *Betula nana / Carex utriculata*, which has an average *B. nana* cover of 29% and S. candida 45% constant, is very similar to *S. candida / C. utriculata*, which has *B. nana* 75% constant with an average cover of 33% and *S. candida* with an average cover of only 19%. That is, in a good share of the *S. candida / C. utriculata* stands *B. nana* is actually the shrub dominant; the high constancy, but low coverage of *S. candida* in the *B. nana / C. utriculata* association may merely reflect intense browsing pressure on this highly preferred species. Separation of these types, at least as they occur in Montana needs to be re-examined. It should also be noted that in the key of Hansen *et al.* (1995) that this is a default association; the vegetation key simply will not take one beyond the lead keying to *S. candida / C. utriculat*a and the stand need not have *C. utriculata* present to be so identified.

Range

This community has been described only from Montana and Idaho; it should be listed as reported from the Yellowstone National Park of Wyoming.

Environmental Description

This community is found in montane to lower subalpine habitats in western, southwestern, and central Montana. It occurs on peat deposits that have developed around the margins of lakes and ponds, particularly as floating mats, and around springs/seeps. These sites are seasonally flooded and have water tables at or near the surface throughout the growing season. Adjacent wetter communities often include *Carex lasiocarpa* floating mats or other *Carex*-dominated plant associations on peaty substrates, *Salix wolfii / Carex aquatilis* or *Salix boothii*-dominated associations; rooted aquatic vegetation like *Nuphar* sp., Potamogeton spp. or simply open water characterize more hydric regimes. Adjacent drier communities include those dominated by *Pentaphylloides floribunda* / *Deschampsia cespitosa* or *Juncus balticus*. Uplands are usually dominated by coniferous forest (Hansen *et al.* 1995).

Range Description

Salix candida grows as a low shrub (to 1.5m) and usually dominates the shrub layer, although canopy coverage tends to be low (10%-40%, average 14%). It is only due to the high constancy and low to moderate coverage of many other shrub species that this plant association can be considered a shrubland and not a shrub herbaceous type, though many stands in fact are more appropriately characterized as the latter type. Notable among these other shrubs is *Betula nana* (73 % constant, 19% average cover), *Pentaphylloides floribunda* (75% constant, 12% cover), *Salix planifolia* (38% constant, 3% cover) and *Cornus sericea* (33% constant, 7% cover). A dense cover of a variable mix of the following graminoids dominates the undergrowth; *Carex utriculata, Carex aquatilis, Carex simulata, Carex livida, Carex limosa, Calamagrostis stricta,* Muhlenbergia spp. and *Juncus balticus*. The fact that so many Carex spp., of such varied ecologies is found within this association, argue for at least reconsidering partitioning this variability into more types. Forb coverage is usually low (Hansen *et al.* 1995) but, *Triglochin maritimum* and *Menyanthes trifoliata* can also comprise significant amounts of cover. The following forbs are present in at least a third of the sample plots; *Allium schoenoprasum, Antennaria anaphaloides, Aster juncifolia, Equisetum arvense, Viola nephrophylla* and *Parnassia palustris*.

Succession

The successional dynamics of this community are poorly understood. It is most likely a fairly stable community as the peat deposits upon which this community is found require a stable hydrologic regime.

Management

The organic soils of this type are easily damaged by livestock use, especially when wet However, due to the wetness of this type, it most likely does not receive much livestock use in any case. The response of *Salix candida* to fire has not been documented.

Conservation Rank

G3 / S3

Element Code

CEGL001188

EDITION / AUTHOR

99-10-18 / Jack Greenlee

Drummond's Willow / Blue joint Reedgrass Shrubland

SALIX DRUMMONDIANA / CALAMAGROSTIS CANADENSIS *Shrubland*

Similar Communities

Similar communities include Tuhy's (1981) *Salix drummondiana / Ribes lacustre / Thalictrum occidentale*, Mutz and Queiroz's (1983) *Salix drummondiana-Salix boothii / Calamagrostis canadensis*, Baker's (1989) *Salix drummondiana-Salix monticola / Calamagrostis canadensis-Carex rostrata,* and Kittel *et al.* (1998) *Salix drummondiana / mesic* forb types.

Range

This community is a minor type in Colorado, Utah, Idaho, Washington, and Montana.

Environmental Description

Elevation ranges from 2320 to 8200 feet through out the range of the community. Type occurs on low gradient slopes adjacent to beaver ponds, lakes, marshes, rivers and streams, or on toeslopes below upland sites. Soils are coarse to fragmented loams or grass peat over deep, erosive, moderately fine textured alluvium (Kovalchik 1993, Tuhy and Jensen 1982). Hansen *et al.* (1995) notes soil textures range from silt to clay loam; mottling and gleyed soils are common. Type is relatively dried compared to other willow plant association (Kovalchik 1993). Water levels range from at the surface to 100 cm below the surface during the growing season.

Range Description

Salix drummondiana dominates the tall shrub layer (25-60% cover). *Salix geyeriana, Salix boothii* and *Salix monticola* are sometimes present in lesser amounts than the dominant shrub. *Lonicera involucrata, Ribes* ssp., *Alnus incana*, and *Potentilla fruticosa* are usually present with up to 15% cover individually. *Calamagrostis canadensis* contributes at least 5% and up to 60% cover to the understory. Other species with high constancy include *Carex microptera, C. utriculata, C. aquatilis, Deschampsia cespitosa, Aster foliaceus,* and *Fragaria virginiana*.

Wildlife Values

Abundant food, cover, and proximity to water provide habitat for numerous wildlife species and songbirds. Moose and beaver tend to heavily utilize most species of willow.

Succession

Grazing pressure will cause a decrease in *Calamagrostis canadensis* and *Deschampsia cespitosa,* with a corresponding increase in either introduced or less desirable species such as *Ribes setosum, Urtica dioica,* and *Equisetum arvense*. Abundance of *Calamagrostis canadensis* suggests that communities may be seral stages of *Abies lasiocarpa / Calamagrostis canadensis* habitat type. The development of a conifer overstory tends to reduce and eventually eliminate the shade intolerant *Salix* species without affecting the herbaceous layer (Tuhy and Jensen 1982, Hansen *et al.* 1995).

Management

The vigor of *Salix* ssp. in these communities appears directly related to streambank stability and rate of sedimentation into stream systems (Tuhy *et al.* 1982). Sustained grazing decreases the vigor, reproductive success, and competitive ability of *Calamagrostis canadensis* and *Deschampsia cespitosa*. To maintain vigor and prevent damage to soils and vegetation, grazing should be deferred until soils dry; proper levels of grazing should range from light to moderate. Overuse by livestock will result in reduced vigor of willow species present, illustrated by uneven stem age distribution, highlining, and clubbing or dead clumps. With continued overuse, willows may be eventually eliminated from the site (Hansen *et al.* 1995).

Adjacent Communities

Adjacent wetter sites may support *Salix drummondiana / Carex utriculata, Carex utriculata, C. aquatilis,* or *C. scirpoidea var. pseudoscirpoidea* types, or open water. Drier sites may support *Salix* dominated types with a *Poa pratensis* or *Juncus balticus* understory, or *Potentilla fruticosa, Alnus incana* or conifer dominated types (Hansen *et al.* 1995, Kovalchik 1993).

Conservation Rank

G3 / SP

Element Code

CEGL001191

EDITION / AUTHOR

1996-06-13 / L. Williams

Drummond's willow / Beaked Sedge Shrubland

SALIX DRUMMONDIANA / CAREX UTRICULATA *Shrubland*

Similar Communities

Earlier studies grouped this community within broader *Salix / Carex* rostrata [often misidentified, actually *Carex utriculata*], *Salix drummondiana-Salix boothii / Carex rostrata-Carex aquatilis,* and *Salix / Carex rostrata-Carex aquatilis* communities (Tuhy and Jensen 1982; Mutz and Queiroz 1983; Walford *et al.* 1997). Likewise, in eastern Idaho, western Wyoming, and Utah, it may have been kept within the *Salix boothii / Carex rostrata* or *Salix geyeriana / Carex rostrata* community types (Youngblood *et al.* 1985; Padgett *et al.* 1989). These communities often have high cover and constancy of *Salix drummondiana* (to the level of co-dominance) making lumping of types seems logical (Hansen *et al.* 1995; Hall and Hansen 1997). *Salix drummondiana* communities, with their mixed *Salix* species composition, may be transitional to other community types (Kovalchik 1993). In addition, *Salix sitchensis* is easily confused with *Salix drummondiana* (with which it may hybridize). *Salix sitchensis* sometimes co-dominates stands making community identification difficult (Jankovsky-Jones [In preparation]).

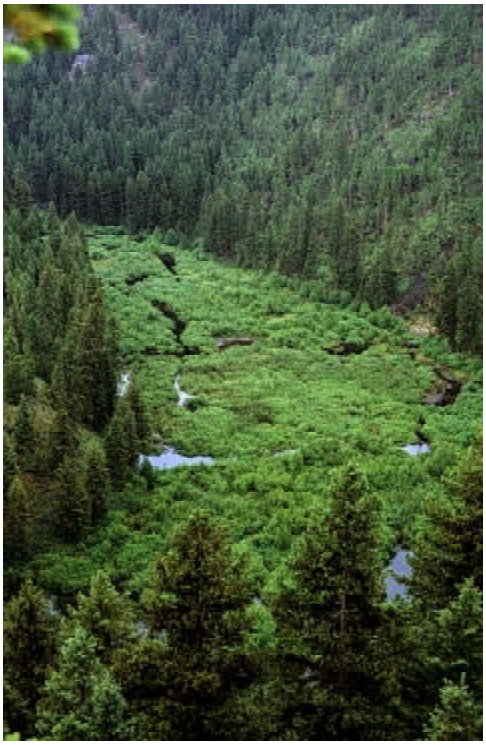

PHOTO BY JACK GREENLEE

The edaphic and hydrologic situations which allow *Carex utriculata* dominance also promote many different *Salix* species. However, dominance by any one *Salix* species can be the result of many factors such as elevation or grazing (Hall and Hansen 1997). Tall willow communities similar to *Salix drummondiana / Carex utriculata* (often with high cover and constancy of *Salix drummondiana*), include *Salix drummondiana-Salix boothii / Carex rostrata-Carex aquatilis, Salix boothii / Carex rostrata, Salix geyeriana / Carex rostrata, Salix lutea / Carex rostrata,* and *Salix drummondiana / Carex aquatilis* (Mutz and Queiroz 1983; Youngblood *et al.* 1985; Padgett *et al.* 1989; Hansen *et al.* 1995; Hall and Hansen 1997; Walford *et al.* 1997; Kittel *et al.* 1998). Short willow species may dominate at higher elevations. *Salix drummondiana* is sometimes present in short willow communities such as: *Salix candida / Carex utriculata; Salix farriae / Carex utriculata;* and *Salix wolfii / Carex rostrata* (Youngblood *et al.*

1985; Padgett *et al.* 1989; Kovalchik 1993; Hansen *et al.* 1995; Walford *et al.* 1997). Other *Carex* species may be more common than *Carex utriculata* in similar communities due to variations in seral status or other factors. These include *Salix boothii / Carex aquatilis, Salix geyeriana / Carex aquatilis,* and *Salix drummondiana / Carex scopulorum var. prionophylla* (Youngblood *et al.* 1985; Padgett *et al.* 1989; Kovalchik 1993; Hansen *et al.* 1995; Hall and Hansen 1997).

Range

The *Salix drummondiana / Carex utriculata* community type is known from Montana, Idaho, Washington, and probably western Wyoming.

Environmental Description

The community is found in narrow to wide valleys on alluvial terraces that are adjacent to streams of low or moderate gradients (Mutz and Queiroz 1983; Hansen *et al.* 1995; Hall and Hansen 1997). These streams are often moderately entrenched, Rosgen C types (Kovalchik 1993). It is equally common adjacent to poorly drained or impounded areas such as beaver ponds, peatlands, lakes, marshes, seeps, springs, and road crossings (Kovalchik 1993; Moseley *et al.* 1994; Hansen *et al.* 1995). Though on mostly flat ground, channels and hummocks (Mutz and Queiroz 1983) characterize the microtopography. As with landform settings, soils vary from Entisols and Histosols to Mollisols. Soils adjacent to moderate gradient streams are often poorly developed, coarse textured, and sandy with high gravel and cobble content. These soils allow the water necessary to support *Carex utriculata* to easily pass through (Hansen *et al.* 1995). In wider valleys, clay and silt-loam or organic soils are more common. Gleying and mottling are often present, typical of a spring/summer surface water table followed by the water table dropping to 100 cm below the surface by late summer (Kovalchik 1993). Organic loam and sedge peat soils, with high available water content, are up to 1 m deep and classified as Cumulic Cryaquolls and Terric, Hemic, Sapric, and Fibric Histosols (Mutz and Queiroz 1983; Kovalchik 1993). A 5cm surface litter/duff layer may be present. The soils of this community are held together by sod mats formed by Carex species and willow cover that effectively stabilize stream banks (Hansen *et al.* 1995).

Range Description

The *Salix drummondiana / Carex urtriculata* community type is variable, often having mixed *Salix* and *Carex* species present. *Salix drummondiana* is usually dominant with 30 to 55% covers and 70 to 100% constancy (Kovalchik 1993; Hansen *et al.* 1995; Jankovsky-Jones [In preparation]). Other tall willow species, such as *Salix geyeriana, S. boothii, S. sitchensis, S. lasiandra, S. bebbiana,* and *S. pseudomonticola*, usually have less than 40% cover and less than 30% constancy. While these species form a tall shrub canopy (to 4 m), shorter species, such as *Salix farriae* or *Salix planifolia*, can be prominent in the understory (Mutz and Queiroz 1983; Kovalchik 1993; Hansen *et al.* 1995). Where *Salix* species have been reduced by beaver or overgrazing, *Betula glandulosa* (10 to 15% covers), *Spiraea douglasii*, or *Ribes* species may be important (Hansen *et al.* 1995). *Picea engelmannii, Abies lasiocarpa,* and *Alnus incana* are also occasionally present. The herbaceous layer is dominated by *Carex utriculata* (10 to 39% cover, about 80% constancy) and *Carex aquatilis* (less than 34% cover, less than 80% constancy) with *Carex vesicaria* also common. Other associated *Carex*, having low cover and constancy, include *Carex lanuginosa, C. lasiocarpa, C. lenticularis,* and *C. nebrascensis.* Other common graminoid species, with low constancy but occasionally moderate cover (less than 40%), are *Calamagrostis canadensis, Phalaris arundinacea, Scirpus microcarpus, Glyceria* species, and *Juncus* species (Mutz and Queiroz 1983; Kovalchik 1993; Hansen *et al.* 1995; Jankovsky-Jones 1996; Jankovsky-Jones [In preparation]). Due to the dense *Salix* and *Carex* species cover, overall forb cover is low and mainly around shrub bases. Widespread species are *Epilobium ciliatum, Geum macrophyllum,* and

Equisetum arvense. Less common species (but occasionally with higher cover) include *Saxifraga arguta, Galium species, Petasites sagittatus,* and *Aster modestus* (Mutz and Queiroz 1983; Kovalchik 1993; Hansen *et al.* 1995; Jankovsky-Jones 1996; Jankovsky-Jones [In preparation]). Moss cover is often high.

Wildlife Values

In the winter, moose heavily browse *Salix drummondiana* shoots. Throughout the year *Salix drummondiana* is utilized by beaver and provides fair forage for elk and deer. Songbirds also utilize *Salix* species habitat for feeding and nesting. In addition to *Salix* root masses, the dense *Carex rostrata* and *Carex aquatilis* sod overhangs undercut banks creating prime fish habitat (Hansen *et al.* 1988; Hansen *et al.* 1995; Hall and Hansen 1997; Walford *et al.* 1997).

Succession

The successional origin of *Salix drummondiana / Carex utriculata* is not well known. Both *Salix drummondiana* and *Carex utriculata* can be colonizers of fresh, mineral alluvium (Hansen *et al.* 1995; Walford *et al.* 1997). Thus, when alluvium is exposed, such as post-flood silt deposits around willow roots or after a beaver dam breaks, these species may invade. Alternately, *Carex utriculata* might invade on silt deposited in open beaver ponds, then allowing later *Salix* invasion as the site dries (Mutz and Queiroz 1983). Another hypothesis, taken from the similar *Salix boothii / Carex utriculata* type, is that a *Salix* community existed before the beaver dam. The beaver dam was built, flooding the *Salix* but not eliminating it, subsequent siltation allowed *Carex utriculata* to invade, and *Salix* rejuvenated later (Youngblood *et al.* 1985; Padgett *et al.* 1989). Whatever the origin, stability of the *Salix drummondiana / Carex utriculata* community is indicated by a thick accumulation of organic matter (Kovalchik 1993). Disturbance by livestock or beaver will reduce *Salix drummondiana* cover and allow graminoids, especially introduced species, to increase (Mutz and Queiroz 1983). If willows are reduced too much, beaver will leave in search of food and fail to maintain dams washed out by storms. The water table will then lower as the stream downcuts and the community will change toward a drier *Salix drummondiana / Calamagrostis canadensis* or Abies lasiocarpa type (Hansen *et al.* 1988; Hansen *et al.* 1995).

Management

Salix drummondiana / Carex utriculata can be a productive community but will decrease if soils are damaged or hydrologic conditions change. For example, recreation trails, road building, agriculture (including draining with ditches), and livestock grazing easily damage organic soils through compaction and reduction of water holding capacity (Mutz and Queiroz 1983; Moseley *et al.* 1994; Hansen *et al.* 1995). These activities may also cause streambank sloughing as well as premature soil drying, the loss of vegetative protection, and eventual loss of the community. Beavers are also important in maintaining necessary hydrologic conditions. Thick shrub cover and excessive wetness often limit activities in this community. Livestock forage value varies with season and historic use, but both *Salix drummondiana* and *Carex utriculata* are fair to good forage in the spring (Hansen *et al.* 1988; Hansen *et al.* 1995). Overgrazing of willows decreases their vigor and can eliminate them from the site allowing graminoid cover to increase. This may occur with a late summer and fall grazing regime, which reduces willow re-growth and allows sedges, with their underground root reserves, to later proliferate. Thus, long rest periods are needed to maintain the community (Hansen *et al.* 1995). Prescribed fire effectively rejuvenates dead clumps because *Salix drummondiana* sprouts vigorously after fire (quick, hot fires are preferred over slow, cool burns). Fires also increase *Carex rostrata* but only if ungrazed before and after the fire (Hansen *et al.* 1995). Both *Salix drummondiana* and *Carex rostrata* (and *Carex aquatilis* and *C. vesicaria*) are excellent for re-vegetation over the long-term and provide good erosion control (Hansen *et al.* 1995).

Adjacent Communities

Communities adjacent to *Salix drummondiana / Carex utriculata* include other *Salix drummondiana* types with slightly drier moisture regimes. Examples are *Salix drummondiana / Calamagrostis canadensis, Salix drummondiana / Carex scopulorum var. prionophylla,* and *Salix drummondiana / Poa pratensis* (Mutz and Queiroz 1983; Hansen *et al.* 1988; Kovalchik 1993; Hansen *et al.* 1995). Other adjacent communities with similar moisture levels are *Salix geyeriana / Carex rostrata, Salix boothii / Carex rostrata, Salix farriae / Carex scopulorum var. prionophylla,* and *Salix wolfii* communities (Mutz and Queiroz 1983; Kovalchik 1993; Hall and Hansen 1997; Walford *et al.* 1997). Slightly drier adjacent communities *include Alnus incana / Calamagrostis canadensis, Alnus incana / Carex utriculata, Potentilla fruticosa / Deschampsia cespitosa,* and *Deschampsia cespitosa* communities. Wetter adjacent communities are herbaceous types (*Carex utriculata, Carex aquatilis*, or *Carex lasiocarpa* dominated) and *Salix farriae / Carex utriculata* (Kovalchik 1993; Hansen *et al.* 1995). Adjacent uplands are *Abies lasiocarpa, Pseudotsuga menziesii, Picea engelmannii*, or *Pinus ponderosa* habitat types (Hansen *et al.* 1988; Hansen *et al.* 1995).

Conservation Rank

G3 / S3

Element Code

CEGL002631

EDITION / AUTHOR

1998-11-25 / Chris Murphy

Sandbar Willow / Barren Shrubland

SALIX EXIGUA / BARREN *Shrubland*

Similar Communities

Manning and Padgett (1995) described the *Salix exigua / Bench* community type from Nevada that is considered the same as the *Salix exigua* / *Barren* type of Padgett *et al.* (1989). Tuhy and Jensen (1982) described a similar type with no diagnostic undergrowth for central Idaho. One or more of Cole's (1995) *Salix exigua* types may be included within the variation of this one.

Range

Stands occur in Idaho (Jankovsky-Jones 1997), Nevada (Manning and Padgett 1995), Utah (Padgett *et al.* 1989), Montana, and Colorado (Kittel *et al.* 1998) and probably elsewhere.

Environmental Description

This community type occurs along active streambanks or on nearby stream terraces. Flooding in this community is probably an annual event. The soils are young and fluvial in origin. It can occur in valley bottoms with very low to moderate gradients and can be from narrow to very wide. Elevations are mostly below 5,500 feet (Padgett *et al.* 1989; Manning and Padgett 1995; Moseley 1998). Soils are highly variable, ranging from highly stable Cumulic Haplaquolls and Aquic Cryoborolls to early developmental Typic Udifluvents. All have developed on alluvium of varying ages. Estimated available water-holding capacity

ranged from low to high, and particle-size classes include fine, loamy and sandy-skeletal. Water tables ranged from near the surface to over 3 feet below the surface (Padgett *et al.* 1989).

Range Description

A dense stand of *Salix exigua* dominates the overstory of this otherwise depauperate community. Other willows, such as *S. lasiandra, S. amygdaloides*, and *S. lutea*, may occasionally be minor components. *Rosa woodsii, Ribes inerme*, or *Cornus sericea* may be present in the shrub layer, but in very low cover. The undergrowth is open with predominantly bare ground, rock, or leaf litter. Forb species are scattered and in low cover, although diversity may be high. Graminoids are generally absent or in low cover (Manning and Padgett 1995).

Wildlife Values

Stands of this community provide excellent thermal and hiding cover for a wide range of wildlife species. *Salix exigua* is normally not as heavily browsed as other willow species. Beavers tend to utilize *Salix exigua* (Hansen *et al.* 1995).

Succession

The *Salix exigua / Barren* type is an early successional type that has had little undergrowth development. Some stands have rather xeric soils which inhibits the establishment of herbaceous species, while others are very wet, but have had insufficient time for establishment. Succession in this community without outside disturbance will likely lead toward the *Salix exigua / Mesic* forb or *S. exigua / Mesic* graminoid types in moist situations, while drier sites may develop into the *S. exigua / Poa pratensis* community (Padgett *et al.* 1989).

Management

There is essentially no herbaceous livestock forage available in this type. The willows provide stability of streambanks as well as stream shading.

Adjacent Communities

A wide range of upland communities can occur on adjacent slopes, ranging from salt desert shrub and sagebrush-steppe communities at the lower elevations to low-montane coniferous woodlands and forests at the higher elevations.

Conservation Rank

G5Q / S5

Element Code

CEGL001200

EDITION / AUTHOR

97-12-31 / B. Moseley

■ SALIX EXIGUA / MESIC GRAMINOID *Shrubland*

Similar Communities

Some Hansen *et al.* (1995) stands may fit in this type.

Range

Stands occur throughout Utah, extreme western Colorado (Padgett *et al.* 1989) and the Colorado Front Range (Kittel *et al.* 1998), and throughout Idaho (Padgett *et al.* 1989; Jankovsky-Jones 1997) and Montana (Hansen *et al.* 1995).

Environmental Description

This type occurs on stream terraces and in meadows associated with stream channels from about 2,000 to 7,700 feet. Valley bottoms may be narrow to very wide and of low to moderate gradient. This community is not in the most dynamic portion of the floodplain, as are some of the other *Salix exigua* types (Padgett *et al.* 1989). Water tables range from the surface to over three feet below the surface. Distinct and prominent mottle are common within 20 inches of the surface, indicating a seasonally high water table. Soils indicate a broad range of development, from the well-developed Terric Borohemists, Cumulic Haploborolls, Typic Cryaquolls, and Pachic Cryoborolls to less-developed Aquic Cryofluvents and Fluvaquentic Haploxerolls. Soils develop on alluvial depositions of varying ages. Particle-size classes were highly variable, with estimated available water-holding capacity from low to moderate (Padgett *et al.* 1989).

Range Description

Salix exigua dominates the overstory of this type. *Salix lutea* and/or *S. lasiandra* may also be prominent in the overstory and in some instances may co-dominate. Other shrubs are typically minor components of this type. The undergrowth is characterized by moderate to dense cover of graminoids species, including *Carex nebraskensis, C. lanuginosa, Juncus balticus, Eleocharis palustris, Agrostis stolonifera, Scirpus pungens, Agropyron repens,* and, in one Idaho stand, *C. sheldonii*. Forb cover is typically sparse (Padgett *et al.* 1989), although *Equisetum* ssp. (*E. arvense* and *E. laevigatum*) can occasionally occur in relatively high cover.

Wildlife Values

Stands of this community provide excellent thermal and hiding cover for a wide range of wildlife species. *Salix exigua* is normally not as heavily browsed as other willow species. Beavers tend to utilize *Salix exigua* heavily (Hansen *et al.* 1995).

Succession

In most situations the *Salix exigua / Mesic* graminoid community is considered an early successional type pioneering sand and gravel bars, but it may be persistent in certain instances. This type appears in general to be wetter that other *Salix exigua* types and the environment is likely to be more favorable to the establishment of rhizomatous graminoids (Padgett *et al.* 1989).

Management

The rhizomatous graminoid cover in this community result in high soil-holding and streambank stabilization ability. Should the stands become drier and/or grazing levels increase, this type might be replaced by the *Salix exigua / Poa pratensis* or possibly the S. exigua / Barren community.

Adjacent Communities

Because of the wide elevation gradient over which this type occurs, adjacent upland communities can range from sagebrush-steppe to coniferous forest associations.

Conservation Rank

G5 / S5

Element Code

CEGL001203

EDITION / AUTHOR

97-12-31/ B. Moseley

Geyer's willow / Bluejoint reedgrass Shrubland

SALIX GEYERIANA / CALAMAGROSTIS CANADENSIS *Shrubland*

Similar Communities

This community has also been documented in Utah (Padgett *et al.*. 1989) and Idaho (Hall and Hansen 1997, Youngblood *et al.*. 1985). Several studies (Hansen *et al.*. 1995, Hall and Hansen 1997) include in this association stands dominated by *Salix boothii*, a willow that is frequently a co-dominant with *Salix geyeriana* and they include *Calamagrostis stricta* as well as *Deschampsia cespitosa* as diagnostic species for the undergrowth component. Using *Deschampsia cespitosa* would give this type complete overlap with the *Salix geyeriana / Deschampsia cespitosa* Shrubland association [CEGL001208] reported for Idaho, Montana, and Utah. Other authors (e.g. Padgett *et al.* 1989) designate *Salix boothii*-dominated stands as a separate plant association, based on structural differences between stands wherein *Salix boothii* is preeminent and those wherein *Salix geyeriana* is predominant. For Colorado, Kittel *et al.* (1998) describe a *Salix geyeriana-Salix monticola* / *Calamagrostis canadensis* community which has an undergrowth that is similar to *Salix geyeriana* / *Calamagrostis canadensis* but which has *Salix monticola* in the overstory as a co-dominant instead of *Salix boothii*. In Nevada, Manning and Padgett (1995) describe a *Salix geyeriana* / Mesic graminoid association which is similar to *Salix geyeriana* / *Calamagrostis canadensis*, although the undergrowth of the former is apparently more diverse.

Range

This community or one very similar to it occurs in Idaho, Montana, Nevada, Utah, Wyoming and possibly Colorado.

Environmental Description

The *Salix geyeriana* / *Calamagrostis canadensis* association can be found in montane habitats in western Montana (from valley bottoms to mid-elevations in the mountains) and in the mountains of central and eastern Montana. It is frequently found on alluvial terraces where beaver activity has created a series of dams that raise the local water table, along streams, and near seeps or springs. Soils are usually deep silt or sand overlying more sand, gravel, or cobbles. This community usually floods during spring, with the water

level within 1m of the surface the rest of the year. Nearby wetter communities could include *Carex utriculata, Carex aquatilis, Salix geyeriana* / *Carex utricutlata, Typha latifolia,* or open water, and nearby drier communities could include *Populus balsamifera ssp. trichocarpa* / *Cornus sericea, Calamagrostis canadensis, Deschampsia cespitosa,* or *Juncus balticus*. A variety of adjacent uplands could occur nearby, ranging from conifer dominated communities to dry shrublands such as *Artemisia tridentata* associations (Hansen *et al.*.1988, Hansen *et al.*. 1995).

Range Description

The *Salix geyeriana* / *Calamagrostis canadensis* association, as it occurs in Montana, has an overstory dominated by *Salix geyeriana* (40% average cover), which occurs as large clumps; a number of shub species occur in approximately a third of the stands, including *Salix bebbiana, Salix drummondiana, Pentaphylloides floribunda, Ribes* spp. About 10% of the the stands of Hansen *et al.* (1995) had *Betula nana* represented at 20% or higher cover, which occasions speculation as to relative importance of the indicator status of *S. geyeriana* and *B. nana*. Bog birch is a species strongly associated with peatlands and all the attendant soils related phenomena. Why a generalist such as *S. geyeriana* should be accorded indicator significance greater than that of *B. nana* begs explanation. These stands have an open corridor aspect, while *Salix boothii* communities are more often closed and less easily accessible by large ungulates (Padgett *et al.* 1989). The undergrowth is dominated by *Calamagrostis canadensis* or *Calamagrostis stricta,* the two seemingly do not co-occur. If the two *Calamagrostis* species have low cover values (less than 5%), then *Deschampsia cespitosa* is used as an indicator but generally its cover and constancy is very low in this association. However, it is decidedly dubious whether this suite of species actually are indicative of a comparable environment. Carex utriculata is the only other native graminoid present in at least 20% of the stands and has low cover, however, a full complement of exotic grasses evidence high constancy and cover, indicating these sites to be livestock impacted. Commonly associated (at least 20% constancy), but by no means indicative, forbs are *Aster occidentalis, Epilobium* spp., *Fragaria virginiana, Geum macrophyllum, Heracleum lanatum, Maianthemum stellatum, Solidago canadensis,* and *Equisetum arvense* (Hansen *et al.* 1995).

Succession

Salix geyeriana / *Calamagrostis canadensis* stands are fairly stable if the hydrologic regime remains unchanged. Kittel *et al.* (1998), suggest that flooding events in *Salix geyeriana* / *Carex utriculata* communities can result in sediment deposition, which raises the floodplain surface higher above the water table. As the floodplain aggrades, the site could become relatively drier, which in turn could cause the graminoid composition to shift towards that of the S. geyeriana / *C. canadensis* association. Similarly, Kittel (1994) states that distance from the stream channel can change the degree of soil saturation, and thereby influence the understory composition. Removal of beaver from a system supporting *Salix geyeriana* / *Carex utriculata* stands could also cause compositional changes. Unmaintained beaver dams could break, and cause a lowering of the water table, which could cause a shift in the dominant understory graminoid towards *Calamagrostis canadensis* (Hansen *et al.* 1995).

Management

Calamagrostis canadensis is moderately to highly palatable, and with high grazing pressure, the vigor, reproductive success, and competitive ability of this grass will decrease. Exotic pasture grasses (e.g. *Poa pratensis, Agrostis stolonifera, Bromus inermis,* etc.) will then increase. Livestock grazing in this association should be avoided when the soils are wet to avoid churning of the soil surface. *Salix geyeriana* / *Calamagrostis canadensis* stands exposed to heavy browsing pressure usually show reduced vigor of the

willow species, such as highlining, clubbing, or dead clumps, with eventual decrease in willow coverage (Hansen *et al.* 1995).

Conservation Rank

G5 / S4

Element Code

CEGL001205

EDITION / AUTHOR

99-10-15 / Jack Greenlee

Geyer's willow / Beaked sedge Shrubland

SALIX GEYERIANA / CAREX UTRICULATA *Shrubland*

Similar Communities

This community has been documented by a number of studies in other western states, including eastern Oregon (Kovalchik 1987), Utah (Padgett *et al.*. 1989), Nevada (Manning and Padgett 1995), Idaho (Hall and Hansen 1997), Colorado (Kittel *et al.*. 1998), and Wyoming (Chadde *et al.*. 1988). Several Montana and Idaho studies (Hansen *et al.*. 1995, Hall and Hansen 1997) include in this association stands dominated by *Salix boothii*, a willow that is frequently a co-dominant with *Salix geyeriana*. Other authors (e.g. Padgett *et al.* 1989) separate *Salix boothii*-dominated stands as a separate plant association, based on structural differences between *Salix boothii* and *Salix geyeriana* stands. These same Montana and Idaho studies, that stess the manaagement applicability of vegetation types, recognize *Carex utriculata*, *Carex vesicaria*, and *Carex atherodes* as ecological analogues; 10% cover of any one of these species or their combined cover is sufficient for recognizing the association. The *Salix geyeriana / Carex aquatilis* association is also quite similar in that *C. aquatilis* is as the undergrowth dominant as it is in a number of stands of the *S. geyeriana / C. utriculata* association. As with the *Salix geyeriana / Calamagrostis canadensis* association the presence of a number of stands with high coverage for *Betula nana* would seem more indicative of a peat-accumulating carr as opposed to a conventional *Salix* spp. swamp, making at least a portion of this association very similar to *Betula nana / Carex utriculata*.

Range

This community is found in Montana, Idaho, eastern Oregon, Utah, Nevada, Colorado, and Wyoming.

Environmental Description

The *Salix geyeriana* / *Carex utriculata* association is found as a major plant association in montane habitats in western Montana (from valley bottoms to mid-elevations in the mountains) and in the mountains of central and eastern Montana. It is frequently found on alluvial terraces where beaver activity has created a series of dams that raise the local water table, along streams, and near seeps or springs. Soils are usually fine textured mineral soils that accumulate during periodic flood events and they may have a surface organic horizon. Soil reaction is neutral to moderately alkaline (pH 7.0 to 7.5), and this community is usually flooded during spring and early summer, with the water level near the surface the rest of the year. Nearby

wetter communities could include *Carex utriculata, Carex lasiocarpa*, *Typha latifolia*, or open water, and nearby drier communities could include *Salix geyeriana* / *Calamagrostis canadensis*, *Calamagrostis canadensis*, *Deschampsia cespitosa*, or *Juncus balticus*. A variety of adjacent uplands could occur nearby, ranging from conifer dominated communities to dry shrublands such as *Artemisia tridentata* associations (Hansen *et al.* 1988, Hansen *et al.* 1995).

Range Description

The *Salix geyeriana* / *Carex utriculata* association typically has a somewhat open aspect with an overstory dominated by *Salix geyeriana* (32% average cover) which occurs as large clumps; the diversity of shrub species occurring in this type is notable, particularly among the *Salix* spp. (14 species) of which *Salix wolfii*, *S. planifolia*, *S. drummondiana*, and *S. boothii* have at least 20% constancy and 10% average cover. *Carex utriculata* is by far the undergrowth dominant, followed in importance by *C. aquatilis* and distantly by *Calamagrostis canadensis, Juncus balticus* and *Deschampsia cespitosa*. Commonly associated forb species are *Aster occidentalis*, *Epilobium ciliatum*, *Geum macrophyllum*, *Mentha arvensis* and *Equisetum arvense*. This community can occur as a part of a diverse mosaic of wetland types depending on degree and frequency of flooding, scouring, channel changes, and beaver activity (Hansen *et al.* 1995).

Succession

Salix geyeriana / *Carex utriculata* stands are fairly stable if the hydrologic regime remains unchanged. However, flooding events can result in sediment deposition, which raises the floodplain surface higher above the water table. As the floodplain aggrades, the site could become less saturated, which could cause the graminoid understory to change. Similarly, Kittel (1994) states that distance from the stream channel can change the degree of soil saturation, and thereby influence the understory composition. Removal of beaver from a system in which *Salix geyeriana* / *Carex utriculata* stands occur could cause compositional changes. Unmaintained beaver dams do break, causing a lowering of the water table, which in turn instigates a shift in the dominant undergrowth graminoids toward a more xeric species assemblage (Hansen *et al.*. 1995).

Management

Salix geyeriana / *Carex utriculata* stands exposed to heavy browsing pressure usually show reduced vigor of the willow species, such as highlining, clubbing, or dead clumps, with eventual decrease in willow coverage. Livestock disturbance in drier *Salix geyeriana* / *Carex utriculata* stands can result in increases in cover of exotic pasture grasses (e.g. *Poa pratensis, Agrostis stolonifera*, *Bromus inermis*) however, these exotics pose less threat here than in the drier *S. geyeriana / Calamagrostis canadensis* association. Weedy forbs include *Taraxacum officinale, Cirsium arvense*, *Chrysanthemum leucanthemum*, though their populations seldom threaten the site.

Carex utriculata palatability is variable, but it may be heavily utilized on narrow riparian sites within extensive rangelands. Continued overgrazing can dry the site and lead to increases in exotic grass cover. The wet and often saturated soils of this association are vulnerable to compaction by livestock (Hansen *et al.*. 1995).

Burning of this association temporarily increases productivity of the sedge understory and can effectively rejuvenate decadent clumps of willows. Geyer's willow will sprout quickly after quick, hot fires. However, burned sites shouldn't be grazed for 2-3 years to avoid attracting livestock to young, palatable re-growth (Hansen *et al.* 1995).

Conservation Rank

G5 / S5

Element Code

CEGL001207

EDITION / AUTHOR

1999-10-15 / Jack Greenlee

Harstem Bulrush Herbaceous Vegetation

SCIRPUS ACUTUS *Herbaceous Vegetation*

Similar Communities

Hansen *et al.* (1995), Hall and Hansen (1997), and Kittel *et al.*. (1998) have *a Scirpus acutus* habitat type in their classifications that includes all combinations of *Scirpus acutus* and *S. validus* (=*S. tabernaemontani*) due to similarities in environmental conditions and management concerns. *Scirpus validus* is often treated as a separate alliance in the Western Regional Vegetation Classification (Bourgeron and Engelking 1994). Cole (1995) described four associations with *S. acutus* as the dominant species, *S. acutus-Veronica anagallis-aquatica*, *S. acutus-Lemna* sp., *S. acutus-Lemna* sp.-*Solanum dulcamara*, and *S. acutus-Typha latifolia*. The *Scirpus acutus* type described in this CCA encompasses enough compositional and structural variation to include Cole's types.

Range

Stands are known from Oregon, Washington, Nevada, California, Idaho, Colorado, and Montana.

Environmental Description

Stands of this community type occur along the margins of ponds, lakes, and reservoirs, stringers paralleling stream and river channels, or broad swaths in backwater marshes and sloughs. It is found at low to mid-elevations, from about 2,000 feet to at least 6,600 feet. This type often inhabits relatively deep water, although the water level may be drawn down considerably through the growing season (Hansen *et al.* 1995; Hall and Hansen 1997). Soils are commonly Mollisols (Aquolls), Entisols (Aquents), or occasionally Histisols. Textures of surface horizons on long-lived stands are predominantly fines, which appear as black or gleyed, mucky clay or silty loam soils with high concentrations of decomposed and partially decomposed plant material that accumulate over time from annual dieback. Alluvial sands, gravel and cobbles may form an unconsolidated matrix in the subsurface horizons. Water tables are generally at or above the soil surface throughout the growing season. Soil reaction varies from neutral to moderately alkaline (pH 7.0 to 8.0)(Hansen *et al.* 1995; Hall and Hansen 1997).

Range Description

The *Scirpus acutus* type usually appears as an impenetrable monotypic stand often reaching 2 m or more in height. *Scirpus* ssp. require high levels of moisture throughout the year, and while stands may colonize saturated soils along streambanks or on the periphery of ponds and reservoirs, they typically extend out into the water column to 2 m in depth. Due to the dense growth form and flooded water regimes, other species are largely absent, or if present, in limited amounts (Cole 1995; Hansen *et al.* 1995; Hall and Hansen 1997).

Wildlife Values

Scirpus acutus provides valuable nesting and roosting cover for a variety of songbirds and waterfowl, notably redwinged blackbirds, yellow-headed blackbirds and wrens. *Scirpus acutus* is a staple for muskrats and is used in construction of their huts. Seeds of *S. acutus* are eaten by a variety of birds. Waterfowl managers often attempt to increase the proportion of *S. acutus* relative to *Typha latifolia* as a means of improving habitat (Hall and Hansen 1997).

Succession

Scirpus acutus occupies some of the wettest sites on the landscape and tolerates prolonged flooding better than most riparian communities. These highly saturated conditions, coupled with an extremely dense growth form, allow this species to colonize sites at an early successional stage and maintain dominance on undisturbed sites as the climax vegetation. However, *Scirpus acutus* is regularly accompanied by other hydrophytes, such as *Sparganium emersum* and *Typha latifolia*. The reasons for the distribution of these species is difficult to discern, but minor changes in water chemistry or nutrient availability may favor the expansion of one species over another. Seasonal climatic changes may also play a role in determining which species may dominate a site at a particular point in time (Hall and Hansen 1997). Cole (1995) discusses tentative successional relationships of her *Scirpus acutus* types.

Management

Wet conditions and lack of palatable forage limit livestock use of this type. However, if upland forage becomes sparse and soil conditions dry, livestock may make use of *Scirpus acutus*. Soils are wet through out the growing season and is easily damaged from trampling by livestock and wildlife. Trampling can also damage vegetation. This community will burn in either late fall or early spring if the water levels have dropped sufficiently (Hansen *et al.*. 1995).

Conservation Rank

G5 / S5

Element Code

CEGL001849

EDITION / AUTHOR

1998-01-05 / B. Moseley

■ SCIRPUS TABERNAEMONTANI *Temperate Herbaceous Vegetation*

Classification Comments

Scirpus tabernaemontani is synonymous with *Scirpus validus* (softstem bulrush) according to Kartesz (1994).

Similar Communities

Scirpus tabernaemontani is synonymous with *Scirpus validus*. Hansen *et al*.. (1995), Hall and Hansen (1997), and Kittel *et al*.. (1998) have a *Scirpus acutus* habitat type in their classifications that includes all combinations of *Scirpus acutus* and *S. tabernaemontani* due to similarities in environmental conditions and management concerns. *Scirpus tabernaemontani* is treated as a separate association in the Western Regional Vegetation Classification (Bourgeron and Engelking 1994). Other communities with this species growing as a dominant or co-dominant have been described: *Scirpus tabernaemontani - Typha latifolia* (e.g. Komarkova 1986), *Scirpus tabernaemontani - Typha* ssp. - (*Sparganium* ssp., *Juncus* ssp.) (Hoagland 1997), from Nebraska *Scirpus acutus – Scirpus tabernaemontani* Sandhills Alkaline Herbaceous Vegetation from Nebraska and. Nebraska *Scirpus acutus – Scirpus tabernaemontani* Sandhills Herbaceous Vegetation and from the eastern U.S. the *Scirpus* (*tabernaemontani, acutus*) Eastern Herbaceous Vegetation. The *Scirpus tabernaemontani* type described here encompasses enough compositional and structural variation to include a large portion of these other types.

Range

Communities of *Scirpus tabernaemontani* apparently extend from coast to coast, though they barely dip into the southeast in Virginia and Maryland; there are of course localized variations that are dependent on the floristics of a given region.

Environmental Description

The *Scirpus tabernaemontani* association is typically found at low to mid elevations across Montana, but more frequently in the eastern part of the state. It is found in marshes, pond and lake margins, oxbow lakes, and backwater areas of rivers and streams. Soils are commonly Mollisols (Aquolls), Entisols (Aquents), or sometimes Histosols, and soil reaction ranges from neutral to moderately alkaline (pH 7.0 to 8.0). This community can occur in standing water up to 1-2 meters deep, and it is usually classified as semi-permanently flooded as the water levels can drop below the soil surface by the end of the growing season. This community occupies the same position in the landscape as *Typha* sp., with open water or aquatic communities occupying wetter spots and *Salix* sp., *Carex* sp., or *Phalaris arundinaceae* communities occupying nearby drier sites (Hansen *et al.* 1988, Hansen *et al.* 1995).

Range Description

This plant association usually forms dense monocultures that can occupy large areas. Stems are usually 1-2 meters tall. The flooded condition in which this species often grows precludes the establishment of other graminoids and forbs; if present, species like *Comarum palustre* and *Polygonum amphibium* are often widely scattered. Its seeds require bare, moist soils for germination, so this species can rapidly colonize newly exposed mudflats and drawdown areas (Hansen *et al.* 1988, Hansen *et al.* 1995).

Succession

This species can colonize newly exposed mudflats and drawdown areas, and communities tend to be persistent if the hydrologic regime is stable.

Management

Softstem bulrush has low to moderate palatability to livestock, and because communities are usually flooded, access for livestock is usually difficult. When stands dry down, livestock may heavily utilize these communities if upland forage is sparse. Stands of soft stem bulrush can buffer wave action on lakes and ponds (Hansen *et al.* 1995).

Conservation Rank

G4 / S3

Element Code

CEGL002623

EDITION / AUTHOR

99-10-15 / Jack Greenlee

Broadleaf Cattail Herbaceous Vegetation

■ TYPHA LATIFOLIA Herbaceous Vegetation

Similar Communities

Some authors place *Typha latifolia* and *Typha angustifolia* together within the same habitat type for management purposes (e.g. Hansen *et al.* 1995).

PHOTO BY JACK GREENLEE

Range

This community occurs in Montana, Colorado, New Mexico, Wyoming, Idaho, and Nebraska.

Environmental Description

This community is found along streams, rivers, and the banks of ponds. The soil is saturated or flooded for much of the year. It usually has a high organic content.

Range Description

This community is dominated by hydrophytic macrophytes, especially *Typha latifolia*, which grow to approximately 2 meters. *T. latifolia* can form dense stands in places, almost to the exclusion of other species. Other species typical of wetlands are found in lesser amounts in this community. Among these are *Carex* ssp. and *Scirpus* ssp.

Wildlife Values

Typha latifolia is an important source of shade, hiding cover, and food for wildlife. Waterfowl use this type for nesting and hiding cover, provided the stands are not too dense. This type is a critical source of nesting cover and roosting cover for yellow-headed and red-winged blackbirds (Hansen *et al.* 1995).

Succession

Typha latifolia is a prolific seed producer and colonizes exposed mineral substrates readily. Communities are stable when water regimes remain fairly high, although the species can tolerate periods of drought (Hansen *et al.* 1988, Hansen *et al.* 1995).

Management

Some consider *Typha latifolia* to be too aggressive for use in wetland restoration projects (Mitsch and Gosselink 1993) because of its ability to form dense monocultures.

Adjacent Communities

Carex ssp. and *Scirpus* ssp. communities commonly occur nearby.

Conservation Rank

G5S5

Element Code

CEGL002010

EDITION / AUTHOR

95-10-19 / J.F. Drake

Appendix C

Site descriptions

Abbotts Flats Wetland

Location

Abbotts Flat is located just west of Glacier National Park, several miles south of Canada, in northwest Montana. From Trail Creek north of Columbia Falls on State Route 486, proceed northerly on State Route 486 for 1 mile to a junction with an unnamed road. Travel 1.5 miles northeasterly on the unnamed road to a trail. Abbot Flats is 0.5 miles to the northwest following the foot trail. Landowner permission is required before entering private property.

PHOTO BY JACK GREENLEE

Richness

This wetland site is located along the riparian floodplain and terraces above the North Fork Flathead River. The site has several *Populus balsamifera* ssp. *trichocarpa* (black cottonwood) communities in different stages of succession and in roughly equal proportions. These are the earlier successional *Populus balsamifera* ssp. *trichocarpa* / recent alluvial bar (black cottonwood / recent alluvial bar) and the later successional plant associations *Populus balsamifera* ssp. *trichocarpa / Cornus sericea* (black cottonwood / red-osier dogwood), and *Populus balsamifera* ssp. *trichocarpa* / herbaceous (black cottonwood / herbaceous). *Hedysarum sulphurescens* (yellow sweetvetch) occurs in cottonwood stands with open undergrowth vegetation, and there were numerous spots where *Hedysarum sulphurescens* had apparently been dug by bears. Higher terraces above the floodplain are dominated by a *Picea engelmannii* / *Cornus sericea* (Engelmann spruce / red-osier dogwood) community. Although *Symphoricarpos albus* (common snowberry) is the dominant shrub in the undergrowth layer, enough red-osier dogwood remains as an indicator species to lend its name to the community type. This terrace is very droughty or becoming so and the community is best characterized as an upland community on an old river terrace. This community did not fit well into any of the common Montana plant community classifications. On a yet higher and older terrace, an *Artemisia tridentata / Festuca campestris* (big sagebrush / rough fescue) community occurs. This is an unusual community for the North Fork, which is primarily dominated by *Pinus contorta* (lodgepole pine) forest at lower elevations.

Key Environmental Factors

This system is clearly driven by fluvial processes; we speculate that some recent downcutting has occurred resulting in drier terraces and that community composition is shifting to reflect the altered moisture regime.

Rarity

No plant or animal species of special concern were observed. Observers were confident, however, that bear diggings for *Hedysarum sulfurescens* (yellow sweetvetch) that dotted the *Populus balsamifera* ssp. *trichocarpa* (black cottonwood)-dominated dry terrace were caused by *Ursus arctos* (grizzly bear). The *Artemisia tridentata / Festuca campestris* (big sagebrush / rough fescue) community is quite uncommon, especially in a riparian setting. The *Populus balsamifera* ssp. *trichocarpa / Cornus sericea* and *Picea*

engelmannii / Cornus sericea communities are much more common than previously recognized. A portion of the *Picea engelmannii / Cornus sericea* community occurred on an upper terrace and exhibited a non-modal composition with *Symphoricarpos albus* dominant; however sufficient *Cornus sericea* was present to classify the stand to this plant association.

Condition

A few very scattered tree stumps were observed, the results of past timber harvest high grading. The presence, and in some places dominance, of the exotic pasture grasses *Phleum pratense* (common timothy), *Bromus inermis* (smooth brome), *Poa pratensis* (Kentucky bluegrass) and *Agrostis stolonifera* (redtop) as well as the weedy herbs *Trifolium repens* (red clover), *Leucanthemum vulgare* (oxeye-daisy) and *Medicago lupulina* (black medic) encourage speculation about past grazing of domestic stock.

Uplands

Stands of *Pinus contorta* (lodgepole pine) on the highest terrace (effectively an upland site) have been logged, and the resulting overstocked *Pinus contorta* stand has been thinned. No other land uses were documented.

Information Needs

Documenting the site's grazing history would help explain the dense *Symphoricarpos albus* (common snowberry) undergrowth within portions of the *Picea*-dominated landscape. Use as a big game winter range is also questioned.

Management Needs

No needs are identified at this time, though one could wish for the control of populations of aggressive exotics. Thankfully none of those present are currently deemed noxious.

Element Occurence Information

Plant Association / Community Type	EO Rank	S Rank	G Rank
Artemisia tridentata / Festuca campestris Shrub Herbaceous Vegetation	*	S3	G3
Picea engelmannii / Cornus sericea Woodland	*	S3	G3
Picea engelmannii / Galium triflorum Forest	*	S4	G4
Populus balsamifera ssp. *trichocarpa* / Alluvial bar	*	*	*
Populus balsamifera ssp. *trichocarpa* / Cornus sericea Forest	A	S3?	G3?
Populus balsamifera ssp. *trichocarpa* / Herbaceous Woodland	*	*	*
Salix exigua Temporarily Flooded Shrubland	C	S5	G5

* rank not assigned

Coal Creek Complex

Location

Coal Creek Complex is located west of Glacier National Park in northwest Montana. From Big Creek Campground on State Route 486 north of Columbia Falls, travel north for approximately 0.5 miles to Forest Route 317. Continue northerly on Forest Route 317 for 7.9 miles. Coal Creek Complex extends from this point southeasterly.

PHOTO BY JACK GREENLEE

Richness

This site occurs in the floodplain at the confluence of Coal and Dead Horse Creeks in the Whitefish Range. It is a complex mosaic of different communities, but is dominated by a series of beaver dams and riparian *Picea engelmannii* (Engelmann spruce) forest. The beaver complex is a matrix of open water and *Salix drummondiana / Carex utriculata* (Drummond willow / beaked sedge) and *Carex utriculata* (beaked sedge) communities, with numerous beaver trails and freshly cut shrubs. Two communities dominate the terrace between the two creeks. Nearer to the creeks is a *Salix drummondiana / Calamagrostis canadensis* (Drummond willow / bluejoint reedgrass) community and at a slightly higher position is a *Calamagrostis canadensis* (bluejoint reedgrass) community, which appears to be drying out (the dominant grass didn't flower). This latter community is also heavily browsed. The adjacent riparian forest is in good condition and is composed of a *Picea engelmannii / Cornus sericea* (Engelmann spruce / red-osier dogwood) community; this community extends as a linear feature up and downstream. Small pockets of this community type are also found within the beaver complex. The *Salix melanopsis* (sandbar willow) community occurs on gravel bars along Coal Creek. This community is frequently disturbed by floods and has numerous exotics in the understory. The creek has formed several new gravel bars through this reach which contain a substantial amount of coarse woody debris. Levels of bank erosion appear normal.

Key Environmental Factors

The activity of *Castor canadensis* (beaver) is primarily responsible for generating the wetland complex on Dead Horse Creek. In contrast, the riparian forest on Coal Creek has established on newly deposited alluvium as the creek moves across the valley floor, setting into motion successional processes.

Rarity

Coal Creek itself is an important and actively monitored spawning stream for *Salvelinus confluentus* (bull trout). Though no species of special concern are present, there are four good to excellent representations of plant associations, including *Salix drummondiana / Calamagrostis canadensis*, *Salix drummondiana / Carex utriculata*, *Salix drummondiana* Shrubland, and *Picea engelmannii / Cornus sericea*.

Condition

Within the wetland proper, no land uses were noted. In some of the disturbance-generated communities, such as those occupied by floodplain willows, a number of exotics were observed, including *Taraxacum officinale*

(dandelion), *Prunella vulgaris* (selfheal) and *Leucanthemum vulgare* (oxeye daisy).

Uplands

A forest road, a possible sediment source, runs along the northern edge of the riparian forest. Upstream of the designated site, timber within the riparian corridor has been harvested.

Information Needs

The meaning of a flagged stake found in floodplain labeled “control point 3522” needs to be explored.

Management Needs

Should harvest of the riparian corridor occur, at a minimum the streamside management zone and management options associated with the zone should be observed.

Element Occurence Information

Plant Association / Community Type	EO Rank	S Rank	G Rank
Calamagrostis canadensis Western Herbaceous Vegetation	B	S4	G4Q
Carex utriculata Herbaceous Vegetation	A	S5	G5
Epilobium latifolium (red willow-herb) / recent alluvial bar	*	*	*
Picea engelmannii / Cornus sericea Woodland	A	S3	G3
Salix drummondiana / Calamagrostis canadensis Shrubland	A	SP	G3
Salix drummondiana / Carex utriculata Shrubland	A	S5	G3
Salix drummondiana Shrubland [Provisional]	B	S3	G3Q

Animal Species Elements			
Salvelinus confluentus (bull trout)	*	S3	G3

* rank not assigned

Coal Creek-North Fork Floodplain

Location

Coal Creek-North Fork Floodplain is located west of Glacier National Park in northwest Montana. From Big Creek Campground on State Route 486 north of Columbia Falls, travel north for approximately 8 miles to an unnamed road. Proceed northeasterly on the unnamed road for 0.4 miles. Coal Creek-North Fork Floodplain is due south along the western shore of the North Fork of the Flathead River below the river's confluence with Coal Creek. Landowner permission is required before entering private lands.

Richness

This site is a series of alluvial terraces in North Fork Flathead River valley bottom. Flooding, channel migration, and bedload deposition have resulted in a good representation of early to late successional riparian communities. The youngest part of the floodplain is composed of river bars with little or no vegetation. Slightly older are bars have a dense cover of *Salix exigua* (sandbar willow). These bars also have a high coverage of exotic pasture grasses. The willow community succeeds to *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* (black cottonwood / red-osier dogwood) forest. This forest is large and well developed, with few exotic species. In the absence of disturbance (as is the case at this site), the cottonwood community succeeds to a *Picea engelmannii / Cornus sericea* (Engelmann spruce / red-osier dogwood) community, which is also large and in good condition. However, there is some evidence of a past grazing at the site. A large meadow dominated by the exotic pasture grass *Phleum pratense* (common timothy) occurs in the middle of the *Picea engelmannii* forest. There is also significant acreage of spruce forest with a large component of the pasture grasses *Agrostis stolonifera* (redtop) and *Phleum pratense* in the undergrowth. The adjacent upland is *Pinus contorta* (lodgepole pine) forest.

Key Environmental Factors

Flooding, channel migration, and bedload deposition have resulted in various substrate materials. *Castor canadensis* (beaver) damming of a seasonally flooded side channel has created a wetland site where succession from *Salix* spp. (willow) to *Populus balsamifera* ssp. *trichocarpa* (black cottonwood) to *Picea engelmannii* (Engelmann spruce) is occurring.

Rarity

There were no rare species recorded from this site but a large *Picea engelmannii / Cornus sericea* (Engelmann spruce / red osier dogwood) community in good to excellent condition was documented. Part of this community is mid-seral with abundant *Populus balsamifera* ssp. *trichocarpa*, and a smaller fraction is in mature to old-growth status.

Condition

Currently fishing, hunting and boating are possible activities on this site. Presence of a number of exotics is circumstantial evidence of past grazing; populations present include *Centaurea maculosa* (spotted knapweed), *Leucanthemum vulgare* (ox-eye daisy), *Phleum pratense* (common timothy) and *Taraxacum officinale* (dandelion).

Uplands

The adjacent upland forest has been thinned, but the effects have not extended into the floodplain.

Information Needs

Information needs have not been recognized at this time.

Management Needs

Control of the very aggressive exotics/noxious weeds is paramount to maintaining the site's quality.

Element Occurence Information

Plant Association / Community Type	EO Rank	S Rank	G Rank
Picea engelmannii / Cornus sericea Woodland	A	S3	G3
Picea engelmannii / Herbaceous Woodland	*	*	*
Populus balsamifera ssp. *trichocarpa / Cornus sericea Forest*	A	S3?	G3?
Salix exigua Temporarily Flooded Shrubland	*	S5	G5
Salix geyeriana / Mesic Graminoid Shrubland	C	*	G2G3Q

* rank not assigned

Cyclone Lake Wetland

Location

Cyclone Lake is located just west of Glacier National Park in northwest Montana. From Big Creek Campground on State Route 486 north of Columbia Falls, travel north for approximately 0.5 miles to Forest Route 317. Continue northerly on Forest Route 317 for 8 miles to Forest Route 909. Travel about 4 miles northerly on Forest Route 909 to an unimproved road. Go approximately 0.3 miles northeasterly on the unimproved road to Cyclone Lake.

PHOTO BY JACK GREENLEE

Richness

Cyclone Lake is a glacially formed lake in the Whitefish Range and is fed by several small streams. It is drained by Cyclone Creek. The lake is primarily open water with a fringe of anchored and floating mat dominated by a *Carex lasiocarpa* (slender sedge) community, which has a high coverage of *Sphagnum subsecundum* (peat moss). Abutting and just below this community is a narrow band of an *Equisetum fluviatile* (water horsetail) community. Beaver activity on one of the inlet creeks has helped to form a *Salix drummondiana / Calamagrostis canadensis* (Drummond's willow / bluejoint reedgrass) community below the beaver dam and a *Carex utriculata* (beaked sedge) community above the dam. *Picea engelmannii / Equisetum arvense* (Engelmann spruce / field horsetail) communities occur in bands along low gradient inlet creeks and on gently sloping ground adjacent to the lake where they are ecotonal to the upland. The uplands near the lake are primarily *Abies lasiocarpa / Clintonia uniflora - Aralia nudicaulis* (subalpine fir / queencup beadlily plant association, wild sarsaparilla phase) forest, mostly in old growth condition.

Key Environmental Factors

A perennial, inflowing stream keeps the water levels within this glacially-formed lake relatively stable, leading to the development of a floating mat, which along with the adjacent bank, is continually saturated. Activity of *Castor canadensis* (beaver) at some time in the past was intensive, creating a persisting marsh setting and willow bottoms on the inlet creek. The lake water is circumneutral (pH = 6.8) and has a low concentration of dissolved solutes (conductivity = 50 uS/cm).

Rarity

A pair of *Gavia immer* (common loons) nest on the lake. The floating mat and saturated sites around the shoreline are breeding habitat for *Rana pretiosa* (spotted frog), *Bufo boreas (*western toad) and *Ambystoma macrodactylum* (long-toed salamander), all of which were observed in August 1999.

Condition

Stumps moldering into duff indicate long past harvesting within the *Picea engelmannii*-dominated communities. Anglers and boaters have trailed across the floating mat's widest portion, denuding it in patches. The

only noxious weed, *Cirsium arvense* (Canada thistle), was found in *Salix* spp. (willow) stands along tributaries immediately upstream of the lake.

Uplands

Conspicuous use of the surrounding uplands has been confined to past high grading of the *Picea-Abies lasiocarpa* old-growth forest; this activity may have had deleterious effects on water quality.

Information Needs

None were identified at the time of site visitation.

Management Needs

The road leading to the lake comes out where the floating mat is most extensively developed; relocating the trail to facilitate put-in and take-out would mitigate wetland impacts.

Element Occurence Information

Plant Association / Community Type	EO Rank	S Rank	G Rank
Carex lasiocarpa Herbaceous Vegetation	A	S4	G4
Carex utriculata Herbaceous Vegetation	B	S5	G5
Equisetum fluviatile Herbaceous Vegetation	A	S4	G4
Picea engelmannii / Equisetum arvense Forest	B	S2	G4
Salix drummondiana / Calamagrostis canadensis Shrubland	A	SP	G3
Animal Species Elements			
Gavia immer (common loon)	*	S2B,SZN	G5

* rank not assigned

Hay Creek Fen

Location

Hay Creek Fen is just west of Glacier National Park in northwest Montana. From the Junction of State Route 40 and State Route 486 in Columbia Falls, travel north on State Route 486 for 34 miles to Forest Route 376. Continue northwesterly on Forest Route 376 approximately 4.25 miles to Forest Route 1685. Travel approximately 1 mile in a northerly direction on Forest Route 1685 to Forest Route 1681. From this junction, proceeds westerly on Forest Route 1681 for approximately 3.5 miles. Hay Creek Fen is located 0.1miles SSE.

PHOTO BY JACK GREENLEE

Richness

Hay Creek Fen is a poor fen located on a drainage divide between Hay Creek and South Fork Red Meadow Creek in the Whitefish Range. Groundwater drainage from the toe of the adjacent slopes is the most likely water source; the fen has a surface water outlet that drains into Hay Creek. Three graminoid communities form a mosaic within the fen: *Calamagrostis canadensis* (bluejoint reedgrass) on hummocks throughout the fen, *Carex limosa* (mud sedge) in swales and low areas throughout the fen and *Equisetum fluviatile* (water horsetail) in soft-bottomed depressions in the fen. Around the diffuse outlet creek, there is a small *Picea engelmannii / Calamagrostis canadensis* (Engelmann spruce / bluejoint reedgrass) community. There is some evident shoreline erosion, indicating higher water in the past. All of the communities are in good condition. The surrounding upland is dominated by *Pinus contorta* (lodgepole pine) forest.

Key Environmental Factors

The existence of this fen is dependent upon ground water flow from surrounding uplands; the perennially saturated conditions and cold-air ponding structure the community and lead to peat accumulation. Soil cores revealed peat depths of .6 to 1 m. The water in the fen is circumneutral (pH = 6.5) and has a low concentration of solutes (conductivity = 20 uS/cm).

Rarity

Rana pretiosa (spotted frog) was noted at water's edge on the floating mat and on saturated sites around the shoreline; currently this is not a listed species but numbers have been in steep decline since the early 1990's. *Carex paupercula* (poor sedge) was the only rare plant, encountered within the ecotone between the *Equisetum fluviatile* and *Picea engelmannii / Calamagrostis canadensis* communities. The *Carex limosa* plant association is currently ranked as rare (G3), the only community present with such status.

Condition

Timber harvest was conducted long ago (based on state of stump decomposition) in the *Picea engelmannii / Calamagrostis canadensis* portions of the wetland. No hard evidence exists for any form of use currently, but hunting likely occurs in the vicinity. No exotic species were observed.

Uplands

Though timber harvesting is no longer being conducted, extensive thinning has occurred in the *Pinus contorta* (lodgepole pine)-dominated uplands.

Information Needs

Maria Mantas (botanist, Flathead National Forest) should be contacted to confirm the existence of several species, including *Kalmia* spp. (small leaved laurel) not observed during the course of inventory, but reputed to occur locally; local botanist Toby Spribille (Columbia Falls) ostensibly has sampled this site as part of his peatland vegetation classification (and would be a good source of bryophyte data).

Management Needs

No management needs are recognized at this time.

Element Occurence Information

Plant Association / Community Type	EO Rank	S Rank	G Rank
Abies lasiocarpa / Ledum glandulosum Forest	*	S4	G4
Calamagrostis canadensis Western Herbaceous Vegetation	A	S4	G4Q
Carex limosa Herbaceous Vegetation	A	S3	G3
Equisetum fluviatile Herbaceous Vegetation	A	S4	G4
Picea engelmannii / Calamagrostis canadensis Forest	B	S3	G4

Vascular and Nonvascular Plant Elements		S Rank	G Rank
Carex paupercula (poor sedge)	*	S3	G5

* rank not assigned

Hay Creek-North Fork Floodplain

Location

Hay Creek-North Fork Floodplain is located west of Glacier National Park in northwest Montana. From Polebridge north of Columbia Falls on State Route 486, proceed southerly on State Route 486 for 3 miles. Hay Creek-North Fork Floodplain is due west of this point and is adjacent to the North Fork of the Flathead River.

PHOTO BY JACK GREENLEE

Richness

This large site is a matrix of riparian community types located in the floodplain of the North Fork Flathead River. An extensive suite of riparian communities, from recent alluvial bars to riparian spruce forests, is well represented. The majority of the site is composed of late seral *Picea engelmannii / Cornus sericea* (Engelmann spruce / red-osier dogwood) community located on the driest terrace. A few old channels dominated by *Alnus incana* (mountain alder) run through this community. Although these channels are infrequently flooded, they most likely have groundwater connections to the main channel, which maintains a high water table. In the active floodplain, the most common community is the *Populus balsamifera* ssp. *trichocarpa* / recent alluvial bar (black cottonwood / recent alluvial bar). Less common, but also present at this site are the later successional *Populus balsamifera* ssp. *trichocarpa* / *Cornus sericea* (black cottonwood / red-osier dogwood) and *Populus balsamifera* ssp. *trichocarpa* / herbaceous (black cottonwood / herbaceous) community types. The latter community, according to the narrow conception Hansen et al. (1995), is invariably a grazing disclimax; however, there was little evidence of cattle in this community. There are also some *Salix exigua* / mesic graminoid (sandbar willow / mesic graminoid) communities on recent gravel bars, as well as very young gravel bars colonized by scattered *Populus balsamifera* ssp. *trichocarpa* seedlings and scattered forbs and graminoids, both native and exotic. There was one silt-filled beaver pond in the active flood plain that hosts an *Eleocharis palustris* (common spikerush) community. There were some scattered patches of the exotic *Bromus inermis* (smooth brome) on some terraces. No evidence of grizzly bear digging for *Hedysarum sulphurescens* (yellow sweetvetch) was observed. The uplands near this site are dominated by *Pinus contorta* (lodgepole pine) forest. There is ample evidence from this site (e.g., new gravel bars, recently scoured channels, wrack deposited on the base of trees) that the fluvial processes associated with this type of riverine system are largely intact.

Key Environmental Factors

Perennial, seasonal flooding and other fluvial processes are the primary drivers of plant community composition and succession at this site.

Rarity

There were no rare plant or animal species recorded from this site but a small adult population of the once common, but now steeply declining species, *Bufo boreas* (western toad) was confirmed. Two very sizable occurrences of G3 communities, *Picea engelmannii / Cornus sericea* and *Populus balsamifera* ssp. *trichocarpa* / *C. sericea*, both in good to excellent condition, were documented.

Condition

Old, scattered stumps testify to past timber harvest. Locally dense populations, especially in seral stands of *Populus balsamifera* ssp. *trichocarpa*, of grazing-associated increaser species (*Bromus inermis* [smooth brome], *Elytrigia repens* [quack grass] and *Trifolium* spp. [clover]) could be a result of past livestock use, though current evidence indicates virtually no livestock use. *Melilotus alba* (white sweet clover) is locally dense within *Salix exigua* (sandbar willow) stands. The only two noxious weeds present, *Cirsium arvense* (Canada thistle) and *Leucanthemum vulgare* (oxeye daisy), are scattered about the whole site and have low cover values.

Uplands

This site is well buffered with no immediate off-site uses evident.

Information Needs

The existence of a grazing allotment on the state-owned portion of the site needs to be checked.

Management Needs

To maintain the generally excellent condition of this site, grazing exclusion should be maintained. Treating the existing weed populations should also be considered.

Element Occurence Information

Plant Association / Community Type	EO Rank	S Rank	G Rank
Alnus incana Shrubland	B	S3	G?Q
Bromus inermis Dominance Type	*	*	*
Eleocharis palustris Herbaceous Vegetation	B	S5	G5
Picea engelmannii / Cornus sericea Woodland	A	S3	G3
Populus balsamifera ssp. *trichocarpa / Cornus sericea* Forest	B	S3?	G3?
Populus balsamifera ssp. *trichocarpa* / Recent Alluvial Bar	*	*	*
Salix exigua / Mesic Graminoids Shrubland	B	S5	G5
Animal Species Elements			
Bufo boreas (western toad)	*	S3S4	G4

*rank not assigned

Mud Lake Complex

Location

Mud Lake Complex is located 1.5 - 2.5 miles south of the Canadian border in the North Fork River Valley. Access wetlands from North Fork road. Landowner permission is needed before accessing private wetlands.

Richness

This large complex of wetlands in the North Fork Flathead River valley is composed of a wide diversity of wetland types, ranging from large willow bottoms in old sloughs of the North Fork to diverse, beaver-influenced marshes and peatlands formed along low-gradient meandering creeks that flow into the North Fork. In fact, beaver activity (either current or historic) was noted in all the wetlands visited. Aquatic communities occur in most of the patches of open water in this complex. Common aquatic species include *Nuphar* sp. (yellow water lily), *Potamogeton natans* (broad-leaved pondweed), *Potamogeton amplifolius* (large-leaved pondweed), and *Potamogeton illinoensis* (Illinois pondweed). Open water is often ponded behind beaver dams. All of the wetlands have a large marsh community component, which is probably related to recurring beaver-caused disturbance. The wettest marsh communities are *Eleocharis palustris* (common spikerush) and *Equisetum fluviatile* (water horsetail). *Carex utriculata* (beaked sedge) communities are the most common marsh type, and there is one *Carex vesicaria* (inflated sedge) community. One of the wetlands is nearly dry at present (perhaps due to lack of beaver maintenance on the dams), and the *Carex utriculata* community is sparse and stunted and being invaded by *Mentha arvensis* (field mint) and *Potentilla norvegica* (Norwegian cinquefoil). The marsh communities are generally in good condition, and there is only one occurrence of the invasive *Phalaris arundinacea* (reed canarygrass). Several shrub communities occur in the wetlands, the most common being the *Salix drummondiana / Carex utriculata* (Drummond's willow / beaked sedge) community. This community occurs as large to small stands on an old river slough, on margins of beaver ponds and on beaver dams, and along outflow channels below beaver dams. It was found in areas with surface water or areas that dried to the subsurface during parts of the year. Some of these stands were dominated by moist forb understories rather than beaked sedge. There was one stand of *Salix drummondiana / Calamagrostis canadensis* (Drummond's willow/bluejoint reedgrass) and one stand of *Salix boothii / Calamagrostis canadensis* (Booth's willow / bluejoint reedgrass). Both willow communities occurred in drawdown zones surrounding marsh vegetation.

Two shrub communities were restricted to areas that appear to have year-round saturated conditions with very slow water flow, implying poorly aerated soils. These are the *Betula glandulosa / Carex utriculata* (bog birch / beaked sedge) and *Salix candida / Carex lasiocarpa* (hoary willow / slender sedge) communities. They occur in a beaver complex in which the dams are intact and ponding water, but which lack beaver activity. As a consequence, peat has begun to accumulate in the ponds, and these communities are colonizing the ponds. Pure *Carex lasiocarpa* (slender sedge) communities occur at the very edge of these ponds as floating mats. This peat development is occurring primarily in parts of the wetland in state section 16.

Three forested wetland types occur at this site, although they are small and do not occupy much area. *Picea engelmannii / Cornus sericea* (Engelmann spruce / red-osier dogwood) and *Picea engelmannii / Equisetum arvense* (Engelmann spruce / field horsetail) occur as small patches on the margins of two of the wetlands. The third community has not been previously described for Montana. It is dominated by an overstory of *Populus tremuloides* (trembling aspen) and by *Rhamnus alnifolia* (alder-leaved buckthorn) undergrowth. It occurs on flat, seasonally flooded ground adjacent to a marsh and small creek.

Key Environmental Factors

Despite being composed of somewhat spatially disjunct entities, the whole wetland complex is structured by the combination glacier-carved depressions and past and current *Castor canadensis* (beaver) activity. At least part of the considerable diversity of wetland associations is due to water level fluctuation, regardless of their source (beaver induced or cycles in groundwater levels).

Rarity

Our inventory revealed only one rare plant species, *Potamogeton obtusifolius* (blunt-leaved pondweed). It is confined to aquatic beds in deeper water beyond the *Carex lasiocarpa* (slender sedge) zone. This complex is also confirmed as occupied territory for breeding populations of the following species of special concern: *Gavia immer* (common loon), *Ursus arctos* (grizzly bear), *Canus lupus* (gray wolf), *Martes pennanti* (fisher), and *Oncorhynchus clarki lewisi* (westslope cutthroat trout). *Ambystoma macrodactylum* (long-toed salamander) and *Rana pretiosa* (spotted frog) also occur. These species though relatively common, are experiencing significant population declines.

Condition

One of the prime features of the wetland complex is its near total lack of disturbance and high degree of intactness. Only two unobtrusive dams were long ago constructed in the state sections to access a timber "island" so that it could be harvested. Timber harvest has also encroached on both sides of the streamside management zone on private property. At least one former beaver pond has dried down and is in the process of being colonized by the exotic species *Phalaris arundinacea* (reed canarygrass), *Potentilla norvegica* (Norwegian cinquefoil), and *Cirsium arvense* (Canada thistle).

Uplands

Human presence, in the form of summer and recreational homesites, is increasing. This will likely result in more wildlife disturbance and possible future concerns for water quality. On both private and state land, timber harvests do not appear in the past to have followed "best management practices." Cutting occurred up to creek banks and the wetland edge in many areas.

Information Needs

Information regarding land use south of the slough needs to be acquired to give a complete picture of potential threats to the complex. Baseline information on water quality is needed to assess the effects of development. Lack of evidence for grazing and timber harvest directly in the wetland begs the question about the source of propagules for the *Phleum pratense* (timothy) and *Taraxacum officinalis* (dandelion) (significant flood episodes?). Is the lake itself a glacial feature?

Management Needs

Streamside Management Zone recommendations need to be adhered to in any future logging within the area. Development around wetlands should be minimized. Populations of *Phalaris arundinacea*, the most aggressive of weedy species present in the complex, need to be monitored; the populations of several other exotics could be monitored in tandem with those of *Phalaris*.

Element Occurence Information

PLANT ASSOCIATION / COMMUNITY TYPE	EO RANK	S RANK	G RANK
Betula glandulosa / Carex utriculata Shrubland	B	S4	G4?
Carex lasiocarpa Herbaceous Vegetation	A, B	S4	G4
Carex utriculata Herbaceous Vegetation	A, B	S5	G5
Carex vesicaria Herbaceous Vegetation	A	S5	G4Q
Eleocharis palustris Herbaceous Vegetation	B	S5	G5
Equisetum fluviatile Herbaceous Vegetation	B	S4	G4
Phalaris arundinacea Western Herbaceous Vegetation	*	S4	G5
Picea engelmannii / Cornus sericea Woodland	B	S3	G3
Picea engelmannii / Equisetum arvense Forest	B	S2	G4
Poa pratensis-Phleum pratense exotic vegetation	*	*	*
Populus tremuloides / Rhamnus alnifolia Dominance Type	*	*	*
Salix boothii / Calamagrostis canadensis Shrubland	B	SR	G3G4Q
Salix candida / Carex lasiocarpa Provisional Shrubland	*	S3	G3
Salix drummondiana / Calamagrostis canadensis Shrubland	A	SP	G3
Salix drummondiana / Carex utriculata Shrubland	B, C	S5	G3
Salix drummondiana / Mesic Forbs Shrubland	*	*	G4
Salix drummondiana Shrubland [Provisional]	A	S3	G3Q
Salix geyeriana / Carex utriculata Shrubland	B	S5	G5
VASCULAR AND NONVASCULAR PLANT ELEMENTS			
Potamogeton obtusifolius (blunt-leaved pondweed)	*	S2	G5
ANIMAL SPECIES ELEMENTS			
Gavia immer (common loon, breeding pair)	*	S2B, SZN	G5
Ursus arctos horribilis (grizzly bear)	*	S1S2	G4T3
Canus lupus (gray wolf)	*	S1	G4
Martes pennanti (fisher)	*	S2	G5
Oncorhynchus clarki bouvieri (Westslope cutthroat trout)	*	S2	G4T3

*rank not assigned

Red Meadow Lake

Location

Red Meadow Lake site is located west of Glacier National Park in northwest Montana. From Upper Whitefish Lake Campground 25 miles north of Whitefish on Upper Whitefish Lake Road, proceed northerly on Forest Route 115 for 5 miles to Red Meadow Lake.

PHOTO BY JACK GREENLEE

Richness

This is a subalpine cirque basin with a lake just below the drainage divide of the Whitefish Range. Large marshes occur above and below the lake. Snowmelt draining from the surrounding slopes provides water for these wetlands, which are drained by Red Meadow Creek. A *Carex utriculata* (beaked sedge) community dominates the marshes, parts of which have a significant *Carex aquatilis* (water sedge) component. There are also two small willow communities that are not described in Hansen et al. (1995). One is dominated by *Salix farriae* (Farr's willow) in the upper canopy and *C. utriculata* (beaked sedge) in the undergrowth, with scattered *Pentaphylloides floribunda* (shrubby cinquefoil). Carex aquatilis (water sedge), *Phleum alpinum* (alpine timothy), *Equisetum variegatum* (variegated horsetail), *Valeriana occidentalis* (western valerian), and *Aster* spp. (aster species) also form significant components of this community. There is also a small willow community along the inlet to Red Meadow Lake; *Salix sitchensis* (Sitka willow) dominates the upper canopy and *Carex utriculata* (beaked sedge) dominates the undergrowth.

Key Environmental Factors

Subsurface groundwater and surface water flow into this subalpine catchment are the defining hydrological parameters for this site; the permanently saturated and semi-permanently flooded conditions combined with cold microclimate are conducive to the development of this fen and carr.

Rarity

Two *Salix* spp. (willow)-dominated communities, characterized on the basis of layer dominance as *S. farriae / Carex utriculata* (Farr's willow / beaked sedge) and *S. sitchensis / C. utriculata* (Sitka willow / beaked sedge), are not treated in current community classifications; their habitats of occurrence do not appear out of the ordinary for subalpine environments. No rare plants or animals are known from this site.

Condition

A road runs along half the length of Red Meadow Lake and both wetlands to either end of the lake, though it is sufficiently removed to be only a minor influence. A campground exists just to the southeast of the lake; from this base various recreational pastimes are conducted, including fishing, hunting and hiking. No exotic species were observed.

Uplands

The campground is not within the wetland boundaries, but certainly could influence it. The most obvious sources of impacts in the area are firewood cutting on adjacent slopes and road travel.

Information Needs

The impact of the road on wetlands, possibly through increased sedimentation, should receive scrutiny.

Management Needs

Efforts should be taken to minimize the impacts of the road and campground activities on the adjacent wetlands.

Element Occurence Information

Plant Association / Community Type	EO Rank	S Rank	G Rank
Salix farriae / Carex utriculata Shrubland	*	*	*
Carex aquatilis - Carex utriculata Herbaceous Vegetation	A	*	G4
Salix sitchensis / Carex utriculata Shrubland	*	*	*

*rank not assigned

Schnaus Cabin Wetland

Location

Schnaus Cabin Wetland is located just west of Glacier National Park in northwest Montana. From Polebridge north of Columbia Falls on State Route 486, proceed northerly on State Route 486 for 7 miles to Forest Route 10372. Travel southerly on Forest Route 10372 for 0.5 miles to Schnaus Cabin Wetland. Landowner permission is required before entering private property

PHOTO BY PETER LESICA

Richness

This large wetland occurs on a broad terrace above the North Fork Flathead River. The water that flows through the site most likely derives from groundwater, either from Moose Creek or from groundwater seepage from the adjacent uplands. The surface water drains into Moose Creek. In parts of the site, the soils are saturated to flooded yearlong, resulting in an anaerobic condition that favors muck and peat formation over alluvial parent materials. This site is a mosaic of willow swamps, bog birch swamps, marshes, and wet spruce forest developed among old stream channels and small spring creeks. *Salix geyeriana / Carex utriculata* (Geyer's willow / beaked sedge) communities are dominant along watercourses, and an undescribed bog birch (*Betula glandulosa*) community with a *Rhamnus alnifolia* (alder buckthorn) understory occurs in the same flooded setting. There are some ponds through this wetland with *Nuphar* spp. (water lilies) on the surface and *Typha latifolia* (common cattail) on the margins. The *Betula glandulosa / Carex utriculata* (bog birch / beaked sedge) community occurs near these ponds. Communities dominated by *Carex utriculata* (beaked sedge) with a high cover of *Carex aquatilis* (water sedge) occur in openings throughout this wetland. *Phalaris arundinacea* (reed canarygrass) communities occur in the same moisture gradient position as the beaked sedge community. Slightly above the former communities is a *Picea engelmannii / Cornus sericea* (Engelmann spruce / red-osier dogwood) forest. The driest communities at this site are wet to moist meadows dominated by the exotic *Poa pratensis* (Kentucky bluegrass). The uplands adjacent to this site are forests dominated by *Picea engelmannii* (or hybrids) and *Pinus contorta* (lodgepole pine) with *Calamagrostis rubescens* (pinegrass) dominated undergrowth.

Key Environmental Factors

The existence of this wetland complex is dependent upon ground water flow from Moose Creek or springs along this west side of the North Fork Flathead River; the perennially saturated conditions and cold-air ponding structure of the site lead to peat accumulation. Conductivity measurements in the shrub communities ranged from 230-265 uS/cm.

Rarity

Carex paupercula (poor sedge) was associated with the mossy edge of the fen pond, where a small steam enters the *Carex aquatilis - C. utriculata* (water sedge - beaked sedge) community. The *Salix geyeriana* / Mesic graminoids (Geyer's willow / Mesic graminoids) plant association may be a disturbance type without much inventory history in Montana.

Condition

An unimproved road has been pushed through the middle of the wetland and partially extends along its northwest boundary with the upland. The abundance of introduced species implies that the site may have been grazed. *Cirsium arvense* (Canada thistle) and *Linaria vulgaris* (butter-and-eggs) constitute the noxious weeds present; however, *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (common timothy), *Bromus inermis* (smooth brome), *Taraxacum officinale* (dandelion), *Thlaspi arvense* (field pennycress) are all aggressive increasers, especially in the drier habitats of this wetland. Stumps within the *Picea* (spruce)-dominated woodland / forest testifies to past timber harvesting.

Uplands

The adjacent land has been at least partially harvested and private land is currently under development for recreational residences.

Information Needs

The source of this wetland's water has not been unequivocally established, though springs along the west side are the likely candidate.

Management Needs

The only noxious weeds present, *Cirsium arvense* (Canada thistle) and *Linaria vulgaris* (butter-and-eggs), need to be eradicated.

Element Occurence Information

Plant Association / Community Type	EO Rank	S Rank	G Rank
Betula glandulosa - Rhamnus alnifolia Dominance Type	*	*	*
Carex aquatilis - Carex rostrata Herbaceous Vegetation	A	*	G4
Danthonia intermedia – Stipa occidentalis Dominance Type	*	*	G2G3
Phalaris arundinacea Western Herbaceous Vegetation	*	S4	G5
Picea engelmannii / Cornus sericea Woodland	B	S3	G3
Picea engelmannii / Equisetum arvense Woodland	B	S3	G3
Poa pratensis Dominance Type	*	*	*
Salix drummondiana / Carex utriculata Shrubland	A	S3	G3
Salix geyeriana / *Carex utriculata* Shrubland	A	S5	G5
Salix geyeriana / Mesic Graminoids Shrubland	*	*	G2G3Q
Typha latifolia Western Herbaceous Vegetation	A	S5	G5

Vascular and Nonvascular Plant Elements			
Carex paupercula (poor sedge)	*	S3	G5

* rank not assigned

Tepee Lake Complex

Location

Tepee Lake Complex is located just west of Glacier National Park in northwest Montana. From Trailcreek north of Columbia Falls on State Route 486, proceed southerly on State Route 486 for 0.5 miles to Forest Route 9899. Travel southwesterly on Forest Route 9989 for 1 mile to Tepee Lake Complex. Landowner permission is needed before accessing private wetlands.

PHOTO BY JACK GREENLEE

Richness

This complex of wetlands surrounding Tepee Lake occurs at the base of the Whitefish Range in what appears to be an old ground moraine. The wetlands all occur in depressional landforms, some of which are closed or have seasonal outflow channels. Some of those that occur along Tepee Creek and have been strongly influenced by beaver activity. Descriptions of the wetlands in this complex follow, grouped by wetland type:

Beaver complex: There are two large beaver complexes along Tepee Creek, with numerous dams and beaver ponds. The *Salix drummondiana / Carex utriculata* (Drummond's willow / beaked sedge) community type is common along water channels and pond edges; in places this type has a significant *Alnus incana* (mountain alder) component. Two marsh communities are common: *Carex utriculata* (beaked sedge) and *C. aquatilis* (water sedge). These occur near ponds and standing water in the willow swamps. A few of the beaver ponds are drying out and are dominated by the exotic species *Phalaris arundinacea* (reed canarygrass), *Phleum pratense* (timothy) and *Poa pratensis* (Kentucky bluegrass).

Forested wetland: Adjacent to one of the beaver complexes is a flat spruce swamp forest along a low gradient intermittent creek. *Picea engelmannii / Equisetum arvense* (Engelmann spruce / field horsetail) forest dominates this wetland, which drains into the beaver complex. While a portion of this complex has been altered by timber harvest, much of it is old growth in outstanding condition.

Oligotrophic lake: Tepee Lake is a shallow, fishless lake in a glacial depression that drains into Tepee Creek. There are small amounts of *Scirpus acutus* (hardstem bulrush) community in deeper parts of the lake, and a stand of *Carex lasiocarpa* (slender sedge) at the north end.

Fen: This peatland north of Tepee Lake appears to be fed by a spring/seep located on a slight rise (probably an area of peat buildup), making it the highest point in the wetland. Water drains north and south from this point. Much of the fen is dominated by *Betula glandulosa* (bog birch) dwarf carr, with *Betula glandulosa / Carex lasiocarpa* (bog birch / slender sedge) and *Betula glandulosa / Carex aquatilis* (bog birch / water sedge) the dominant communities. There are some small inclusions in the fen where the overstory is dominated by a sparse cover of *Pinus contorta* (lodgepole pine), both dead and alive. Very old beaver dams at the north end block an outflow that drains to Trail Creek; a *Carex lasiocarpa* (slender sedge) floating mat surrounds the ponds that occur behind the dam. Part of the water in the fen drains to a *Carex lasiocarpa* and *Carex buxbaumii* (Buxbaum's sedge) meadow to the east. Peat depths in the fen are over 1 m. Other common plants in the fen are: *Menyanthes trifoliata* (bog buckbean), *Viola macloskeyi* (small white violet),

Eleocharis pauciflora (few flowered spikerush), *Triglochin palustre* (marsh arrowgrass), and *Drosera anglica* (English sundew).

Glacial pothole: Shallow glacial depressions with varying amounts of peat accumulation occur east and northeast of Tepee Lake. Fairly stable water levels have probably allowed peat to accumulate. One of these depressions has a large amount of open water dominated by *Nuphar* sp. (yellow water lily) surrounded by a *Carex lasiocarpa* (slender sedge) quaking mat. Floating *Carex limosa* (mud sedge) mats and stands of *Menyanthes trifoliata* (bog buckbean) occur in low spots.

Key Environmental Factors

The preeminent factors in structuring this complex are the activity associated with *Castor canadensis* (beaver), seasonal flooding and seeps. *Castor canadensis* has constructed many dams creating ponds and old water-filled channels; at least some of the complex's water comes from seeps. The undulating surface terrain of this glaciated landscape is also a factor in providing necessary depressions.

Rarity

Rare plant populations consist of *Drosera anglica* (great or English sundew) and three rare *Scirpus* (bulrush or clubrush) species, including *Scirpus cespitosus* (tufted clubrush), *Scirpus subterminalis* (water clubrush), and *Scirpus hudsonianus* (Hudson's Bay bulrush). All of the above-listed species occur exclusively in the fen portions of the complex. On the basis of a cursory inventory, at least three rare mosses have been identified within the fen habitat, *Calliergonella cuspidata*, *Scorpidium scorpioides* and *Meesia triquetra*. This complex is also occupied territory for breeding populations of *Gavia immer* (common loon), *Ursus arctos* (grizzly bear), and *Canus lupus* (gray wolf). Six relatively rare plant associations occur at the site: *Carex limosa* (mud sedge), *Carex buxbaumii* (Buxbaum's sedge), *Picea engelmannii / Cornus sericea* (Engelmann spruce / red osier dogwood), *Alnus incana / Carex* spp. (mountain alder / sedge spp.), *Salix drummondiana / Carex utriculata* (Drummond's willow / beaked sedge), and *Salix drummondiana*.

Condition

Inferring from the extent of the exotic plant populations in the northern end of the complex, this locality may have experienced livestock grazing. Exotic plant species are present primarily in the beaver complex. *Phalaris arundinacea* (reed canarygrass) is present in the cutover portion of spruce forest and in dried out beaver pond; *Poa pratensis* (Kentucky bluegrass), *Cirsium arvense* (Canada thistle), *Potentilla norvegica* (Norwegian cinquefoil), *Thlaspi arvense* (field pennycress) are also found in the dried up beaver pond.

Uplands

Logging has occurred up to the edge of a number of the component wetlands (subunits) and there is much active recreational subdivision in the vicinity.

Information Needs

Is the northern end of the complex being dewatered or drying out and becoming merely a moist meadow

Management Needs

Populations of aggressive exotics, as well as and particularly, *Phalaris arundinacea* (reed canarygrass) should be monitored.

Element Occurence Information

PLANT ASSOCIATION / COMMUNITY TYPE	EO RANK	S RANK	G RANK
Alnus incana / Carex spp. Shrubland	C	*	G3
Betula glandulosa / Carex lasiocarpa Shrubland	A	S4	G *
Betula glandulosa / Carex utriculata Shrubland	A,C	S4	G4?
Carex aquatilis - Carex utriculata Herbaceous Vegetation	B	*	G4
Carex aquatilis Herbaceous Vegetation	A	S4	G5
Carex buxbaumii Herbaceous Vegetation	A	S3	G3
Carex lasiocarpa Herbaceous Vegetation	A	S4	G4
Carex limosa Herbaceous Vegetation	A	S3	G3
Carex oederi Dominance Type	*	*	*
Carex utriculata Herbaceous Vegetation	B, C	S5	G5
Eleocharis palustris Herbaceous Vegetation	C	S5	G5
Elymus glaucus Herbaceous Vegetation	8	*	G2
Equisetum fluviatile Herbaceous Vegetation	B	S4	G4
Menyanthes trifoliata Herbaceous Vegetation	*	*	*
Phalaris arundinacea Western Herbaceous Vegetation	*	S4	G5
Picea engelmannii / Cornus sericea Woodland	B	S3	G3
Picea engelmannii / Equisetum arvense Forest	A	S2	G4
Poa pratensis Dominance Type	*	*	*
Populus tremuloides / Cornus sericea Forest	C	S3	G4
Salix drummondiana / Carex utriculata Shrubland	A	S5	G3
Salix drummondiana Shrubland [Provisional]	*	S3	G3Q
Scirpus acutus Herbaceous Vegetation	B	S5	G5
ANIMAL SPECIES ELEMENTS			
Canus lupus (gray wolf)	*	S1	G4
Gavia immer (common loon)	*	S2B,SZN	G5
Ursus arctos horribilis (grizzly bear)	*	S1S2	G4T3
VASCULAR AND NONVASCULAR PLANT ELEMENTS			
Calliergonella cuspidata (moss)	*	S1	G5
Drosera anglica (great or English sundew)	*	S2	G5
Meesia triquetra (moss)	*	S1	G5
Scirpus cespitosus (tufted clubrush)	*	S2	G5
Scirpus hudsonianus (Hudson's Bay bulrush)	*	S1	G5
Scirpus subterminalis (water clubrush)	*	S2	G4G5
Scorpidium scorpioides (moss)	*	S1	G4G5

* rank not assigneds

■ Appendix D.

Watersheds considered by Montana Natural Hertitage Program as having high biological diversity and conservation value

		Criteria						
Area	**Watershed**	**1**	**2**	**3**	**4**	**Evaluation Status**		
Clark Fork, Upper	Bitterroot			x	x			
Clark Fork, Upper	Blackfoot		x	x				
Clark Fork, Upper	Upper Clark Fork			x				
Flathead	Flathead Lake	x		x	x	1998		
Flathead	Lower Flathead		x	x	x			
Flathead	North Fork Flathead	x	x	x	x	1999		
Flathead	Stillwater (Flathead)	x		x	x	1998		
Flathead	Middle Fork Flathead	x	x	x				
Flathead	South Fork Flathead	x	x	x				
Flathead	St. Mary	x	x	x				
Flathead	Swan	x	x	x		1998		
Milk	Beaver		x	x	x	1998		
Milk	Cottonwood		x	x	x			
Milk	Upper Milk		x		x			
Milk	Whitewater		x	x	x			
Milk	Milk Headwaters	x	x	x				
Missouri Headwaters	Gallatin			x	x			
Missouri Headwaters	Madison		x	x	x			
Missouri Headwaters	Beaverhead			x				
Missouri Headwaters	Big Hole			x				
Missouri Headwaters	Jefferson			x				
Missouri Headwaters	Red Rock	x	x	x				
Missouri, Lower	Big Muddy		x	x	x			
Missouri, Lower	Brush Lake	x		x				
Missouri, Upper	Cut Bank		x		x			
Missouri, Upper	Sun		x		x			
Missouri, Upper	Two Medicine		x	x	x			
Missouri, Upper	Bullwacker-Dog		x	x				
Missouri, Upper	Smith			x				
Missouri, Upper	Teton		x	x				
Missouri, Upper	Willow		x	x				
Yellowstone, Lower	Little Powder		x	x				
Yellowstone, Lower	Lower Powder		x	x				
Yellowstone, Lower	Lower Yellowstone			x				
Yellowstone, Lower	Middle Powder		x	x				
Yellowstone, Upper	Bighorn Lake			x				
Yellowstone, Upper	Clark's Fork Yellowstone			x		1999/2000		
Yellowstone, Upper	Upper Yellowstone	x	x	x		1999/2000		
Criteria:								
1. Extent and development of wetland and riparian communities								
2. Quality and integrity of wetland and riparian communities								
3. Presence of sensitive, endangered or threatened species, rare communities, or outstanding community exam								
4. Level of threat								

Ranking of Montana watersheds was compiled by staff at the Montana Natural Heritage Program and The Nature Conservancy's Montana Field Office. This is a qualitative ranking based on best professional judgement. The watersheds were evaluated using the criteria listed above.