Appendix 29b

See Also: Ecologically Significant Wetlands in the North Fork of the Flathead River Valley

Ecologically Significant Wetlands

in the Flathead, Stillwater, and Swan River Valleys

FINAL REPORT

JUNE 1, 1999

Submitted to
the Montana Department of Environmental Quality

Prepared by
Jack Greenlee

MONTANA
Natural Heritage Program

Ecologically Significant Wetlands

in the Flathead, Stillwater, and Swan River Valleys

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Abstract

The Montana Natural Heritage Program received a wetland protection grant from the Environmental Protection Agency to identify and inventory ecologically significant wetlands and prioritize them for conservation, restoration, and mitigation applications. Much of the state lacks basic information about its wetland resources like National Wetland Inventory maps, and there is even less information available about which of the remaining wetlands are functionally intact and of high quality. This report summarizes the results of a field inventory of high quality wetlands in the Flathead Valley.

The project focused on both public and private wetlands found in the Flathead Lake, Stillwater, and Swan drainages in the Flathead River watershed. We identified potential wetlands for inventory by querying locally knowledgeable individuals, and by using National Wetland Inventory maps, aerial imagery, and agency data. Criteria used to select wetlands for inventory included large size, wetlands without geomorphic or hydrologic modification, presence of intact native plant communities, presence of concentrations of rare plants or animals, and intact uplands. Of the approximately 100 potential wetlands that were identified, 54 appear in this report.

The ecological assessment of each wetland focussed primarily on vegetation, documenting the types of wetland communities present, their quality and condition, and rare or sensitive plant species present. We also recorded information on selected hydrologic and soil variables used in hydrogeomorphic assessments, and the quality/condition of the surrounding landscape as it related to functional integrity.

Our observations indicate that some types of wetlands, like wet meadows and valley bottom riparian communities, have decreased in acreage and quality in the last 150 years, while some types of marsh communities, like cattail communities, are likely more common than they were historically. Peatlands and forested wetlands, such as spruce swamps, are intrinsically rare and provide outstanding habitat for wildlife and rare plants and animals.

The quality and significance of each site was ranked, and sites were placed in one of four categories based on size, wetland condition, upland condition, the diversity of plant communities and wetland features at the site, and presence of rare species and communities. Options and priorities for protecting sites, such as special status designation of public lands or placing sites under conservation easements or in the Wetland Reserve Program, are summarized. Detailed descriptions of wetland sites and communities are presented in appendices. Land managers can apply the process presented here to help evaluate wetlands which were not inventoried.

The wetland information presented here can be used to prioritize wetlands for conservation, identify irreplaceable wetlands, identify reference wetlands, identify potential mitigation sites, provide a context for wetland permit review, and provide information for landuse decisions.

INTRODUCTION

PURPOSE AND SIGNIFICANCE

Wetlands in North America have historically been viewed as unproductive lands with little value to society (Mitsch and Gosselink1993). As a consequence, swamps, marshes, sloughs, and other wetlands have long been drained, filled, and otherwise manipulated to produce goods and services with more value to society. The result of these efforts has been the estimated loss of over half of the conterminous United States' wetland acreage since the 1780's, and a loss of about 25% of Montana's wetland acreage in the same time period (Dahl 1990).

In the last 20 years, however, as awareness of the cumulative losses and impacts to wetlands has grown, so, too, has society's awareness of the numerous ecosystem services provided by wetlands, as well as their economic value; the most recent estimate valued global wetland ecosystem services at $4.9 trillion/year (Costanza et al. 1997). Efforts to protect wetlands have intensified also, and take many forms: acquisition, creation, education, incentives, management, regulation, research, and restoration, to name a few (World Wildlife Fund 1992).

For conservation efforts to be most effective, baseline information must be gathered via wetland inventories to document the location and types of wetlands that exist in an area. The need for wetland inventory information was recognized by the Montana Wetland Council in its Draft Conservation Strategy (Montana Wetland Council Strategy Working Group 1997). This inventory can take many forms, from the National Wetland Inventory's (NWI) mapping of wetlands determined by remote sensing to field inventories of high quality wetlands such as was conducted by the Montana Natural Heritage Program (MTNHP) in 1998.

The purpose of MTNHP's wetland inventory is to identify and inventory ecologically significant wetlands and prioritize them for conservation, restoration, and mitigation applications. Although Montana is one of the few states to have a relatively comprehensive wetland vegetation classification, a comparable inventory of wetlands – one that details location, community composition, condition, functional integrity, and conservation significance – has been sorely lacking. MTNHP's wetland inventory is significant because it will provide government agencies, watershed groups, land trusts, local planners, Conservation Districts, and others involved in wetland protection efforts access to reliable information on the diversity of wetland types, where they are, and their relative significance, in order to effectively prioritize wetland conservation efforts. Good wetland information can help ensure that protection, mitigation, and restoration efforts target the full range of wetland diversity, including those wetlands which are outstanding, unique, or which contribute most to watershed integrity and function. Until now, access to such information in Montana has been limited because it resides in various formats among different agencies or because it has not been collected.

In other western states such as Idaho, Colorado, and Oregon, similar wetland inventories have been underway for several years. These inventories have contributed directly to the protection of wetlands in these states. For example, in Idaho, the Forest Service, Bureau of Land Management, and Natural Resources Conservation Service have used the inventory results to strategically focus protection efforts on high quality wetlands identified by the inventory, through natural area designation or inclusion in the Wetland Reserve Program. The emphasis of these inventories is on protecting and restoring existing wetlands, rather than creating new wetlands. Although wetland creation is sometimes a necessary mitigation practice, studies of created wetlands reveal the mixed success that such projects have had at creating functioning wetland (e.g. Mitsch et al. 1998). Protecting existing wetlands has the greatest chance of conserving wetland functions, and wetland restoration can be a cost effective way of protecting wetlands (e.g. restoring hydrologically altered sites.)

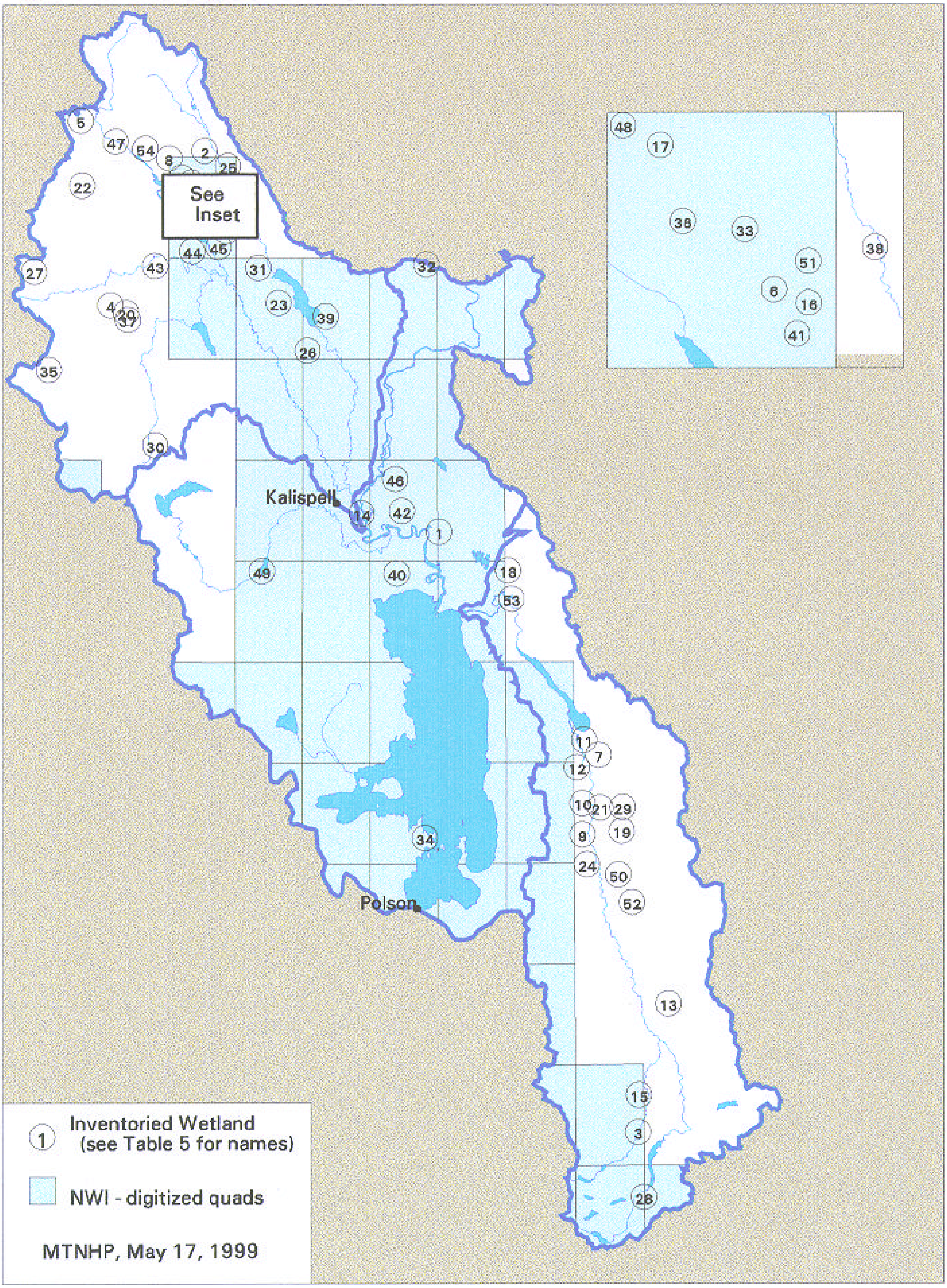
Through consultation with the Wetland Council, MTNHP identified several subdrainages of the Flathead River watershed as the study area for this wetland inventory (Figure 1). The Flathead supports one of the greatest and most diverse concentrations of wetlands in the Rocky Mountains, including peatlands, oxbow ponds, springs and seeps, complexes of pothole ponds, vernal pools, and beaver ponds. Like other areas of the arid West, the importance of wetlands in the Flathead far exceeds their relatively small area.

CLARIFICATION OF TERMS

The sites which were examined in this inventory fall within the definition of wetlands used by Cowardin et al. (1979) because they all had at least one of the following attributes: hydrophytic vegetation, hydric soils, and wetland hydrology. This definition includes riparian areas, wet meadows, and vernal pools.

We use several wetland terms in this report that can be interpreted in more than one way, so following are some definitions to clarify the meaning of these terms. **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. In contrast, **peatlands** are wetlands that accumulate peat, or partially decomposed plant matter. All the peatlands in Montana are **fens**, whose water source is predominantly groundwater, as opposed to **bogs**, whose water source is predominantly precipitation. Peatlands dominated by shrubs are known as **carrs**, and carrs are sometimes best developed in the **lagg**, or moat-like ring sometimes found the outer margin of the peatland. A wetland dominated by trees is known as a **swamp**. **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 slender sedge (*Carex lasiocarpa*), 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).

Figure 1. Drainages in which 1998 wetland inventory was performed.



Study Area

The study area is located in northwest Montana in three drainages of the Flathead River watershed: the Swan River drainage, Stillwater River drainage, and Flathead Lake (Figure 1). These drainages correspond to 4^{th} Code U.S.G.S. Hydrologic Units (HUC's 17010211, 17010210, and 17010208, respectively). The total acreage of this area is 1.7 million acres.

The study area is within the Flathead Valley (M333B) and Northern Rockies (M333C) ecoregional sections (Nesser et al. 1997). The lower elevations in the study area are predominantly (or have the potential to be) forested with conifers, with ponderosa pine and Douglas fir dominant in drier areas and grand fir, spruce, and western redcedar dominant in more mesic areas. Douglas fir, western larch, and subalpine fir are dominant at mid-elevations, and whitebark pine and subalpine fir are dominant at higher elevations (Sirucek and Bachurski 1995).

The parent materials in the study area are predominantly sedimentary rocks of the Belt formation. Major rock types are argillite, quartzite, and siltite, with localized areas of limestone. The large low elevation valleys were scoured by several advances of continental glaciers during the Pleistocene, and higher mountains were acted on by alpine glaciers. Since the retreat of the glaciers, valley bottoms have been subjected to alluvial processes. Many lakes and wetlands occur on glacially influenced landforms like kettle ponds, outwash plains, and foothills moraines (Alt and Hyndman 1986).

The climate of the study area is strongly influenced by Pacific maritime weather systems. Winters are cool, cloudy, and wet. On average, most precipitation during a year falls between September and February, but June is usually the wettest single month. Kalispell averages 42cm (16.4 inches) of precipitation per year, and has an average yearly temperature of 5.8°C (42.4°F); the highest mountain ridges nearby average about 256cm (100 inches) of precipitation. Summers are warm and dry with cool nights (NOAA 1993, Sirucek and Bachurski 1995).

STATUS OF NATIONAL WETLAND INVENTORY IN STUDY AREA

Large scale final NWI maps have been completed for all of the quads in the study area, and digitized NWI maps exist for a portion of the quads (Figure 1). We summarized wetland area for different classes of wetlands for the digitized quads (Figure 2A-C).
A majority of the wetlands in the study area for which digitized quads are available fall into Cowardin's (1979) lacustrine system, primarily because Flathead Lake is in the study area (Figure 2B). If the deepwater habitat (i.e. lacustrine limnetic) is removed from consideration and one looks at the percentage of different Cowardin wetland classes in the study area, it is clear that the dominant wetland class is emergent wetlands (Figure 2C). The aquatic bed class makes up a surprisingly large portion of the wetland classes (20.5%), with scrub-shrub and forested classes comprising smaller portions of the wetland acreage.

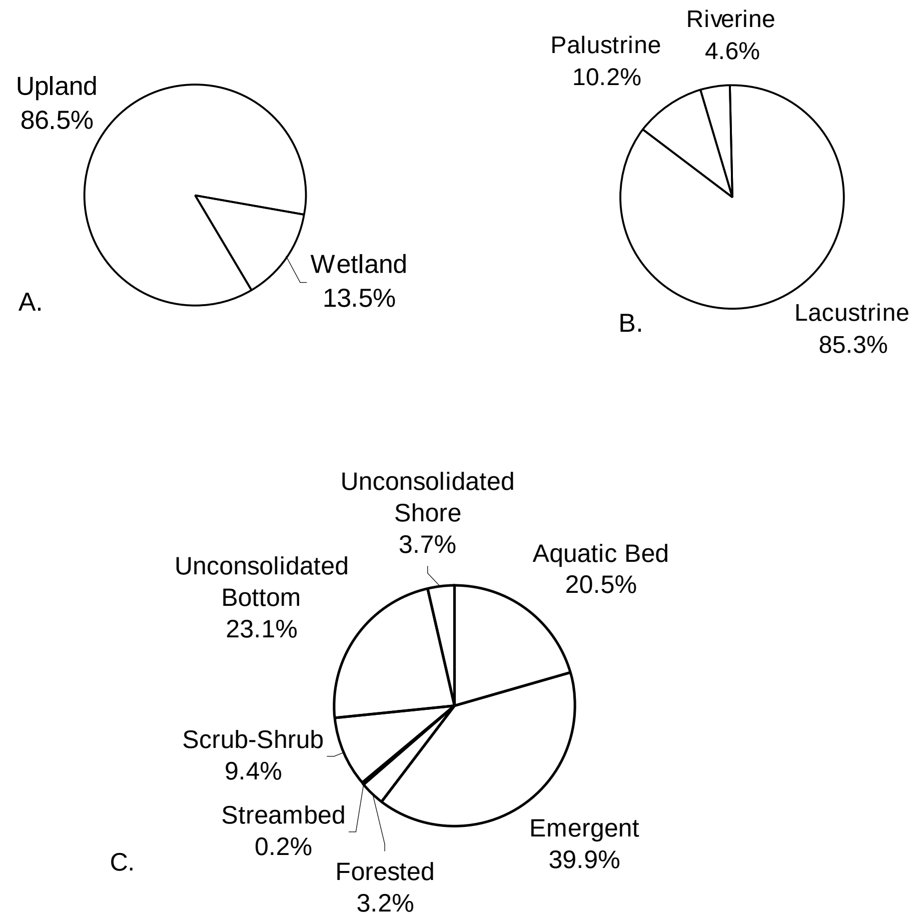


Figure 2. A. Percentage of upland and wetland from digitized NWI maps in study area. B. Percentage of different Cowardin wetland systems from digitized NWI maps in study area. C. Percentage of different Cowardin wetland classes (excluding deepwater classes) from digitized NWI maps in study area.

METHODS

IDENTIFYING AND SELECTING WETLANDS FOR INVENTORY

Several sources of information were consulted to identify wetlands for potential inclusion in the wetland inventory. We first contacted individuals with local knowledge of wetland resources. This list of public and private sector groups included: U.S. Forest Service, U.S. Fish and Wildlife Service, Natural Resource Conservation Service, Montana Department of Fish, Wildlife, and Parks, Montana Department of Natural Resources and Conservation, Confederated Salish and Kootenai Tribes, Riparian and Wetland Research Program, Flathead Lake Biological Station, The Nature Conservancy, ecological consultants, and members of the Montana Native Plant Society. We asked them to identify wetlands they considered ecologically significant, based on the following criteria: sites without major hydrologic or geomorphic modifications, sites with intact, representative native plant communities, sites with concentrations of rare plant or animal species, sites within established grazing exclosures, or sites with outstanding value as wildlife habitat. We also identified potential sites by inspecting the Flathead National Forest map, National Wetland Inventory maps, and U.S.G.S. quad maps.

About 100 sites were identified through this process, and they are listed in Appendix A. We prioritized the sites using the following guidelines:

- Emphasize larger wetlands over smaller wetlands
- Emphasize sites without geomorphic and hydrologic modification
- Emphasize sites with intact native plant communities, both in the wetland and in the uplands surrounding the wetland
- Emphasize sites with known concentrations of rare plants and animals

Aerial photos from the Flathead National Forest, feedback from the locally knowledgeable individuals, and existing wetland reports were used to aid the selection process. The above guidelines were designed to be flexible and not absolute, since the significance of the wetland depends in part on its landscape context. For example, a valley bottom wetland which is surrounded by lands used for agriculture and which has some irrigation withdrawals and exotic species might nevertheless be considered a priority for inventory if it still has intact native plant communities. If the same wetland were located on state forest lands and surrounded by intact upland forest communities, it might not have been a high priority for inventory if it had the same irrigation withdrawals and exotic species noted above.

Additional wetlands for inventory were identified during the course of fieldwork. Some wetlands that merited inventory were not field-visited because sufficient information from previous fieldwork was already stored in MTNHP files; several peatlands and U.S. Forest Service Research Natural Areas fell into this category. Sixty-three wetlands were inventoried during the 1998 field season.

DATA COLLECTION

Wetlands were surveyed during the summer of 1998 following standard methodology to assess site condition, catalog community types, and document rare plant and animal occurrences (Bougeron et al. 1992). Specifically, we attempted to walk through all wetland plant communities at any given site, except where prevented by deep water. The dominant species in each stratum and ocular estimates of their canopy coverage were noted, as was an estimate of the acreage of each community. We classified each wetland plant community using Hansen et al. (1995) and noted the condition of each community, including: presence of exotic species, evidence of hummocking or pugging, presence of ditches, dikes, riprap, and other geomorphic and hydrologic modifications, presence of old growth conditions in forests, depth of standing water, and beaver activity. A blank field data form is included in Appendix B. For plant communities not previously described or which are uncommon, detailed community plot information was gathered.

At each site 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 made notes about offsite landuses and spoke to landowners/ managers about landuse history when possible. A cursory rare plant survey was conducted during our walk-through of each wetland.

Faunal surveys were conducted for selected wetlands. These surveys focussed on animal groups that are ecologically important in wetlands, but inconspicuous and not well documented. This work included surveys for amphibians and snails as well as for carabid beetles, a family of predaceous beetles that includes a diversity of wetland/riparian specialists.

Although no wetland delineations or formal wetland functional assessments were performed as part of this project, MTNHP's wetland inventory was informed by two regional HGM models being developed by researchers at the Flathead Lake Biological Station (Hauer et al. 1999, Hauer 1998). For instance, at some sites the depth of two soil horizons, the O horizon and A horizon, was measured in some plant communities. This variable is measured in the intermontane pothole HGM model, and 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). A very thick A horizon, for example, can mean an excessive amount of upland erosion is taking place. This and other soil data (see field form, Appendix B) was gathered for some wetlands.
About one-fourth of the sites were on private land. Landowners were contacted for permission to gain access to their property prior to site visits. Users of this wetland inventory report should note that they, too, need to get permission before entering private lands.

DATA MANAGEMENT

We created four types of database records for the data we gathered: community **plot** records, community **occurrence** records, **site** records, and community **abstracts**. Wetland plant community plot information (e.g. species composition and cover data) was entered into ECADS, a database developed by the U.S. Forest Service for managing ecological data (Jensen et al. 1993). We created a wetland plant community occurrence record for each community at each site. Community occurrence information (e.g. HGM class, Cowardin class/subclass, dominant species, hydrology, landscape setting) was entered in the Biological and Conservation Data System (BCD), a database developed by The Nature Conservancy and used by Heritage Programs across the country. Summary information about each site as a whole (e.g. general site descriptions, on- and offsite landuses, management needs) was also entered into the appropriate module in BCD. Detailed community abstracts were created which characterize both common and rare wetland plant communities. Information about community range, typical landscape setting, typical species composition, and successional and management information was synthesized from a variety of sources and is being stored temporarily in a word processing template, for later uploading into a new BCD module being developed. The boundaries of each wetland site were digitized and stored as polygons in a GIS layer.

RANKING OF COMMUNITIES AND SITES

Plant community rarity was ranked using the same protocol that was developed by The Nature Conservancy for ranking plant and animal species. The ranking system is intended to allow managers to 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 either rangewide (for global or G ranks) or statewide (for state or S ranks). Secondarily, trends in condition, threats, and fragility contribute to ranks when this information is 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 C.

A list of wetland and riparian plant communities found in the study area was assembled based on field data gathered for this inventory and range comments found in Pfister et al. (1977), Hansen et al. (1995), and Sirucek and Bachurski (1995). Preliminary global and state community ranks were obtained from the Western Regional Office of The Nature Conservancy. This list of communities with preliminary ranks was sent to a panel of experts with broad knowledge of wetland plant communities statewide, who further refined the ranks. These ranks are not static but will change as more community information is collected from across the state.

Each individual wetland community occurrence was also ranked into one of four categories (A, B, C, or D) using a protocol developed by The Nature Conservancy (The Nature Conservancy 1998). Community size, condition, and landscape context were used to rank each community occurrence. Each of these factors was evaluated for each community and assigned a rank of A to D, and then the ranks of all the factors were averaged for a final community occurrence rank. Community occurrence ranks are not presented in this report; however, they are available upon request. Community occurrence ranks were not explicitly used for ranking sites, but the community occurrence ranking factors were considered during the site ranking process (see below).

Wetland sites were ranked using methods similar to those used to rank wetlands in Idaho and Washington (Washington Department of Ecology 1991, Jankovsky-Jones 1997, Chadde et al. 1998). Each wetland site was evaluated on 5 factors (Table 1). Each factor at each site was assigned a score of 0 to 3, and then all scores at a site were summed for a total ranging from 0 to 15. Presence of rare species as well their degree of rarity influenced the rarity score; for example, presence of a single globally rare species was rated higher than presence of a single state rare species. The condition and landscape context of all the community occurrences at a site was considered when assigning the condition and uplands scores, respectively. The scores of all the sites were then arranged from highest to lowest, and the distribution of scores was divided into quartiles. Each of these quartiles defined a category of site quality or significance. The four categories are described below.

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.

OUTSTANDING SIGNIFICANCE

Sites in this category represent the most ecologically significant wetlands in the survey area. These wetlands are large and composed of a diverse array of plant communities and other important wetland features such as peatlands, beaver ponds, and springs, which provide a diversity of habitats for wildlife. These are pristine sites which typically provide habitat for concentrations of state 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 fairly intact, thus maintaining the sites' hydrologic regime. Impacts to these sites are not fully mitigable, and any alterations to such sites could lead to significant degradation.

VERY HIGH SIGNIFICANCE

Wetlands in this category are generally composed of diverse, high quality plant communities, but they are distinguished from the previous category of wetlands by having a larger 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 concentrations 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 some 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 at this type of site and could put them on a trajectory to become an Outstanding significance site.

HIGH SIGNIFICANCE

High significance sites tend to have a lower diversity of types of wetland plant communities than either of the two previous categories, although they still tend to be large. These sites may support populations of rare plants and animals, but they usually have fewer different species than wetlands in the two previous categories. The degree of anthropogenic disturbance at these sites tends to be similar to that in the previous category. Most of the wetland plant communities at these sites are in excellent condition, but a few may have some moderate impacts. Because the plant communities at these types of sites tend to be less diverse, these sites may be the most appropriate models for wetland restoration projects; they provide good examples of the distribution and composition of common native wetland communities, and they could also serve as seed sources for plant material.

MODERATE SIGNIFICANCE

These sites are similar to High significance sites because they do not have a very diverse array of communities and they harbor few rare species. However, these sites are generally in poorer condition than High significance sites; for instance, they have more communities influenced by exotics (e.g. reed canarygrass or redtop) or with simple structure (e.g. cattail monocultures). Although these sites tend to have the greatest level of current or historic on- and offsite impacts, their large size still makes them good habitat for waterfowl and some types of wildlife. Despite having been impacted to some degree, these wetlands still provide important wetland functions besides wildlife habitat, such as moderation of peak flows or removal of compounds and particulates. Adjacent or nearby wetlands that have been degraded are good candidates for mitigation sites, as their restoration would add to the total wetland acreage at the site.

TAXONOMIC CONSIDERATIONS

We generally used Hitchcock et al. (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 *Betula glandulosa*, we used Flora of North America (1997), which provides a more recent treatment of the genus *Betula*.

A common wetland sedge, usually referred to as beaked sedge, was erroneously called *Carex rostrata* in previous studies. In this report, the species is named *Carex utriculata* (Griffiths 1989). Also, *Picea* sp. (spruce) is used to include *Picea engelmannii*, *Picea glauca*, and hybrids (Daubenmire 1974).

RESULTS AND DISCUSSION

COMMUNITIES

Wetland and riparian plant communities found in the study area are displayed in Table 2. Although we followed the classification developed by Hansen et al. (1995), we split into separate plant associations some communities which Hansen et al. (1995) lumped into one community type for management purposes. For instance, we split the *Carex rostrata* habitat type (Hansen et al. 1995) into three plant associations: *Carex utriculata*, *Carex vesicaria*, and *Carex atherodes* Herbaceous Vegetation, and we split the *Betula glandulosa*/*Carex rostrata* habitat type into three plant associations as well: *Betula glandulosa*/*Carex utriculata*, *Betula glandulosa*/*Carex cusickii*, and *Betula glandulosa*/*Carex lasiocarpa* Shrublands. Lumped plant associations were split out for greater clarity in describing vegetation at each site. Plot data describing these plant associations is on file at MTNHP.

Our treatment of communities not described by Hansen et al. (1995) depended on whether they had been previously described elsewhere. For communities that are described in another classification (e.g. *Thuja plicata*/*Lysichiton americanus* [Kunze 1994, Utzig et al. 1986]), we entered community information into ECADS and BCD and added the plant association to the list in Table 2. Undescribed communities which we repeatedly encountered (e.g. *Betula glandulosa*/*Carex cusickii*) were treated in the same manner. Finally, for undescribed communities which we encountered only rarely, we are maintaining a running list of dominance types. Community plot data supporting all communities not described by Hansen et al. (1995) is on file at MTNHP.

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

Scientific Name	Common Name	Rank
PALUSTRINE FORESTED COMMUNITIES, NEEDLE-LEAVED EVERGREEN		
Abies grandis/Athyrium filix-femina	Grand fir/Ladyfern	G2QS2Q
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 sp./Calamagrostis canadensis	Spruce/Bluejoint reedgrass	G3S3
Picea sp./Clintonia uniflora	Spruce/Beadlily	G4S4
Picea sp./Cornus sericea	Spruce/Red osier dogwood	G3G4S3S4
Picea sp./Equisetum arvense	Spruce/Field horsetail	G4S3
Picea sp./Galium triflorum	Spruce/Sweet scented bedstraw	G4S4
Picea sp./Lysichitum americanum	Spruce/Skunkcabbage	G2S2
Thuja plicata/Athyrium filix-femina	Western redcedar/Ladyfern	G3G4S3
Thuja plicata/Gymnocarpium dryopteris	Western redcedar/Oakfern	G3S3
Thuja plicata/Lysichitum americanum	Western redcedar/Skunkcabbage	G4QS2
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/Symphoricarpos albus	Quaking aspen/Common snowberry	G3?S3?
PALUSTRINE SCRUB-SHRUB COMMUNITIES, BROAD-LEAVED DECIDUOUS		
Alnus incana	Mountain alder	G5S5
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 drummondiana	Drummond's willow	G5S5
Salix drummondiana/Calamagrostis canadensis	Drummond's willow/Bluejoint reedgrass	G5S5
Salix drummondiana/Carex utriculata	Drummond's willow/Beaked sedge	G5S5
Salix exigua/Barren	Sandbar willow/Barren	G5QS5
Salix exigua/Mesic graminoid	Sandbar willow/Mesic graminoid	G5QS5
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 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
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 arundinaceae	Reed canarygrass	G5S5
Scirpus acutus	Hardstem bulrush	G5S5
Typha latifolia	Broadleaf cattail	G5S5

Most emergent and scrub-shrub communities in the study area are relatively common and widespread. For instance, some community types, like cattail (*Typha latifolia*), hardstem bulrush (*Scirpus acutus*), reed canarygrass (*Phalaris arundinacea*) are extremely common in the valley bottom, and may in fact be proportionally more common than before white settlers started populating the valley. Cattail is known to increase in abundance in the presence of increased nutrients, especially nitrogen (Neill 1990), and rapid increases of nutrients are possible with fertilizer run-off and inputs of septic effluent to water bodies. The tendency of reed canarygrass to spread aggressively could be related to the native or exotic origin of this species. Merigliano and Lesica (1998) hypothesize that both native and exotic genotypes of reed canarygrass exist in the state, with the exotic genotypes being responsible for the dense monocultures of this grass found in some wetlands.

Other types of native wetland communities are less common and have probably decreased in acreage in the last 150 years. Wet meadow communities in valley bottoms are one such type. At many sites in valley bottoms, temporarily flooded wet meadows have been converted from native grass communities (e.g. tufted hairgrass (*Deschampsia cespitosa*) and bluejoint reedgrass (*Calamagrostis canadensis*)) to communities dominated by exotics like redtop (*Agrostis stolonifera*) and Kentucky bluegrass (*Poa pratensis*).

Although intact native wet meadow communities are still relatively common at higher elevations, valley bottom wet meadows that have been converted to exotics are quite common and represent a restoration challenge.

Another type of wetland/riparian community that has decreased in acreage in the last 150 years is well developed valley bottom cottonwood riparian forest types (Mitsch and Gosselink 1993). Many such communities in the Flathead have been converted to agricultural uses, urban uses, and subdivisions. In addition, many of the mature cottonwood communities that remain have shifted from more palatable understory species (e.g. red-osier dogwood) to less palatable species (e.g. snowberry) as the result of past landuses such as livestock grazing (Hansen et al. 1995). Finally, fluvial processes that lead to the development of cottonwood bottoms, such as flooding and sediment deposition, have been affected by Hungry Horse dam and bank stabilization efforts. As the result of these factors, valley bottom cottonwood forests are relatively uncommon.

Peatlands are a type of wetland in the study area that are uncommon but which probably have not decreased markedly in acreage in Montana (Chadde et al. 1998). MTNHP tracks the occurrence of 28 peatlands in the study area (MTNHP 1999). Several peatlands in the study area were ranked using existing information; these sites were not field inventoried for this project. Peatlands are common in boreal biomes, but environmental conditions that favor peat formation are less common in more southerly latitudes such as the Northern Rocky Mountains. For a more detailed description of the ecology and conservation of peatlands in Montana, see Chadde et al. (1998).

Some community types in the study area appear to be intrinsically rare. For example, swamp forests such as spruce/skunk cabbage (*Picea* sp./*Lysichiton americanus*) or western redcedar/skunk cabbage (*Thuja plicata*/*Lysichiton americanus*) typically cover small acreages in areas with high water tables adjacent to fens, beaver ponds, or at low gradient toeslope seeps (Hansen et al. 1995, Kunze 1994, Utzig et al. 1986). Although some historic swamp forests were probably converted to scrub-shrub wetlands by timber harvest (pers. obs.), the combination of factors that led to the development of this forest type appears uncommon at this latitude. Spruce swamps in Montana share numerous species with boreal forests (Elliott-Fisk 1988), but also have a maritime influence as evidenced by the presence of skunk cabbage, a species more common in low lying areas near the Pacific coast (Hitchcock et al. 1969). In some regions, boreal swamp forests have declined markedly (H rnberg et al. 1998).

Three emergent wetland communities appear to be rare in the study area: Columbia sedge (*Carex aperta*), dulichium (*Dulichium arundinaceum*), and beaked spikerush (*Eleocharis rostellata*) communities. Beaked spikerush is tracked as a rare plant in Montana as well as a rare community; it is a rhizomatous species of alkaline substrates. Dulichium is a rhizomatous peatland species, and it is rare most likely because peatlands are rare. Lastly, Columbia sedge is a rhizomatous species that forms communities in depressional basins that are flooded intermittently. More information on these and some common wetland communities is available in Appendix D.

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).

FORESTED VEGETATION

Riparian and wetland forests in the study area are dominated by both needle-leaved and broad-leaved deciduous vegetation. Islands and alluvial terraces along major rivers like the Flathead, the Swan, and the Stillwater are dominated by stands of black cottonwood (*Populus balsamifera* ssp. *trichocarpa*) and spruce (*Picea* sp.), and western redcedar (*Thuja plicata*) or grand fir (*Abies grandis*) occasionally dominates low elevation tributaries. 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 developed riparian areas. Poorly drained sites on the margins of fens, beaver ponds, or toe slope seeps are usually dominated by wet spruce forests, or by black cottonwood and smaller amounts of spruce, which eventually replaces cottonwood at such sites. Pothole lakes often have a narrow fringe of black cottonwood, quaking aspen (*Populus tremuloides*), and/or western redcedar that quickly gives way to upland forest because of the gradient of the slopes around these sites.

SCRUB-SHRUB VEGETATION

Riparian and wetland shrublands in the study area occur in peatlands, from terraces to the active floodplain of low and high gradient streams and rivers, around beaver ponds, and on the edge of marshes, potholes, and lakes. Drummond's willow (*Salix drummondiana*) is the most common willow species found in the study area; stands of Drummond's willow are found on terraces of low gradient streams and rivers at mid-elevations and higher, and as a mosaic with marsh vegetation in wet meadow complexes (which often have some beaver influence). Bebb's willow (*Salix bebbiana*) and Geyer's willow (*Salix geyeriana*) are much less common as dominant species. Sandbar willow (*Salix exigua*) stands dominate active gravel- and sand-bars. Mountain alder (*Alnus incana*) and red-osier dogwood (*Cornus sericea*) 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.

EMERGENT (HERBACEOUS) VEGETATION

Herbaceous emergent vegetation in the study area is typically found growing in a variety of settings, including peatlands, marshes, potholes, beaver ponds, wet meadows, lake-edges, oxbows, and sloughs. This type of vegetation usually occurs as 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*) are three sedges that can dominate portions of fens and sedge meadows. Marshes in the study area are typically dominated by cattail (*Typha latifolia*), hardstem bulrush (*Scirpus acutus*), beaked sedge (*Carex utriculata*), inflated sedge (*Carex vesicaria*), and awned sedge (*Carex atherodes*). Wet meadows are frequently dominated by exotics like reed canarygrass (*Phalaris arundinacea*) or redtop (*Agrostis stolonifera*), or by native grasses like tufted hairgrass (*Deschampsia cespitosa*) or bluejoint reedgrass (*Calamagrostis canadensis*).

AQUATIC BED VEGETATION

Palustrine, Lacustrine, and Riverine aquatic bed vegetation occurs in littoral (< 2m) and limnetic (> 2m) zones of ponds and lakes or on the bed of slow-moving perennial streams in the study area. An aquatic community classification for western Montana and northern Idaho is in preparation (Pierce, pers. comm.). What follows are some of our observations of aquatic dominance types 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.

RARE PLANTS

Forty-two plant species which are rare in Montana are known from the study area (Table 3; Heidel 1999). Of these, one (*Asplenium trichomanes*) is believed to be extinct, and 6 are only known from historic collections (*Atriplex truncata*, *Carex* tincta, *Cirsium brevistylum*, *Cyperus erythrorhizos*, *Myosotis verna*, *Ranunculus petafidus*). Of the remaining species, most fall generally into one of two groups: species with a boreal or circumboreal distribution which are restricted to peatlands, or aquatic species. Several moonworts (*Botrychium* spp.) also occur in the study area; they tend to be more terrestrial species, but can occur in riparian forests.

Table 3. Rare flora of Flathead wetlands and their conservation rank (* indicates an historic occurrence of a species that also occurs elsewhere in the state).

Scientific Name	Common Name	Rank
Amerorchis rotundifolia	Round-leaved Orchis	G5S2S3
Asplenium trichomanes	Maidenhair Spleenwort	G5SX
Atriplex truncata	Wedge-leaved Saltbush	G5SH
Bidens beckii	Beck Water-marigold	G4S2
Botrychium campestre	Prairie Dunewort	G3S1
Botrychium crenulatum	Wavy Moonwort	G3S2
Botrychium minganense	Mingan Island Moonwort	G4S3
Botrychium montanum	Mountain Moonwort	G3S2
Botrychium paradoxum	Peculiar Moonwort	G2S2
Brasenia schreberi	Watershield	G5S2
Carex chordorrhiza	Creeping Sedge	G5S2
Carex comosa	Bristly Sedge	G5S1
Carex livida	Pale Sedge	G5S3
Carex paupercula	Poor Sedge	G5S3
Carex prairea	Prairie Sedge	G5?S1

Carex synchocephala	Many-headed Sedge	G4S1
*Carex tincta**	Slender Sedge	G4S1
*Cirsium brevistylum**	Short-styled Thistle	G4S1
Cyperus erythrorhizos	Red-root Flatsedge	G5SH
Cypripedium parviflorum	Small Yellow Lady's-slipper	G5S3
Cypripedium passerinum	Sparrow's Egg Lady's-slipper	G4G5S2
Drosera anglica	English Sundew	G5S2
Dryopteris cristata	Buckler Fern	G5S2
Eleocharis rostellata	Beaked Spikerush	G5S2
Epipactis gigantea	Giant Helleborine	G4S2
Eriophorum gracile	Slender Cottongrass	G5S2
Heteranthera dubia	Water Star-grass	G5S1
Howellia aquatilis	Water Howellia	G2S2
Liparis loeselii	Loesel's Twayblade	G5S1
*Myosotis verna**	Early Forget-Me-Not	G5S1
Najas guadalupensis	Guadalupe Water-nymph	G5S1
Nymphaea tetragona	Pygmy Waterlily	G5S1
Ophioglossum pusillum	Adder's Tongue	G5S2
Petasites frigidus v. nivalis	Palmate-leaved Coltsfoot	G5T?S1
Potamogeton obtusifolius	Blunt-leaved Pondweed	G5S2
*Ranunculus petafidus**	Northern Buttercup	G5S1
Scheuchzeria palustris	Podgrass	G5S2
Scirpus cespitosus	Tufted Club-rush	G5S2
Scirpus subterminalis	Water Bulrush	G4G5S2
Utricularia intermedia	Flat-leaved Bladderwort	G5S1
Viola renifolia	Kidney-leaved violet	G5S3
Wolffia columbiana	Columbia Water-meal	G5S2

RARE ANIMALS

The watersheds included in this inventory provide wetland habitat for 37 animal species of special concern within Montana (Table 4). Two of these (Yellowstone Cutthroat Trout and Snapping Turtle) are not native to the area. Yellowstone Cutthroat are apparently restricted to Echo Lake in the Flathead Lake watershed. There is no evidence that Snapping Turtles are reproducing where they have been introduced near Kalispell, also in the Flathead Lake watershed. The remaining 35 species native to the watersheds use wetland habitats for breeding and foraging to various degrees, or pass through them during migration.

Non-breeding species that utilize wetlands in these watersheds for foraging or during migration (and more local movements) include American White Pelican, Trumpeter Swan, Harlequin Duck, Black-necked Stilt, Franklin's Gull, Forster's Tern, and all of the mammals except Northern Bog Lemming. All of these bird species breed elsewhere in Montana (Harlequin Ducks probably bred in the recent past within the inventory area and still breed in several adjacent watersheds). Species like the Gray Wolf, Grizzly Bear, North American Wolverine and Lynx may use riparian areas, especially in the Swan and Stillwater watersheds, during seasonal and annual movements but are not especially dependent upon them.

Table 4. Rare animals associated with Flathead wetlands and their conservation rank.

Common Name	Scientific Name	Global Rank	State Rank
Fish			
Shorthead Sculpin	*Cottus confusus*	G5	S3
Yellowstone Cutthroat Trout (I)	*Oncorhynchus clarki bouvieri*	G4T2	S2
Bull Trout	*Salvelinus confluentus*	G3	S3
Montana Arctic Grayling	*Thymallus arcticus montanus*	G5T2Q	S1
Amphibians			
Tailed Frog	*Ascaphus truei*	G4	S4
Western Toad	*Bufo boreas*	G4	S3S4
Northern Leopard Frog	*Rana pipiens*	G5	S3S4
Reptiles			
Snapping Turtle (I)	*Chelydra serpentina*	G5	S3
Birds			
Common Loon	*Gavia immer*	G5	S1S2B,SZN
American White Pelican	*Pelecanus erythrorhynchos*	G3	S2B,SZN
Great Blue Heron	*Ardea herodias*	G5	S4B,SZN
Black-crowned Night-heron	*Nycticorax nycticorax*	G5	S2S3B,SZN
White-faced Ibis	*Plegadis chihi*	G5	S1B,SZN
Trumpeter Swan	*Cygnus buccinator*	G4	S2B,SZN
Harlequin Duck	*Histrionicus histrionicus*	G4	S2B,SZN
Bald Eagle	*Haliaeetus leucocephalus*	G4	S3B,S3N
Peregrine Falcon	*Falco peregrinus*	G4	S1S2B,SZN
Black-necked Stilt	*Himantopus mexicanus*	G5	S2B,SZN
Franklin’s Gull	*Larus pipixcan*	G4G5	S3B,SZN
Caspian Tern	*Sterna caspia*	G5	S2B,SZN
Common Tern	*Sterna hirundo*	G5	S3B,SZN
Forster’s Tern	*Sterna forsteri*	G5	S2B,SZN
Black Tern	*Chilodonias niger*	G4	S3B,SZN
Great Grey Owl	*Strix nebulosa*	G5	S3
Western Screech-owl	*Otus kennicottii*	G5	S3S4
Black Swift	*Cypseloides niger*	G4	S3B,SZN
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*	G3T3	S1S2
Fisher	*Martes pennanti*	G5	S2
North American Wolverine	*Gulo gulo luscus*	G4T4	S2
Lynx	*Felis lynx*	G5	S2
Damselflies			
Subarctic bluet	*Coenagrion interrogatum*	G5	S1S2
Last, best damselfly	*Enallagama optimolocus*	G1G3	S1S3
Mollusks			
Flathead pondsnail	*Stagnicola elrodi*	G1	S1
Largemouth pondsnail	*Stagnicola elrodiana*	G1	S1

Townsend's Big-eared Bat breeds and hibernates in caves and abandoned mines, but often forages in forest openings over streams and ponds where insects are abundant.

Most species are relatively widespread in these watersheds. Several species, however, are quite restricted. There are fewer than 6 sites (ponds or sloughs) in the Flathead Lake watershed where Northern Leopard Frogs still occur, and the Northern Bog Lemming is known only from one area (several fens) along Sunday Creek in the Stillwater watershed. Fisher were extirpated from Montana in the 1920's and successfully reintroduced at three release sites in the late 1950's; one of the reintroduction sites was in the Swan watershed near Holland Lake. Current distribution of Fisher is poorly known, but typically the species is associated with mature spruce-fir and cedar-hemlock forests, sometimes with wetland and riparian habitat. Both damselflies (Subarctic bluet and Last,best damselfly) are reported from one location each in the Whitefish area of the Stillwater watershed (at Whitefish Lake and along the Whitefish River, respectively). The Flathead pondsnail is reported only from Flathead Lake in shallow muddy near-shore habitats. The Largemouth pondsnail is reported from Swan Lake in the Swan watershed and Upper Whitefish Lake in the Stillwater watershed; this species occurs most often on shallow rocky substrates.

Results of faunal surveys conducted as part of this wetland inventory are presented in the site descriptions in Appendix E and in Appendix F, which summarizes the results of the carabid beetle surveys in the study area.

CONSERVATION PRIORITIES FOR ECOLOGICALLY SIGNIFICANT WETLANDS

Sixty-three wetlands in the study area were inventoried during1998, and summary information about 54 wetland sites is presented in Table 5. The original 63 wetlands were reduced to 54 wetlands for several reasons. In several cases, wetlands located near each other were lumped together due to their proximity and treated as a "complex". A few wetlands that were visited are not reported here because they were too degraded and did not qualify in any of the ranking categories. Furthermore, several wetlands are included that were not field-inventoried; ample information to describe and rank these sites was available from a variety of sources including existing Research Natural Area and Botanical Special Interest Area establishment records, unpublished reports from previous field inventories, peatland records from MTNHP's Biological and Conservation Data System, and Chadde et al. (1998).

Several previous efforts to identify significant wetlands have occurred in the study area. One study identified ecologically significant watersheds, river-lake corridors, and wetland complexes of the Swan Valley using existing information sources (Frissell et al. 1995); the authors identified large patches of the Swan Valley landscape which contribute significantly to biodiversity in the watershed. The present MTNHP wetland inventory further refines and complements this previous work by providing site-specific field inventory data gathered at wetlands which nest within the wetland complexes identified by Frissell et al.

Table 5. Site rankings, management status, and ownership of Flathead wetlands inventoried in 1998.

Site	Management Status*	Ownership**
WETLANDS WITH OUTSTANDING SIGNIFICANCE		
1. Ambrose Fen	-	Pri
2. Antice Creek	-	Stillwater
3. Glacier Slough	-	FNF
4. Gregg Creek Fen	-	FNF
5. Hidden Lake BSIA	Partially within BSIA	KNF, Pri, MT
6. Lazy Creek Fen	-	Cpt
7. Lost Creek Fen	Candidate BSIA	FNF
8. Molly Lake	-	Stillwater
9. Plum Creek Fen	-	Cpt
10. Porcupine Creek Complex	-	Swan, Cpt, FNF
11. Swan River Delta	TNC Preserve, NWR	FNF, USFWS,TNC
12. Swan River RNA	RNA	FNF
WETLANDS WITH VERY HIGH SIGNIFICANCE		
13. Condon Creek BSIA	BSIA	FNF
14. Flathead River Islands	Partially within Natural Area & State Game Preserve	MT, Pri, FNF
15. Glacier/Windfall Kettle Complex	-	FNF, Cpt
16. Lewis Meadow	-	Cpt
17. McCabe Meadow	-	Stillwater
18. Mud Lake	-	Pri, MT
19. Napa Creek Fen	-	Swan
20. North Sanko Creek Fen	-	FNF
21. Point Pleasant Fen	-	Swan
22. Sunday Creek Bottom	-	Pri, KNF
23. Woods-Beaver-Rainbow Lakes Complex	-	Stillwater, Cpt, Pri
24. Woodward Meadows	-	Pri, Swan, Cpt
WETLANDS WITH HIGH SIGNIFICANCE		
25. Bear Paw Meadow	-	Stillwater
26. Blanchard Lake	Fishing Access	Pri, FWP
27. Bowen Creek Fen	-	FNF
28. Crystal Fen	Wilderness	FNF
29. Foothills Meadow	-	Swan
30. Logan Creek Meadow	-	FNF
31. Lower Lazy Creek Bottom	-	Stillwater, Cpt
32. Ninemile Fen	-	FNF
33. Round Meadow-Meadow Lake	-	Cpt, Stillwater
34. Safe Harbor Marsh	TNC Preserve	TNC
35. Sheppard Creek Fen	-	FNF
36. Skunk Meadow	-	Stillwater
37. South Sanko Creek Fen	-	FNF
38. Swift Creek Meadow	-	Cpt
39. Whitefish Spruce Swamp	CE	Pri
WETLANDS WITH MODERATE SIGNIFICANCE		
40. Blasdel WPA	WPA	USFWS
41. Bootjack Meadows	-	Cpt

42. Egan Slough	CE	Pri
43. Good Creek Marsh	-	FNF
44. Good Creek Tributary	-	Stillwater
45. Lake House Meadow	-	Stillwater
46. McWennegar Slough	-	Pri
47. Point of Rocks	-	KNF, Pri, Stillwater
48. Ritsenburg Meadow	-	Stillwater
49. Smith Lake WPA	Partially within WPA	USFWS, Pri
50. Squeezer Meadows	-	Cpt, Swan
51. Upper West Fork Lazy Creek	-	Cpt
52. Van Lake	-	Swan, Cpt
53. Wolf Creek Slough	CE	Pri
54. Woods Lake	-	Stillwater

***Management Status:** RNA = designated Research Natural Area; BSIA = designated Botanical Special Interest Area; TNC = The Nature Conservancy; NWR = National Wildlife Refuge; WPA = Waterfowl Production Area; CE = conservation easement. ****Ownership**: FNF = Flathead National Forest, KNF = Kootenai National Forest, USFWS = Fish and Wildlife Service, Stillwater = Stillwater State Forest, Swan = Swan River State Forest, FWP = MT Fish, Wildlife and Parks, MT = undesignated state land, Cpt = corporate timber land, Pri = private.

(1995). Two other wetland inventories have been conducted which emphasized identification of wetlands with significant waterfowl production capabilities (King 1975, Wittmier 1986). Both studies partially overlap the present study area, and they both identify priority wetlands for acquisition and conservation easements, but they differ from MTNHP's current inventory because they emphasize the wetlands' value as waterfowl habitat rather than presence of intact native wetland plant communities.

Detailed information about wetland sites can be found in Appendix E, with highlights summarized below. A map showing general locations of wetland sites can be found in Figure 1, with more detailed locations shown in Figures 3A-3E. Users of this wetland inventory report should note that about ¼ of the wetlands are on private land, and permission from landowners is needed before accessing any private lands.

OUTSTANDING SIGNIFICANCE

Sites in this category 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. For example, the Porcupine Creek Complex features a spruce swamp, marsh communities, bog birch carr, willow stands, rich fen communities, beaver ponds, and floating mats. Most of the sites are quite large, and all but Glacier Slough have some degree of peatland development. Most of the fens at these sites have concentrations of rare plant species.

These wetlands tend to be in excellent condition, and the surrounding uplands generally have minimal human impacts. The two wetlands that are closest to being exceptions are Swan River Delta and Ambrose Fen. The former has some large reed canarygrass stands, old ditches which were intended to drain the site, and roads on three sides; however, there are no dams on the Swan River above this site, thus leaving intact many of the fluvial processes which helped form the site. Ambrose Fen, in spite of some grazing impacts and a major highway nearby, is one of the largest and most diverse fens west of the continental divide in Montana.

Several of these wetlands already have some conservation status. Swan River Research Natural Area (RNA) and Hidden Lake Botanical Special Interest Area (BSIA) are protected by their special Forest Service designations. Part of the Swan River Delta is a U.S. Fish and Wildlife Service National Wildlife Refuge, and part is Nature Conservancy Preserve. Lost Creek Fen is a candidate BSIA, but none of the other sites have any protected status. Glacier Slough is an outstanding example of a montane marsh with intact wet meadow communities and largely intact upland forests in the drainage. It qualifies for Natural Area designation, as do the state owned sites. The remaining Outstanding quality wetlands are in mixed ownership or privately owned. Conservation of these sites will require collaborative efforts between the private parties, land trusts, and/or public agencies.

VERY HIGH SIGNIFICANCE

Very High significance wetlands share some qualities of Outstanding significance wetlands, such as large size, a diversity of wetland plant communities, or concentrations of rare species. They are generally distinguished from the former category by having a greater degree of human impacts, either on- or off-site. For example, Woodward Meadows and Point Pleasant Fen are both composed of a diversity of wetland plant communities that are in good condition (e.g. few exotics, no grazing impacts, etc.). However, the conditions in the uplands next to the two sites have been affected by road-building and timber harvest. Similarly, Flathead River Islands, which has some of the best-developed examples of valley bottom riparian forest in the study area, is surrounded by urban and agricultural landuses. Two sites, Condon Creek BSIA and Glacier/Windfall Kettle Complex, are outstanding examples of glacial pothole ponds in a forested setting.

Minor changes in management practices at some of these sites could put them on a trajectory to become Outstanding significance wetlands. For example, changing the grazing management practices at Sunday Creek Bottom could improve the condition of the willow community at the site and stabilize streambanks. Alternatively, leaving larger buffers between timber harvest units and wetlands like Lewis Meadow would lessen changes to the hydrology of such sites and reduce potential inputs of sediments. Only Owen Sowerwine Natural Area (part of the Flathead River Islands) and Condon Creek BSIA have any special conservation status.

HIGH SIGNIFICANCE

Wetlands in this category differ from the previous category chiefly by having a lower diversity of wetland plant communities and wetland features; these wetlands are also more numerous than those in the previous categories. For example, Skunk Meadow only has some willow and marsh communities, rather than the mix of communities noted above for the Porcupine Creek Complex. The High significance peatlands also tend to be smaller and less diverse than peatlands in the previous categories. One site, Round Meadow-Meadow Lake, has some large areas of wet meadow, although some parts have been invaded by reed canarygrass. The condition of these wetlands and the surrounding uplands tends to be similar to the previous category.

Only a few of these sites are under conservation management, one as a Nature Conservancy Preserve (Safe Harbor Marsh) and another with a conservation easement (Whitefish Spruce Swamp). Because the plant communities at these types of sites tend to be less diverse, these sites may be the most appropriate models for wetland restoration projects. They provide good examples of the distribution and composition of common native wetland communities, and they could also serve as seed sources for wetland plant. Some of the sites, which have had some hydrologic modification (like Round Meadow-Meadow Lake), could serve as potential mitigation sites.

MODERATE SIGNIFICANCE

Wetlands in this category range from small to large, but they all tend to be dominated by just a few wetland plant communities, and very few sites support populations of rare plants or animals. Moderate significance sites tend to be less functionally intact than any of the previous categories, either because of historic landuses, existing impacts, or both. A few moderate significance sites are in excellent condition, but are quite small; while such wetlands may be functionally intact, their priority for conservation is still relatively low compared to large sites that are in good condition. Despite some of their impacts, these sites do provide some good habitat for wildlife and waterfowl.

Like High significance sites, Moderate significance sites are relatively common. Of the Moderate quality sites we inventoried, only four are under conservation management, two as Waterfowl Production Areas and two with conservation easements. Many of these sites have potential for restoration and/or as mitigation sites due to past use by domestic animals or because of alterations of hydrologic regimes. Restoration may be as simple as fencing and allowing native vegetation to recover. Revegetation, channel stabilization, weed control, and hydrologic restoration may be necessary and should be evaluated on a site specific basis.

WETLANDS NOT INVENTORIED IN 1998

Additional wetlands in the study area are present that were not surveyed as part of this wetland inventory project. Readers should not infer that wetlands that were not inventoried are in poor condition or have low functional integrity. The 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 applications. Therefore, many wetlands were not inventoried because they did not meet the selection criteria. However, many of the unsurveyed wetlands do provide important wetland functions and are quite valuable for this reason alone.

The majority of the wetland sites in the study area which were not inventoried as part of this project are High and Moderate significance wetlands. Many of these sites 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 single plant communities. The High and Moderate significance sites that we did visit are a fairly representative sample of these types of wetlands. Plant community diversity, presence of rare species, and wetland size and condition information can be summarized for unsurveyed or data-poor wetlands by consulting NWI maps, requesting rare plant and animal occurrence data from MTNHP, and on-site evaluation of impacts.

We are relatively confident that all Outstanding significance wetlands have been identified in the study area and that few to none of the unsurveyed wetlands fall into this category. Our confidence is based on two reasons: 1) the depth and breadth of the locally knowledgeable individuals who were contacted during the inventory, and 2) using NWI maps and aerial photos, we identified and inspected large wetlands which had not been mentioned by the locally knowledgeable individuals.

This wetland inventory identifies and prioritizes certain types of wetlands and wetland functions and processes, but some other types of wetlands and processes were underemphasized during the inventory. Because of the emphasis we placed on large sites, some smaller sites, like small spring/seeps with unique annual plant communities (J. DeSanto, pers. comm.), were not inventoried. Furthermore, some fluvial processes (like deposition, channel migration, and flooding) occur at a larger scale than was targeted by this project. Riparian cottonwood communities are inextricably tied to such processes, and these communities cannot be conserved solely by protecting existing patches of mature cottonwood forest. 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 intent of this wetland inventory project is to provide information that will assist in the conservation of wetland diversity and quality. The following points illustrate ways in which the information from this wetland inventory can be used:

- *Provide a prioritized list of wetlands for conservation*

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

- *Identify irreplaceable wetlands*

This list of significant wetland sites identifies wetlands that are essentially irreplaceable. Some of the Outstanding and Very High significance sites contain wetland features like peatlands and spruce swamps whose loss could not realistically be mitigated.

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

High ranking sites on Forest Service lands may be good candidates for Research Natural Area or Botanical Special Interest Area designation. Likewise, similar sites on state land merit conservation management and/or designation as Natural Areas.

- *Identify reference wetlands*

This list can be used as a tool 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 restoration projects, or as seed sources for plant materials. Reference wetlands are also extremely useful for inferring impacts of landuse activities.

- *Identify potential mitigation sites*

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

- *Provide context for wetland permit review*

For watershed-based assessments of wetland resources, 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.

- *Provide information for landuse decisions*

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

- *Assist HGM modeling efforts*

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

FUTURE NEEDS

With the wetland inventory in the Stillwater, Swan, and Flathead Lake drainages now complete, MTNHP sees two needs for improving Montana wetlands information systems in the future. First, there is tremendous need for completing the National Wetland Inventory for Montana. NWI provides very valuable information on the distribution, size, and types of wetlands found across the state. Second, MTNHP recommends continuing efforts to identify and prioritize ecologically significant wetlands on a watershed basis for other priority watersheds in the state. Appendix G contains a preliminary list of Montana watersheds with a preliminary prioritization by biodiversity value and level of threat that could 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://nris.state.mt.us/wis/wis1.html). Hard copy maps are available for inspection at U.S.F.W.S. 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 wetland community information
- Information on ecologically significant wetland sites not currently under conservation management
- Information on ecologically significant wetland sites currently protected

For more information, please contact the MTNHP Information Manager at (406) 444-3009, or via MTNHP's website at http://nris.mt.gov/mtnhp/. In the coming months, selected wetland information from the 1998 inventory will also become available via the MTNHP website.

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Appendix B – Field Form

MTNHP WETLAND SURVEY FORM GENERAL SITE/PLOT DATA:

IDENTIFICATION AND LOCATION: MANUAL: ________ UNITS: __ft. __m

EXAMINER(S): ____________________________________ Date. _______________ EOCODE:____________

PLOT NO. __

PLOT NO. __

SITE NAME: ____ STATE: ______ COUNTY: ______________

PURP: ____ PREC: ____ QUAD NAME: _____________________________________ QUAD CODE: __ __ __ __ __ __ __

GPS REF. NO.:__________________ SITE'S LEGAL LOC.: T _ _; R _ _; S _ _; ____1/4S; ____4/4; ____4/4/4

OWNERSHIP (circle): Private (Name:__________________), U. S. Forest Service, BLM, Tribal, Bur. of Rec. , State MT, ____________________

PLOT TYPES: __ __ __ __ __ __ PLOT SIZE: ______ RADIUS/LN; _____WIDTH____SURVEY: ___ ___ ___ ___ ___ ___

PHOTOGRAPHY: (type, azimuth, etc.) ____

____

____

DIRECTIONS: ____

____

GENERAL WETLAND FEATURES

			Cowardin Class		
HGM class	System/subsystem	Class/subclass	Water regime	Water/soil chem.	Dominance type

WETLAND SIZE (ac)______OUTLET____________________________________INLET__________________________

PRIMARY WATER SOURCE: SURFACE FLOW (perennial/intermittent stream, overland flow), PPT., SPRING/SEEP, GROUNDWATER, OTHER____

PRIMARY WATER OUTFLOW: SURFACE FLOW (perennial/intermittent stream, overland flow), evapotranspir., GROUNDWATER, OTHER____

FLOODING/PONDING EVIDENCE: ________ (A aerial photo, B banded veg. C rocks w/ w/o carbonate coat, D sediment deposition, L rocks w/ and w/o lichen, R herb wrack lines, S water/silt stains) ___________________________________

INUNDATION PERIOD (deepest zone present): Permanently flooded (52 wks.), Intermittently exposed (52 wks.), Semipermanently flooded (13-51 wks), seasonally flooded (2-13 wks), Temporary (<2 wks), None ____

AVG. DEPTH STANDING/PONDED WATER (m)____

BANK STABILITY: Rills, Gully Cutting, Headcuts, Slumps, Undercut Bank, Stable, Other______________________________:

% OF BANK W/ DEEP BINDING ROOTMASS____________________________

BEAVER EVIDENCE (Y, N, describe)____

____

RIVERINE

GAUGE DATA___________________________________VALLEY FLOOR GRADIENT: _______

FLOODPLAIN WIDTH: (m, ft.) _________ RIPARIAN/WETLAND ZONE WIDTH RANGE (m,ft)_____________________

BED MATERIAL(Bedrock, boulder, cobble, gravel, sand, silt/clay): _______________

BANKFULL WIDTH: __________________________ BANKFULL DEPTH: __________________________________

FLOODPRONE WIDTH (width at 2x bankfull) ____

CHANNEL ENTRENCH. (width at 2x bankfull/bankfull width): ____

ROSGEN STREAM TYPES ____

SILT/SEDIMENT DEPOSITION(buried root collars,natural levees): __________________________COVER (%), _______ DEPTH (cm or in.)

EVIDENCE OF SURFACE INFLOWS FROM UPLAND (rills, gullys, lateral tribs that don't connect to channel)______________________

EVIDENCE OF SUBSURFACE FLOW (seeps at wetland edge, veg growing during dry season, wetland occurs at toe of slope, upwelling evident)

____

EVIDENCE OF BRAIDED CHANNEL (Y, N) ________ POINT BARS REVEGETATING? (Y, N, NA)________

COARSE WOODY DEBRIS SOURCES PRESENT NEARBY IN SYSTEM (Y, N, NA)________

GENERAL SITE DESCRIPTION (position in landscape, communties present [e.g. carr, marsh, fen, etc.],adjacent c.ts., etc.):

KEY ENVIRONMENTAL FACTORS(driving factors like seasonal flooding, wind, soil, hydrology, geomorphology, beaver activity, etc)

LANDUSE HISTORY (past landuse on site)

LANDUSE COMMENTS (current landuse on site, like recreation, dumping, grazing, agriculture, mining, ROW's, improvements, irrigation, etc)

OFFSITE USES (e.g. farming, logging, grazing, dumping, watershed diversion, etc)

EXOTICS

INFO NEEDS

MANAGEMENT NEEDS

KNOWN RARE PLANT/ANIMAL EO'S (SPP., EO #)

FAUNA OBSERVATIONS

OCULAR PLANT SPECIES DATA:

Plot number: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ Date: _____________ Site: ____________________________

Min. cover value:____ GROUND COVER (classes): ___ SOIL+___ GRAVEL+___ ROCK + ___ LITTER + ___WOOD + ___ MOSS + ___ BASAL VEG. + ___ OTHER=100% Plant IDL ______ PNC: ________________________

TREES: TOTAL CV. _____ MEAN HT. ______

SPECIES IDENTIFICATION* HT. CCC[1,2]

T 1 _ _ _ _____ _ _ _ ________/__ [__/ __]
T 2 _ _ _ _____ _ _ _ ________/__ [__/ __]
T 3 _ _ _ _____ _ _ _ ________/__ [__/ __]
T 4 _ _ _ _____ _ _ _ ________/__ [__/ __]
T 5 _ _ _ _____ _ _ _ ________/__ [__/ __]
T 6 _ _ _ _____ _ _ _ ________/__ [__/ __]
T 7 _ _ _ _____ _ _ _ ________/__ [__/ __]
T 8 _ _ _ _____ _ _ _ ________/__ [__/ __]

SHRUBS: TOTAL CV. _____ MEAN HT. ______

S 1 _ _ _ _______ _ _ _ _________/___[___]
S 2 _ _ _ _______ _ _ _ _________/___[___]
S 3 _ _ _ _______ _ _ _ _________/___[___]
S 4 _ _ _ _______ _ _ _ _________/___[___]
S 5 _ _ _ _______ _ _ _ _________/___[___]
S 6 _ _ _ _______ _ _ _ _________/___[___]
S 7 _ _ _ _______ _ _ _ _________/___[___]
S 8 _ _ _ _______ _ _ _ _________/___[___]
S 9 _ _ _ _______ _ _ _ _________/___[___]
S10 _ _ _ _______ _ _ _ _________/___[___]
S11 _ _ _ _______ _ _ _ _________/___[___]
S12 _ _ _ _______ _ _ _ _________/___[___]
S13 _ _ _ _______ _ _ _ _________/___[___]
S14 _ _ _ _______ _ _ _ _________/___[___]

GRAMINOIDS: TOT. CV. ____ MEAN HT. ______

G 1 _ _ _ _______ _ _ _ _________/___[___]
G 2 _ _ _ _______ _ _ _ _________/___[___]
G 3 _ _ _ _______ _ _ _ _________/___[___]
G 4 _ _ _ _______ _ _ _ _________/___[___]
G 5 _ _ _ _______ _ _ _ _________/___[___]
G 6 _ _ _ _______ _ _ _ _________/___[___]
G 7 _ _ _ _______ _ _ _ _________/___[___]
G 8 _ _ _ _______ _ _ _ _________/___[___]
G 9 _ _ _ _______ _ _ _ _________/___[___]
G10 _ _ _ _______ _ _ _ _________/___[___]
G11 _ _ _ _______ _ _ _ _________/___[___]
G12 _ _ _ _______ _ _ _ _________/___[___]
G13 _ _ _ _______ _ _ _ _________/___[___]
G14 _ _ _ _______ _ _ _ _________/___[___]
G15 _ _ _ _______ _ _ _ _________/___[___]
G16 _ _ _ _______ _ _ _ _________/___[___]
G17 _ _ _ _______ _ _ _ _________/___[___]
G18 _ _ _ _______ _ _ _ _________/___[___]

FORBS: TOTAL CV. _____ MEAN HT. _____

SPECIES IDENTIFICATION HT. CCC

F 1 _ _ _ ________ _ _ _ ___________/___[___]
F 2 _ _ _ ________ _ _ _ ___________/___[___]
F 3 _ _ _ ________ _ _ _ ___________/___[___]
F 4 _ _ _ ________ _ _ _ ___________/___[___]
F 5 _ _ _ ________ _ _ _ ___________/___[___]
F 6 _ _ _ ________ _ _ _ ___________/___[___]
F 7 _ _ _ ________ _ _ _ ___________/___[___]
F 8 _ _ _ ________ _ _ _ ___________/___[___]
F 9 _ _ _ ________ _ _ _ ___________/___[___]
F10 _ _ _ ________ _ _ _ ___________/___[___]
F11 _ _ _ ________ _ _ _ ___________/___[___]
F12 _ _ _ ________ _ _ _ ___________/___[___]
F13 _ _ _ ________ _ _ _ ___________/___[___]
F14 _ _ _ ________ _ _ _ ___________/___[___]
F15 _ _ _ ________ _ _ _ ___________/___[___]
F16 _ _ _ ________ _ _ _ ___________/___[___]
F17 _ _ _ ________ _ _ _ ___________/___[___]
F18 _ _ _ ________ _ _ _ ___________/___[___]
F19 _ _ _ ________ _ _ _ ___________/___[___]
F20 _ _ _ ________ _ _ _ ___________/___[___]
F21 _ _ _ ________ _ _ _ ___________/___[___]
F22 _ _ _ ________ _ _ _ ___________/___[___]
F23 _ _ _ ________ _ _ _ ___________/___[___]
F24 _ _ _ ________ _ _ _ ___________/___[___]
F25 _ _ _ ________ _ _ _ ___________/___[___]
F26 _ _ _ ________ _ _ _ ___________/___[___]
F27 _ _ _ ________ _ _ _ ___________/___[___]
F28 _ _ _ ________ _ _ _ ___________/___[___]
F29 _ _ _ ________ _ _ _ ___________/___[___]
F30 _ _ _ ________ _ _ _ ___________/___[___]
F31 _ _ _ ________ _ _ _ ___________/___[___]
F32 _ _ _ ________ _ _ _ ___________/___[___]
F33 _ _ _ ________ _ _ _ ___________/___[___]
F34 _ _ _ ________ _ _ _ ___________/___[___]
F35 _ _ _ ________ _ _ _ ___________/___[___]
F36 _ _ _ ________ _ _ _ ___________/___[___]

FERNS AND ALLIED FORMS:

TOTAL CV.____ MEAN HT. ____ MED. CV.____

F 1 _ _ _ ________ _ _ _ ___________/___[___]
F 2 _ _ _ ________ _ _ _ ___________/___[___]
F 3 _ _ _ ________ _ _ _ ___________/___[___]
F 4 _ _ _ ________ _ _ _ ___________/___[___]
F 5 _ _ _ ________ _ _ _ ___________/___[___]
F 6 _ _ _ ________ _ _ _ ___________/___[___]

BRYOIDS & LICHENS: TOTAL CV. ______

B 1___________________________/ __ [______] B 2___________________________/ __ [______]
B 3___________________________/ __ [______] B 4___________________________/ __ [______]
B 5___________________________/ __ [______] B 6___________________________/ __ [______]
B 7___________________________/ __ [______] B 8___________________________/ __ [______]
L 1___________________________/ __ [______] L 2___________________________/ __ [______]
L 3___________________________/ __ [______] L 4___________________________/ __ [______]

COMMENTS(EODATA)____
____

PARENT MAT.:__________________ LANDFORM: ____________ PLOT POSITION: _______ SLOPE SHAPE:______

ASPECT(°): __ __ __ SLOPE (%): __ __ __ ELEVATION: __ __ __ __ __ EROSION POT.: _______ EROS. TYPE: _______

HORIZON ANGLE: N ____; E ____; S ____; W ____ LEGAL: T_______ R_______ S______ 1/4______ 4/4______ 4/4/4____

[2] Tree canopy cover for mature (> 5 in. dbh) and seedlings/saplings (< 5 in. dbh.)

[1] Canopy Cover Classes (Percent Values): 0; 1 = >0, <1; 3 =>1, <5; 10= >5,<15; 20= >15, <25; 30= >25, <35; 40= >35, <45; 50= >45, <55; 60= >55, <65; 70= >65, <75; 80= >75, <85; 90= >85, <95; 98 = >95, <100

*First three letters of genus and species; write complete species name if confusion possible within lifeform

WETLAND PLANT COMMUNITIES

Site Name:________________________________ Date: Mo.____ Day____ Yr.____ Investigator(s): ____________________
Open Water (lacking emergents,% of total): __ __ Bottom Substrate: ______________________ Wetland ditched or tiled? If yes, into which zone (DM, SM, WM, LP) _________________Adjacent Vegetation: ____
pH:_ _ ._ _, Conductivity (μS/cm):_ _ _ _, Temp (°C):____, $CaCO_3$_______, Sulfide odor __Y__N; Root channels __Y__N
Hydrology comments: ____

____

____

VEGETATION DESCRIPTION:(see Hansen et al. [1995] for wetland/riparian keys; use six-letter acronyms, cc = canopy cover with standard ECODATA classes)

Plant Associations	Layer 1 Species (cc)	Layer 2 Species (cc)	Layer 3 Species (cc)	Layer 4 Species (cc)	Exotics/Weeds	Position rel. to adjacent comm./water depth	%AA
1)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
2)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
3)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
4)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
5)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
6)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
7)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
8)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
9)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
10)_ _ _ _ _ _/_ _ _ _ _ _ NHMTECW__99__ ____	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _( )_ _ _ _ _ _( ) _ _ _ _ _ _( )_ _ _ _ _ _( )		
						%open water	

Comments____

____

____

____

HYDROLOGICAL AND PEDOLOGICAL VARIABLES:

Comm. type #	Depth of surface water (cm)	Depth to free water (cm)	Depth to saturated soil (cm)	Depth to impermeable layer (cm)	O horizon thickness (cm)	A horizon thickness (cm)	A horizon hue/chroma	Texture	% of AA
1)									
2)									
3)									
4)									
5)									
6)									
7)									
8)									
9)									
10)									
LowPrairie									
WetMeadow									
ShllowMarsh									
DeepMarsh									
Upland								(A hor.)	

Comments: ____

____

Appendix C – G/S Rank Guidelines

For state ranks, just 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).

E Exotic

CRITERIA 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;

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 D – COMMUNITY CHARACTERIZATION ABSTRACTS

Characterization Abstracts for Plant Communities in the Stillwater, Swan, and Flathead Lake Drainages

BETULA GLANDULOSA/CAREX UTRICULATA **(BOG BIRCH/BEAKED SEDGE) Herbaceous Vegetation**

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). Carex utriculata was erroneously referred to as Carex rostrata in earlier taxonomic and ecological studies (Griffiths 1989). A similar community with an understory dominated by Deschampsia cespitosa was described by Pierce (1986). Other communities with Betula glandulosa overstories and Carex lasiocarpa understories exist in northern Idaho and northwest Montana (Jankovsky-Jones 1997, Chadde et al. 1998, Greenlee 1999). Betula glandulosa/Carex cusickii plant associations also exist in northwest Montana (Greenlee 1999).

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 wet alluvial 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).

VEGETATION 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 communites 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 lasicocarpa, Pseudotsuga menziesii, and Pinus ponderosa series, depending on elevation and aspect (Hansen et al. 1995).

CONSERVATION RANK

G4?S4

EDITION/AUTHOR

95-09-05/L. Williams

CAREX BUXBAUMII (BUXBAUM'S SEDGE) Herbaceous Vegetation

SIMILAR COMMUNITIES

Includes the Carex buxbaumii-Carex saxatilis (Tuhy 1981) c.t.and Carex buxbaumii-Carex aquatilis (Mattson 1984) h.t. and phases. Hansen et al. (1995) lump 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 4 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.

VEGETATION 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-dominants. 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).

WILDLIFE VALUES

SUCCESSION

MANAGEMENT

Herbage production varies from low to moderate. Saturated soils is 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

G3S3

EDITION/AUTHOR

95-06-09/ L. Williams

CAREX LASIOCARPA (SLENDER SEDGE) 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).

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 which favor the accumulation of peat. Occasionally this community occurs as floating or quaking mats on fluid peat subsoils. 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 year-long saturated soil conditions in the root zone at minimum. This community can tolerate year-long flooded conditions.

VEGETATION 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, sandhill 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 which could cause rutted and hummocky 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 beaver 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 either Carex utriculata, C. aquatilis, or C. nebrascensis communities. Drier sites may be dominated by Deschampsia cespitosa, Artemisia cana/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

G5S5

EDITION/AUTHOR

95-07-11/ L. Williams

CAREX LIMOSA (MUD SEDGE) 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). Includes Mattson's (1984) C. limosa series and phases described for the central portion of Yellowstone National Park.

RANGE

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 in central Yellowstone National Park.

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.

VEGETATION DESCRIPTION

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

WILDLIFE VALUES

Otters, beaver, sandhill 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 decompositon 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 either the Carex utriculata, C. aquatilis, C. lasiocarpa, or the Scirpus acutus ht (Hansen et al. 1995).

CONSERVATION RANK

G3S3

EDITION/AUTHOR

95-07-10/ L. Williams

CAREX UTRICULATA (BEAKED SEDGE) Herbaceous Vegetation

SIMILAR COMMUNITIES

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.

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).

VEGETATION 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. utriculata (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 a 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 elevational 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

G5S5

EDITION/AUTHOR

1998-01-02/ B. Moseley

CAREX VESICARIA (INFLATED SEDGE) 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, 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 lumped 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 which 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 silty-loams with high organic matter accumulation and water holding capacity.

VEGETATION 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 arvensis, Senecio species, and others (Mattson 1984; Kovalchik 1987; Hansen et al. 1988; Crowe and Clausnitzer 1997; Jankovsky-Jones [in preparation]). Due to longperiods 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 which 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 to 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 palatible 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 forseveral 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 leaved, 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 which 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

G5S5

EDITION/AUTHOR

1998-01-09/ CHRIS MURPHY

CORNUS SERICEA (RED-OSIER DOGWOOD) 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 silty clays to sandy loams. These layers may be relatively shallow or as deep as 5 feet. Underlying layers are typically coarse sands, gravels, 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).

Vegetation 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 are 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. The young stems and bark are eaten by deer mice, meadow voles, and other small rodents. 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

G4S3

Edition/Author

98-01-02/ B. Moseley

DULICHIUM ARUNDINACEUM (DULICHIUM) Herbaceous Vegetation

SIMILAR COMMUNITIES

The community is easily recognized by the abundance of Dulichium, 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).

VEGETATION 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 which could cause rutted and hummocky 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. Adjacent uplands are dominated by conifers.

CONSERVATION RANK

G3?S2

EDITION/AUTHOR

97-01-06/ Mabel Jankovsky-Jones

ELEOCHARIS PALUSTRIS (COMMON SPIKERUSH) 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.

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, gravels, and cobbles usually constitute the main body of deeper subsurface materials (Manning and Padgett 1995; Crowe and Clausnitzer 1997; Hall and Hansen 1997).

VEGETATION 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 spp., 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 spp. 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 increaser 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

G5S5

EDITION/AUTHOR

98-12-08/ B. Moseley

ELEOCHARIS ROSTELLATA (BEAKED SPIKERUSH) Herbaceous Vegetation

SIMILAR COMMUNITIES

In Montana, Hansen et al. (1995) lumped 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.

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 which are saturated throughout the year, often with water running over the ground surface through the stands (Moseley 1995)

VEGETATION 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. Adjacent riparian communities may be dominated by Carex spp., Potentilla fruticosa, and Deschampsia cespitosa.

CONSERVATION RANK

G?S1

EDITION/AUTHOR

95-12-20/ L. Williams

JUNCUS BALTICUS (BALTIC RUSH) 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.

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 hummocky. 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).

VEGETATION DESCRIPTION

Baltic rush dominates the stands with canopy cover generally over 50%, usually higher. Cover by other graminoids is usually low, although Poa pratensis appears to be a common associate over the range of the this type. 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 and a wide ecological amplitude. It is an excellent streambank stabilizer with dense fibrous roots that not only bind horizontally in the soil, but 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 aggrading 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 elevational 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

G5S5

EDITION/AUTHOR

98-12-09/ B. Moseley

PICEA SP./*CORNUS SERICEA* (SPRUCE/RED-OSIER DOGWOOD) Forest

SIMILAR COMMUNITIES

The Picea engelmannii/Cornus sericea community type is often treated as Picea/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). 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 understory composition. This also facilitates lumping 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).

RANGE

The Picea engelmannii/Cornus sericea type (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 (including Picea/Cornus stolonifera) community type is found at elevations ranging from as low as 820 m in Montana (Hansen et al. 1995), to around 1400 to 1700 m in Oregon (Crowe and Clausnitzer 1997) to as high as 2300 m elsewhere. Though it is the driest of the riparian Picea 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 slopes 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 seasonal 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).

VEGETATION DESCRIPTION

The Picea engelmannii/Cornus sericea (including Picea/Cornus stolonifera) community type has a partially closed overstory dominated by mature Picea. Picea (mostly P. engelmannii) constancy ranges from 86 to 100% with cover from 23 to 50% (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 25%. Species vary across the community's range, though Abies lasiocarpa and Pseudotsuga menziesii are most commonly encountered throughout. There is a dense shrub layer with high cover of mixed species. Usually the dominant species, Cornus sericea constancy ranges from 67 to 100% with 10 to 58% cover (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). 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 are all sometimes present with 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 a desired forage. 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 interracting soil, site moisture, disturbance, and micro-climate 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 succeptible 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). Other adjacent wet communities are dominated by Alnus incana, Populus species, Salix species (e.g. Salix exigua), Carex species, or other Cornus stolonifera types (Crowe and Clausnitzer 1997, Hall and Hansen 1997, Hansen et al. 1995, Youngblood et al. 1985). Adjacent uplands are often dominated by 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).

CONSERVATION RANK

G3G4S3S4

EDITION/AUTHOR

1998-11-16/ CHRIS MURPHY

PICEA SP./*EQUISETUM ARVENSE* (SPRUCE/FIELD HORSETAIL) 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).

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 throughout the year with standing water. Water tables are usually less than 50 cm deep (Padgett et al. 1989, Hansen et al. 1995).

VEGETATION DESCRIPTION

Picea engelmannii dominates a normally dense overstory. 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 spp., 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 spp., Calamagrostis canadensis, Elymus glaucus, Geranium richardsonii, Senecio triangularis, and Smilacina stellata (Padgett et al. 1989).

WILDLIFE VALUES

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. Adjacent wetter communities are frequently dominated by Carex spp., Salix spp., or Betula glandulosa (Padgett et al. 1989, Hansen et al. 1995).

CONSERVATION RANK

G4S3

EDITION/AUTHOR

95-04-04/Mabel Jankovsky-Jones

PICEA SP./*LYSICHITON AMERICANUS* (SPRUCE/YELLOW SKUNK CABBAGE) 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).

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 slope 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).

VEGETATION 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 spp. 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

G2S2

EDITION/AUTHOR

99-04-14/J. Greenlee

***POPULUS BALSAMIFERA* SSP. *TRICHOCARPA/CORNUS SERICEA* (BLACK COTTONWOOD/RED-OSIER DOGWOOD) 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).

Vegetation 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 and Betula papyrifera and Populus tremuloides occurring 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 Haliaeetus leucocephalus (bald eagles), Pandion haliaetus (osprey), and Ardea herodias (great blue heron). Woodpeckers, great horned owls, wood ducks, and raccoons nest in trunk cavities. Beaver 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).

The erosional 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, which limit peak flows, can lead to the gradual disappearance of mature cottonwood forest because of 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

EDITION/AUTHOR

95-08-07/L. Williams

SALIX DRUMMONDIANA/CALAMAGROSTIS CANADENSIS (DRUMMOND'S WILLOW/BLUEJOINT REEDGRASS) 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.'s (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 throughout 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 dry 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.

VEGETATION 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 spp., 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 spp. 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, 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

G5S5

EDITION/AUTHOR

1996-06-13/L. Williams

SALIX DRUMMONDIANA/CAREX UTRICULATA (DRUMMOND'S WILLOW/BEAKED SEDGE) Shrubland

SIMILAR COMMUNITIES

Earlier studies lumped 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 seem 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]).

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 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, the microtopography is characterized by channels and hummocks (Mutz and Queiroz 1983). 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 5 cm 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 which effectively stabilize stream banks (Hansen et al. 1995).

VEGETATION 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% cover 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% cover), 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, Salix drummondiana shoots are heavily browsed by moose. 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. Beaver 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 regrowth 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

G5S5

Edition/Author

1998-11-25/Chris Murphy

SALIX EXIGUA/BARREN (SANDBAR WILLOW/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).

VEGETATION 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

G5QS5

EDITION/AUTHOR

97-12-31/B. Moseley

SALIX EXIGUA/MESIC GRAMINOID (SANDBAR WILLOW/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).

VEGETATION 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 codominate. 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 it typically sparse (Padgett et al. 1989), although Equisetum spp. (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 results 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 elevational gradient over which this type occurs, adjacent upland communities can range from sagebrush-steppe to coniferous forest associations.

CONSERVATION RANK

G5QS5

EDITION/AUTHOR

97-12-31/B. Moseley

SCIRPUS ACUTUS (HARDSTEM BULRUSH) 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, gravels 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).

VEGETATION DESCRIPTION

The Scirpus acutus type usually appears as an impenetrable monotypic stand often reaching 2 m or more in height. Scirpus spp. 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 throughout the growing season and is easily damaged from trampling by livestock and wildlife. Vegetation can also be damaged by trampling. This community will burn in either late fall or early spring if the water levels have dropped sufficiently (Hansen et al. 1995).

ADJACENT COMMUNITIES

CONSERVATION RANK

G5S5

EDITION/AUTHOR

1998-01-05/B. Moseley

THUJA PLICATA/LYSICHITON AMERICANUS (WESTERN RED CEDAR/YELLOW SKUNK CABBAGE) Forest

SIMILAR COMMUNITIES

On many sites Tsuga heterophylla characterizes the potential natural community, however, Thuja plicata is also a late seral co-dominant or dominant species. Thus, the Thuja plicata/Lysichiton americanus community is sometimes included within Thuja plicata-Tsuga heterophylla/Lysichitum americanum [syn. Lysichiton americanus], Tsuga heterophylla/Lysichitum americanum, and Tsuga heterophylla-Thuja plicata/Lysichitum americanum by some authors (Utzig et al. 1986; Kunze 1994). Also virtually synonomous are communities which add a moss layer to the description such as Thuja plicata-Tsuga heterophylla/Lysichiton americanum [syn. Lysichiton americanus]/Mnium species (Utzig etal. 1986).

RANGE

The Thuja plicata/Lysichiton americanus community is known from Idaho, British Columbia, Oregon, Washington, and possibly southeast Alaska. This coastal community type is disjunct in wet , maritime climate influenced areas of northern Idaho and southeastern British Columbia (Utzig et al. 1986). It found near the North Fork Clearwater River (Moseley and Wellner 1991) and in the Selkirk Mountains along the Washington and Idaho border (Wellner 1989). On the west side of the Cascade Mountains, it was once relatively common in the lowlands of Washington (such as the Puget Sound trough), Oregon (Kunze 1994), and probably British Columbia. However, due to logging, development, agriculture, and wetland destruction, it is now much rarer with few viable occurrences remaining. A similar community (with a mixed conifer canopy) is also known from southeast Alaska (Viereck et al. 1992). It is also known from the Stillwater Valley of northwestern Montana.

ENVIRONMENTAL DESCRIPTION

The Thuja plicata/Lysichiton americanus community is found in wet, maritime climate influenced, valley bottoms and lower mountain slopes. It is found at low elevations in the Selkirk Mountains and North Fork Clearwater River (around 500 to 1000 m) and down to sea level on the coast (Utzig et al. 1986; Wellner 1989; Moseley and Wellner 1991; Kunze 1994). The maritime influenced climate of inland southeast British Columbia and north Idaho is characterized by warm, rainy summers and cold, heavy snowfall winters. Thuja plicata/Lysichiton americanus is restricted to poorly drained swamps or "bogs" on floodplains, flat ground, and depressions near low gradient streams, seeps, springs, and perched water tables (Utzig et al. 1986; Kunze 1994). The soils often have high organic content (muck or peat) with medium to rich soil nutrients, gleying and mottling, and subhydric moisture regimes (e.g. minerotrophic). Fallen trees, upturned root wads, and soil mounds form hummocks above the saturated or seasonally flooded soil. The water table level varies from slightly above the soil surface to slightly below (Utzig et al. 1986; Kunze 1994).

VEGETATION DESCRIPTION

The Thuja plicata/Lysichiton americanus community (including Thuja plicata-Tsuga heterophylla/Lysichitum americanum) is dominated by either Tsuga heterophylla (20 to 50% cover) or Thuja plicata (5 to 80% cover) (Kunze 1994). The canopy is open to closed (60% or more cover) and usually composed of old, small diameter trees with occasional large old growth trees and young trees. Other trees, sometimes co-dominant, include Picea sitchensis (coastal) and Abies grandis and Alnus rubra (coastal and possible inland). There is often a shrub layer (to 1.5 m tall) of varying cover composed of species such as Oplopanax horridus, Cornus canadensis, Vaccinium ovalifolium, Menziesia ferruginea, Rhamnus purshiana, and Spiraea douglasii (all with low cover) (Utzig et al. 1986; Kunze 1994). On the coast (and possibly disjunct inland) common species are Gaultheria shallon (20 to 50% cover), Vaccinium alaskaense (less than 20% cover), Rubus spectabilis (less than 10% cover), Acer circinatum, and Vaccinium parvifolium (Kunze 1994). Shrubs tend to grow on downed logs and soil mounds. The herbaceous layer is dominated by Lysichitum americanum (5 to 80% cover) with a diverse assemblage of ferns and allies such as Athyrium filix-femina, Blechnum spicant, Gymnocarpium dryopteris, Dryopteris species, and Equisetum species (Utzig et al. 1986; Kunze 1994). A moss layer sometimes covers the soil, mainly composed of Mnium species, Rhizomnium punctatum, and Sphagnum species (e.g. Sphagnum sqarrosum and S. recurvum, on poorer sites) (Utzig et al. 1986; Viereck et al. 1992). There are few common graminoids, mainly a few Carex species with low cover.

WILDLIFE VALUES

Thuja plicata communities provide large amounts of food, cover, and water for a variety of wildlife. Though deer feed on Thuja plicata needles and twigs, overall forage amounts for ungulate species is low. Many birds, such as Chestnut-backed chickadees and goshawks, utilize old growth trees for foraging, cover, and nesting (Hansen et al. 1995).

SUCCESSION

Little information on the successional dynamics of Thuja plicata/Lysichiton americanus is available. Thuja plicata/Lysichiton americanus (including Thuja plicata- Tsuga heterophylla/Lysichitum americanum) is a very old potential natural community. It may originate from the early seral Alnus rubra (or Alnus incana)/Lysichitum americanum community (Kunze 1994). In southeast Alaska, clearcut logging of similar communities promotes Tsuga heterophylla and shrub species dominance (Viereck et al. 1992).

MANAGEMENT

Thuja plicata and Tsuga heterophylla are highly valued timber trees , however, Thuja plicata re-planting is not as successful as Tsuga heterophylla. Sites supporting Thuja plicata/Lysichiton americanus vary from highly productive to nutrient poor bogs. However, forage production for livestock is very low. In addition, the water table is high, making logging, road building, recreational development, or livestock grazing impractical (Utzig et al. 1986; Hansen et al. 1988; Hansen et al. 1995). The saturated organic soils are very succeptible to compaction and make tree windthrow hazard high. Thuja plicata/Lysichiton americanus rarely has wildfires though Thuja plicata is succeptible to fire mortality due to its shallow bark and root system. Older trees, however, can survive fire damage to bole.

ADJACENT COMMUNITIES

In north Idaho and southeast British Columbia, Thuja plicata/Lysichiton americanus is adjacent to slightly drier communities which fall into a wet (floodplains, riparian valley bottoms) to mesic (toeslopes) gradient. From wet to mesic, communities include : Thuja plicata-Tsuga heterophylla/Cornus sericea/Equisetum arvense; Thuja plicata/Equisetum arvense; Thuja plicata/Oplopanax horridum; Thuja plicata/Athyrium filix-femina; Thuja plicata-Tsuga heterophylla/Rubus parviflora/Athyrium filix-femina; and Thuja plicata/Adiantum pedatum (Utzig et al. 1986; Wellner 1989; Moseley and Wellner 1991). Other adjacent wet communities are riparian, such as various sedge, scrub-shrub, or Alnus rubra communities including Alnus rubra (or Alnus incana)/Lysichitum americanum (Kunze 1994). Thuja plicata/Lysichiton americanus also intergrades with shrubbier communities such as : Thuja plicata-Tsuga heterophylla/Gaultheria shallon/Lysichitum americanum/Sphagnum species; Thuja plicata/Alnus rubra-Cornus stolonifera/Lysichitum americanum-Smilacina stellata; Tsuga heterophylla/Acer circinatum/Lysichitum americanum; and Tsuga heterophylla-Thuja plicata/Vaccinium species/Lysichiton americanum (Viereck et al. 1992; Kunze 1994). Adjacent uplands are usually forests of drier community types dominated by Tsuga heterophylla, Thuja plicata drier types, Abies grandis, and Pseudotsuga menziesii.

CONSERVATION RANK

G4QS2

EDITION/AUTHOR

1998-12-04/Chris Murphy

TYPHA LATIFOLIA (BROADLEAF CATTAIL) 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).

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.

VEGETATION 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 spp. and Scirpus spp.

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 spp. and Scirpus spp. communities commonly occur nearby.

CONSERVATION RANK

G5S5

EDITION/AUTHOR

95-10-19/J.F. Drake

Appendix F – Carabid Beetle Fauna Associated With Wetlands Of The Flathead River Watershed Of Northwest Montana

CARABID BEETLE FAUNA *(Coleoptera, Carabidae)* ASSOCIATED WITH WETLANDS OF THE FLATHEAD RIVER WATERSHED OF NORTHWEST MONTANA

By:
James C. Bergdahl
University of the Wilderness
Conservation Biology Center
7330 23rd NE, Seattle, Washington, USA, 98115
Ph: (206) 523 0580 • Fax: (206) 523 4314 • Email: bergdahl@wolfenet.com

Contract:
Contract No. MTHP98-28
The Nature Conservancy - Montana Natural Heritage Program
1515 East 6th Ave., PO Box 201800, Helena, MT, USA - 59620-1800
Ph: (406) 444 3019 • Fax: (406) 444 0581 • Email: scrispin@nris.state.mt.gov

Date:
11 March, 1999

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INTRODUCTION

Project Overview

This project is part of a multi-disciplinary survey designed to inventory, and prioritize for conservation and mitigation applications, wetlands in the Flathead River watershed of northwest Montana. The project is being coordinated by The Nature Conservancy - Montana Natural Heritage Program. The objective of this project was to inventory carabid beetle faunulas of five wetlands using rapid bioassessment techniques limited to hand-collecting. Although the results of only five wetland carabid surveys are presented here (03-12 August, 1998), I sampled carabids at more than 60 wetland sites in northwest Montana from 31 July - 19 August, 1998. Whereas these more diverse samples provide a more complete assessment of the wetland carabid fauna of northwest Montana, the carabid species and their relative abundance in samples from all sites have yet to be determined. I anticipate publishing the results of the more inclusive survey at a later date and after final determination of all unidentified species. The information synthesized in this report will hopefully stimulate additional research on carabid beetles as biological indicators of wetland ecology in western Montana.

Pacific Northwest Carabid Beetles

Carabid beetles are primarily generalist predators (and scavengers) of other soil invertebrate species. Seed (including conifers), snail, and millipede specialists have also been described, as well as some large-bodied forest species known to prey on juvenile salamanders. Within soil food webs carabids are the ecological equivalent of lions, tigers and bears. Carabids typically produce one generation each year, although individuals of large-bodied species often live for multiple years. In the mild climates of the Pacific Northwest some adult carabids are active in the winter, but spring and fall peaks in soil-surface activity by adults in the lowlands are typical. Because of their abundance and predaceous food habits, carabids are important biological control agents of potential pests in many ecosystems (e.g. *Calasoma* spp.) Their role in other ecosystem services, such as organic matter decomposition, nutrient cycling, and the structuring of soil invertebrate communities is undoubtedly significant (albeit largely undocumented).

The beetle fauna of the Pacific Northwest (and presumably its insect fauna in general) shares significant similarities with the southeast United States and Japan-Manchuria region. These faunal similarities probably have their origin in a common, widespread, ancient (early Tertiary?) Holarctic fauna that subsequently migrated south due to major climate change and become isolated in these three widely-separated regions. Yet there are some obvious peculiarities in the general composition of the Northwest beetle fauna; most notable is the poor representation of major, primarily sun-loving, leaf-feeding taxa. In contrast, families favoring cool and moist climates are well-represented (e.g. Carabidae and Staphylinidae). The selective action of dense conifer forests and a damp, cool climate has evidently been the major filter excluding many sun-loving herbivores. Biogeographers refer to the Pacific Northwest insect fauna as *Vancouveran*, a biogeographic realm that extends along the coast from the Aleutian Archipelago south into central California and easterly along the Rocky Mtns. and Sierra Nevada. Paleobotanical evidence suggests the Vancouveran biota is very old (Pliocene?), and once occupied a much larger and continuous region. There are a number of interesting relicts in the Vancouveran carabid beetle fauna - taxa with an ancient origin that have strayed far from their original home. Among the carabids these include *Omus* and *Promecognathus* with closest relatives in South Africa, and *Metrius* with its relatives in South America and Australia. *Callisthenes* species (= *Calasoma*) are found only in the montane regions of western North America and Eurasia. As discussed in the previous section, many of these spectacular range disjunctions probably have their origin on the Paleozoic supercontinent of Pangea, followed by 250 million years of plate-tectonic movement of the continents to their current locations. These carabid relics are primarily large-bodied, flightless, forest beetles with relatively poor dispersal power. This suite of characters is similar to those seen in relic ant taxa.

The other major biogeographic realm in the Pacific Northwest is the *Sonoran*, an arid region with hot summers. Many classic Sonoran taxa have distant affinities with Neotropical or southern South America groups, however, the Sonoran biota is also very ancient (early Tertiary?) and significantly distinct.

Bousquet et al. (1991) recently published a checklist of the beetles of Canada and Alaska (*7,447 species*). Given the similarity in geography, climate, and vegetation of British Columbia (BC) and the U.S. Pacific Northwest [Washington (WA), Idaho (ID) and Oregon (OR)], the BC beetle fauna can be used as a regional model. British Columbia has the second highest beetle diversity for a Canadian province (*3,628 species*). British Columbian beetles are primarily aggregated in the following families: Staphylinidae (rove-beetles; *581 species*), Carabidae (ground-beetles; *463 species*), and Curculionidae (weevils; *261 species*). Carabids, which make up the bulk of the beetle biomass of northern ecosystems because of their abundance and large body size, account for more than 13% of the beetle species of British Columbia. In Sweden, which is a little more northern and only about half the size of BC, approximately 9% of the beetle fauna (ca. *4,400 spp.)* are carabids (*356* spp.). In Oregon's H.J. Andrews Forest, carabids account for 12% of the beetle species. Statistical analysis of the species distributions of different beetle families across Canadian provinces suggests there is significantly more *species turnover* between regions in phytophagous beetle families than in the Carabidae (primarily predators/scavengers), and significantly less in the aquatic beetle familes (Bergdahl *unpubl.*).

Carabid beetle species richness is correlated ($n = 69$, $r^2 = 0.35$, $p < 0.001$) with geographic area in North America. Regional (state) carabid beetle species richness is correlated ($n = 48$, $r^2 = 0.36$, $p < 0.001$) with vascular plant species richness, as is the number of endemic plant species and endemic carabid species ($n = 49$, $r^2 = 0.79$, $p < 0.001$). It is interesting to note that vascular plant species richness of the 48 contiguous United States is not much better of a predictor of butterfly species richness than it is of carabid beetle richness (plant species richness vs. butterfly: $n = 48$, $r^2 = 0.54$, $p < 0.001$). Interestingly, carabid beetle vs. plant richness is more strongly correlated than carabid vs. butterfly richness ($n = 48$, $r^2 = 0.17$, $p < 0.01$).

I have recently completed an account of all known carabid beetle species in the Pacific Northwest (BC, WA, ID & OR), a fauna which totals 698 species and subspecies. The carabid species richness of the individual geographic units are as follows: BC (486), WA (447), ID (321) and OR (478). (California has 671 carabid beetle species!) Introduced carabids account for 4% of the PNW taxa. Near 53% of the fauna is strictly associated with wetlands, and ca. 30% are forest specialists. The average adult body size of the 698 Pacific Northwest carabid species is ~ 8.4 mm (range ~ 1.6 mm - 28 mm).

The rarefaction (species accumulation) curve for Pacific Northwest carabids suggests that relatively few carabid species have yet to be discovered. Four new species have been described over the last ten years, and three undescribed species are known. However, more systematic exploration of remote mountain ranges in the Pacific Northwest may yield a surprising number of undiscovered invertebrate species with small geographic ranges. For instance, using a comprehensive U.S. National Park Service analysis of endemic species from the Olympic Mountains, and the assumption that the number of endemics is roughly proportional to the relative size of taxa from the H.J. Andrews forest, I predicted the number of endemic invertebrate species in the Olympics should be ~150 species, an order-of-magnitude more than the 11 species presently known. Furthermore, a number of factors suggest that endemic invertebrates should be over-represent within regional biotas when compared to plants and vertebrates. Some of these undiscovered endemic species may be carabids. Similar gaps in our knowledge undoubtedly occur throughout the Pacific Northwest.

With regard to which genera the undiscovered carabid species in the region may belong, Bousquet & LaRochelle (1993) suggest: "*... the current number of* [carabid] *species and subspecies occurring in America north of Mexico certainly is much greater than* [2,635 species]. *Obviously, there are numerous undescribed carabid species and subspecies in the area, particularly in the western mountains and the southern regions. Most of these taxa probably belong to the tribes Bembidiini and Trechini.*" They estimate the number of species and subspecies in North America north of Mexico to be close to 3,100 taxa, i.e. there are about 500 taxa yet to be accounted for in the U.S. and Canada. Bembidiini and Trechini have small-bodied adults, are typically wetland/riparian habitat specialists, and are found from sea level to the alpine elevations.

Eighty-nine (89) carabid species are endemic to the Pacific Northwest region (33% of the fauna). Six species are narrowly restricted to BC, 11 to WA, 6 to ID, and 25 to OR. California has 225 endemic carabids, also about 1/3rd of its fauna. I have determined that the geographic range size of North America carabid beetle species on a continental-scale is significantly correlated with the extent of regional distribution (i.e. rarity is spatially concordant). Some Pacific Northwest carabid endemics may currently be at risk of extinction due to rapid change in habitat or climate. Four Pacific Northwest carabid species are on the 1994 U.S. Fish & Wildlife Service's list of potentially endangered or threatened species: *Nebria gebleri siskiyouensis* (CA, OR), *Cicindela arenicola* (ID), *Scaphinotus behrensi* (CA, OR), *Pterostichus rothi* (OR) and *Agonum belleri* (BC, WA, OR). Other lowland carabids should be added to the list including *Cicindela columbica* (WA, ID, OR), *Scaphinotus manni* (WA, OR) and *Stomis termitiformis* (OR). These *Nebria* and *Cicindela* are riparian species, *Agonum belleri* is an acute sphagnum specialist, and the others are forest carabids, some of which are probably closely associated with the margin of small streams.

The Carabid Fauna of Montana

TABLES MTTRIBES and MTGENERA provide a summary of my assessment of the tribes and genera of the 354 carabid beetles species currently known from Montana (Bousquet & LaRochelle 1993; Bergdahl *unpubl.*).

An overview of the carabid fauna of Montana is as follows:

No. of MT tribes = 26
No. of MT genera = 65
No. MT species = 354
No. holarctic MT species = 32
No. introduced MT species = 6
Average year MT species was first described in entomology literature = 1858
Average number of 65 states and provinces MT species occur in = 23
No. species found in both MT & ID = 238
No. species found in both MT & WY = 219
No. species found in both MT & ND = 160
No. species found in both MT & SK = 230
No. species found in both MT & AB = 287
No. species found in both MT & BC = 284

There are no known carabid species *narrowly endemic* to Montana. However, in comparison to other Pacific Northwest states and provinces, this is anomalous, suggesting that a few carabids endemic to Montana have yet to be discovered. The number of endemics in regions near Montana are:
BC = 7, AB = 2, WA = 11, ID = 7, OR = 25, UT = 15, WY = 2, NV = 6, CA = 226, and PNW (BC, WA, ID & OR) = 88.

Six species currently known from Montana are found in only 2 or 3 states or provinces, as indicated below:

Cicindela (Cylindera) terricola cyanella	MT, NE
Pterostichus (Hypherpes) beyeri	MT, ID
Pterostichus (Hypherpes) idahoae	MT, ID
Scaphinotus merkelii	MT, ID, BC
Bembidion rosslandicum	MT, BC, AB
Pterostichus (Hypherpes) restrictus	MT, CO, WY

Cicindela terricola is a tiger beetle, and a habitat specialist on saline ditches and flats of eMT. The species is uncommon. Soil conditions undoubtedly significantly affect the distribution of the beetle. All of these *Pterostichus (Hypherpes)* are large-bodied, flightless, forest species. A few of the flightless, forest-stream

Pterostichus (Pseudoferonina) species presently known as narrowly endemic to Idaho will undoubtedly eventually be collected along the crest of the Bitterroot Mountains in Montana. *Scaphinotus merkelli* is a good candidate for threatened & endangered status since it is known from only a very small area in nID, seBC, and nwMT, and few sites and specimens. The species is a flightless, snail predator found only along small, montane-forest streams. *Bembidion rosslandicum* is a subalpine/alpine species in the Rocky Mountains ca. the USA-Canada border.

Two hundred and thrity two (232) carabid beetle species (TABLE NWMTLIST) are known or suspected as resident in northwest Montana (Bousquet & LaRochelle 1993, LaBonte & Johnson 1989, Edwards 1975, Russell 1968). Based on trends of habitat affinity of carabids in the Pacific Northwest (BC, WA, ID, OR), near 55% of these species are probably wetland/riparian habitat specialists.

Invertebrates as Biological Indicators

Terrestrial invertebrates are valuable indicators of biodiversity pattern and ecosystem monitoring tools for many reasons including: 1) their high species richness and biomass, and 2) wide range of body sizes, habitat and food requirements, seasonal activity, reproductive biology and population growth rates, powers of dispersal, and geographic distributions. Low-cost, passive, survey methods can reliably sample large numbers of individuals over short periods of time with minimal manpower. Because of the diversity of invertebrate species and their tendency to exhibit large population sizes, statistical rigor and robust conclusions are feasible for experimental and comparative studies.

Invertebrates have been shown to respond to many environmental impacts, including habitat fragmentation and population isolation, habitat modification and disturbance, climate change, and chemical pollution. Many invertebrates species have the potential for rapid response to fluctuating environmental conditions because of their high population growth rates and short generation times. Invertebrate species are often so faithful to specific climates and habitats that their fossils have been used to reconstruct climate history. Many published reports using carabids to reconstructed paleoenvironments can be found in the paleoecology literature. Given the high number of regional endemics and habitat specialists, many Northwest invertebrate species will undoubtedly prove to be very accurate indicators of habitat conditions (including local and regional biodiversity hotspots) and management impacts.

Not all invertebrate taxa are equally effective as indicators of biodiversity patterns or environmental impacts. Ideally, indicator taxa should exhibit the following characteristics: 1) high species diversity, endemism and habitat fidelity, 2) wide geographic distribution, 3) taxonomically and ecologically well-known, 4) easy to obtain large random samples of species, and 5) large body size for easy identification. Also, indicator taxa should be ecologically diverse (encompass a broad range of ecological requirements and life-histories, and exhibit varying sensitivity to environmental perturbations), in addition to being functionally important in ecosystem processes, and having relatively sedentary habits or poor powers of dispersal. Carabids meet these qualifications much better than many other terrestrial invertebrate taxa. In northern Europe, where the biology of carabid species is much better known, carabids have been used extensively to monitor the biological integrity of forest and heathland. In North America this potential has barely been tapped. Carabid faunas are analyzed in a recent article focusing on multivariate methods to determine indicator species and characteristic species assemblages in biological assessment research (Dufrene & Legendre 1997).

METHODS

Study Sites and Sample Dates

The carabid beetles faunulas at five wetlands in the Flathead River Basin were sampled (see TABLE SITES). These wetlands were selected by staff at The Nature Conservancy - Montana Natural Heritage Program, and are a small subset of the many wetlands in TNC/MTNHP-Flathead wetland project. All study sites included a mosaic of habitat types ranging from forest edge to open water. In most cases, I attempted to sample all major habitat types suitable for carabids. Sphagnum communities occur at the Swan River, Ambrose Fen, and Bowen Creek sites. Since a number of rare or endemic carabids are known from sphagnum bogs in the Pacific Northwest, collecting on sphagnum mats received special attention. An overview of the bogs of the region, including some color pictures, can be found in Chadde et al. (1998), however, none of the wetlands in this study are described in their report. More detailed descriptions of the wetlands in this study will be provided in future reports by TNC/MTNHP Flathead wetland project.

The dates of the samples span 03 -12 August, 1998. The weather during this period of time was warm and sunny, and provided excellent conditions for hand-collecting carabids. The weather on both 01 and 02 August was warm and cloudy with light rain. Due to an abundance of precipitation in June in northwest Montana, wetlands in the region probably had water-table elevations that were higher than average. When wetland basins are full there is in general less periodically-submerged habitat available for sampling non-aquatic wetland insects such as carabids, which are well-adapted to exploit these ephemeral micro-habitats. It is unclear how wetter than normal conditions may have effected the diversity or abundance of the samples.

Collection Methods

All carabids in the samples were collected by hand-collection technique. No pitfall traps were used due to the very limited number of funds available to the project. All carabids that were seen were taken if they could be caught regardless of the fact that the species may have already been taken in the sample. That is, the samples represent an estimate of the relative abundance of the carabid beetle species actually seen. Although hand-collecting at night can yield large carabid samples and help find rare species, no night collecting was conducted at these five wetlands. I relied primarily on flooding and trampling the ground to scare carabids from hiding places. A small, three-pronged garden fork was used to move litter. When available, decaying logs and branches were dissected and examined for hiding beetles. Small bodied species were quickly aspirated into a vial to reduce the possibility of escape. All specimens were immediately pickled in small vials in 70% ethanol + 30% kitchen vinegar. Labels were added to each vial immediately after the sample was taken.

Assessment of Samples

All samples were assessed in my lab in Seattle. Specimens were quickly washed in a tea strainer using tap water, dried on paper, pointed (glued to a small paper point using water-soluble Elmers glue), and then the point was pinned with an insect pin.

All specimens were examined under a dissecting scope and sorted into "morphospecies". Most of these groups were then identified to species using Lindroth (1961-1969) and reference to my large Pacific Northwest synoptic collection. Twelve of the fifteen (15) *Bembidion* species have yet to be identified to species. The genus *Bembidion* is exceptionally rich in species (e.g. the largest carabid genus in Montana), the species have small adult body size, and are often difficult to key to species without access to a good synoptic collection of the region and previous experience. My preliminary determinations of these species will need to be verified by another carabidologist before the *Bembidion* of these samples can be fully assessed.

RESULTS

Seventeen samples were taken - locality describtions are outlined in TABLE SITES. Forty-four (44) species among 259 specimens were represented in the samples. A brief overview of these species is provided in TABLE SPECIES. The species and their relative abundance within and between the 17 individual samples is presented in TABLE SAMPLES, in addition to notes on "hunting success" and rarefaction (FIGURE RAREFACTION) of the entire collection.

DISCUSSION

Very little has been published on the carabid beetles of Montana. Russell's (1968) unpublished University of Washington masters thesis focused on the faunal affinities of the Coleoptera of western Montana, and provides the first detailed list of carabids for the region. Edwards (1975) surveyed the carabid fauna of Glacier National Park from 1947-68, which includes parts of the Flathead River basin, but primarily at higher elevations than the sites described in this report. The number of carabids he reported from Glacier National Park includes 109 species and 28 genera, but as with Russell (1968), some of the taxa are no longer recognized as unique or resident in Montana (Bousquet & LaRochelle 1993). In a note on the first records of *Bethisa multipunctata* and *B. quadricollis* in Montana (Lake County), LaBonte & Johnson (1989) provide a list of wetland carabids associated with these species in their collections. Chadde et al. (1998) provide an appendix on the invertebrates associated with peatlands in the Rocky Mountains of Montana, Idaho, Washington and Wyoming, including beetles, but surprisingly no carabids are mentioned. The species reported here, combined with Russel (1968), Edwards (1975), LaBonte & Johnson (1989) and Bousquet & LaRochelle (1993), provides a provisional list of 232 carabid species known or suspect as resident in the Flathead River watershed (TABLE NWMTLIST). Ca. 55% of these species can be expected to be wetland/riparian habitat specialists.

In general, in comparison to wetlands that I have sampled in Washington, Idaho and Oregon, these Montana wetlands yielded rather small samples. These is especially true when they are compared to non-sphagnum wetlands west of the Cascade Mountains. Although sphagnum bogs and fens everywhere typically yield small carabid samples, the numerous non-sphagnum Flathead samples produced remarkably poor catches. One factor probably accounts for most of this variation: the longer and more intense winters of northwest Montana. Many of the "missing specimens" include species in the following genera: *Stenolophus*, *Bradycellus*, and *Bembidion*.

Of the 17 samples, Swan 1 Oxbow and Swan 2 Oxbow produced the greatest number of specimens/hr and high species/hr (TABLE SAMPLES). Sunday 2 was also high in this regard. The catch at the Swan River oxbox was undoubtedly influenced by proximity to riparian habitats associated with the active floodplain of Swan River, which was extremely close to the western end of the oxbow (ca. 100 meters). Floodplain habitats support the highest abundance and diversity of carabids in the Pacific Northwest. The Sunday Creek samples were typical for small mountains streams with forested shorelines, "riparian" habitats which also support an abundance of carabids, albeit a much less diverse fauna than habitats associated with large rivers.

Similarly, the sphagnum fen samples deserve comment - these samples typically yielded the fewest specimens-per-unit-effort, and low-to-moderate diversity. However, whereas capture rates may be low in sphagnum habitats, the species are typically unique bog/fen specialists. Carabid species associated with sphagnum habitats in the Flathead River watershed include: *Pterostichus patruelis, Agonum mutatum, Agonum gratiosum, Bembidion* sp. 3 and *Bembidion* sp. 4. The first three of these species are known to be associated with sphagnum throughout their range in North America. *Agonum mutatum* is a widespread, acute sphagnum specialist in western Washington, and maybe in Montana. *Agonum gratiosum*, however, is not a sphagnum specialist in the Flathead region. *Agonum cupripenne* was the only carabid collected in a 1 hour sample from the Swan 4 Fen. This species is not closely associated with sphagnum. It was collected at Swan 4 Fen on bare, wet, gravel/sand substrate at the margin of a spring that originates at this fen. Although the sphagnum hummocks at this site were well-developed, the sphagnum mats at this site were not very extensive. The diversity of species in the Ambrose 2 Fen sample is remarkably high in comparison to the other fen samples. Ambrose Fen is a very-large, (raised?) forest-sphagnum bog supporting what appeared to be exceptionally high plant diversity. The single *Lebia moesta* in this sample most likely represents the rarest species across all 17 samples. *Lebia* are parasites of leaf-beetles, and *Lebia moesta* is a leaf-beetle mimic. I rarely encounter them in the Pacific Northwest, however, this may be an artifact of the difficulty of sampling canopy habitats.

This is the first time I have personally collected *Agonum errans* after many years of hunting carabids in the Pacific Northwest. The species is an exceptionally beautiful, shiny-metallic green color. It is day active, a strong flier, and difficult to catch. It appears to prefer, warm, sun-exposed shorelines with a dry, compacted clay/sand substrate, which was found just above the cattails at Cat Bay marsh. The species is widespread in North America, but according to Lindroth (1961-69) the species does not reach the Pacific coast. I collected the species at a number of other Flatead Basin wetlands in August 1998, indicating the species is not uncommon in the Flathead Lake area. These is the possibility that Flathead Lake, which is the largest natural lake in the U.S.A. west of the Missippissi River, contributes directly to the abundance of *Agonum errans* in the area due to the large extent of the Lake's open, sun-sxposed shorelines.

None of the identified species in the 17 samples appear to represent exceptional records except for *Trechus obtusus*, an introduced species from Europe and the only introducted carabid is the 17 samples. The Ambrose Fen specimens represent the first records of this carabid in Montana, and deserves a publication note in the entomological literature. The spread of this species across the Pacific Northwest has been rapid and is fairly well-documented (e.g. Kavanaugh & Erwin 1985). This small-bodied, wing-dimorphic species was first reported in Seattle, WA - Vancouver, BC area in 1933 (Hatch 1933), California in 1972 (Erwin 1972), and in eastern Washington and Central Idaho in 1985 (LaBonte 1989). The species is not a wetland specialist - is it often found in open-grassy areas. Some of the unidentified *Bembidion* species may also prove to be noteworthy records once final determinations are available.

Rarefaction (FIGURE RAREFACTION) of the catch data produces a curve that has not flattened, indicating that additional collecting will add a number of taxa to the list of 44 carabid species represented across the 259 specimens analyzed within these 17 samples.

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TABLE MTTRIBES: The 26 carabid beetle tribes *(Coleoptera: Carabidae)* in Montana (U.S.A.) and their species richness.

Data based on analysis by J.C. Bergdahl, 05 March, 1999.

TRIBE	NO. SPP.
Bembidiini	**89**
Brachinini	**4**
Broscini	**2**
Carabini	**11**
Chlaeniini	**9**
Cicindelini	**26**
Clivinini	**13**
Cychrini	**4**
Elaphrini	**8**
Gehringiini	**1**
Harpalini	**42**
Lebiini	**21**
Licinini	**7**
Loricerini	**1**
Nebriini	**10**
Notiophilini	**4**
Omophronini	**4**
Opisthiini	**1**
Patrobini	**7**
Platynini	**32**
Psydrini	**2**
Pterostichini	**19**
Scaritini	**1**
Trachypachini	**2**
Trechini	**4**
Zabrini	**30**
Total No. Species =	*354*

TABLE MTGENERA: The 65 carabid beetle genera *(Coleoptera: Carabidae)* in Montana (U.S.A.) and their species richness.

Data based on analysis by J.C. Bergdahl, 05 March, 1999.

TRIBE	GENUS	NO. SPP.
Bembidiini	***Bembidion***	81
Bembidiini	***Elaphropus***	3
Bembidiini	***Phrypeus***	1
Bembidiini	***Tachys***	1
Bembidiini	***Tachyta***	3
Brachinini	***Brachinus***	4
Broscini	***Miscodera***	1
Broscini	***Zacotus***	1
Carabini	***Calosoma***	7
Carabini	***Carabus***	4
Chlaeniini	***Chlaenius***	9
Cicindelini	***Cicindela***	26
Clivinini	***Dyschirius***	11
Clivinini	***Schizogenius***	2
Cychrini	***Cychrus***	1
Cychrini	***Scaphinotus***	3
Elaphrini	***Blethisa***	2
Elaphrini	***Elaphrus***	6
Gehringiini	***Gehringia***	1
Harpalini	***Anisodactylus***	6
Harpalini	***Bradycellus***	5
Harpalini	***Cratacanthus***	1
Harpalini	***Dicheirus***	1
Harpalini	***Discoderus***	1
Harpalini	***Euryderus***	1
Harpalini	***Harpalus***	19
Harpalini	***Piosoma***	1
Harpalini	***Stenolophus***	6
Harpalini	***Trichocellus***	1
Lebiini	***Apristus***	3
Lebiini	***Calleida***	1
Lebiini	***Coptodera***	1
Lebiini	***Cymindis***	3
Lebiini	***Dromius***	1
Lebiini	***Lebia***	9
Lebiini	***Microlestes***	1
Lebiini	***Syntomus***	1
Lebiini	***Tecnophilus***	1
Licinini	***Badister***	3
Licinini	***Dicaelus***	1
Licinini	***Diplocheila***	3
Loricerini	***Loricera***	1
Nebriini	***Leistus***	1
Nebriini	***Nebria***	9
Notiophilini	***Notiophilus***	4
Omophronini	***Omophron***	4

TRIBE	GENUS	NO. SPP.
Opisthiini	***Opisthius***	1
Patrobini	***Diplous***	2
Patrobini	***Patrobus***	4
Patrobini	***Platidiolus***	1
Platynini	***Agonum***	24
Platynini	***Anchomenus***	1
Platynini	***Calathus***	2
Platynini	***Oxypselaphus***	1
Platynini	***Platynus***	1
Platynini	***Sericoda***	3
Psydrini	***Nomius***	1
Psydrini	***Psydrus***	1
Pterostichini	***Poecilus***	3
Pterostichini	***Pterostichus***	15
Pterostichini	***Stereocerus***	1
Scaritini	***Pasimachus***	1
Trachypachini	***Trachypachus***	2
Trechini	***Trechus***	4
Zabrini	***Amara***	30
Total No. Species =		*354*

TABLE SITES *(mtsites.xls;10iii99)*:

Collection localities for seventeen 1998 Flathead (nw Montana) wetland carabid samples.

NO	NAME	LOCATION	ELEVATION	DATE	START TIME	END TIME	HRS
1	Swan 1 Oxbow	SWAN R. OXBOW, USFW Nat. Wildl. Res., Porcupine Ck. Rd., USFS Rd.10229, so. SWAN LAKE, LAKE Co., nw MT	3070 FASL	03viii	1530	1630	1
2	Swan 2 Oxbow	SWAN R. OXBOW, USFW Nat. Wildl. Res., Porcupine Ck. Rd., USFS Rd.10229, so. SWAN LAKE, LAKE Co., nw MT	3070 FASL	04viii	1900	1930	0.5
3	Swan 3 forest	SWAN R. FOREST ca. bridge, USFW Nat. Wildl. Res., Porcupine Ck. Rd., USFS Rd.10229, so. SWAN LAKE, LAKE Co., nw MT	3070 FASL	04viii	1930	2000	0.5
4	Swan 4 Fen	SWAN R. SPHAGNUM FEN, USFW Nat. Wildl. Res., Porcupine Ck. Rd., USFS Rd.10229, so. SWAN LAKE, LAKE Co., nw MT	3070 FASL	05viii	930	1030	1
5	Ambrose Fen 1	AMBROSE SPHAGNUM FEN, 7 miles N of BIGFORK, HWY 35, FLATHEAD Co., nw MT	2910 FASL	05viii	1300	1400	1
6	Ambrose Fen 2	AMBROSE SHPAGNUM FEN, 7 miles N of BIGFORK, HWY 35, FLATHEAD Co., nw MT	2910 FASL	05viii	1415	1515	1
7	Bowen 1 Fen	BOWEN CREEK SPHAGNUM FEN (Upper), USFS Rd. 60, OLNEY, LINCOLN Co., nw MT	4720 FASL	06viii	1200	1300	1
8	Bowen 2 Marsh	BOWEN CREEK SEDGE MARSH (Lower), USFS Rd. 60, OLNEY, LINCOLN Co., nw MT	4720 FASL	06viii	1330	1430	1
9	Bowen 3 F&M	BOWEN CREEK FEN & MARSH, USFS Rd. 60, OLNEY, LINCOLN Co., nw MT	4720 FASL	06viii	1530	1630	1
10	Sunday 1 FstSh	SUNDAY CREEK forested shoreline, USFS Rd. 315, STRYKER, FLATHEAD Co., nw MT	4310 FASL	07viii	1230	1330	1
11	Sunday 2 DpCh	SUNDAY CREEK wet side channels, USFS Rd. 315, STRYKER, FLATHEAD Co., nw MT	4310 FASL	07viii	1345	1415	0.5
12	Sunday 3 FstSh	SUNDAY CREEK forested shoreline, USFS Rd. 315, STRYKER, FLATHEAD Co., nw MT	4310 FASL	07viii	1430	1500	0.5
13	Sunday 4 DpCh	SUNDAY CREEK wet side channels, USFS Rd. 315, STRYKER, FLATHEAD Co., nw MT	4310 FASL	07viii	1600	1630	0.5
14	Sunday 5 FstSh	SUNDAY CREEK forested shoreline, USFS Rd. 315, STRYKER, FLATHEAD Co., nw MT	4310 FASL	07viii	1700	1730	0.5
15	Sunday 6 Marsh	SUNDAY CREEK sedge-willow-birch marsh, below USFS Rd. 3711, STRYKER, FLATHEAD Co., nw MT	4300 FASL	11viii	1245	1315	0.5
16	Cat 1 Marsh	CAT BAY CATTAIL MARSH - NW Arm, 7 mi. N of POLSON, LAKE Co., nw MT	2895 FASL	12viii	1000	1100	1
17	Cat 2 Marsh	CAT BAY CATTAIL MARSH - NE Arm, 7 mi. N of POLSON, LAKE Co., nw MT	2895 FASL	12viii	1300	1400	1
						Total	**13.5**

TABLE SPECIES *(species.xls;10iii99)*:
The 44 carabid species in the 17 wetland samples from Flathead River watershed, with notes on their biology and geographic distribution.

SpNo follows Bergdahl *(unpubl.)*. **Taxonomy** and **species names** follow Bousquet & LaRochelle (1993).
HL: 1 = holarctic species. **IT**: 1 = introduced species. *BS* = median adult body size (mm).
WINGS: (+) = all individuals long-winged, and probably capable of flight; (-) = all individual brachypterous; (+/-) = species dimorphic for wingedness.
HABITAT: xero = xerophilic; meso = mesophilic; hygr = hygrophilic; arbo = arboreal.
fqNA = number of 65 North American U.S. states and Canadian provinces species has been recorded in.

NO	SpNo	TRIBE	GENUS	SUBGENUS	SPECIES	SUBSPECIES	AUTHOR	YEAR	HL	IT	BS	WINGS	HABITAT	fqNA
1	9004	Loricerini	***Loricera***		***pilicornis***	***pilicornis***	(Fabricius)	1775	1	0	7.8	+	hygr	39
2	18071	Cychrini	***Scaphinotus***	***Brennus***	***marginatus***		(Fischer von Waldheim)	1820	0	0	14.0	-	meso	9
3	21011	Elaphrini	***Elaphrus***	***Elaphrus***	***californicus***		Mannerheim	1843	0	0	7.2	+	hygr	50
4	52007	Trechini	***Trechus***	***Trechus***	***chalybeus***		Dejean	1831	1	0	4.3	-	hygr	11
5	52019	Trechini	***Trechus***	***Trechus***	***obtusus***		Erichson	1837	0	1	3.9	+/-	meso	6
6	54050	Bembidiini	***Bembidion***	***Trechonepha***	***iridescens***		(LeConte)	1852	0	0	4.3	+	hygr	9
7	54054	Bembidiini	***Bembidion***		***kuprianovii***		Mannerheim	1843	0	0	5.1	+	hygr	12
8	54163	Bembidiini	***Bembidion***	***Eupetedromus***	***incrematum***		LeConte	1860	0	0	5.5	+	hygr	33
9		Bembidiini	***Bembidion***		***sp. 1***									
10		Bembidiini	***Bembidion***		***sp. 2***									
11		Bembidiini	***Bembidion***		***sp. 3***									
12		Bembidiini	***Bembidion***		***sp. 4***									
13		Bembidiini	***Bembidion***		***sp. 5***									
14		Bembidiini	***Bembidion***		***sp. 6***									
15		Bembidiini	***Bembidion***		***sp. 7***									
16		Bembidiini	***Bembidion***		***sp. 8***									
17		Bembidiini	***Bembidion***		***sp. 9***									
18		Bembidiini	***Bembidion***		***sp. 10***									
19		Bembidiini	***Bembidion***		***sp. 11***									
20		Bembidiini	***Bembidion***		***sp. 12***									
21	93004	Pterostichini	***Pterostichus***	***Argutor***	***patruelis***		(Dejean)	1831	0	0	7.0	+/-	hygr	37
22	93006	Pterostichini	***Pterostichus***	***Bothriopterus***	***adstrictus***		Eschscholtz	1823	1	0	11.3	+	meso	41
23	93008	Pterostichini	***Pterostichus***	***Bothriopterus***	***mutus***		(Say)	1823	0	0	11.5	+	meso	37
24	93153	Pterostichini	***Pterostichus***	***Hypherpes***	***sphodrinus***		LeConte	1863	0	0	10.3	-	meso	6
25		Pterostichini	***Pterostichus***	***Hypherpes***	***sp. 1***									
26		Pterostichini	***Pterostichus***	***Hypherpes***	***sp. 2***									
27	93188	Pterostichini	***Pterostichus***	***Cryobius***	***riparius***		(Dejean)	1828	0	0	7.3	-	hygr	9
28	111011	Licinini	***Badister***	***Baudia***	***grandiceps***		Casey	1920	0	0	4.9	+	hygr	26
29	119011	Harpalini	***Stenolophus***	***Stenolophus***	***incultus***		Casey	1914	0	0	5.2	+	hygr	7

NO	SpNo	TRIBE	GENUS	SUBGENUS	SPECIES	SUBSPECIES	AUTHOR	YEAR	HL	IT	BS	WINGS	HABITAT	fqNA
30		Harpalini	***Harpalus***		***sp. 1***									
31	151007	Platynini	***Agonum***	***Europhilus***	***gratiosum***		(Mannerheim)	1853	0	0	7.8	+/-	hygr	36
32	151017	Platynini	***Agonum***	***Platynomicrus***	***ferruginosum***		(Dejean)	1828	0	0	6.3	+/-	hygr	12
33	151018	Platynini	***Agonum***	***Platynomicrus***	***nigriceps***		LeConte	1848	1	0	5.6	+/-	hygr	23
34	151019	Platynini	***Agonum***	***Platynomicrus***	***piceolum***		(LeConte)	1879	0	0	6.8	+/-	hygr	21
35	151025	Platynini	***Agonum***	***Agonum***	***corvus***		(LeConte)	1860	0	0	8.8	+	hygr	17
36	151026	Platynini	***Agonum***	***Agonum***	***cupreum***		Dejean	1831	0	0	8.3	+/-	hygr	24
37	151027	Platynini	***Agonum***	***Agonum***	***cupripenne***		(Say)	1823	0	0	8.4	+	hygr	46
38	151034	Platynini	***Agonum***	***Agonum***	***harrisii***		LeConte	1848	0	0	9.5	+	hygr	27
39	151037	Platynini	***Agonum***	***Agonum***	***metallescens***		(LeConte)	1854	0	0	9.5	+	hygr	21
40	151044	Platynini	***Agonum***	***Agonum***	***propinquum***		(Gemminger & Harold)	1868	0	0	7.4	+	hygr	31
41	151050	Platynini	***Agonum***		***mutatum***		(Gemminger & Harold)	1868	0	0	8.0	+/-	hygr	30
42	151062	Platynini	***Agonum***	***Stereagonum***	***errans***		(Say)	1823	0	0	8.2	+	hygr	34
43	152004	Platynini	***Platynus***	***Platynus***	***decentis***		(Say)	1823	0	0	11.5	-	hygr	58
44	175031	Lebiini	***Lebia***	***Lebia***	***moesta***		LeConte	1850	0	0	4.5	+	arbo	23

TABLE SAMPLES *(mtsampl2.xls;10iii99)*:

Distribution of carabid species within samples and between collection sites in 1998 Flathead wetland samples.

Species names follow Bousquet & LaRochelle (1993). SpNo follow Bergdahl (*unpubl.*). The last two rows of data describe the rarefaction of the samples (FIGURE RAREFACTION).

						COLLECTION LOCALITY (sample #)																	
					SITE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
NO	SpNo	TRIBE	GENUS	SUBGENUS	SPECIES	Swan 1 Oxbow (14-98)	Swan 2 Oxbow (18-98)	Swan 3 Forest (19-98)	Swan 4 Fen (21-98)	Ambrose 1 Fen (22-98)	Ambrose 2 Fen (23-98)	Bowen 1 Fen (24-98)	Bowen 2 Marsh (25-98)	Bowen 3 F&M (26-98)	Sunday 1 FstSh (27-98)	Sunday 2 DpCh (28-98)	Sunday 3 FstSh (29-98)	Sunday 4 DpCh (30-98)	Sunday 5 FstSh (31-98)	Sunday 6 Marsh (38-98)	Cat 1 Marsh (42-98)	Cat 1 Marsh (43-98)	TOTAL
					Date	3viii	4viii	4viii	5viii	5viii	6viii	6viii	6viii	6viii	7viii	7viii	7viii	7viii	7viii	11viii	12viii	12viii	7 day
					# Hours	1	0.5	0.5	1	1	1	1	1	1	1	0.5	0.5	0.5	0.5	0.5	1	1	13.5 hr
1	9004	Loricerini	***Loricera***		***pilicornis***																	1	**1**
2	18071	Cychrini	***Scaphinotus***	***Brennus***	***marginatus***	2		1										3					**6**
3	21011	Elaphrini	***Elaphrus***	***Elaphrus***	***californicus***		2						2										**4**
4	52007	Trechini	***Trechus***	***Trechus***	***chalybeus***	2										4							**6**
5	52019	Trechini	***Trechus***		***obtusus***						2												**2**
6	54050	Bembidiini	***Bembidion***	***Trechonepha***	***iridescens***										15	8	7						**30**
7	54054	Bembidiini	***Bembidion***		***kuprianovii***	1									1	7	1	1	5				**16**
8	54163	Bembidiini	***Bembidion***	***Eupetedromus***	***incrematum***	1	2						2										**5**
9		Bembidiini	***Bembidion***		***sp. 1***		11														2	1	**14**
10		Bembidiini	***Bembidion***		***sp. 2***		3												1		3		**7**
11		Bembidiini	***Bembidion***		***sp. 3***						1		2		1							1	**5**
12		Bembidiini	***Bembidion***		***sp. 4***						1												**1**
13		Bembidiini	***Bembidion***		***sp. 5***								4		1								**5**
14		Bembidiini	***Bembidion***		***sp. 6***								3	1						6			**10**
15		Bembidiini	***Bembidion***		***sp. 7***								2										**2**
16		Bembidiini	***Bembidion***		***sp. 8***										1								**1**
17		Bembidiini	***Bembidion***		***sp. 9***										5	1							**6**
18		Bembidiini	***Bembidion***		***sp. 10***											3							**3**
19		Bembidiini	***Bembidion***		***sp. 11***												1						**1**
20		Bembidiini	***Bembidion***		***sp. 12***																	1	**1**
21	93004	Pterostichini	***Pterostichus***	***Argutor***	***patruelis***						2	1		1									**4**
22	93006	Pterostichini	***Pterostichus***	***Bothriopterus***	***adstrictus***	1																	**1**
23	93008	Pterostichini	***Pterostichus***	***Bothriopterus***	***mutus***			2															**2**
24	93153	Pterostichini	***Pterostichus***	***Hypherpes***	***sphodrinus***											1							**1**
25		Pterostichini	***Pterostichus***	***Hypherpes***	***sp. 1***	3		1				3				2							**9**
26		Pterostichini	***Pterostichus***	***Hypherpes***	***sp. 2***			1															**1**
27	93188	Pterostichini	***Pterostichus***	***Cryobius***	***riparius***			4								9	2	5	2				**22**
28	111011	Licinini	***Badister***	***Baudia***	***grandiceps***						1												**1**
29	119011	Harpalini	***Stenolophus***	***Stenolophus***	***incultus***																2		**2**
30		Harpalini	***Harpalus***		***sp. 1***	1																	**1**
31	151007	Platynini	***Agonum***	***Europhilus***	***gratiosum***	3	2			4	4			1							11	1	**26**
32	151017	Platynini	***Agonum***	***Platynomicrus***	***ferruginosum***						1			1							2		**4**
33	151018	Platynini	***Agonum***	***Platynomicrus***	***nigriceps***		1														2		**3**
34	151019	Platynini	***Agonum***	***Platynomicrus***	***piceolum***			5															**5**
35	151025	Platynini	***Agonum***	***Agonum***	***corvus***							1											**1**
36	151026	Platynini	***Agonum***	***Agonum***	***cupreum***						2				3								**5**
37	151027	Platynini	***Agonum***	***Agonum***	***cupripenne***				2														**2**
38	151034	Platynini	***Agonum***	***Agonum***	***harrisii***		2																**2**
39	151037	Platynini	***Agonum***	***Agonum***	***metallescens***																	1	**1**
40	151044	Platynini	***Agonum***	***Agonum***	***propinquum***	10	6						2								2	1	**21**
41	151050	Platynini	***Agonum***		***mutatum***					6		1		1									**8**
42	151062	Platynini	***Agonum***	***Stereagonum***	***errans***																1	1	**2**
43	152004	Platynini	***Platynus***	***Platynus***	***decentis***	5		2			1												**8**
44	175031	Lebiini	***Lebia***	***Lebia***	***moesta***						1												**1**
				No. of Specimens		**29**	**29**	**16**	**2**	**10**	**16**	**6**	**17**	**5**	**27**	**35**	**11**	**9**	**8**	**6**	**25**	**8**	**259**
				No. of Species		**10**	**8**	**7**	**1**	**2**	**10**	**4**	**7**	**5**	**7**	**8**	**4**	**3**	**3**	**1**	**8**	**8**	**44**
				Specimens/hr		**29**	**58**	**32**	**2**	**10**	**16**	**6**	**17**	**5**	**27**	**70**	**22**	**18**	**16**	**12**	**25**	**8**	**19.2**
				Species/hr		**10**	**16**	**14**	**1**	**2**	**10**	**4**	**7**	**5**	**7**	**16**	**8**	**6**	**6**	**2**	**8**	**8**	**3.3**
				Σ Specimens		**29**	**58**	**74**	**76**	**86**	**102**	**108**	**125**	**130**	**157**	**192**	**203**	**212**	**220**	**226**	**251**	**259**	
				Σ Species		**10**	**15**	**19**	**20**	**21**	**29**	**30**	**33**	**33**	**36**	**38**	**39**	**39**	**39**	**39**	**41**	**44**	

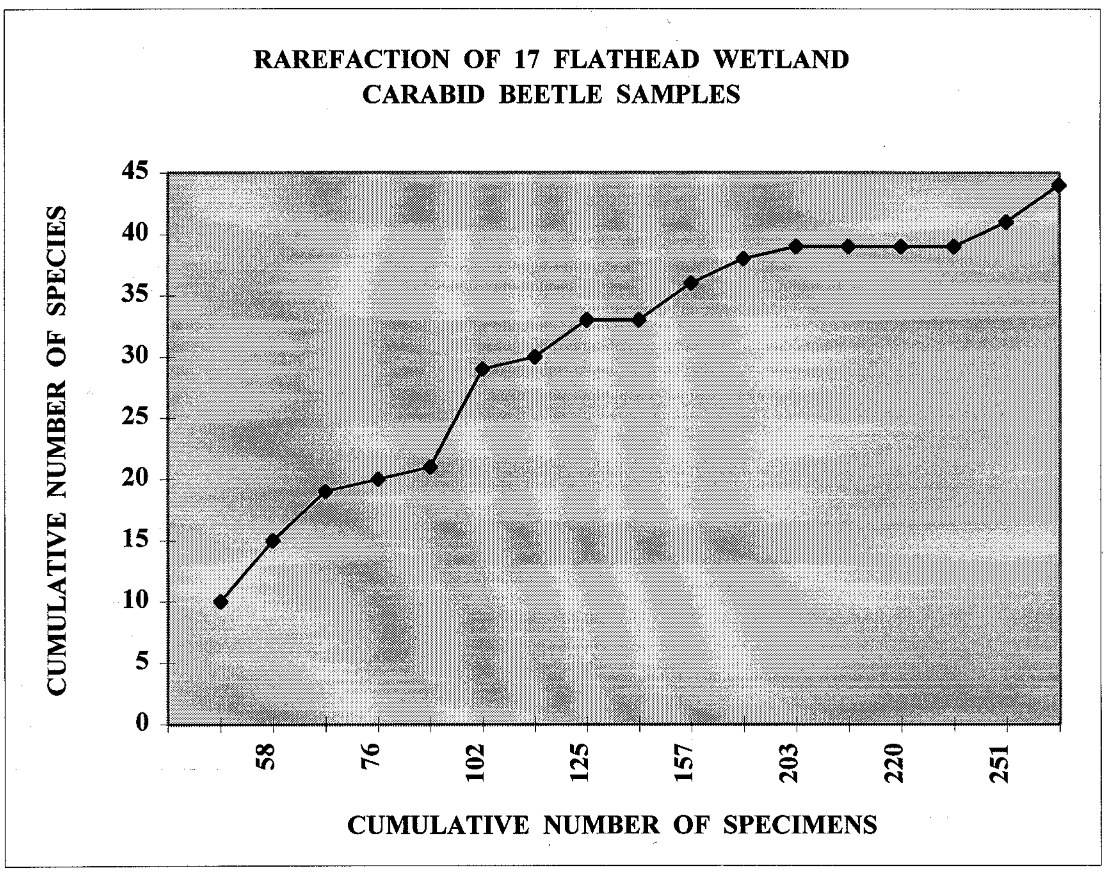

FIGURE RAREFACTION: Rarefaction of 17 wetland carabid samples from the Flathead River watershed of northwest Montana.

TABLE NWMTLIST *(nwmtlist.xls;11iii99)*:
Checklist of 232 carabid beetle species (Coleoptera: Carabidae) known or suspected as resident in the Flathead River watershed of northwest Montana.

SpNo follow Bergdahl *(unpubl.)*. **Taxonomy** and **species names** follow Bousquet & LaRochelle (1993).
References are: 1: Bergdahl (this report); 2: LaBonte & Johnson (1989); 3: Edwards (1975); and 4: Russell (1968).
The following valid species recorded by Edwards (1975) in Glacier National Park area are not recognized as Montana residents by Bousquet & LaRochelle (1993): *Bembidion californicum*(OR,CA); *Bembidion nigrocoeruleum* (CA,OR,WA); *Bembidion rusticum lenensoides* (AB,AK,BC,YT); *Amara impuncticollis* and *Amara pennsylvanica* (eastern species not reaching Pacific Northwest).
The following valid species recorded by Russell (1968) in west Montana are not recognized as Montana residents by Bousquet & LaRochelle (1993): *Nebria eschscholtzii* (CA,ID,NV,OR,WA), *Elaphrus americanus* (widespread in North America), *Bembidion lorquini* (BC,CA,ID,NV,OR,WA), *Bembidion disjunctum* (BC,CA,OR), *Bembidion approximatum* (CA,OR,WA), *Amara impuncticollis* (see above), *Amara brunnea* (AK,YT), *Amara exlineae* (WA), *Amara rubrica* (eastern species), *Stenolophus limbalis* (BC,WA,OR,WA), and *Apristus laticollis* (CA,OR,UT)
All of these species should be seriously considered as possible residents in northwest Montana.
Bousquet & LaRochelle (1993) do not list Edwards' (1975) *Bembidion nigricornis* as a recognized published name, or Russell's (1968) *Amara surata* and *Agonum californum*, so it is unclear what species these authors' records represent.

NO	SpNo	TRIBE	GENUS	SUBGENUS	SPECIES	SUBSPECIES	AUTHOR	YEAR	REF
1	1001	Trachypachini	***Trachypachus***		***gibbsii***		Leconte	1861	3,4
2	1002	Trachypachini	***Trachypachus***		***holmbergi***		Mannerheim	1853	3,4
3	4001	Opisthiini	***Opisthius***		***richardsoni***		Kirby	1837	3,4
4	5002	Nebriini	***Leistus***	***Neoleistus***	***ferruginosus***		Mannerheim	1843	4
5	7006	Nebriini	***Nebria***	***Boreonebria***	***crassicornis***	***intermedia***	Van Dyke	1949	3,4
6	7009	Nebriini	***Nebria***	***Boreonebria***	***gyllenhali***	***castanipes***	(Kirby)	1837	3,4
7	7012	Nebriini	***Nebria***	***Boreonebria***	***hudsonica***		LeConte	1863	3,4
8	7024	Nebriini	***Nebria***		***arkansana***	***edwardsi***	Kavanaugh	1979	3,4
9	7042	Nebriini	***Nebria***		***obliqua***	***obliqua***	LeConte	1866	3,4
10	7045	Nebriini	***Nebria***		***sahlbergii***	***sahlbergii***	Fischer von Waldheim	1828	3
11	7061	Nebriini	***Nebria***		***metallica***		Fischer von Waldheim	1820	4
12	7079	Nebriini	***Nebria***		***gebleri***	***gebleri***	Dejean	1831	3,4
13	8002	Notiophilini	***Notiophilus***		***aquaticus***		(Linné)	1758	4
14	8005	Notiophilini	***Notiophilus***		***directus***		Casey	1920	3,4
15	8008	Notiophilini	***Notiophilus***		***nitens***		LeConte	1857	4
16	8014	Notiophilini	***Notiophilus***		***simulator***		Fall	1906	3,4
17	9004	Loricerini	***Loricera***		***pilicornis***	***pilicornis***	(Fabricius)	1775	1,4
18	13030	Cicindelini	***Cicindela***	***Cicindela***	***hirticollis***	***shelfordi***	Graves	1988	4
19	13043	Cicindelini	***Cicindela***	***Cicindela***	***longilabris***	***laurentii***	Schaupp	1884	4
20	13046	Cicindelini	***Cicindela***	***Cicindela***	***nebraskana***		Casey	1909	4
21	13051	Cicindelini	***Cicindela***	***Cicindela***	***oregona***	***oregona***	LeConte	1857	4
22	13062	Cicindelini	***Cicindela***	***Cicindela***	***purpurea***	***audubonii***	LeConte	1845	4
23	13068	Cicindelini	***Cicindela***	***Cicindela***	***repanda***	***repanda***	Dejean	1825	4
24	13089	Cicindelini	***Cicindela***	***Cicindela***	***tranquebarica***	***tranquebarica***	Herbst	1806	4
25	13169	Cicindelini	***Cicindela***	***Cylindera***	***terricola***	***cyanella***	LeConte	1857	4
26	14016	Carabini	***Calosoma***	***Chrysostigma***	***calidum***		(Fabricius)	1775	4
27	14023	Carabini	***Calosoma***	***Chrysostigma***	***tepidum***		LeConte	1852	4
28	14033	Carabini	***Calosoma***	***Callisthenes***	***luxatum***		Say	1823	4
29	14034	Carabini	***Calosoma***	***Callisthenes***	***moniliatum***		(LeConte)	1852	4
30	15006	Carabini	***Carabus***	***Archicarabus***	***nemoralis***		O.F. Müller	1764	4
31	15007	Carabini	***Carabus***	***Hemicarabus***	***serratus***		Say	1823	4
32	15012	Carabini	***Carabus***	***Oreocarabus***	***taedatus***	***agassii***	LeConte	1850	3,4
33	17002	Cychrini	***Cychrus***		***hemphillii***	***rickseckeri***	LeConte	1884	4
34	18030	Cychrini	***Scaphinotus***	***Pseudonomaretus***	***merkelii***		(G.H. Horn)	1890	4
35	18032	Cychrini	***Scaphinotus***	***Pseudonomaretus***	***relictus***		(G.H. Horn)	1881	4
36	18071	Cychrini	***Scaphinotus***	***Brennus***	***marginatus***		(Fischer von Waldheim)	1820	1,3,4
37	20004	Elaphrini	***Blethisa***		***multipunctata***	***aurata***	Fischer von Waldheim	1828	2,4
38	20006	Elaphrini	***Blethisa***		***quadricollis***		Haldeman	1847	2
39	21004	Elaphrini	***Elaphrus***	***Neoelaphrus***	***clairvillei***		Kirby	1837	4
40	21011	Elaphrini	***Elaphrus***	***Elaphrus***	***californicus***		Mannerheim	1843	1,3,4
41	21013	Elaphrini	***Elaphrus***	***Elaphrus***	***lecontei***		Crotch	1876	3,4
42	21021	Elaphrini	***Elaphrus***	***Elaphroterus***	***purpurans***		Hausen	1891	4

NO	SpNo	TRIBE	GENUS	SUBGENUS	SPECIES	SUBSPECIES	AUTHOR	YEAR	REF
43	22008	Omophronini	***Omophron***		***ovale***		G.H. Horn	1870	3,4
44	27017	Brachinini	***Brachinus***	***Neobrachinus***	***fumans***		(Fabricius)	1781	4
45	27029	Brachinini	***Brachinus***	***Neobrachinus***	***medius***		T.W. Harris	1828	4
46	27041	Brachinini	***Brachinus***	***Neobrachinus***	***quadripennis***		Dejean	1825	2,4
47	30008	Clivinini	***Dyschirius***	***Dyschirius***	***tridentatus***		LeConte	1852	4
48	30036	Clivinini	***Dyschirius***		***sphaericollis***		(Say)	1823	4
49	30052	Clivinini	***Dyschirius***	***Dyschiriodes***	***integer***		LeConte	1852	2,4
50	41001	Broscini	***Zacotus***		***matthewsii***		LeConte	1869	4
51	43001	Gehringiini	***Gehringia***		***olympica***		Darlington	1933	3
52	52007	Trechini	***Trechus***	***Trechus***	***chalybeus***		Dejean	1831	1,3,4
53	52019	Trechini	***Trechus***	***Trechus***	***obtusus***		Erichson	1837	1
54	52020	Trechini	***Trechus***	***Trechus***	***oregonensis***		Hatch	1951	4
55	52029	Trechini	***Trechus***	***Trechus***	***tenuiscapus***		Lindroth	1961	3,4
56	54007	Bembidiini	***Bembidion***	***Bracteon***	***inaequale***		Say	1823	4
57	54009	Bembidiini	***Bembidion***	***Bracteon***	***levettei***		Casey	1918	3,4
58	54015	Bembidiini	***Bembidion***	***Odontium***	***bowditchii***		LeConte	1878	4
59	54027	Bembidiini	***Bembidion***	***Ochthedromus***	***bifossulatum***		(LeConte)	1852	3,4
60	54028	Bembidiini	***Bembidion***	***Eurytrachelus***	***interventor***		Lindroth	1963	3,4
61	54029	Bembidiini	***Bembidion***	***Eurytrachelus***	***nitidum***		(Kirby)	1837	3,4
62	54032	Bembidiini	***Bembidion***	***Leja***	***dyschirinum***		LeConte	1861	3,4
63	54040	Bembidiini	***Bembidion***	***Lionepha***	***erasum***		LeConte	1859	3,4
64	54050	Bembidiini	***Bembidion***	***Trechonepha***	***iridescens***		(LeConte)	1852	1,3,4
65	54054	Bembidiini	***Bembidion***		***kuprianovii***		Mannerheim	1843	1,3,4
66	54058	Bembidiini	***Bembidion***	***Plataphodes***	***breve***		(Motschulsky)	1845	3
67	54059	Bembidiini	***Bembidion***	***Plataphodes***	***complanulum***		(Mannerheim)	1853	3,4
68	54062	Bembidiini	***Bembidion***	***Plataphodes***	***haruspex***		Casey	1918	4
69	54065	Bembidiini	***Bembidion***	***Plataphodes***	***manningense***		Lindroth	1969	4
70	54068	Bembidiini	***Bembidion***	***Plataphodes***	***quadrifoveolatum***		Mannerheim	1843	3,4
71	54069	Bembidiini	***Bembidion***	***Plataphodes***	***rosslandicum***		Lindroth	1963	4
72	54073	Bembidiini	***Bembidion***	***Plataphus***	***curtulatum***		Casey	1918	3,4
73	54075	Bembidiini	***Bembidion***	***Plataphus***	***gebleri***	***turbatum***	Casey	1918	3,4
74	54077	Bembidiini	***Bembidion***	***Plataphus***	***gratiosum***		Casey	1918	4
75	54081	Bembidiini	***Bembidion***	***Plataphus***	***planatum***		(LeConte)	1848	3,4
76	54083	Bembidiini	***Bembidion***	***Plataphus***	***rufinum***		Lindroth	1963	4
77	54099	Bembidiini	***Bembidion***	***Hirmoplataphus***	***concolor***		(Kirby)	1837	4
78	54102	Bembidiini	***Bembidion***	***Hirmoplataphus***	***quadrulum***		LeConte	1861	3,4
79	54103	Bembidiini	***Bembidion***	***Hirmoplataphus***	***recticolle***		LeConte	1863	3,4
80	54104	Bembidiini	***Bembidion***	***Hirmoplataphus***	***salebratum***		(LeConte)	1848	3
81	54114	Bembidiini	***Bembidion***		***commotum***		Casey	1918	3,4
82	54116	Bembidiini	***Bembidion***		***nebraskense***		LeConte	1863	4
83	54120	Bembidiini	***Bembidion***		***actuosum***		Casey	1918	4
84	54122	Bembidiini	***Bembidion***		***nevadense***		Ulke	1875	4
85	54127	Bembidiini	***Bembidion***	***Peryphanes***	***grapii***		Gyllenhal	1827	4
86	54129	Bembidiini	***Bembidion***	***Peryphanes***	***platynoides***		Hayward	1897	3,4
87	54135	Bembidiini	***Bembidion***		***bimaculatum***		(Kirby)	1837	3,4
88	54138	Bembidiini	***Bembidion***		***sordidum***		(Kirby)	1837	4
89	54142	Bembidiini	***Bembidion***	***Peryphus***	***obscurellum***		(Motschulsky)	1845	3,4
90	54144	Bembidiini	***Bembidion***	***Peryphus***	***petrosum***	***petrosum***	Gebler	1833	4
91	54146	Bembidiini	***Bembidion***	***Peryphus***	***rupicola***		(Kirby)	1837	3,4
92	54149	Bembidiini	***Bembidion***	***Peryphus***	***tetracolum***		Say	1823	4
93	54151	Bembidiini	***Bembidion***		***transversale***		Dejean	1831	3,4
94	54152	Bembidiini	***Bembidion***		***scopulinum***		(Kirby)	1837	3
95	54163	Bembidiini	***Bembidion***	***Eupetedromus***	***incrematum***		LeConte	1860	1,3,4
96	54179	Bembidiini	***Bembidion***	***Notaphus***	***castor***		Lindroth	1963	3
97	54180	Bembidiini	***Bembidion***	***Notaphus***	***coloradense***		Hayward	1897	3,4
98	54187	Bembidiini	***Bembidion***	***Notaphus***	***graphicum***		Casey	1918	4
99	54191	Bembidiini	***Bembidion***	***Notaphus***	***intermedium***		(Kirby)	1837	4
100	54194	Bembidiini	***Bembidion***	***Notaphus***	***nigripes***		(Kirby)	1837	3,4
101	54198	Bembidiini	***Bembidion***	***Notaphus***	***patruele***		Dejean	1831	2,3,4
102	54202	Bembidiini	***Bembidion***	***Notaphus***	***semipunctatum***		(Donovan)	1806	4

NO	SpNo	TRIBE	GENUS	SUBGENUS	SPECIES	SUBSPECIES	AUTHOR	YEAR	REF
103	54203	Bembidiini	***Bembidion***	***Notaphus***	***umbratum***		(LeConte)	1848	3,4
104	54219	Bembidiini	***Bembidion***		***impotens***		Casey	1918	4
105	54222	Bembidiini	***Bembidion***		***timidum***		(LeConte)	1848	3,4
106	54224	Bembidiini	***Bembidion***		***versicolor***		(LeConte)	1848	4
107	54233	Bembidiini	***Bembidion***	***Bembidion***	***quadrimaculatum***	***dubitans***	(LeConte)	1852	3,4
108	54237	Bembidiini	***Bembidion***	***Semicampa***	***convexulum***		Hayward	1897	4
109	54244	Bembidiini	***Bembidion***	***Dioplocampa***	***transparens***		(Gebler)	1829	2,4
110	54245	Bembidiini	***Bembidion***	***Trepanedoris***	***acutifrons***		LeConte	1879	2,4
111	54250	Bembidiini	***Bembidion***	***Trepanedoris***	***concretum***		Casey	1918	2,4
112	54251	Bembidiini	***Bembidion***	***Trepanedoris***	***connivens***		(LeConte)	1852	4
113	54252	Bembidiini	***Bembidion***	***Trepanedoris***	***fortestriatum***		(Motschulsky)	1845	4
114	54257	Bembidiini	***Bembidion***	***Trepanedoris***	***siticum***		Casey	1918	4
115	55001	Bembidiini	***Phrypeus***		***rickseckeri***		(Hayward)	1897	4
116	57003	Bembidiini	***Tachyta***	***Tachyta***	***nana***	***inornata***	(Say)	1823	4
117	57004	Bembidiini	***Tachyta***	***Tachyta***	***nana***	***kirbyi***	Casey	1918	4
118	58001	Bembidiini	***Elaphropus***		***anceps***		(LeConte)	1848	4
119	58014	Bembidiini	***Elaphropus***		***incurvus***		(Say)	1830	4
120	75001	Psydrini	***Nomius***		***pygmaeus***		(Dejean)	1831	3
121	76001	Psydrini	***Psydrus***		***piceus***		LeConte	1846	3
122	77001	Patrobini	***Diplous***		***aterrimus***		(Dejean)	1828	3,4
123	77002	Patrobini	***Diplous***		***californicus***		(Motschulsky)	1859	4
124	78001	Patrobini	***Patrobus***	***Neopatrobus***	***longicornis***		(Say)	1823	3,4
125	80001	Patrobini	***Platidiolus***		***vandykei***		Kurnakov	1960	3
126	86010	Pterostichini	***Poecilus***	***Poecilus***	***lucublandus***	***lucublandus***	(Say)	1823	4
127	93004	Pterostichini	***Pterostichus***	***Argutor***	***patruelis***		(Dejean)	1831	1
128	93006	Pterostichini	***Pterostichus***	***Bothriopterus***	***adstrictus***		Eschscholtz	1823	1,3,4
129	93008	Pterostichini	***Pterostichus***	***Bothriopterus***	***mutus***		(Say)	1823	1
130	93045	Pterostichini	***Pterostichus***	***Morphnosoma***	***melanarius***		(Illiger)	1798	4
131	93077	Pterostichini	***Pterostichus***	***Hypherpes***	***beyeri***		Van Dyke	1925	4
132	93092	Pterostichini	***Pterostichus***	***Hypherpes***	***ecarinatus***		Hatch	1936	3,4
133	93102	Pterostichini	***Pterostichus***	***Hypherpes***	***herculaneus***		Mannerheim	1843	4
134	93106	Pterostichini	***Pterostichus***	***Hypherpes***	***idahoae***		Csiki	1930	4
135	93143	Pterostichini	***Pterostichus***	***Hypherpes***	***protractus***		LeConte	1860	4
136	93153	Pterostichini	***Pterostichus***	***Hypherpes***	***sphodrinus***		LeConte	1863	1,3,4
137	93188	Pterostichini	***Pterostichus***	***Cryobius***	***riparius***		(Dejean)	1828	1,3,4
138	97005	Zabrini	***Amara***	***Curtonotus***	***carinata***		(LeConte)	1848	4
139	97018	Zabrini	***Amara***	***Bradytus***	***apricaria***		(Paykull)	1790	3,4
140	97026	Zabrini	***Amara***	***Bradytus***	***latior***		(Kirby)	1837	3
141	97032	Zabrini	***Amara***	***Percosia***	***obesa***		(Say)	1823	4
142	97043	Zabrini	***Amara***	***Amara***	***californica***	***californica***	Dejean	1828	4
143	97048	Zabrini	***Amara***	***Amara***	***conflata***		LeConte	1855	3,4
144	97049	Zabrini	***Amara***	***Amara***	***confusa***		LeConte	1848	3,4
145	97050	Zabrini	***Amara***	***Amara***	***convexa***		LeConte	1848	3,4
146	97052	Zabrini	***Amara***	***Amara***	***cupreolata***		Putzeys	1866	3
147	97053	Zabrini	***Amara***	***Amara***	***discors***		Kirby	1837	3,4
148	97056	Zabrini	***Amara***	***Amara***	***erratica***		(Duftschmid)	1812	3,4
149	97059	Zabrini	***Amara***	***Amara***	***familiaris***		(Duftschmid)	1812	3,4
150	97060	Zabrini	***Amara***	***Amara***	***farcta***		LeConte	1855	3
151	97069	Zabrini	***Amara***	***Amara***	***littoralis***		Mannerheim	1843	3
152	97078	Zabrini	***Amara***	***Amara***	***patruelis***		Dejean	1831	4
153	97080	Zabrini	***Amara***	***Amara***	***pseudobrunnea***		Lindroth	1968	3
154	97081	Zabrini	***Amara***	***Amara***	***quenseli***		(Schönherr)	1806	4
155	97084	Zabrini	***Amara***	***Amara***	***sanjuanensis***		Hatch	1949	4
156	97086	Zabrini	***Amara***	***Amara***	***sinuosa***		(Casey)	1918	3
157	97099	Zabrini	***Amara***	***Triaena***	***pallipes***		Kirby	1837	3,4
158	97100	Zabrini	***Amara***	***Triaena***	***scitula***		Zimmermann	1832	3,4
159	107027	Chlaeniini	***Chlaenius***	***Chlaenius***	***sericeus***	***sericeus***	(Forster)	1771	2,4
160	107033	Chlaeniini	***Chlaenius***	***Agostenus***	***alternatus***		G.H. Horn	1871	2,4
161	107035	Chlaeniini	***Chlaenius***	***Agostenus***	***harpalinus***		Eschscholtz	1833	3
162	107037	Chlaeniini	***Chlaenius***	***Agostenus***	***niger***		Randall	1838	2

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163	107042	Chlaeniini	Chlaenius	Brachylobus	lithophilus	lithophilus	Say	1823	4
164	107055	Chlaeniini	Chlaenius	Chlaeniellus	pennsylvanicus	pennsylvanicus	Say	1823	2,4
165	107059	Chlaeniini	Chlaenius	Chlaeniellus	tricolor	tricolor	Dejean	1826	4
166	108006	Licinini	Diplocheila	Isorembus	obtusa		(LeConte)	1848	4
167	108008	Licinini	Diplocheila	Isorembus	striatopunctata		(LeConte)	1844	2
168	111006	Licinini	Badister	Badister	neopulchellus		Lindroth	1954	2,4
169	111011	Licinini	Badister	Baudia	grandiceps		Casey	1920	1, 2
170	115003	Harpalini	Anisodactylus	Anisodactylus	californicus		Dejean	1829	4
171	115013	Harpalini	Anisodactylus	Anisodactylus	similis		LeConte	1851	4
172	115026	Harpalini	Anisodactylus	Anadaptus	nivalis		G.H. Horn	1880	4
173	115029	Harpalini	Anisodactylus	Anadaptus	sanctaecrucis		(Fabricius)	1798	4
174	118005	Harpalini	Dicheirus		piceus		(Ménétriés)	1843	4
175	119002	Harpalini	Stenolophus	Stenolophus	anceps		LeConte	1857	2,4
176	119011	Harpalini	Stenolophus	Stenolophus	incultus		Casey	1914	1
177	119028	Harpalini	Stenolophus	Agonoleptus	conjunctus		(Say)	1823	3,4
178	120010	Harpalini	Bradycellus	Catharellus	lecontei		Csiki	1932	2,4
179	120013	Harpalini	Bradycellus	Stenocellus	californicus		(LeConte)	1857	2,4
180	120015	Harpalini	Bradycellus	Stenocellus	congener		(LeConte)	1848	3,4
181	122002	Harpalini	Trichocellus	Trichocellus	cognatus		(Gyllenhal)	1827	4
182	126001	Harpalini	Piosoma		setosum		LeConte	1848	4
183	127001	Harpalini	Euryderus		grossus		(Say)	1830	4
184	128017	Harpalini	Harpalus	Euharpalops	animosus		Casey	1924	3,4
185	128018	Harpalini	Harpalus	Euharpalops	fraternus		LeConte	1852	3,4
186	128021	Harpalini	Harpalus	Euharpalops	laevipes		Zetterstedt	1828	3,4
187	128025	Harpalini	Harpalus	Euharpalops	reversus		Casey	1924	3
188	128031	Harpalini	Harpalus		nigritarsis		C.R. Sahlberg	1827	3,4
189	128041	Harpalini	Harpalus		cautus		Dejean	1829	4
190	128043	Harpalini	Harpalus		innocuus		LeConte	1863	4
191	128050	Harpalini	Harpalus	Harpalomerus	amputatus		Say	1830	3,4
192	128054	Harpalini	Harpalus		somnulentus		Dejean	1829	3,4
193	128064	Harpalini	Harpalus	Harpalobius	fuscipalpis		Sturm	1818	4
194	132011	Harpalini	Discoderus		parallelus		(Haldeman)	1843	3
195	138004	Platynini	Calathus	Neocalathus	ingratus		Dejean	1828	3
196	138011	Platynini	Calathus	Procalathus	advena		(LeConte)	1848	3,4
197	143002	Platynini	Sericoda		bogemannii		(Gyllenhal)	1813	3,4
198	145001	Platynini	Anchomenus		aeneolus		(LeConte)	1854	4
199	150001	Platynini	Oxypselaphus		pusillus		(LeConte)	1854	4
200	151001	Platynini	Agonum	Europhilus	anchomenoides		Randall	1838	4
201	151007	Platynini	Agonum	Europhilus	gratiosum		(Mannerheim)	1853	1, 2
202	151008	Platynini	Agonum	Europhilus	lutulentum		(LeConte)	1854	2
203	151013	Platynini	Agonum	Europhilus	sordens		Kirby	1837	4
204	151015	Platynini	Agonum	Europhilus	thoreyi		Dejean	1828	2,4
205	151016	Platynini	Agonum	Platynomicrus	bicolor		(Dejean)	1828	4
206	151017	Platynini	Agonum	Platynomicrus	ferruginosum		(Dejean)	1828	1,4
207	151018	Platynini	Agonum	Platynomicrus	nigriceps		LeConte	1848	1,4
208	151019	Platynini	Agonum	Platynomicrus	piceolum		(LeConte)	1879	1,4
209	151020	Platynini	Agonum	Agonum	affine		Kirby	1837	2
210	151025	Platynini	Agonum	Agonum	corvus		(LeConte)	1860	1,3,4
211	151026	Platynini	Agonum	Agonum	cupreum		Dejean	1831	1,3,4
212	151027	Platynini	Agonum	Agonum	cupripenne		(Say)	1823	1,3,4
213	151034	Platynini	Agonum	Agonum	harrisii		LeConte	1848	1,2,4
214	151036	Platynini	Agonum	Agonum	melanarium		Dejean	1828	4
215	151037	Platynini	Agonum	Agonum	metallescens		(LeConte)	1854	1
216	151043	Platynini	Agonum	Agonum	placidum		(Say)	1823	3,4
217	151044	Platynini	Agonum	Agonum	propinquum		(Gemminger & Harold)	1868	1,2,4
218	151046	Platynini	Agonum	Agonum	suturale (= subsericeum)		Say (LeConte)	1830	4
219	151050	Platynini	Agonum		mutatum		(Gemminger & Harold)	1868	1,4
220	151062	Platynini	Agonum	Stereagonum	errans		(Say)	1823	1
221	151066	Platynini	Agonum	Stictanchus	decorum		(Say)	1823	2,4
222	152004	Platynini	Platynus	Platynus	decentis		(Say)	1823	1,4

NO	SpNo	TRIBE	GENUS	SUBGENUS	SPECIES	SUBSPECIES	AUTHOR	YEAR	REF
223	163005	Lebiini	***Cymindis***	***Cymindis***	***cribricollis***		Dejean	1831	3,4
224	163013	Lebiini	***Cymindis***	***Cymindis***	***planipennis***		LeConte	1863	3,4
225	163015	Lebiini	***Cymindis***	***Cymindis***	***unicolor***		Kirby	1837	3
226	169001	Lebiini	***Dromius***	***Dromius***	***piceus***		Dejean	1831	3,4
227	172004	Lebiini	***Apristus***		***constrictus***		Casey	1920	4
228	174001	Lebiini	***Syntomus***		***americanus***		(Dejean)	1831	2, 3
229	175021	Lebiini	***Lebia***	***Lebia***	***cyanipennis***		Dejean	1831	4
230	175031	Lebiini	***Lebia***	***Lebia***	***moesta***		LeConte	1850	1
231	175047	Lebiini	***Lebia***	***Lebia***	***viridis***		Say	1823	4
232	180014	Lebiini	***Calleida***	***Philophuga***	***viridis***	***amoena***	(LeConte)	1848	4

APPENDIX G – PRIORITY WATERSHEDS FOR WETLAND INVENTORY

Montana Watersheds of High Biodiversity Value Prioritized for Inventory and Conservation
Compiled by the Montana Natural Heritage Program, Montana State Library

Watershed	Criteria used
Blackfoot	2,3
Lower Flathead	2,3,4
Swan	1,2,3
Flathead Lake	1,3,4
Stillwater (Flathead)	1,3,4
North Fork Flathead	1,2,3,4
Middle Fork Flathead	1,2,3
South Fork Flathead	1,2,3
St. Mary	1,2,3
Milk Headwaters	1,2,3
Cut Bank	2,4
Two Medicine	2,3,4
Upper Milk	2,4
Willow	2,3
Teton	2,3
Sun	2,4
Upper Clark Fork	3
Bitterroot	3,4
Big Hole	3
Beaverhead	3
Red Rock	1,2,3
Madison	2,3,4?
Jefferson	3
Yellowstone Hdwtrs	1,2,3
Clarks Fork Yllwstone	3
Gallatin	3,4
Smith	3
Bighorn Lake	3
Middle Powder	2,3
Little Powder	2,3
Lower Powder	2,3
Lower Yellowstone	3
Big Muddy	2,3,4
Brush Lake	1,3
Whitewater	2,3,4
Cottonwood	2,3,4
Bullwacker-Dog	2,3
Beaver	2,3,4

This is a preliminary ranking of Montana watersheds compiled by staff of 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 below.

Criteria:

1. Extent and degree of development of wetland & riparian communities
2. Quality and integrity of wetland and riparian communities
3. Presence of rare communities, outstanding community examples and sensitive or E/T species
4. Level of threat