Polygonum amphibium (Water Smartweed)	2	0-30	13
Ranunculus sceleratus (Blister Buttercup)	<1	0-1	7
Rumex crispus (Curly Dock)	2	0-20	33
Senecio serra (Tall Butterweed)	<1	0-1	7
Sium suave (Hemlock Water-parsnip)	<1	0-1	7
Smilacina stellata (Starry Solomon-plume)	2	0-20	13
Solidago canadensis (Canada Goldenrod)	2	0-20	13
Stachys palustris (Swamp Hedge-nettle)	<1	0-1	7
Taraxacum officinale (Common Dandelion)	<1	0-3	7
Thalictrum occidentale (Western Meadowrue)	<1	0-3	7
Urtica dioica (Stinging Nettle)	<1	0-3	13
Veronica americana (American Speedwell)	<1	0-3	13
Ferns and Allies			
Equisetum arvense (Field Horsetail)	<1	0-3	13
Equisetum laevigatum (Smooth Scouring-rush)	5	0-70	13

SUCCESSIONAL INFORMATION

Salix exigua (sandbar willow) is a pioneer species which colonizes barren, alluvial deposits on floodplains, islands and river bars. It prospers under conditions of frequent, and sometimes prolonged, flooding. *Salix exigua* (sandbar willow) may germinate with *Populus trichocarpa* (black cottonwood) or *Populus angustifolia* (narrowleaf cottonwood), and may dominate newly deposited sediments for the first few seasons. However, as cottonwoods overtake the willows to dominate the site, the shade intolerant *Salix exigua* (sandbar willow) will eventually decline. Where cottonwoods are not present, other willow species, particularly in the *Salix geyeriana* (Geyer willow) series, the *Salix lutea* (yellow willow) series, or the *Salix drummondiana* (Drummond willow) series, may become the climax vegetation, for *Salix exigua* (sandbar willow) communities promote bank building and soil development, preparing inhospitable sites for later successional stages. The *Acer negundo/ Prunus virginiana* (box-elder/common chokecherry) habitat type may represent a climax on these sites in some areas as well.

SOILS

Padgett and others (1989) indicate that soils of this type are classified as Entisols, Inceptisols, Mollisols or even Histosols. Soil textures range over a broad spectrum from silty clays to sandy loams. Nutrient rich surface horizons may extend to a depth of 45 cm (18 in) on some sites, while other sites may be characterized solely by mineral deposits such as fine or coarse sands. Underlying layers are comprised of sands, gravels, cobbles or various sized rocks. Fluctuating subsurface water tables foster conditions suitable for oxidation/reduction reactions resulting in mottled and gleyed soil characteristics in the upper horizons. Water tables are generally at or near the surface, but may occur at depths of 60 cm (24 in) or more. Surface soils are expected to be moist throughout most of the year.

ADJACENT COMMUNITIES

Because *Salix exigua* (sandbar willow) is capable of germinating on sites characterized by a broad range of sub-

strates, it is often encountered with a variety of other vegetation communities. *Eleocharis* spp. (spikesedge) and *Phalaris arundinacea* (reed canarygrass) tend to occupy adjacent inundated and/or saturated sites. Neighboring riparian shrub communities, typically mid seral stages, associated with the *Salix exigua* (sandbar willow) community type include *Crataegus douglasii* (Black Hawthorn), *Betula occidentalis* (water birch), *Salix geyeriana* (Geyer willow), *Salix lasiandra* (Pacific willow), *Salix lutea* (yellow willow), *Salix bebbiana* (Bebb willow), and *Salix boothii* (Booth willow) types. Tree-dominated types, represented by *Pseudotsuga menziesii* (Douglas fir), *Populus tremuloides* (quaking aspen), *Acer negundo* (box-elder), *Populus trichocarpa* (Black cottonwood) and *Populus angustifolia* (Narrowleaf Cottonwood), may be present as well. Uplands are often dominated by *Artemisia tridentata* (big sagebrush) steppe or *Juniperus scopulorum* (Rocky Mountain juniper)/grassland communities.

MANAGEMENT INFORMATION

Additional management information can be found in Appendix A.

Livestock

Although the dense formation of *Salix exigua* (sandbar willow) communities suggests that forage production is low to occasionally moderate (Hansen and others 1995), the lush undergrowth accompanying all stands surveyed in Idaho indicate that forage value may be high, both from the willow and herbaceous components.

Overuse by livestock will result in reduced vigor of willows, as illustrated by highlining, clubbing, or dead clumps. With continued overuse, willows show a sharp decline in vigor and may be eventually eliminated from the site. However, release from heavy grazing pressure will allow it to reestablish itself, provided it has not been totally removed from the site (Hansen and others 1995).

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants such as photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during long growing season rest periods that the essential biological processes of food production and storage, reproduction, and seedling establishment take place. In some instances, additional periods of rest may be required to either improve or maintain a plant community.

Wildlife

Stands of this community type provide excellent thermal and hiding cover for many species of wildlife. *Salix exigua* (sandbar willow) is normally not as heavily browsed as other willow species. Beaver tends to heavily utilize *Salix exigua* (sandbar willow) (Hansen and others 1995).

Fisheries

Although *Salix exigua* (sandbar willow) typically provides only a limited amount of overhanging shade due to the up right growth form, it may function in a variety of capacities to promote stream health and enhance fisheries. Willows form dense root networks that stabilize streambanks against lateral cutting and erosion and provide cover in the form of overhanging banks. Although not a source of large woody debris, *Salix exigua* (sandbar willow) may trap large trees borne downstream, creating deeper pools and additional cover for fish species. *Carex* spp. (sedge) and other associated mat-forming understory species trap sediments, essentially building streambanks

and filtering steam flows.

Fire

The use of fire in this type as an improvement technique has been little studied. However, limited information indicates this type tends to sprout vigorously following fire. Quick, hot fires result in more sprouts than slower fires, which are potentially more damaging to the willows and tend to result in fewer sprouts (Hansen and others 1995).

Soil Management and Rehabilitation Opportunities

Soil compaction is usually not a problem on coarse textured substrates. Fine textured soils are subject to compaction when moist. Unlike most other willows, *Salix exigua* (sandbar willow) can send up individual stems from a complex underground root system, making it an excellent woody species for stabilizing streambanks. Woody species provide the greatest amount of streambank protection. Herbaceous species rarely afford sufficient stream bank protection. Management should emphasize the importance of willows in protecting the streambank (Hansen and others 1995).

Salix exigua (sandbar willow) is a pioneering species commonly located along irrigation ditches, cutbanks, and wet areas adjacent to roads. It has an excellent capability to rapidly colonize and spread on disturbed areas, making it useful in streambank stabilization and revegetation projects at low to mid elevations. Once *Salix exigua* (sandbar willow) has stabilized soils, other shrub and herbaceous species become established. Because of this characteristic, it would be wise for farmers, ranchers, and other land managers to maintain these stands. Once degradation occurs, rapid erosion of the streambank can occur with devastating results (Hansen and others 1995).

Salix exigua (sandbar willow) is highly adapted to most forms of disturbance. It is a prolific sprouter and will reestablish itself following release from heavy grazing pressure; provided it has not been totally removed from the site (Hansen and others 1995).

Revegetating degraded sites or exposed sand/gravel bars is feasible using *Salix exigua* (sandbar willow). Cuttings should be rooted and grown in a nursery to insure survival. *Salix exigua* (sandbar willow) produces an abundance of roots along the entire stem. Cuttings are best taken in the spring from dormant two to four year old wood. Cuttings 30-50 cm (12-20 in) long and >1 cm (0.5 in) in diameter produce the best results. Roots and shoots from cuttings can be expected to appear 10 days after planting (Hansen and others 1995).

Recreational Uses and Considerations

Salix exigua (sandbar willow) often forms dense, impenetrable stands, prohibiting access to streambanks in some locations for fishermen. This type offers little shade for campers as it is only a medium sized shrub, and may be subject to intense mosquito infestation.

RELATIONSHIP TO OTHER CLASSIFICATION SYSTEMS

One additional classification system that is being used to describe/define riparian and wetland ecosystems is listed below along with the appropriate "type(s)" that best describes this particular habitat type or community type.

USDI Fish and Wildlife Service Wetland Classification (Cowardin and others 1979)

System = palustrine; Class = scrub-shrub; Subclass = broad-leaved deciduous; Water Regime (nontidal) = saturated to temporarily flooded.

OTHER STUDIES

Similar *Salix exigua* (sandbar willow) community types have been described by Norton and others (1981; Greys River, Wyoming), Mutz and Queiroz (1983; southeastern Idaho), Tuhy and Jensen (1982; central Idaho), Youngblood and others (1985b; eastern Idaho and western Wyoming), Padgett and others (1989; Utah and southeastern Idaho), Chadde and others (1988; northern Yellowstone National Park), and Szaro (1989; Arizona and New Mexico). Undergrowth composition varied widely but was often composed of introduced grasses such as *Agrostis stolonifera* (redtop), *Poa palustris* (fowl bluegrass), and *Poa pratensis* (Kentucky bluegrass).

Salix geyeriana/Calamagrostis canadensis Habitat Type
(Geyer Willow/Bluejoint Reedgrass Habitat Type)

SALGEY/CALCAN (SAGE2/CACA4)

Number Of Stands Sampled in Montana= 32

NOTE: The *Salix geyeriana* (Geyer willow) habitat type includes all combinations of *Salix geyeriana* (Geyer willow) and *Salix boothii* (Booth willow) due to similarities in environmental conditions and management concerns.

NOTE: The *Salix geyeriana/Calamagrostis canadensis* (Geyer willow/bluejoint reedgrass) habitat type has been documented in Idaho according to field surveys conducted in 1994. However, due to time constraints during the 1995 field season, homogeneous stand data could not be collected for this type. In the subsequent discussion, any references to physical site location or vegetation characteristics for this type in Idaho were interpreted from 1994 field surveys. The remainder of this description was taken from the Classification and Management of Montana's Riparian and Wetland Sites (Hansen and others 1995).

LOCATION AND ASSOCIATED LANDFORMS

The *Salix geyeriana/Calamagrostis canadensis* (Geyer willow/bluejoint reedgrass) habitat type is a minor type throughout mountains and valleys of Idaho, ranging in elevation from from 1,576 to 2,182 m (5,200 to 7,200 ft). This type prospers on broad, level floodplains of riverine systems, or may be found in narrow bands on alluvial terraces along streams in U-shaped canyons. Salix geyeriana (Geyer willow) may colonize grassy sites associated with seeps and springs, or dominate the periphery of beaver ponds, but wetter sites tend to be dominated by the *Salix geyeriana/Carex rostrata* (Geyer willow/beaked sedge) habitat type. Types in the *Salix geyeriana - Salix boothii* (Geyer willow - Booth willow) series occupy intermediate elevations on the landscape, between higher elevational types in the *Salix drummondiana* (Drummond willow) series and lower elevational types of the *Salix lutea*

(yellow willow) series.

VEGETATION

In Idaho, the shrub overstory is generally dominated by *Salix geyeriana* (Geyer willow) and *Salix boothii* (Booth willow); however, in some cases, only one of these species may be present. As noted earlier, these two willows occupy similar positions on the landscape with similar environmental conditions and are combined into one series for the purposes of this classification. Understory species variations are often subject to the types and levels of disturbance, but are customarily dominated by *Calamagrostis canadensis* (bluejoint reedgrass). *Juncus balticus* (Baltic rush) and *Poa pratensis* (Kentucky bluegrass) may be present on sites with some disturbance.

In Montana, the overstory is dominated by *Salix geyeriana* (Geyer willow) and *Salix boothii* (Booth willow). *Calamagrostis canadensis* (bluejoint reedgrass) and/or *Calamagrostis stricta* (narrow-spiked reedgrass) are the dominant undergrowth species. A variety of forbs are present, including *Geum macrophyllum* (large leaved avens), *Pyrola asarifolia* (pink wintergreen), *Galium trifidum* (small bedstraw), and *Epilobium ciliatum* (common willow-herb) (Table 6). Table 6 reflects vegetation surveyed on sites exclusively in Montana, and may not accurately portray species composition and canopy cover for sites identified in Idaho.

Table 6. Average canopy cover, range of canopy cover, and constancy for species recorded in late seral to climax stands of the *Salix geyeriana/Calamagrostis canadensis* (Geyer willow/bluejoint reedgrass) habitat type (number = 32 stands)

Species	% Canopy Cover		
	Average	Range	Constancy
Shrubs			
Lonicera utahensis (Utah honeysuckle)	20	0-20	33
Potentilla fruticosa (shrubby cinquefoil)	10	0-10	33
Ribes spp. (currant)	5	0-10	67
Salix boothii (Booth willow)	2	0-3	67
Salix drummondiana (Drummond willow)	3	0-3	33
Salix geyeriana (Geyer willow)	70	60-80	100
Salix wolfii (Wolf's willow)	3	0-3	33
Graminoids			
Agrostis scabra (tickle-grass)	1	0-1	33
Agrostis stolonifera (redtop)	3	0-3	33
Calamagrostis canadensis (bluejoint reedgrass)	40	0-60	67
Calamagrostis stricta (narrow-spiked reedgrass)	20	0-20	33
Carex rostrata (beaked sedge)	3	0-3	33
Carex vesicaria (inflated sedge)	1	0-1	33
Deschampsia cespitosa (tufted hairgrass)	3	0-20	28
Forbs			

Arnica chamissonis (meadow arnica)	3	0-3	33
Aster foliaceus (leafy aster)	1	0-1	33
Aster occidentalis (western aster)	1	0-1	33
Cirsium arvense (Canada thistle)	10	0-10	33
Epilobium angustifolium (fireweed)	3	0-3	33
Epilobium ciliatum (common willow-herb)	2	0-3	67
Galium trifidum (small bedstraw)	2	0-3	67
Geum macrophyllum ((large-leaved avens)	1	1-3	100
Ligusticum tenuifolium (slender-leafed licorice-root)	1	0-1	33
Pyrola asarifolia (pink wintergreen)	2	0-3	67
Ranunculus repens (creeping buttercup)	1	0-1	33
Senecio integerrimus (western groundsel)	1	0-1	33
Smilacina stellata (starry Solomon-plume)	1	0-1	33
Viola spp. (violet)	10	0-10	33

SUCCESSIONAL INFORMATION

Grazing pressure by livestock will cause a decrease in the more desirable grasses such as *Calamagrostis canadensis* (bluejoint reedgrass) and *Deschampsia cespitosa* (tufted hairgrass) with a corresponding increase in either introduced or less desirable species such as *Poa palustris* (fowl bluegrass), *Poa pratensis* (Kentucky bluegrass), *Agrostis stolonifera* (redtop), or *Juncus balticus* (Baltic rush). If grazing pressures are severe enough, the site takes on the appearance of the grazing disclimax *Salix geyeriana* (Geyer willow) community type.

Personal observations tend to indicate that *Salix geyeriana* (Geyer willow) is less tolerant of browsing pressures when compared to *Salix boothii* (Booth willow). This may account for the reduced abundance and canopy cover of *Salix geyeriana* (Geyer willow) in select stands of the *Salix geyeriana/Calamagrostis canadensis* (Geyer willow/bluejoint reedgrass) habitat type.

SOILS

Youngblood and others (1985) indicate that *Salix boothii* (Booth willow) and *Salix geyeriana* (Geyer willow) dominated communities in Idaho may occur over a range of soil types generally classified as Mollisols and Histosols, or, where less soil development has occurred, Inceptisols and Entisols. Deeper alluvial mineral deposits are comprised of coarse and fine sands and gravels. Where organic surface horizons are present, they may contain a moderate fibrous root/plant material component. Soil textures are categorized as fines, generally silts and clays. Water tables are probably found near the surface for most of the growing season, within a depth of 1 m (39 in). Although mottled and gleyed soil characteristics were not observed, they may be present where water tables occur just below the surface.

ADJACENT COMMUNITIES

Adjacent sites that are slightly wetter may support the *Salix geyeriana/Carex rostrata* (Geyer willow/beaked sedge) habitat type. In other situations, wetter sites may support the *Carex rostrata* (beaked sedge) habitat type or open

water. Drier sites may support a variety of types including the *Poa pratensis* (Kentucky bluegrass) and *Juncus balticus* (Baltic rush) community types, the *Potentilla fruticosa/Deschampsia cespitosa* (shrubby cinquefoil/tufted hairgrass) habitat type or upland types.

MANAGEMENT INFORMATION

Additional management information can be found in Appendix A.

Livestock

Forage production is high, and where extensive, this type may be an important source of summer forage. Palatability of *Calamagrostis canadensis* (bluejoint reedgrass) and *Deschampsia cespitosa* (tufted hairgrass) varies from moderate to high, depending upon season and availability of other species (USDA Forest Service 1937). Foliage is most palatable when young, but wet conditions early in the grazing season limits use by livestock, especially sheep. Due to the high forage production and highly palatable grasses, many of these sites have heavy summer and fall use, especially after uplands have been grazed. Sustained grazing decreases the vigor, reproductive success, and competitive ability of *Calamagrostis canadensis* (bluejoint reedgrass) and *Deschampsia cespitosa* (tufted hairgrass) (Volland 1985). Under season long grazing, they may be replaced by *Poa pratensis* (Kentucky bluegrass). 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 willows, as illustrated by highlining, clubbing, or dead clumps. With continued overuse, willows show a sharp decline in vigor and may be eventually eliminated from the site.

Personal observations tends to indicate that *Salix geyeriana* (Geyer willow) is less tolerant of browsing pressures when compared to *Salix boothii* (Booth willow). This may account for the reduced abundance and canopy cover of *Salix geyeriana* (Geyer willow) in select stands of the *Salix geyeriana* (Geyer willow) dominated types.

To minimize undesired changes in community composition and structure, pasture or allotment management should be based on the forage available from stands of this and other riparian or wetland communities. This concept of the riparian or wetland pasture has had some success in maintaining or improving the health of riparian or wetland vegetation (Kinch 1987).

Frisina (1991) states that for a grazing program to be successful, it must meet the basic biological requirements of the plants such as photosynthesis, food storage, reproduction, and seedling establishment. In order to meet these requirements, long periods of rest are needed. It is during long growing season rest periods that the essential biological processes of food production and storage, reproduction, and seedling establishment take place. In some instances, additional periods of rest may be required to either improve or maintain a plant community.

Wildlife

Abundant food, cover, and proximity to water provide habitat for numerous wildlife species such as mammals and songbirds. Summer and winter use by elk may be moderate (Gaffney 1941). The linear nature of many of

these communities along waterways serve as important corridors for wildlife movement. Moose and beaver tend to heavily utilize most species of willows.

Both *Salix geyeriana* (Geyer willow) and *Salix boothii* (Booth willow) are used as browse by wildlife and livestock. However, *Salix geyeriana* (Geyer willow) seems to be less tolerant of repeated browsing than *Salix boothii* (Booth willow). This may account for the reduced canopy cover and occurrence of *Salix geyeriana* (Geyer willow) in select stands of the *Salix geyeriana* (Geyer willow) dominated types.

Beaver perform a vital role in the health and maintenance of riparian ecosystems. Beaver dams assist in controlling the downcutting of channels, bank erosion, and the movement of sediment downstream (Gordon and others 1992). When beaver construct a dam, they raise the water table in the area, which provides water for hydrophytic plants such as willows and sedges. The beaver dam also slows down the water in the channel, which allows suspended sediment to be deposited behind the dam. The combination of sediment deposition and plant reproduction raises the channel bed, creating a wetland environment which is excellent waterfowl and fish habitat. 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.

Fisheries

Where adjacent to streams, this type effectively stabilizes soils and forms overhanging banks, enhancing fisheries quality. The importance of willows in streambank protection, cover, and thermal protection for fisheries cannot be emphasized enough. The herbaceous understory aids in filtering out sediments during high flows thereby contributing to the overall building of the streambanks. Some stands may be so dense as to hinder most forms of recreational fishing. If fishing access is important, dense stands may be opened by the use of livestock as a management tool.

Fire

Prescribed burning in this type is an effective method of rejuvenating decadent clumps. The various willow species present in this type sprout vigorously following fire, especially in wetter stands (Kovalchik 1986 and 1987). Quick, hot fires result in more sprouts than slower fires, which are potentially more damaging to the willows and tends to result in fewer sprouts.

Calamagrostis canadensis (bluejoint reedgrass) propagates itself by both seeds and rhizomes, making this species an aggressive invader of moist, burned sites (Crane and Fischer 1986). These features also make it a valuable species for stabilizing or rehabilitating mountain streams.

Deschampsia cespitosa (tufted hairgrass) is resistant to damage from fire (DeBenedetti and Parsons 1984). Root crowns are rarely damaged, even by hot, intense fires. However, repeated burning favors rhizomatous species such as *Poa pratensis* (Kentucky bluegrass).
After burning, the site should be eliminated from livestock grazing for at least 2 to 3 years to avoid attracting livestock to young, palatable regrowth.