USDA Natural Resources
Conservation Service

Ecological site R046XC520MT
Riparian Subirrigated (RSb) RRU 46-C 13-19 PZ

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

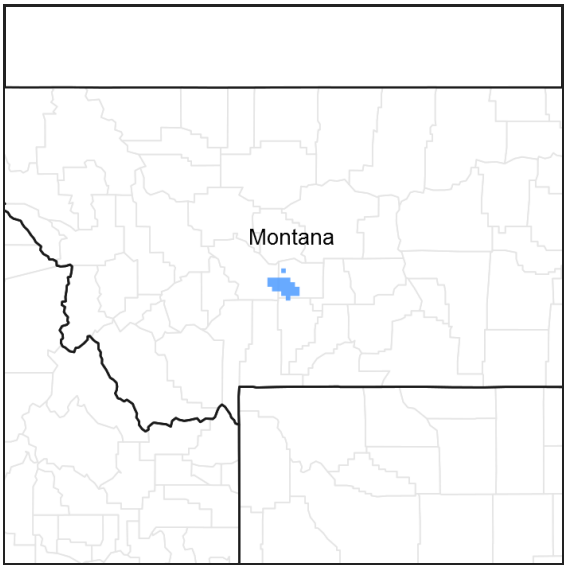


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

Associated sites

R046XC512MT	**Subirrigated (Sb) RRU 46-C 13-19 PZ**

Similar sites

R046XC512MT	**Subirrigated (Sb) RRU 46-C 13-19 PZ** The Subirrigated site differs mainly by not being saturated to the surface and not being in the flood-prone area.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix boothii* (2) *Salix geyeriana*
Herbaceous	(1) *Deschampsia caespitosa* (2) *Calamagrostis stricta*

Physiographic features

This site occurs within the floodplain adjacent to perennial streams and adjacent to flowing springs. Slopes are mainly 1-4%, but can range up to 15%. This site is also known as a "Lotic" (running water) riparian area. This site has a permanent water table within approximately 3.5 feet of the surface. In addition, this site will receive additional surface moisture from stream overflow. Surfaces, above the water table will typically not remain flooded or saturated for prolonged periods of time.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Flooding duration	Long (7 to 30 days)
Flooding frequency	Frequent
Slope	1–15%
Water table depth	91–107 cm
Aspect	Aspect is not a significant factor

Climatic features

See Climatic Data Sheet for more details (Section II of the Field Office Technical Guide) or reference the following climatic web site: http://www.wrcc.sage.dri.edu/ .

Table 3. Representative climatic features

Frost-free period (characteristic range)	67-87 days
Freeze-free period (characteristic range)	111-124 days
Precipitation total (characteristic range)	381-432 mm
Frost-free period (actual range)	53-88 days
Freeze-free period (actual range)	104-126 days
Precipitation total (actual range)	356-483 mm
Frost-free period (average)	76 days
Freeze-free period (average)	116 days
Precipitation total (average)	432 mm

Climate stations used

- (1) RAYNESFORD 2 NNW [USC00246902], Raynesford, MT
- (2) STANFORD [USC00247864], Stanford, MT
- (3) LEWISTOWN MUNI AP [USW00024036], Lewistown, MT
- (4) ZORTMAN [USC00249900], Zortman, MT
- (5) DENTON [USC00242347], Denton, MT
- (6) HOBSON [USC00244193], Hobson, MT

Influencing water features

Typically, these sites occur along streams of moderate energy as indicated by the presence of riffles. The floodplain/riparian area has a cross-section and profile which limits surface ponding. The upper part of the soil profile will begin to drain soon after an over-bank flow event has receded.

Soil features

These soils are hydric due to frequent flooding. The soils associated with this site are mainly deep or very deep (>60 inches). They tend to be medium (loamy or silty) to lighter (sandy) textured. They are generally in the aquic moisture regime or aquic intergrade and somewhat poorly or poorly drained. They generally have a very gravelly

layer and permanent water table within 3.5 feet of the surface. This ground water is normally available to the plants throughout the growing season.

Redoxomorphic features (mottles) in the soil profile indicate that the level of the seasonal water table will tend to fluctuate during the year. The seasonal water table is mainly because of the site's hydrologic connection with the stream, as well as the result of flooding events, and is generally present for only a relatively short period of time. These soils are non-saline and non-sodic. They are non-calcareous or only slightly calcareous in the upper part.

Table 4. Representative soil features

Surface texture	(1) Mucky loam (2) Gravelly silt (3) Cobbly sand
Drainage class	Poorly drained
Permeability class	Moderate to moderately slow
Soil depth	51–183 cm
Soil reaction (1:1 water) (0-101.6cm)	6.6–7.8

Ecological dynamics

This site developed under Northern Rocky Mountain foothills climatic conditions, which included the natural influence of large herbivores and occasional fire. The plant community upon which interpretations are primarily based is the Historic Climax Plant Community (HCPC). This community is described as a reference to understand the original potential of this site, and is not always considered to be the management goal for every acre of rangeland. The following descriptions should enable the landowner or manager to better understand which plant communities occupy their land, and assist with setting goals for vegetation management. It can also be useful to understand the environmental and economic values of each plant community.

This site is considered resilient to disturbance as it has essentially no limitations for plant growth, except for the growing season. Changes may occur to the Historic Climax Plant Community due to management actions and/or climatic conditions, such as a drop in water table level or change in stream flows due to prolonged drought conditions. A extremely high flow event (i.e., a 100 year storm) can also cause what appear to be significant impacts to this community. However, if the riparian area was stable and funtioning properly prior to the flood (e.g., at HCPC), the impacts should be minimal and the recovery period should be relatively short.

Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments, this site can readily return to the Historic Climax Plant Community.

Continual adverse impacts to the site over a period of years results in a departure from the HCPC, with a decrease of the taller, more palatable species such as the beaked, Nebraska, and water sedges, mannagrasses, and reedgrasses. These plants will be replaced by smaller sedges, Baltic rush, meadow barley, and forbs. There is often a reduction in young willows for recruitment and maintenance of the riparian area and stream channel stability.

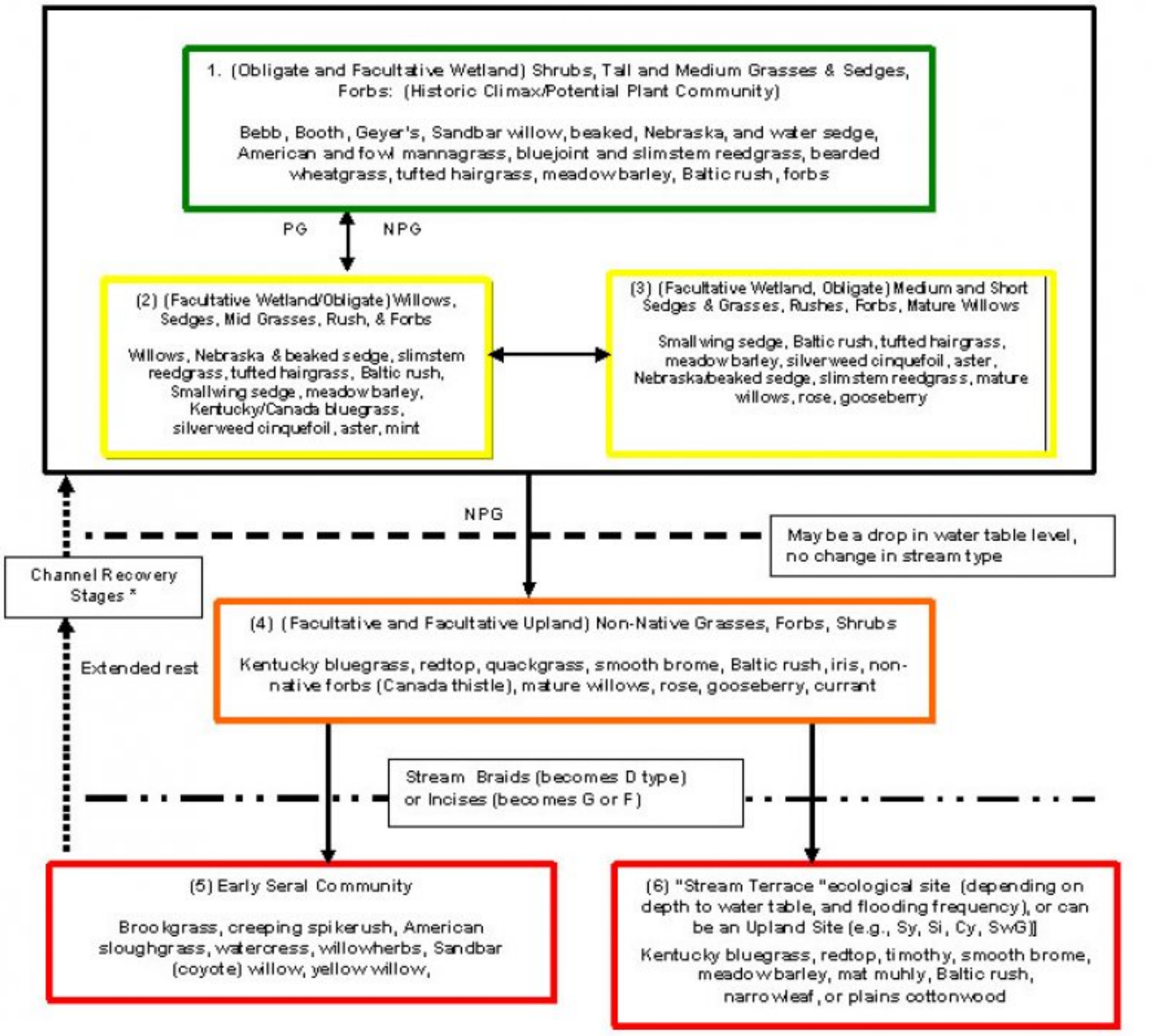
Adverse impacts to the willows can occur in a number of ways, not always related to livestock use. Extended use during the hot season of the year often results in physical damage from animals seeking shade (thermal cover), along with some browsing. Extended use in the fall usually results in heavy grazing use as most of the adjacent upland vegetation will be mature and less nutritious and palatable. Heavy browsing of the young shoots can occur during this period. Winter use by wildlife can be substantial, often creating plants that appear stunted the following year. Consequences of severe willow degradation typically is a significant loss of stability and function of the riparian area and its ability to dissipate stream energy, trap sediment, and store water.

Willows are also subject to natural mortality. Above ground stems generally have a life span of about 20 years. They can also die when inundated for extended lengths of time, such as when beaver build a new dam that floods an area that hadn't been previously flooded.
Continued deterioration results in an abundance of short grasses and short sedges, non-native grasses and forbs, and annuals. A lowering of the water table or major flood event can also cause a significant change in the plant

community. Plants that are not a part of the Historic Climax Plant Community that are most likely to invade include Kentucky, fowl, and Canada bluegrass, timothy, smooth brome, redtop, quackgrass, Canada thistle, dandelion, non-native clovers, leafy spurge, knapweeds, sulfur cinquefoil, annuals and other weed species. Russian olive and salt cedar are common invader shrubs.

Long-term non-use (>3 years) combined with the absence of fire will result in excessive litter, decadent plants, and an increase of some weedy species such as Canada thistle.

State and transition model



* Refer to the appropriate channel evolution/recovery model (e.g., Schumm et al., Jensen) for details.

Smaller boxes within a larger box indicate that these communities will normally shift among themselves with slight variations in precipitation and other disturbances. Moving outside the larger box indicates the community has crossed a threshold (heavier line) and will require intensive treatment to return to Community 1 or 2. Dotted lines indicate a reduced probability for success. Yellow boxes indicate caution that the community may be in danger of crossing a threshold. Orange boxes represent communities that have crossed over thresholds from the HCPC and may be difficult to restore with grazing management alone. Red boxes represent communities that have severely shifted away from the HCPC and probably cannot be restored without mechanical inputs.

NOTE: Not all species present in the community are listed in this table. Species listed are representative of the plant functional groups that occur in the community.

PG = Prescribed Grazing: Use of a planned grazing strategy to balance animal forage demand with available forage resources. Timing, duration, and frequency of grazing are controlled and some type of grazing rotation is applied to allow for plant recovery following grazing.

NPG = Non-Prescribed Grazing: Grazing which has taken place that does not control the factors as listed above, or animal forage demand is higher than the available forage supply.

Figure 8. State and Transition Model

State 1
Shrubs, Tall and Medium Grasses and Sedges, Forbs (Obligate and Facultative Wetland)

Community 1.1
Shrubs, Tall and Medium Grasses and Sedges, Forbs (Obligate and Facultative Wetland)

This is the interpretive plant community and is considered to be the Historic Climax Plant Community (HCPC) for this site. This plant community contains a high diversity of willows (Bebb, Booth, Geyer's, Yellow, Sandbar), tall sedges (beaked, Nebraska, and water), and grasses (American and fowl mannagrass, bluejoint and slimstem reedgrass, tufted hairgrass). There are several other grasses, sedges, and rushes (bearded wheatgrass, meadow barley, American sloughgrass, and Baltic rush), along with a variety of forbs. Slight variations in climate and elevation may cause some minor shifting of the willow species, but the general proportions should remain somewhat constant. This site is considered highly resilient to disturbance as it has minimal soil limitations for plant growth, plus a permanent water table within rooting depth. Changes may occur to the Historic Climax Plant Community due to management actions and/or climatic conditions. Under continued adverse impacts, a moderate decline in vegetative vigor and composition will occur. Under favorable vegetative management treatments, this site can more readily return to the Historic Climax Plant Community (HCPC). Streams and their associated riparian areas are highly dynamic systems and are subject to events that other rangeland ecological sites are not, such as flooding. Major changes to the stream's geomorphology as a result of a significant flood event (e.g., a 100 year event) can be potentially catastrophic. Should the change to the geomorphology be severe enough (e.g., be changed from a C type to a D or G type), this site will cease to exist in that reach of stream until the channel progresses through several stages in its recovery, usually taking several years. Maintaining good vegetative cover, especially the willow component, is critical to maintaining the integrity, function and stability of this site. This plant community is well adapted to the Northern Rocky Mountain foothills climatic conditions. The diversity in plant species allows for drought tolerance. Individual species can vary greatly in production depending on growing conditions (timing and amount of precipitation, and temperature). This plant community is well suited to managed livestock grazing and provides diverse habitat for many wildlife species. Plants on this site have strong, healthy root systems that allow production to increase significantly with favorable moisture conditions. This plant community provides for soil stability and a properly functioning hydrologic cycle. Abundant plant litter is available for soil building and moisture retention. Plant litter is properly distributed with very little movement off-site and natural plant mortality is very low. The soils associated with this site provide a favorable soil-water-plant relationship.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1838	2096	2371
Shrub/Vine	1838	2096	2371
Forb	230	370	527
Total	**3906**	**4562**	**5269**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	55-65%
Grass/grasslike foliar cover	40-50%
Forb foliar cover	5-10%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Soil surface cover

Tree basal cover	0%

Shrub/vine/liana basal cover	16-25%
Grass/grasslike basal cover	16-25%
Forb basal cover	2-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	45-55%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0-5%
Water	0%
Bare ground	0-1%

Figure 10. Plant community growth curve (percent production by month). MT0816, Permanent water table. All sites with a permanent water table..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	5	20	25	20	20	10	0	0	0

State 2
Facultative Wetland/Obligate Shrubs, Medium and Short Grasses and Sedges, and Rushes, Forbs

Community 2.1
Facultative Wetland/Obligate Shrubs, Medium and Short Grasses and Sedges, and Rushes, Forbs

Early stages of degradation, including non-prescribed grazing, will tend to change the HCPC to a community dominated primarily of sedges (Nebraska and beaked) and medium grasses (slimstem reedgrass, tufted hairgrass). The sedges, with their extensive system of roots and rhizomes are particularly resistant. Some of the taller grasses (bearded wheatgrass, bluejoint reedgrass) will be present in smaller amounts. Smaller sedges (smallwing), Baltic rush, increaser grasses such as meadow barley, along with forbs such as silverweed cinquefoil, aster, and goldenpea, will be more common. Shrubs, such as Wood’s rose and gooseberry sometimes increase. Non-native grasses such as Kentucky bluegrass and redtop can become more common. There will be a reduction in the willow component, especially the younger shoots and sprouts that are needed for recruitment and maintenance of the riparian area. The willows that are present are mainly mature individuals that will eventually become decadant and die.

State 3
Facultative Wetland/Obligate Medium and Short Grasses, Sedges, and Rushes, Forbs, mature Willows

Community 3.1
Facultative Wetland/Obligate Medium and Short Grasses, Sedges, and Rushes, Forbs, mature Willows

Further degradation to community 2, but still having intact, functioning B and C channel types present, will lead to a community dominated by smaller sedges (smallwing), Baltic rush, increaser grasses such as meadow barley, and forbs such as silverweed cinquefoil, aster, and goldenpea, will be more common. The bigger sedges (Nebraska and beaked) and medium grasses (slimstem reedgrass, tufted hairgrass) will be common, and abundant in some situations. Some of the taller grasses (bearded wheatgrass, bluejoint reedgrass) will be also be present in smaller amounts. Wood’s rose and gooseberry may be abundant. Non-native grasses such as Kentucky bluegrass and redtop can become more common. Reed canarygrass can move in and become dominant. There will be a reduction

in the willow component, especially the younger shoots and sprouts that are needed for recruitment and maintenance of the riparian area. The willows that are present are mainly mature individuals that will eventually become decadant and die. Plant biomass production and litter become reduced on the site with communities 2 and 3 as some of the larger willows die back and the taller grasses are replaced by shorter ones, especially the non-native species. Some natural ecological processes will be altered. Evapotranspiration increases, moisture retention is reduced, and soil surface temperatures increase. Additional open space in the community can result in undesirable species (e.g., Canada thistle) invading. This plant community provides for moderate soil stability and is susceptible to degradation from a high stream flow event. A key objective at this point is to implement a grazing strategy that prevents further degradation. Communities 2 and 3 will readily respond to improved grazing management, but a significant amount of time can be necessary to move it toward a higher successional stage and a more productive plant community similar to the HCPC.

State 4
Facultative and Facultative Upland, Non-Native Grasses, Forbs

Community 4.1
Facultative and Facultative Upland, Non-Native Grasses, Forbs

As grazing pressure or other disturbance continues, the understory vegetation becomes dominated by non-native grasses such as Kentucky bluegrass, smooth brome, timothy, quackgrass, and redtop. Species with a wide tolerance of moisture conditions, such as Baltic rush, will persist with even limited available ground water. Dandelion, iris, Canada thistle, and other weed species also tend to increase under these conditions. The willows should persist provided the water table is still within their rooting zone. The reproduction of the willows will diminish except from root sprouting (suckering). This plant community is the result of long-term, heavy, continuous grazing and/or annual seasonal grazing during either the hot season or fall. Repeated spring grazing depletes stored carbohydrates, resulting in weakening and eventual death of the cool season tall and medium grasses. Repeated heavy use during the hot season can be detrimental, particularly to the willows. Repeated fall use can also be detrimental to the willows as well as the herbaceous component, from grazing/browsing. This plant community can occur throughout the pasture, on spot grazed areas, and around water sources where season-long grazing patterns occur. This plant community produces less usable forage than either Plant Community 1, 2 or 3 for wildlife and livestock. The loss of some of the tall willow component adversely affects the structure of the community. The lack of litter and short plant heights result in higher soil temperatures, poor water infiltration rates, and high evapotranspiration, giving plants like Kentucky bluegrass, redtop, and Baltic rush a competitive advantage over the deeper rooted cool season tall and medium sedges and grasses. This community has lost many of the attributes of a healthy rangeland and riparian area, including good energy dissipation, water storage, sediment trapping, nutrient cycling and energy flow. This community will generally correspond to either “Sustainable at Risk” or “Functioning at Risk” stream assessment rating, depending on the method used. Further degradation can be catastrophic, leading to a riparian area and associated stream system that is no longer stable and functioning. The objective at this point is to implement a grazing strategy that will restore the stability, health, and hydrology of the site. This plant community will respond to improved grazing management. Often,grazing management alone will not be enough to restore the site to one that resembles the HCPC, Once plants such as Kentucky or Canada bluegrass, or timothy become established, they are very difficult to remove and replace by grazing management alone. Additionally, the chances for success are significantly reduced. Additional rest can usually help with re-establishment of the desired species, depending on the species composition at the time. A significant amount of time can be necessary to move it toward a higher successional stage and a more productive plant community similar to the HCPC. There are limitations to using seeding on this site because of the location of this site and the frequency of flooding. Brush control should not be used as the willows and other shrubs are critical for the stability and function of this site.

State 5
Early Seral Species

Community 5.1
Early Seral Species

If disturbance to Community 4 continues, the potential for excessive lateral streambank erosion or stream incisement increases. Plants like Kentucky bluegrass and redtop do not possess the root mass necessary to protect the streambanks and riparian area from the erosive forces of the stream. That in turn generally leads to the stream

channel becoming too wide which eventually results in one where there is no longer a floodplain that is readily accessible by the stream. The hydrology of the entire system has become severely altered wherever this has occurred. The permanent water table also becomes lower leading to conditions that further benefit the shallow rooted Kentucky and Canada bluegrass and redtop. After such a major disturbance to the stream, there will be a period of time, often several years, when the riparian plant community will be composed of pioneer or disturbance induced species as it begins to re-establish and stabilize. This new riparian area will typically have a plant community comprised of species such as sandbar (coyote) willow, yellow willow, creeping spikerush, brookgrass, American sloughgrass and some forbs such as watercress and willowherbs that will colonize the site. Species such as Kentucky and Canada bluegrass and redtop may persist. This community is susceptible to further degradation from high stream flow events (e.g., about a 35 year storm) until species such as Nebraska sedge and other willows get established. Plant community 5 produces very limited usable forage for wildlife and livestock. The continuation of the downward trend of the vegetation component of this site has resulted in a degraded, unstable, and non-functioning riparian area. Most of the attributes of a healthy rangeland and riparian area, including energy dissipation, water storage, sediment trapping, nutrient cycling and energy flow, have been lost. The primary objective at this point is to implement a grazing strategy that will restore the stability, function, health, and hydrology of the site. This community can respond positively to improved grazing management. Additional rest is usually needed for re-establishment of the desired species. Generally at this stage, several years will be necessary before the site resembles one similar to the HCPC.

State 6
New site

Community 6.1
New site

If the continued degradation results in a channel that no longer functions as a B or C type, there will tend to be a shift towards a totally different ecological site depending on the resultant depth to a permanent water table and proximity to the stream channel. The “new” site will generally be either a Stream Terrace, subirrigated, or an upland ecological site (e.g., Sandy, Silty, Clayey, Shallow to Gravel), but can sometimes be one of the others. The Stream Terrace ecological site is typically located on low terraces in stream systems. The willows will tend to be replaced by increasing amounts of rose, gooseberry, or other shrubs as the site tends to become drier. Tree species such as cottonwood and Rocky Mountain juniper often begin to occupy or dominate the site, eventually converting it to a forested site. The understory tends to be mainly Kentucky bluegrass, redtop, timothy, quackgrass, and/or smooth brome along with forbs similar to those found on an Overflow site (American licorice, goldenrods, cudweed sagewort).

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Shrubs**			1838–2371	
	Geyer willow	SAGE2	*Salix geyeriana*	460–1054	–
	Booth's willow	SABO2	*Salix boothii*	460–1054	–
	sandbar willow	SAIN3	*Salix interior*	230–527	–
	yellow willow	SALU2	*Salix lutea*	230–527	–
	Pacific willow	SALUL	*Salix lucida ssp. lasiandra*	0–263	–
	Drummond's willow	SADR	*Salix drummondiana*	0–263	–
	Missouri gooseberry	RIMI	*Ribes missouriense*	46–263	–
	Woods' rose	ROWO	*Rosa woodsii*	46–263	–
	Bebb willow	SABE2	*Salix bebbiana*	0–263	–
	Shrub, broadleaf	2SB	*Shrub, broadleaf*	0–1	–
	mountain alder	ALVIC	*Alnus viridis ssp. crispa*	0–1	–

	mountain alder	ALVIC	*Alnus viridis ssp. crispa*	0–1	–
	water birch	BEOC2	*Betula occidentalis*	0–1	–
	redosier dogwood	COSES	*Cornus sericea ssp. sericea*	0–1	–
Grass/Grasslike					
0	**Grasses, Sedges, and Rushes**			1838–2371	
	slimstem reedgrass	CAST36	*Calamagrostis stricta*	230–790	–
	fowl mannagrass	GLST	*Glyceria striata*	230–639	–
	slender wheatgrass	ELTRS	*Elymus trachycaulus ssp. subsecundus*	230–527	–
	slender wheatgrass	ELTRT	*Elymus trachycaulus ssp. trachycaulus*	230–527	–
	American mannagrass	GLGR	*Glyceria grandis*	230–527	–
	beaked sedge	CARO6	*Carex rostrata*	230–527	–
	water sedge	CAAQA	*Carex aquatilis var. aquatilis*	230–527	–
	bluejoint	CACA4	*Calamagrostis canadensis*	230–527	–
	Nebraska sedge	CANE2	*Carex nebrascensis*	230–527	–
	woolly sedge	CAPE42	*Carex pellita*	0–263	–
	Grass, perennial	2GP	*Grass, perennial*	0–263	–
	American sloughgrass	BESY	*Beckmannia syzigachne*	46–263	–
	water whorlgrass	CAAQ3	*Catabrosa aquatica*	0–263	–
	woollyfruit sedge	CALA11	*Carex lasiocarpa*	0–263	–
	Torrey's rush	JUTO	*Juncus torreyi*	0–263	–
	meadow barley	HOBR2	*Hordeum brachyantherum*	46–263	–
	swordleaf rush	JUEN	*Juncus ensifolius*	0–263	–
	rush	JUNCU	*Juncus*	0–119	–
	smallwing sedge	CAMI7	*Carex microptera*	24–118	–
	sedge	CAREX	*Carex*	0–118	–
Forb					
0				0–263	
	Forb, perennial	2FP	*Forb, perennial*	0–263	–
	silverweed cinquefoil	ARAN7	*Argentina anserina*	0–263	–
	willowherb	EPILO	*Epilobium*	0–263	–
	largeleaf avens	GEMA4	*Geum macrophyllum*	0–263	–
	Rocky Mountain iris	IRMI	*Iris missouriensis*	0–263	–
	wild mint	MEAR4	*Mentha arvensis*	0–263	–
	slender cinquefoil	POGR9	*Potentilla gracilis*	0–263	–
	alpine leafybract aster	SYFOF	*Symphyotrichum foliaceum var. foliaceum*	0–263	–
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0–263	–

Animal community

Livestock Grazing Interpretations: Managed livestock grazing is suitable on this site as it has the potential to produce a large amount of high quality forage. This site is sensitive to inappropriate grazing management. Management objectives should include maintenance or improvement of the plant community that is specific to this riparian/wetland area. Heavy stocking and season long use of this site is detrimental and will alter the plant

community composition resulting in potential stream and riparian area degradation over time.

Vegetation is important for this site to maintain its proper function and stability. A plant community having a strong, healthy root system is important for maintaining this ecological site and the integrity of the associated streambank. Vegetation also acts as a filter for sediment and nutrients that may be carried by surface runoff from the adjacent uplands to the stream.

Soil compaction and/or streambank shearing can occur because of the wet soils often associated with this ecological site. Grazing should occur after soils have dried unless the amount of time the livestock spend on this site can be managed. Plant communities 1, 2 and 3 will shift back and forth with variations in weather/climate, frequency and duration of flooding, depth to water table, and soils, as well as grazing use.

These communities can be maintained or improved by: providing occasional rest during the growing period, grazing for a shorter period of time, limiting duration of use during the hot season. Grazing when the upland vegetation is green and high quality can help reduce livestock use of this site. Strategically locating livestock supplements, such as low moisture block, can help attract livestock away from riparian areas. Several studies as well as experience have shown that providing off-stream stock water can significantly reduce the amount of time livestock will spend at this site.

Recommended grazing periods for the hot season (generally July 1 through September 15) is generally no more than 14 days. During the other times of the grazing season, the recommended grazing period can be up to 28 days. A switch to browse use can indicate the need to move livestock from this site to maintain or improve the shrub community.

When Plant Community 2 or 3 occurs as a result of non-prescribed grazing, management strategies need to be implemented soon to avoid further deterioration. This community is still stable, productive, and healthy provided it receives proper management. Improved grazing management alone can usually move this community back to one more similar to potential fairly quickly, or at least prevent any further degradation. However, continuation of non-prescribed grazing will eventually cause the community to cross a threshold whereby returning to a community similar to the HCPC/PPC more difficult.
Plant Community 4 is the result of long-term, continuous season long grazing; annual, early spring seasonal grazing; repeated long duration hot season use; a lowering of the water table; or a combination of these.

This community is typically comprised of non-native grasses such as Kentucky bluegrass or redtop. Additional rest is a recommended treatment as it often helps facilitate replacement of these with desired native obligate species. Extra rest is intended to maintain more above ground production and help restore some of the stability and natural hydrology of the site. This growth helps trap sediment during flood events. Over time, the trapped sediment begins to restore the stream banks. The stream’s cross section often becomes narrower and deeper as a result. This often leads to the water column/water table in the system raising. Restored natural hydrology will cause a shift back to the native species of the site.

Sites having mainly over-mature and decadent willows need a treatment strategy that will allow for establishment of younger plants. Often, depending on the site and situation, treatments in addition to grazing management may be necessary, such as temporary fencing to restrict access to the riparian area.

Plant Community 4 has significantly reduced forage production. The primary objective at this point needs to be restoring the stability and health of the site before potentially catastrophic degradation occurs. It will respond positively to improved grazing. Additional rest is often necessary for re-establishment of the desired species and to restore the stability and health of the site. Prescribed grazing usually needs to be coupled with other practices which generally require sizeable economic inputs, such as temporary fencing, along with a significant amount of time, usually many years.

There are sometimes situations where the stream has become braided or incised and there is minimal potential for restoring original hydrology, yet there is still a significant component of willows and other woody species that are desirable to maintain. Rest should be included in the management plan to aid with the maintenance of the woody species that are present and to establish multiple age classes. Without frequent flooding providing habitat for new seedling establishment, these plants will depend on vegetative means for reproduction. Rest allows that to happen. The rest period needs to be long enough (often 3-5 years or more, depending on their growth rate) to allow the new

sprouts to grow out of reach of the grazing/browsing animal. These areas can often be safely utilized at a time of year when the herbaceous component is lush. Consider techniques to either help attract the animals out of these areas or restrict their access.

A site dominated by an early seral plant community (community 5) will also need annual rest sometime during the growing season until the site has stabilized and the plant community begins to move towards mid or late seral. Mid to late seral species on this ecological site are predominantly obligate and facultative-wet.

Riparian ecological sites need to be managed as part of a plan for all grazing lands and not treated as a separate entity. Otherwise, some component of the ecosystem will not be properly managed.

Calculating Safe Stocking Rates: Proper stocking rates should be incorporated into a grazing management strategy that protects the resource, maintains or improves rangeland health and riparian function, and is consistent with management objectives. Safe stocking rates will be based on useable forage production, and should consider ecological condition and trend of the site, and past grazing use history.

Calculations used to determine a safe stocking rate are based on the amount of useable herbaceous forage available, taking into account the harvest efficiency of the animal and the grazing strategy to be implemented. Average annual production must be measured or estimated to properly assess useable forage production and stocking rates.

Stocking rates are calculated from average forage production values using a 25% Harvest Efficiency factor for preferred and desirable plants, and 10% Harvest Efficiency for less desirable species. AUM calculations are based on 915 pounds (air-dry) per animal unit month (AUM) for a 1,000-pound cow with calf up to 4 months. No adjustments have been made for site grazability factors, such as steep slopes, site inaccessibility, or distance to drinking water.

The following is an example of how to calculate the recommended stocking rate. This example does not use production estimates from this specific ecological site. You will need to adjust the annual production values and run the calculations using total annual production values from the ecological sites encountered on each individual ranch/pasture. Before making specific recommendations, an on-site evaluation must be made.

Example of total annual production amounts by type of year:
Favorable years = 2200 lbs/acre
Normal years = 1480 lbs/acre
Unfavorable years = 1200 lbs/acre

It is recommended that on slopes of 30% or less, stocking rate should be derived from the total annual production pounds minus 500 pounds for residual dry matter and 25% harvest efficiency. On slopes over 30%, stocking rate is derived from total annual production pounds minus 800 pounds for residual dry matter and 25% harvest efficiency. Refer to the NRCS National Range and Pasture Handbook for a list of Animal Unit Equivalents.

Sample Calculations using Favorable Year production amounts:

< 30% slopes: AUM/AC = [(2200-500)(0.25)]/915 lbs/month for one AU = 0.46 AUM/AC
AC/AUM = (1.0 AU)/(0.46AUM/AC) = 2.2 AC/AUM

> 30% slopes: AUM/AC = [(2200-800)(0.25)]/915 lbs/month for one AU = 0.38 AUM/AC
AC/AUM = (1.0 AU)/(0.38 AU! M/AC) = 2.6 AC/AUM

NOTE: 915 lbs/month for one Animal Unit is used as the baseline for maintenance requirements. This equates to 30 lbs/day of air-dry forage (1200 lb cow at 2.5% of body weight).

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group B. The infiltration rates for these soils will normally be moderate. The runoff potential for this site is low. Runoff curve numbers generally range from 61 to 79. This ecological site typically receives and generates runoff. The site is typically wet, receiving the majority

of its moisture by its hydrologic connection with stream flow and water table fluctuations.

Runoff is characterized by frequent surface flooding from over bank flows. On site precipitation is generally considered a minor source of runoff from this site. As the stream flow subsides, runoff typically becomes subsurface return flows.

Any condition that would cause an increased instantaneous runoff peak (e.g., poorly designed clear cutting in the upper watershed) could degrade the channel causing either lateral instability or head cutting. A braided (Rosgen D type) or an incised stream (G or F type) is typically the result.

Down cutting (incisement) would be a catastrophic event to this ecosystem. Channel down cutting will increase subsurface drainage, lower the seasonal water table, reduce frequency of over bank flow, and reduce duration of near surface saturation. Bank erosion will increase.

The stream, in time, will adjust to a lower base elevation. However, the result of down cutting will be a new floodplain at a lower elevation, lower water table elevation, less flood prone width, and less adjacent riparian/wetland area. The dominant vegetation in the previous riparian/wetland area will change (i.e., from Obligate and Facultative-wet to Facultative, etc.). Given enough time, these conditions will eventually result in this site becoming either a Stream Terrace, or upland site, depending on resulting depth to the water table

The vegetative community can also be changed for other reasons, such as if the water table drops during the growing season due to a lowering of base elevation of adjacent streams, or several years of drought conditions.

Good hydrologic conditions exist on rangelands if plant cover (grass, sedge, rush, litter, and brush canopy) is greater than 70%. Fair conditions exist when cover is between 30 and 70%, and poor conditions exist when cover is less than 30%. Sites in high similarity to HCPC (Plant Communities 1,2,and 3) generally have enough plant cover and litter to optimize infiltration, minimize runoff and erosion, and have a good hydrologic condition. The deep root systems of the potential vegetation help maintain or increase infiltration rates and reduce runoff.

Sites in low similarity (Plant Communities 4 and 5) are generally considered to be in poor hydrologic condition as the majority of plant cover is from shallow-rooted species such as blue grama and annual grasses. Erosion is minor for sites in high similarity. Rills and gullies should not be present. Water flow patterns, if present, will be barely observable. Plant pedestals are essentially non-existent. Plant litter remains in place and is not moved by erosion. Soil surfaces should not be compacted or crusted. Plant cover and litter helps retain soil moisture for use by the plants. Maintaining a healthy stand of perennial vegetation will optimize the amount of precipitation that is received. (Reference: Engineering Field Manual, Chapter 2 and Montana Supplement 4).

Recreational uses

This site provides many recreational opportunities for most outdoor activities. These are often favored sites for picnics and other activities because of the shade and the associated stream. The stream may provide opportunities for fishing. The forbs have flowers that appeal to photographers. This site provides valuable open space and visual aesthetics. Leaves of the shrubs provide nice fall colors that appeal to photographers and others.

Wood products

None

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Approval

Kirt Walstad, 4/29/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	03/01/2020
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are not present in the reference condition.

2. **Presence of water flow patterns:** Water flow patterns are not present in the reference condition.

3. **Number and height of erosional pedestals or terracettes:** Pedestals are not evident in the reference condition.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground is 0-2%. It consists of small, randomly scattered patches.

5. **Number of gullies and erosion associated with gullies:** Gullies are not present in the reference condition.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Wind scoured, or depositional areas are not evident in the reference condition.

7. **Amount of litter movement (describe size and distance expected to travel):** Litter movement is not evident in the reference condition.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** The average soil stability rating is 5-6 under plant canopies and plant interspaces. The A horizon is 18-25 inches thick.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil

Structure at the surface is typically strong to medium fine granular. A Horizon should be 18-25 inches thick with color, when wet, typically ranging in Value of 3 or less and Chroma of 2 or less. A thin organic horizon may exist on this site. Local geology may affect color, it is important to reference the Official Series Description (OSD) for characteristic range. https://soilseries.sc.egov.usda.gov/osdname.aspx

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Infiltration of the Riparian Subirrigated ecological site is moderate to moderately rapid. The site is somewhat poorly drained. An even distribution of shrubs (40-50%), mid stature, cool season bunchgrasses (25-35%), cool season sedges (20-30%) along with forbs (5-10%), and rhizomatous grass (<5%)

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** A compaction layer is not present in the reference condition.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Shrubs > Mid-statured, cool season, perennial bunchgrasses = cool, season sedges

    Sub-dominant: forbs > rhizomatous grasses

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Mortality in herbaceous species is not evident. Species with bunch growth forms may have some natural mortality in centers is 3% or less.

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14. **Average percent litter cover (%) and depth (in):** Total litter cover ranges from 60 to 65%. Most litter is irregularly distributed on the soil surface and is less than ¾" thick.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Average annual production is 4070. Low: 3485 High 4700. Production varies based on effective precipitation and natural variability of soil properties for this ecological site.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Potential invasive (including noxious) species (native and non-native). Invasive species on this ecological site include (but not limited to) sulphur cinquefoil, houndstounge, whitetop, Canada thistle, yellow toadflax, leafy spurge, Kentucky bluegrass, Redtop, Creeping meadow foxtail

Native species such as lupine, larkspur, Rocky Mountain iris when their populations are significant enough to affect ecological function, indicate site condition departure.

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17. **Perennial plant reproductive capability:** In the reference condition, all plants are vigorous enough for reproduction either by seed or rhizomes in order to balance natural mortality with species recruitment.
