UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE

ECOLOGICAL SITE DESCRIPTION

GENERAL SITE INFORMATION

Site Type	Lotic Riparian Complex
Site ID	055BY002ND
Site Name	Central Black Glaciated Plains, Intermittent Riparian Complex, (Valley Type VIII, E5 Stream Type)

Major Land Resource Area(s)

Number	Name
55B	Central Black Glaciated Plains

For further information regarding MLRAs, refer to: http://soils.usda.gov/survey/geography/mlra/index.html

Site Concept	This site occurs in MLRA 55B and characterizes tributaries of the James and Sheyenne Rivers with sands as the dominate bed material. The site begins at the outlets of the tributaries and continues upstream until water surface slopes exceed 2% , the dominate channel material changes, and/or the flow becomes emphemeral. The site concepts are based on the E5 stream type (predominantly sandy channel materials) and fluvial surfaces including a floodplain (with a plant community component of stable, bank holding obligate vegetation), a floodplain step plant community (with a community component of sedges and grasses) that can dissipate energy and trap sediments during high flow events, and a low terrace (dominated by big bluestem and green needlegrass). The plant community associated with the low terrace has been previously described as a loamy overflow ecological site.

Original Site Description Approval

Site Date	
Site Approval	
Site Authors	M. Meehan, J. Printz, K. Sedivec
Site Contributors	F. Aziz, L. Voigt, G. Sandness, M. Ell, J. Collins
Site Reviewers	J. Repp
Approval Date	

Revisions

Revision Date	
Reviser	
Revision Approval	
Approval Date	
Revision Notes	

REPRESENTATIVE PHYSIOGRAPHIC FEATURES

Narrative	This site occurs within the James River Watershed, located in the young glaciated plain of the Central Lowland province. The James River flows through a large melt-water trench that dissects the glaciated plain. The valley of the James River broadens in the southern part and coalesces with the lake plain of glacial Lake Dakota. The James River valley is steep sided, nearly flat bottomed, and ranges in width from about 500 feet in the northern end of the valley to nearly three miles in the southern part. The Niobrara and Pierre formations of Cretaceous age underlie the glacial drift of Pleistocene age. Glacial drift covers most of the area; however, major alluvial deposits of Holocene age occur on the floodplain of the James River (Christensen and Miller 1988). The floodplain is composed primarily of loams with sands, silts and clays present in the banks.

	Minimum	**Maximum**
Elevation (feet)	1000	2050
Valley Slope (percent)	0	3

Fluvial Surface/Landform 1 [1/]	Floodplain	
	Minimum	**Maximum**
Water Table Depth (inches)	surface	12
Water Table Duration (days) [2/]	365	365
Water Table Frequency (months) [3/]	January	December
Flooding Frequency	Frequent	Very frequent
Flooding Duration	Long	Very long
Ponding Depth (inches)	None	12
Ponding Frequency	Frequent	Frequent
Ponding Duration	Long	Very Long
Runoff Class	Negligible	Negligible

[1/] Landforms are numbered as they change laterally away from the channel.
[2/] Enter the number of days the water table is above 6 ft depth.
[3/] Enter the beginning and ending month of elevated water table (above 6 ft depth).

Fluvial Surface/Landform 2 [1/]	Floodplain Step	
	Minimum	**Maximum**
Water Table Depth (inches)	surface	72
Water Table Duration (days) [2/]	365	365
Water Table Frequency (months) [3/]	January	December
Flooding Frequency	Frequent	Frequent
Flooding Duration	Brief	Long
Ponding Depth (inches)	None	12
Ponding Frequency	None	Frequent
Ponding Duration	None	None
Runoff Class	Negligible	Negligible

[1/] Landforms are numbered as they change laterally away from the channel.
[2/] Enter the number of days the water table is above 6 ft depth.
[3/] Enter the beginning and ending month of elevated water table (above 6 ft depth).

Fluvial Surface/Landform 3 [1/]	Low Terrace	
	Minimum	**Maximum**
Water Table Depth (inches)	36	>72
Water Table Duration (days) [2/]	365	365
Water Table Frequency (months) [3/]	January	December
Flooding Frequency	Rare	Frequent
Flooding Duration	Extremely Brief	Brief
Ponding Depth (inches)	None	None
Ponding Frequency	None	None
Ponding Duration	None	None
Runoff Class	Low	Low

[1/] Landforms are numbered as they change laterally away from the channel.
[2/] Enter the number of days the water table is above 6 ft depth.
[3/] Enter the beginning and ending month of elevated water table (above 6 ft depth).

Fluvial Surface/Landform 3 [1/]	High Terrace	
	Minimum	**Maximum**
Water Table Depth (inches)	>72	-
Water Table Duration (days) [2/]	0	0
Water Table Frequency (months) [3/]	-	-
Flooding Frequency	None	Rare
Flooding Duration	None	Very Brief
Ponding Depth (inches)	None	None
Ponding Frequency	None	None
Ponding Duration	None	None
Runoff Class	Very Low	Low

[1/] Landforms are numbered as they change laterally away from the channel.
[2/] Enter the number of days the water table is above 6 ft depth.
[3/] Enter the beginning and ending month of elevated water table (above 6 ft depth).

REPRESENTATIVE CLIMATIC FEATURES

Narrative	MLRA 55B is considered to have a continental climate – cold winters and hot summers, low humidity, light rainfall, and much sunshine. Extremes in temperature are characteristic. The climate is the result of this MLRA's location in the geographic center of North America. There are few natural barriers on the northern Great Plains. The air masses move unobstructed across the plains and account for rapid changes in temperature. Annual precipitation ranges from 16 to 21 inches per year. The normal average annual temperature is about 41.5°F. January is the coldest month with average temperatures ranging from about 2° F (Maddock, ND) to about 11°F (Mellette, SD). July is the warmest month with temperatures averaging from about 67° F (Maddock, ND) to about 73° F (Redfield 2 NE, SD). The range of normal average monthly temperatures between the coldest and warmest months is about 64° F. This large annual range attests to the continental nature of this MLRA's climate. Winds average about 11 miles per hour annually, ranging from about 13 miles per hour during the spring to about 10 miles per hour during the summer. Daytime winds are generally stronger than nighttime and occasional strong storms may bring brief periods of high winds with gusts to more than 50 miles per hour. Growth of native cool-season plants begins in late March and continues to early to mid July. Native warm-season plants begin growth in mid May and continue to the end of August. Green up of cool-season plants can occur in September and October when adequate soil moisture is present.

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.dri.edu/climsum.html

	Minimum	Maximum
Frost-free period (days)	118	140
Freeze-free period (days)	132	161
Annual effective precipitation (inches)	16.0	21.0

Monthly precipitation (inches) and temperature (degrees F) distribution

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precip. Avg.	0.53	0.42	1.12	2.22	3.04	3.21	2.51	1.70	1.25	0.92	0.42	0.26
Temp. Min	-7.9	-1.4	10.8	28.1	39.1	49.7	54.1	51.9	41.8	31.5	16.7	1.4
Temp. Max.	23.0	28.6	41.0	58.5	70.7	79.8	86.6	85.4	74.9	61.8	42.3	28.7

Climate Stations

Number	Name	State	Period of Records	
			From	To
ND1224	Butte	ND	1948	2007
ND1360	Carrington	ND	1948	2004
ND3117	Forman 5 SSE	ND	1948	2007
ND4013	Harvey	ND	1948	2007
ND4937	LaMoure	ND	1948	2007
ND5434	Maddock	ND	1948	2004
SD5456	Mellette	SD	1896	2007
SD7052	Redfield 2 NE	SD	1949	2007

INFLUENCING WATER FEATURES

Narrative	This site is a lotic, fluvial system that includes the area influenced by the stream and its associated ground water on very low gradients (< 2%) that include adjacent floodplains and terraces. The stream occurs in alluvial valley fill and sediments supplied are sandy and clayey materials from adjacent prairie landscapes. The potential natural channel is the expression that has the best combinations of energy dissipation, sediment transfer, floodplain development and the associated high quality values associated with the system. It is rarely found in this site due to past disturbances and that resulted in entrenchment and widening of the stream system.

Level II Rosgen Stream Type Classification

Valley Type(s)	**Valley Type VIII: Wide, gentle valley slope with well-developed floodplain adjacent to river terraces.** Valley Type VIII is most readily identified by the presence of multiple river terraces positioned laterally along broad valleys with gentle, down-valley elevation relief. Alluvial terraces and floodplains are the predominant depositional landforms which produce a high sediment supply. Soils are developed predominantly over alluvium originating from combined riverine and lacustrine depositional processes. Stream types "C" or "E," which have slightly entrenched, meandering channels that develop a riffle/pool bed-form, are normally seen in the Type VIII valley. However, "F," and "G" stream types can also be found, depending on local stream and riparian conditions.		
Reference Stream Type	The E5 stream types are systems with low to moderate sinuosities, gentle to moderately steep channel gradients, and with very low channel width/depth ratios. The E5 stream type is a riffle/pool stream found in broad alluvial valleys with well developed floodplains. The E5 stream channels within this site are found in valley type VIII.		
Channel Material(s)	Sand dominated bed with smaller accumulations of gravel and occasional cobbles in areas of glacial outwash. Streambanks composed of sandy/silt/clay mixture with dense root mat.		
Stream Succession Scenario[1/]	E5→G5c →F5 →B5c →C5→E5		
Channel Evolution Stage[1/]	I → II → III → IVa → IVb → V		
Delineative Criteria		**Low**	**High**
Entrenchment Ratio (floodprone width / bankfull width)[2/]		1.1	20
Width/Depth Ratio (bankfull width / bankfull depth at riffle)[2/]		5	100
Sinuosity (stream length / valley length) [2/]		1.0	1.6
Slope Range[2/]		.001	.02
Channel Materials D_{50} (particle size index, mm)		0.54	5.1
Channel Materials D_{84} (particle size index, mm)		1.0	180

Information from Rosgen, 1996 and modified as needed for site description. Delineative criteria are for the stream type and may represent a larger range of values than exists for the reference channel.

[1/] Describe succession of channel types and their associated channel evolution stage (I – V)

[2/] Expressed as ft/ft.

Stream & Valley Cross-Sections (F5 Channel)

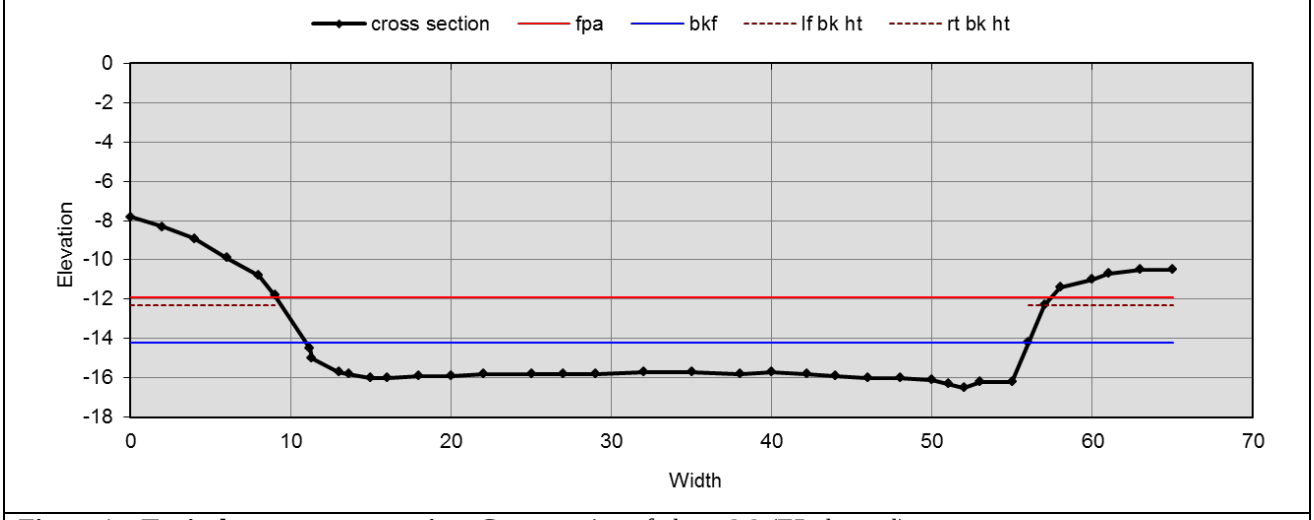


Figure 1 – Typical stream cross-section. *Cross-section of phase 2.2 (F5 channel).*

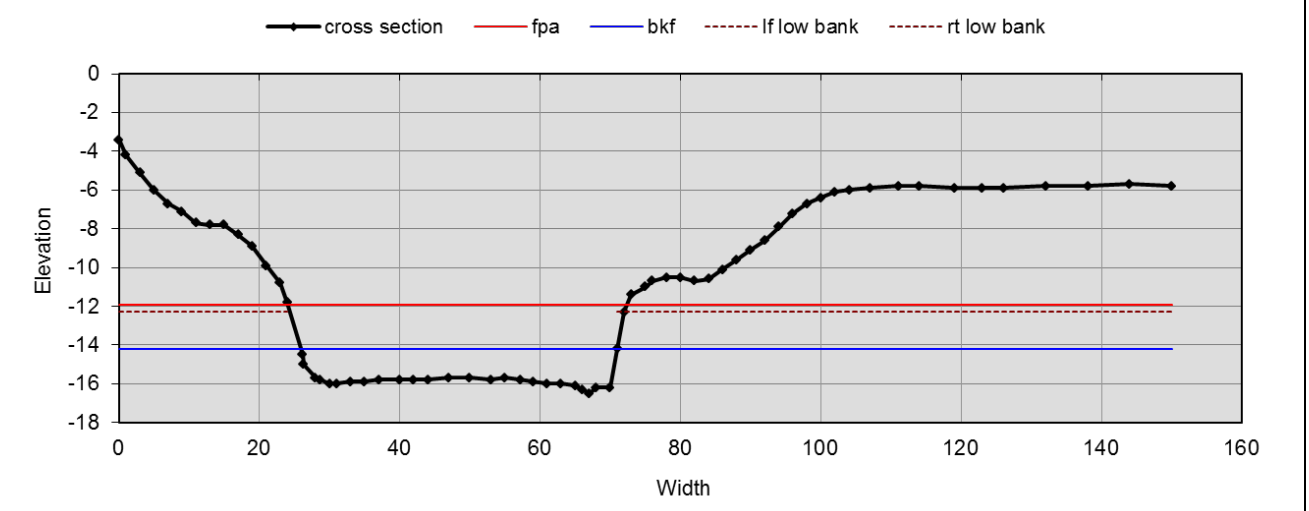


Figure 2 – Typical valley cross-section. *Valley cross-section of Phase 2.2 (widened unstable channel) that has lost connectivity with the floodplain.*

Stream & Valley Cross-Sections (Bc5 Channel – most prevalent stable analogue)

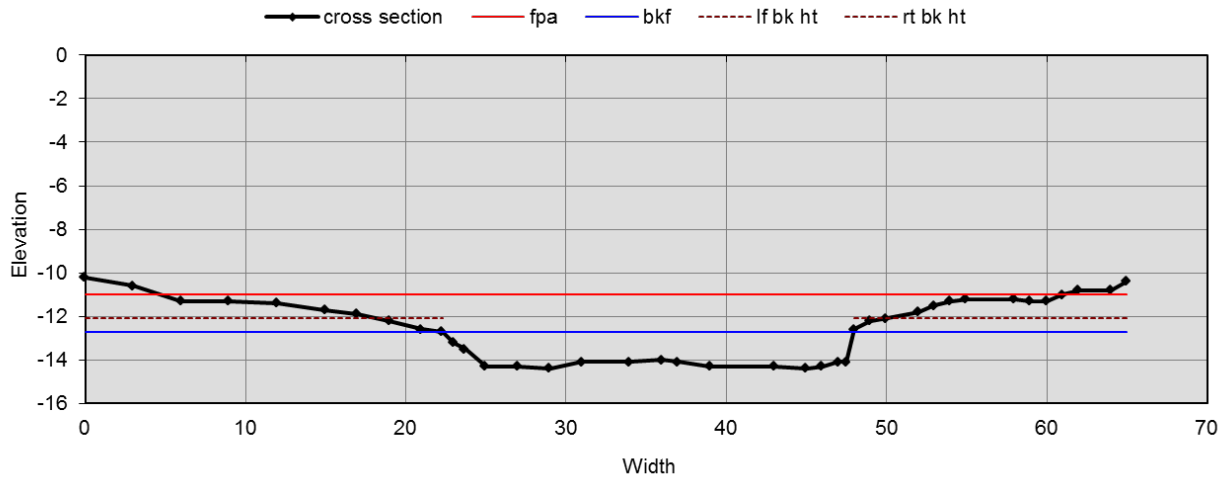


Figure 1 – Typical stream cross-section. *Bc5channel cross-section that may be prevalent within the site (phase 3.1).*

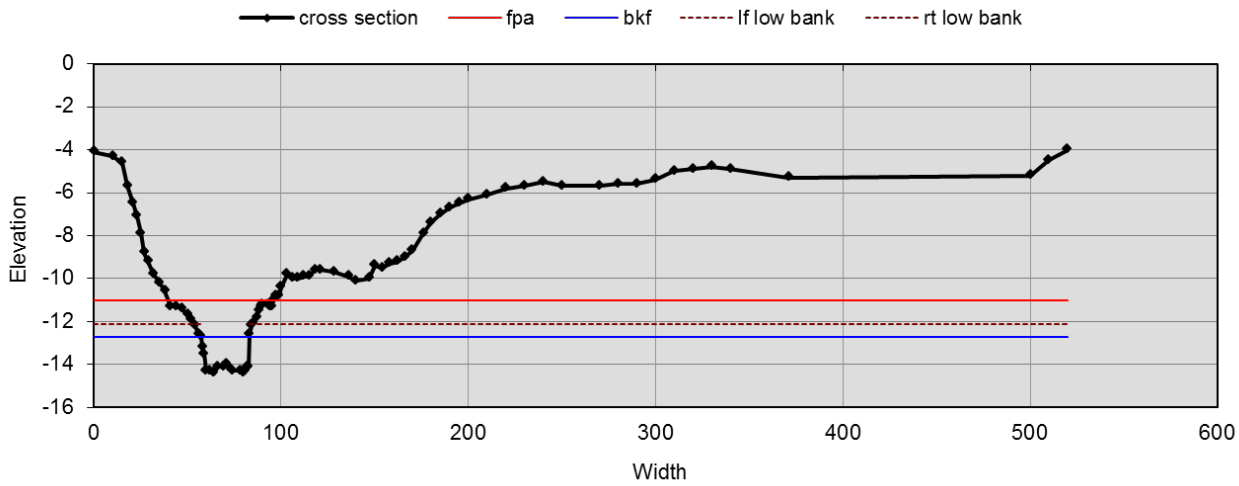


Figure 2 – Typical valley cross-section. *Entrenched Bc5channel found in phase 1 of state 3. Note multiple terraces indicative of entrenchment.*

Stream & Valley Cross-Sections (C5 Channel)

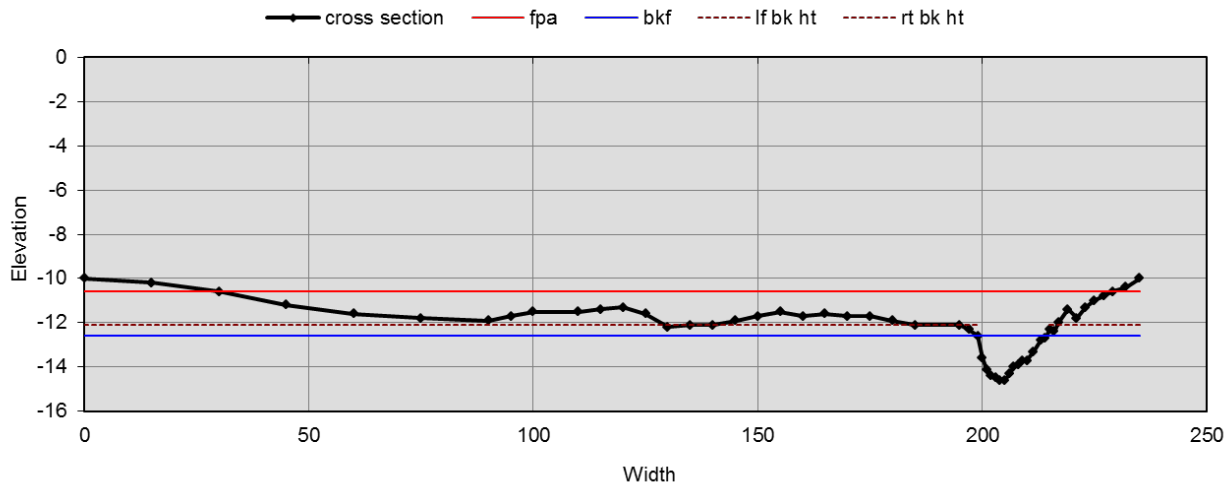


Figure 1 – Typical stream cross-section. *C5 channel cross-section (phase 3.2)*

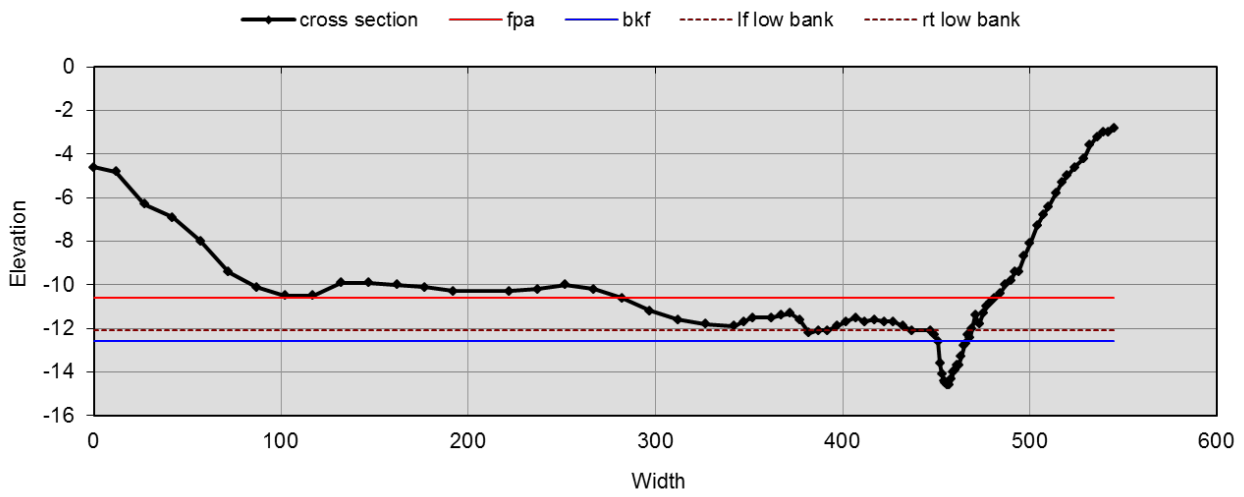


Figure 2 – Typical valley cross-section. *Entrenched C5 channel of state 3 phase 2. Note the multiple terraces indicative of past incision.*

Stream & Valley Cross-Sections (E5 Channel – stable analogue)

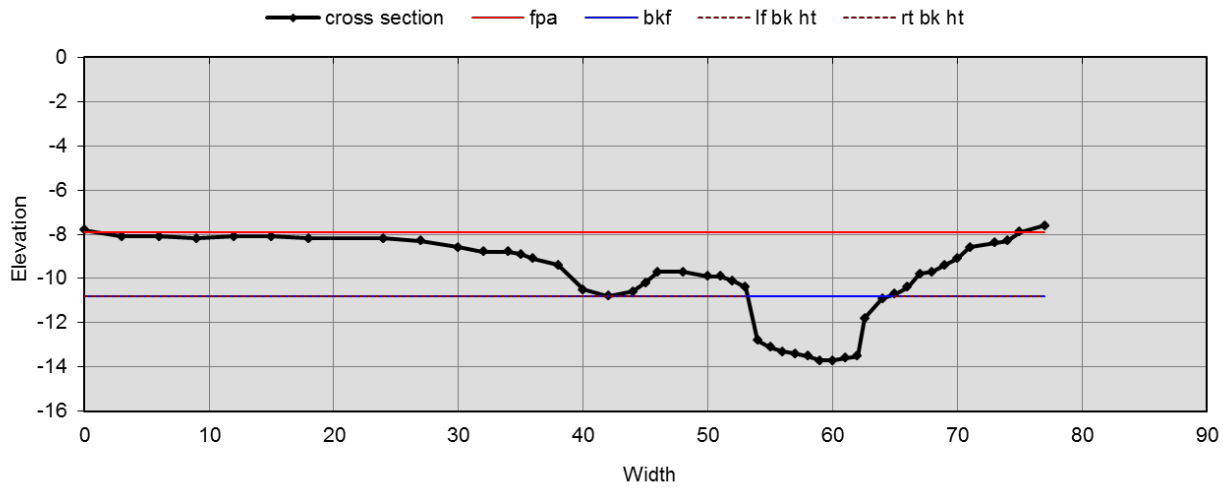


Figure 1 – Typical stream cross-section. *An example from phase 3.3 (E5entrenched stable analogue) that replicates the features of the potential natural channel plase of state 1.*

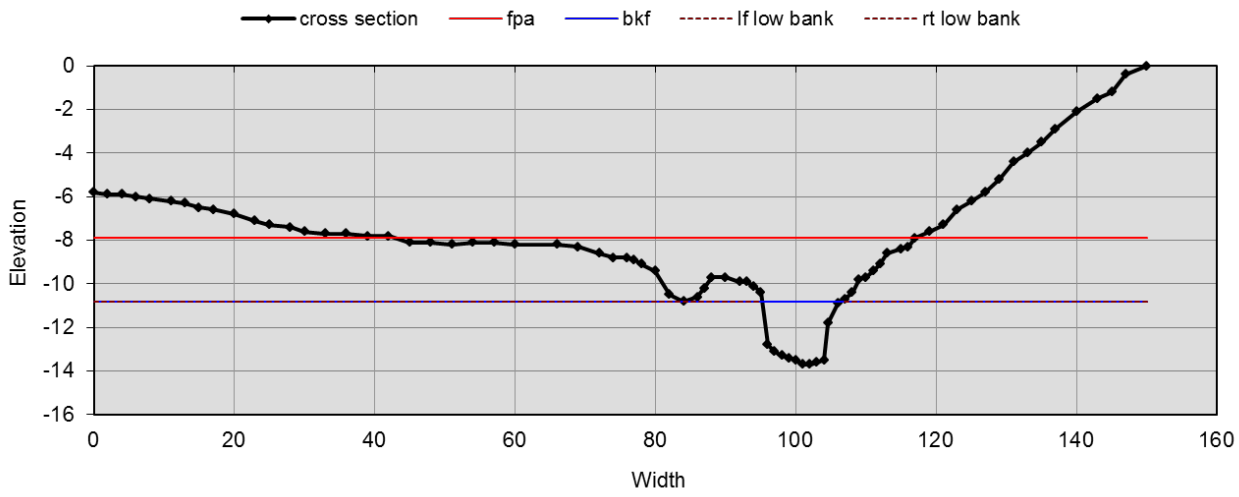


Figure 2 – Typical valley cross-section. *Valley cross-section of phase 3.3.*

REPRESENTATIVE SOIL FEATURES

Narrative	The soils in MLRA 55B of the James River floodplain are deposits of glacial drift. These soils are classified as Entisols and Mollisols soil orders. The soils of the flood plain have also been influenced from the sediments of the glacial drift listed above, and other glacial meltwater sediments. Typically the sediments and soils of the river system consist of a mixture of sediments (sands, silts, clays, and gravels) due to the flow events of the river. There is no soil development on the edge of the river channel (floodplain) due to constant re-working of the sediments, time has not allowed soil development; this zone is considered a miscellaneous land type called "Channel". As you increase in elevation from the channel edge, the soils on the primary steps are Fluvaquents and typically the particle size family class is Sandy, Coarse-Loamy or Loamy. There are stratified thin layers of sediments that range from sand to clay loams throughout the soil profile. The soils are frequently flooded and the water table will fluctuate with the depth of water in the river channel. The soils on the floodplain step are Typic Calciaquolls and the particle size family class is Fine-loamy. The parent material does have stratified thin layers of sediments that range from loamy sands to silty clay loams in the lower profile. These soils are frequently flooded and the water table will also fluctuate with the depth of water in the river channel. The Low Terrace was classified as fine-loamy, frigid, Cumulic Hapludolls.

Fluvial Surface/Landform 1	Floodplain		
Soil Features Narrative	The soil associated with the floodplain are classified as Fluvaquents		
Parent Materials - Kind	Loamy alluvium		
Bedrock - Kind	none		
Typical Surface Texture (<2mm)	Silt Loam		
Surface Texture Modifier	none		
		Minimum	**Maximum**
Surface Fragments ≤10" (% cover)		none	none
% Coarse Fragments >2mm (% volume in 10–20" layer)		0	10
Drainage Class		Very poorly	Very poorly
Saturated Hydraulic Conductivity Class		10	100
Depth to Bedrock (inches)		>72	> 72
Depth to Redoximorphic Features (inches)		0	16
Depth of Fine Roots (1-2mm)		0	42
Electrical Conductivity (mmhos/cm)		0	4
Sodium Adsorption Ratio within 16" Depth		0	0
Calcium Carbonate Equivalent within Surface 10"		0	10
Soil Reaction within Surface 4 Inches		slight	strong
Available Water Capacity (inches)		5.1	16.6

Fluvial Surface/Landform 2	Floodplain Step		
Soil Features Narrative	The soils associated with the primary floodplain step are classified as Fine-loamy, frigid Typic Calciaquolls (Lowe Series). These soils are mixed and superactive.		
Parent Materials - Kind	Loamy alluvium		
Bedrock - Kind	none		
Typical Surface Texture (<2mm)	Silt loam, loam		
Surface Texture Modifier	none		
		Minimum	**Maximum**
Surface Fragments ≤10" (% cover)		none	none
% Coarse Fragments >2mm (% volume in 10–20" layer)		0	2
Drainage Class		Very poorly	poorly
Saturated Hydraulic Conductivity Class		1	10
Depth to Bedrock (inches)		>72	>80
Depth to Redoximorphic Features (inches)		0	15
Depth of Fine Roots (1-2mm)		0	40

Electrical Conductivity (mmhos/cm)	0	7.9
Sodium Adsorption Ratio within 16" Depth	0	5
Calcium Carbonate Equivalent within Surface 10"	5	30
Soil Reaction within Surface 4 Inches	slight	violent
Available Water Capacity (inches)	8.4	11.6

Fluvial Surface/Landform 3	Low Terrace	
Soil Features Narrative	The soils associated with the low terrace are classified as fine-loamy, frigid, Cumulic Hapludolls (LaPrairie Series). They are mixed and superactive.	
Parent Materials - Kind	Loamy alluvium	
Bedrock - Kind	none	
Typical Surface Texture (<2mm)	loam	
Surface Texture Modifier	none	
	Minimum	**Maximum**
Surface Fragments ≤10" (% cover)	0	0
% Coarse Fragments >2mm (% volume in 10–20" layer)	0	0
Drainage Class	Moderately well	Moderately well
Saturated Hydraulic Conductivity Class	1	10
Depth to Bedrock (inches)	> 60	>60
Depth to Redoximorphic Features (inches)	36	60
Depth of Fine Roots (1-2mm)	0	62
Electrical Conductivity (mmhos/cm)	0	2
Sodium Adsorption Ratio within 16" Depth	0	0
Calcium Carbonate Equivalent within Surface 10"	0	0
Soil Reaction within Surface 4 Inches	none	slight
Available Water Capacity (inches)	10.6	13.4

COMMUNITY PHASE INFORMATION

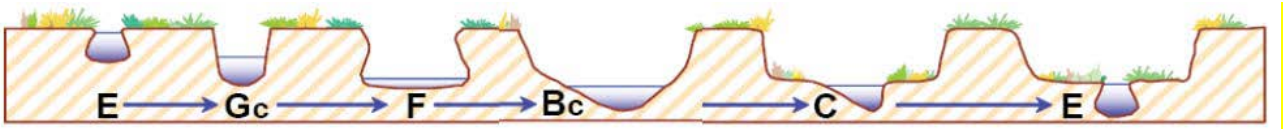
Fluvial Geomorphology, Channel Evolution, and Stream Type Succession of the Site

The site has a potential E5 channel type in an alluvial valley with a broad floodplain, floodplain step, and low terrace fluvial surfaces. The site has a succession scenario (channel evolution) of E5→G5c →F5→B5c →C5→E5 (similar to Rosgen scenario #1 with the addition of a Bc channel type in the stable analogue state).

The state and transition model includes these channel types as phases and depicts the characteristics of potential stream types (E5 in alluvial valleys). The phases are arranged in the order of channel evolution and are grouped by their inherent stability. State 1 is the potential natural channel and has the best expression of vegetative communities, stability, habitat, and resilience. State 2 is the most unstable and apt to change quickly. The Gc channel phase depicted may not always be present in the evolution of the channel when bed materials prevent vertical stability, or with looser materials, it will exist only for a short period before widening into the more characteristic F channel. State 3 phases are considered stable analogues; they have inherent stability, although with a more limited ability to form floodplains and terraces due to the entrenchment of the stream. There is a natural progression from the B5c to the C5to the E5channel. Proper management of the uplands is critical to this progression.

Transition 1A occurs in response to severe flooding combined with disturbance to the riparian vegetation that reduce resistance and resilience, allowing the channel to widen and/or deepen resulting in the loss of beneficial and stabilizing bank vegetation (PCC1 is usually completely gone after this transition). Transition 2A occurs when management and conditions facilitate the development of floodplains, raising of the water table, and return of beneficial bank vegetation. The channel bottom changes from flat to parabolic and the entire stream is more capable of transporting water, sediments, and nutrients, and is more capable of dispersing energy from high flows. There is also a significant increase in water storage in the adjacent soils.

The end point of channel evolution is the entrenched E5 channel with floodplains, floodplain step, and low terrace that support appropriate plant community components. The phase has high stability (if bank vegetation is maintained) and is in balance with energy, water, and sediment supplied by the catchment. Transition 3A is similar to 1A where the stable analogue is disturbed enough that high flow events scour out the channel resulting in a further entrenched version of the phases in state 2. Removal of disturbances and reestablishment of beneficial vegetation will facilitate the transition back to state 3 and the development of stable channels through the community pathways.



Ecological Dynamics of the Site

The site occurs on low gradient, alluvial valleys, with sandy channel materials on tributaries of the James and Sheyenne Rivers (including Baldhill, Buffalo and Beaver Creeks). The potential (or reference) reach consists of a E5 channel with a broad relatively flat floodplain that has a low terrace. The potential channel is slightly entrenched (entrenchment ratio 10 to 20, considerably more floodplain than stream bankfull width), has a narrow and deep channel (width/depth ratio<12), and moderate to high sinuosity. Channel materials are predominately sands with a small amount of gravels and very few cobbles. Beaver are a necessary part of maintaining the plant communities, trapping sediments, maintaining grade levels and local water tables, and providing the perennial reaches that occur within the site.

The entire system has experienced historic and anthropogenic disturbances (drought, flood, fire, overgrazing, reduced beaver activity, and crop production). These disturbances resulted in the system becoming entrenched, thus true reference areas can not be located. The best examples of reference for this site are found in the stable analogues of E5 channels that are moderately confined, but adequately express the plant community components.

Plant Communities and Fluvial Surfaces:

The site exhibits 2-4 plant community components. There is no significant instream plant community associated with these streams. The first plant community is a herbaceous community associated with the floodplain. The floodplain, floodplain step, low terrace, and high terrace plant community are herbaceous. Trees and shrubs are present on some

high and low terraces, but are not a dominant lifeform. The floodplain, floodplain step, and low terrace are hydrologically influenced by the stream; whereas, the high terrace is an abandoned floodplain that is no longer influenced by the stream.

PCC1: The greenline plant community, which occurs at the at water's edge (PCC1) consists of prairie cordgrass (*Spartina pectinata*) and native obligate sedge species such as water sedge (*Carex* aquatilis) and wooly sedge (*Carex pellita*). The greenline community generally occurs within the bankfull elevation (or slightly higher) and is maintained by seasonal flows and a local water table. Considerable scouring occurs in this portion of the floodplain on an annual basis so the plants in this community are adapted to this frequent disturbance and function to protect and stabilize banks. The native sedges and the prairie cordgrass serve to protect and bind the bank materials and can maintain bank integrity in most high flow events.

This plant community is subject to damage by natural forces that include extreme flooding and drought, and anthropogenic actions including channel modification (bridges, fords, crossings, straightening, ect.), overgrazing, and crop production. Disturbance can result in the plant community being replaced by shallow rooted upland species that are not capiable of protecting and stabilizing banks; resulting in the formation of tensil cracks, bank sloughing, accelerated lateral and vertical movement (unstable state). In the unstable channel phases PCC1 has been lost and the stream is subject to extreme bank and bed erosion.

PCC2: The next plant community component (moving away from the channel) occurs on a floodplain step and consists of a herbaceous plant community dominated by prairie cordgrass and clustered field sedge (*Carex praegracilis*), woolly sedge (*Carex pellita*), and western wheatgrass (*Pascopyrum smithii*). The primary species that comprise this community have facultative wetland and facultative indactor statuses and are common in meadow ecosystems. This community is subject to scouring in high flow events and sediment deposition. The plant species in this community have adaptations to withstand highflow events that dissipate energy and trap sediments.

This plant community is also susceptible to flooding, drought, channel modification (bridges, fords, crossings, straightening, ect.), overgrazing, and crop production. Similarly, disturbance can result in the plant community being replaced by shallow rooted upland species, esspecially Kentucky bluegrass (*Poa pratensis*). When the plant community dominants are replaced by shallow-rooted grasses and forbs the site is susceptible to scouring and avulsion and the energy reduction and sediment trapping abilities are severely limited. In unstable channels phases (2.1 and 2.2) PCC2 is either severly reduced in size or eliminated.

PCC3: This component is a transitional plant community between the riparian complex and the adjacent uplands and occurs on the low terrace. The low terrace plant community is subject to flooding, but not on an annual basis. The plant community associated with the low terrace is dominanted by big bluestem (*Andropogon gerardii*) and green needlegrass (*Nassella viridula*) and has been described as a Loamy Overflow ecological site.

PCC4: This component is actually PCC3 that is no longer connected to the stream as a result of massive erosion and the subsequent entrenchment of the stream. These high terraces occur where there has been significant entrenchment of the stream channel. The majority of this entrenchment happened since Euporean agricultural practices became widespread in the region. The plant communities associated with this feature are upland plant communities, the most common being community is a western wheatgrass (*Pascopyrum smithii*) and green needlegrass (*Nassella viridula*) community and has been described as a Loamy ecological site. It may be incorporated into the riparian complex or left as an associated site that was formerly part of the riparian complex.

These disconnected components now have their own states, phases, and transitions and function as loamy sites and other upland ecological sites. Only the remaining alluvial soils testify to the former floodplain attributes of this community.

Disturbances:
The site has endured many disturbances that have altered the form and function of the stream. Historic records do not describe local conditions well but there is evidence that years of drought and changes in land use within the watershed followed by above-average rainfall caused entrenchment of the stream channel: in many cases the former nature of the gradually sloping, highly sinuous E type stream has been replaced by multiple terraces created by streams actively downcutting then widening and flattening over time. In some places, rehabilitation of the stream has rebuilt floodplains and floodplain steps that support riparian vegetation within the entrenchment.

The absence of fire from the adjacent ecosystem has also altered the natural fire frequency. The riparian areas probably burned less often than the surrounding uplands, but fire was undoubtedly a factor in creating and maintaining the plant communities.

Decades of unmanaged livestock grazing (and overgrazing) have denuded streambanks and led to the entrenchment of several reaches and the total replacement of critical riparian species within the floodplain that are necessary for maintaining the integrity of the banks, trapping sediments, and reducing the energy of high flows. Overgrazing tends to facilitate the invasion of Kentucky bluegrass, a shallow rooted upland species, within the riparian complex resulting in decreased bank stability and increased erosion and runoff. However, the absence of grazing within the Northern Great Plains makes sites susceptible to invasion by smooth brome another shallow rooted upland species.

Farming is the primary use of uplands within the watershed, and in many instances field edges encroach on the riparian complex. In addition floodplains in the area are often located near farmsteads and are commonly used as wintering areas for livestock. Both these activities have resulted in increased nutrient levels, which has facilitated the invasion of reed canarygrass and smooth brome within the riparian complex.

Hydrologic Modifications:
Most of the direct hydrologic alteration has come from roads, livestock grazing, and farming. There are some reaches that have been disturbed by channel straightening, bridge, and dam construction. Changes to the uplands have disrupted the hydrology of the watersheds: invasions of reed canarygrass and smooth brome due to nutrient inputs from farming and animal agriculture and invasions of smooth brome and Kentucky bluegrass on rangelands are likely causes. The effects of climate change are unknown but should be monitored in the future.

Invasive Species: PCC1 is susceptible to invasion by reed canarygrass (*Phalaris arundinacea*) and quackgrass (*Elymus repens*). Invasive species observed within PCC2 include: leafy spurge (*Euphorbia esula*), quackgrass, smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), and reed canarygrass. Species invasions of these plant community are generally a result of overgrazing or increased nutrient inputs from the uplands. Overgrazing tends to promote the growth of Kentucky bluegrass; whereas, reed canarygrass and smooth brome capitalize on increased nutrient inputs.

Water Quality:
The waters associated with this site should have superior water quality and low sediment loads. At times when sediments enter the system from breached beaver dams or from background bank erosion they will be occluded but should clear up rapidly if the downstream beaver dams are in place where they can trap the sediments. Where agriculture is present runoff can add contaminants to the stream, increases nutrient loads, pesticide residues, and fertilizers. Animal waste can be a problem where animals are allowed access to the stream. Besides wastes entering the waters, livestock can break down banks (especially where the stabilizing bank vegetation has been removed) and cause excess erosion and increased sediment loads.

The primary beneficial uses identified in the State's water quality standards are aquatic life and recreation. Protection for aquatic life means surface waters should be suitable for the propagation and support of fish and other aquatic biota, including aquatic macroinvertebrates, and that these waters will not adversely affect wildlife in the area. Protection of surface waters for recreation means waters should be suitable for direct body contact activities such as bathing and swimming and for secondary contact activities such as boating, fishing, and wading. Other beneficial uses identified in the State's water quality standards are municipal and domestic water (e.g., water suitable for drinking after appropriate treatment), agriculture (e.g., stock watering and irrigation), and industrial (e.g., washing and cooling). These uses apply to all classified rivers, streams, lakes, and reservoirs.

Based on the 2012 Section 303(d) List of Impaired Waters Needing Total Maximum Daily Loads (TMDLs), the North Dakota Department of Health (NDDoH) has identified a 32 mile segment of the Buffalo Creek from its beginning to its confluence with Beaver Creek as impaired for recreational uses and a 16 mile segment of Beaver Creek from its confluence with Buffalo Creek to its confluence with the James River as impaired for recreational uses. Both segments were impaired due to excessive Escherichia coli bacteria concentrations. The primary sources of the bacteria contamination are runoff from unconfined animal feeding operations and from livestock grazing in riparian areas. Other stressors negatively affecting the water quality of the Buffalo/Beaver Creeks are riparian habitat degradation and siltation.

Plant Communities and Transitional Pathways (Narrative)

A State and Transition Model (STM) for the Central Black Glaciated Plains Riparian Complex E5 ecological site (055BY001ND) is depicted in Figure 1. Thorough descriptions of each state, transition, plant community, and pathway follow the model. This model is based on available experimental research, field observations, and interpretations by experts. It is likely to change as knowledge increases.

The plant communities will differ across the MLRA due to the naturally occurring variability in the extent of fluvial surfaces, soils, and influence of surface water and ground water in the hyporheic zone. The biological processes on this site are complex; therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Both percent species composition by weight and percent canopy or foliar cover are used in this ESD. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs). Species composition by dry weight remains an important descriptor of the herbaceous community and of the community as a whole. Woody species are included in species composition for the site.

This STM includes only native communities and states. The converted communities are described in the Ecological Dynamics section above.

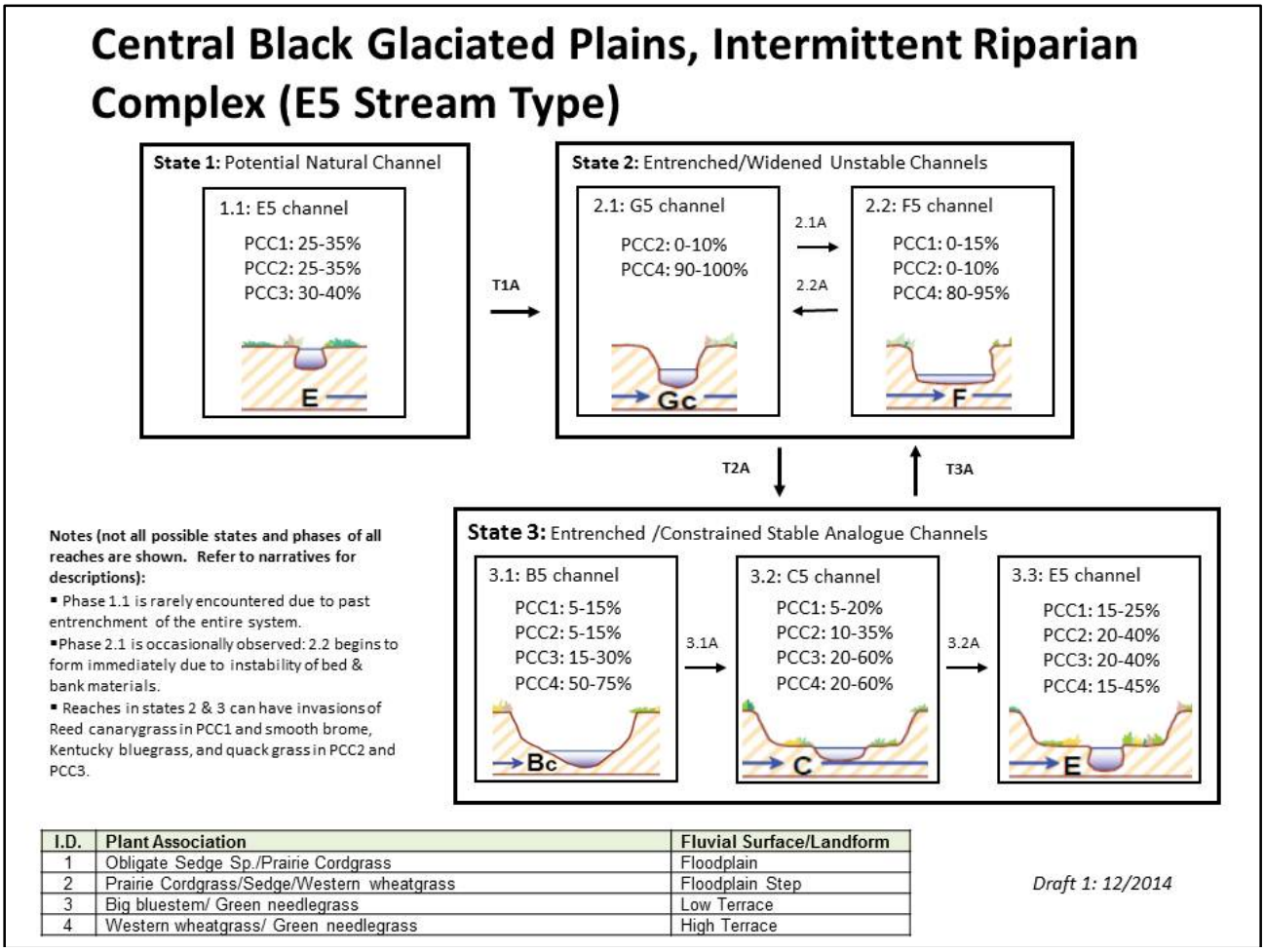


Figure 3: *State and Transition Model*

STATE 1 SECTION

State Number	1
State Name	Potential Natural Channel
State Narrative	This state includes the phase and plant community components believed to be the potential natural channel and incorporates the natural channel for the gradient and valley fill materials (E5) and fluvial surfaces that are freshened intermittently in order to produce the characteristic types of vegetation. This stream type is suited to handle the energy, water, and sediments supplied by the watershed and promote the plant community components that provide stability to the system. If undisturbed, this phase can supply the highest benefits and services from the riparian complex including, but not limited to: diverse, resilient plant community components that can withstand high flow events, significant fish and wildlife habitat, resistance to invasive species invasions, highest potential water quality and quantity, and ground water recharge and release. The natural disturbance regime within this state would have included beaver dam complexes which slowed stream flow rates, elevated water tables and reduced sediment loads; infrequent fires usually associated with periods of prolonged drought which, due to the fire tolerant nature of the plant species occupying these sites. Fire frequency would have been less on these sites as compared to the adjoining upland ecological sites due to increased fuel moisture associated with the greener vegetation; grazing by native herbivores which would have been attracted to these areas by the greener vegetation and reliable water supply, especially during periods of below normal precipitation or late summer months when upland vegetation is less palatable.

State 1 Photos

Photo 1. *Characteristic E5 channel type for this site. Due to decades of disturbance to this system, the best references were found in state 3, phase 3.3*

Photo 2. *The characteristic valleys are gently sloping and slightly parabolic. Reference streams develop large floodplains.*

Photo 3. *The floodplain is characterized by native obligate sedges and prairie cordgrass that receive water and trap sediments from bankfull events.*

Photo 4. *The floodplain step is dominanted by prairie cordgrass and facultative wet sedges, these species are deep rooted and help stabilize banks.*

State 1 Community Phases

Community Phase Number	1.1
Community Phase Name	E5 Potential Natural Channel
Community Phase Narrative	This channel and its associated fluvial surfaces and plant community components represent the highest expression of functioning and ecological services of the site. Streambanks have high percentages of stabilizing vegetation and channels are narrow and relatively deep with continuous flow connecting to downstream sites. Habitat for amphibians and fish is very good. Beaver are active in constructing low statured dams that raise the local water table and positively influence riparian vegetation. Elevating the water table which permits an expansion of plant community component PCC2 (Prairie Cordgrass/Sedge/Western wheatgrass) with lesser amounts of PCC1 (Obligate Sedge Sp./Prairie Cordgrass) forming a narrow strip adjacent to the water. The uplands adjacent to the riparian complex are dominated by big bluestem and green needlegrass.

Plant Community Components

PCC	Plant Association	Fluvial Surface/Landform[1/]	Composition (%)
1	Obligate Sedge Sp./Prairie Cordgrass	Floodplain	25-35
2	Prairie Cordgrass/Sedge/Western wheatgrass	Floodplain Step	25-35
3	Big bluestem/ Green needlegrass	Low Terrace (Loamy Overflow)	30-40

[1/] Corresponds to fluvial surfaces/landforms in the Physiographic Features and Representative Soil Features sections.

T1A Transition to Entrenched/Widened Unstable Channels State (State 2) from Reference State (State 1)

Entrenchment of reference E channel due to loss of vegetation (obligate and facultative wet plant functional groups), increased bank erosion, and down cutting. This transition may be initiated by overgrazing and changes in upland management likely following European settlement.

STATE 2 SECTION

State Number	2
State Name	Entrenched and/or Widened, Unstable Channels
State Narrative	This state represents a set of degraded channels (G5c – F5) that have crossed a threshold by becoming vertically and laterally unstable resulting in moderately deep entrenchment and loss of floodplain and floodplain step connectivity and vegetation. They are difficult, if not impossible to restore without changing profile, pattern, and dimension of the stream. These channels have little value for wildlife, fish, and water quality unless residual pools are deep enough to remain inundated between recharge or storm events that restore stream flows and re-connect isolated pools.

2.1A Community Phase Change to 2.2

Lateral movement with significant bank erosion, increased sediment load and increase in width/depth ratio.

2.2A Community Phase Change to 2.1

Increased vertical instability and entrenchment from further loss of vegetation (similar to T1A). This may be caused by disturbances that remove stabilizing vegetation, natural flooding, ice or beaver dam failure. Significant increase in bank erosion although some stabilizing vegetation may increase.

State 2 Photos

Photo 1.*Disturbance associated with road washout lead to gully (G channel)and subsequent F channel formation (Phase 2.2).*

Photo 2. *Loss of connectivity to the floodplain results in riparian plants being replaced by upland species, which contributes to bank instability.*

Photo 3. *F5 channel (Phase 2.2). This site has a wide shallow channel with no floodplain.*

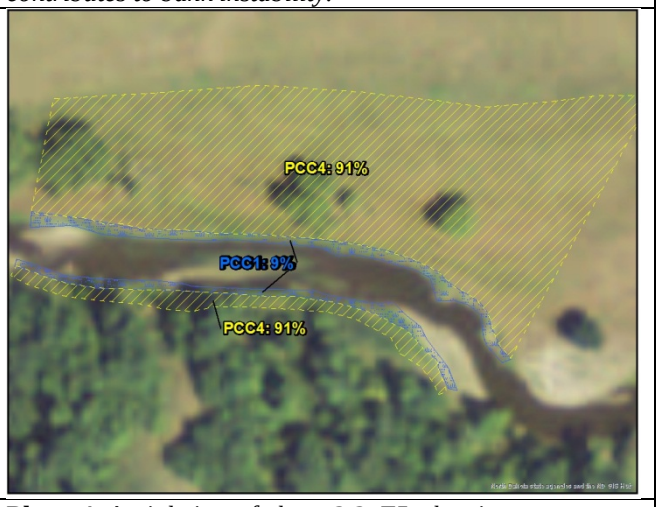


Photo 4. *Aerial view of phase 2.2, F5, showing arrangement of community components.*

State 2 Community Phases

Community Phase Number	2.1
Community Phase Name	G5 Channel (active entrenchment)
Community Phase Narrative	This channel phase is the result of loss of floodplain connectivity and vegetation (PCC1 and possibly PCC2) resulting in rapid vertical instability and deep entrenchment. The forces which cause the entrenchment continue to shape the channel into the next phase (F5) through bank sloughing and accelerated lateral movement.

Plant Community Components

PCC	Plant Association	Fluvial Surface/Landform[1/]	Composition (%)
2	Prairie Cordgrass/Sedge/Western wheatgrass	Floodplain Step	0-10
4	Western wheatgrass/ Green needlegrass	High Terrace (Loamy)	90-100

[1/] Corresponds to fluvial surfaces/landforms in the Physiographic Features and Representative Soil Features sections.

Community Phase Number	2.2
Community Phase Name	F5 Channel (Entrenched/ Widened)
Community Phase Narrative	This channel continues the lateral expansion of phase 2.1 resulting in an F5channel. These channels are highly unstable and further disturbances can force these quickly transform these back into vertically unstable G5 channels. These channels are generally disconnected from the floodplain except for during extreme flooding events. As a result, PCC1 is non-existent and water tables in terraces are further lowered. Fish and wildlife habitat and water quality values are significantly lowered or absent. If carefully managed, these channels can begin to build new floodplains and re-establish floodplain vegetative communities.

Plant Community Components

PCC	Plant Association	Fluvial Surface/Landform[1/]	Composition (%)
1	Obligate Sedge Sp./Prairie Cordgrass	Floodplain	0-15
2	Prairie Cordgrass/Sedge/Western wheatgrass	Floodplain Step	0-10
4	Western wheatgrass/ Green needlegrass	High Terrace (Loamy)	80-95

[1/] Corresponds to fluvial surfaces/landforms in the Physiographic Features and Representative Soil Features sections.

T2A Transition to Entrenched/Constrained Stable Analogue Channels State (State 3) from Entrenched/Widened Unstable Channels State (State 2)

Rehabilitation of entrenchment with stabilizing herbaceous vegetation (increased connectivity and/or formation of new flood plain and return to better energy and sediment balance). Multiple plant community components present on fluvial surfaces. May be significant decreases in bank height ratios.

T3A Transition to Entrenched/Widened Unstable Channels State (State 2) from Entrenched/Constrained Stable Analogue Channels State (State 3)

Disturbance results in entrenchment of stable analogue channels (Bc, C, or E) due to loss of vegetation (obligate and facultative wet plant functional groups), increased bank erosion, and down cutting.

STATE 3 SECTION

State Number	3
State Name	Entrenched / Constrained Stable Analogue Channels
State Narrative	This state includes channels that, after experiencing vertical and lateral instability and entrenchment, develop new floodplains within the entrenchment. Floodplain plant community components return to the incipient floodplains and streams develop new connectivity. Channel forming processes at bankfull are better able to handle the energy, flow, and sediments. Channels begin as B5c channels and with careful management, are able to develop E5 morphology with associated (although truncated) floodplains and terraces. Water tables are elevated and expand laterally. There is increased connectivity of upstream and downstream habitats resulting in improved fish and wildlife habitat and enhanced water quality. Some streams that have had the riparian vegetation removed and/or significantly changed may not develop the native plant community components. Where Kentucky bluegrass (*Poa pratensis*), smooth bromegrass (*bromus inermis*), or other shallow rooted grasses have taken over as dominant on the floodplain marginal bank stabilization will occur.

3.1A Community Phase Change to 3.2

The B5c channel will eventually (with proper management that increases bank stabilizing vegetation and normal flow variability) develop a small floodplain within the entrenched area, forming point bars and slight cut banks. This pathway may require particularly long time periods to complete due to the stability of phase 3.1.

3.2A Community Phase Change to 3.3

Increase of desirable greenline vegetation, sediment trapping, expansion of water table, and widening of flood plain (increased sinuosity, energy, and sediment transport balance). Stream narrows and deepens. Increased connectivity to floodplain. Bank height ratio decreases (3.3).

State 3 Photos

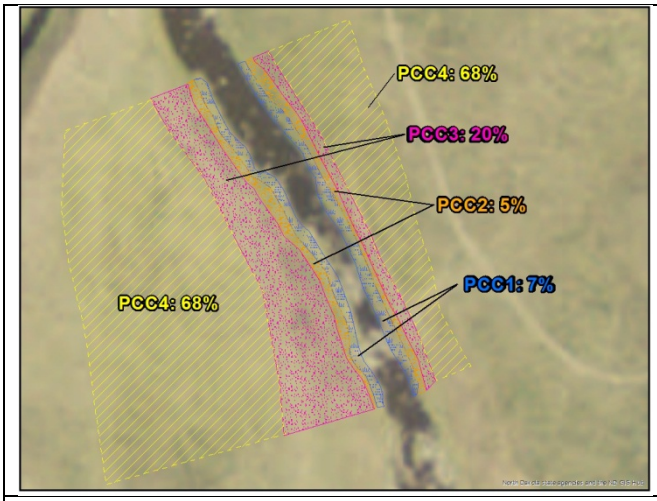


Photo 1. *Aerial view of phase 3.1, Bc, showing arrangement of community components.*

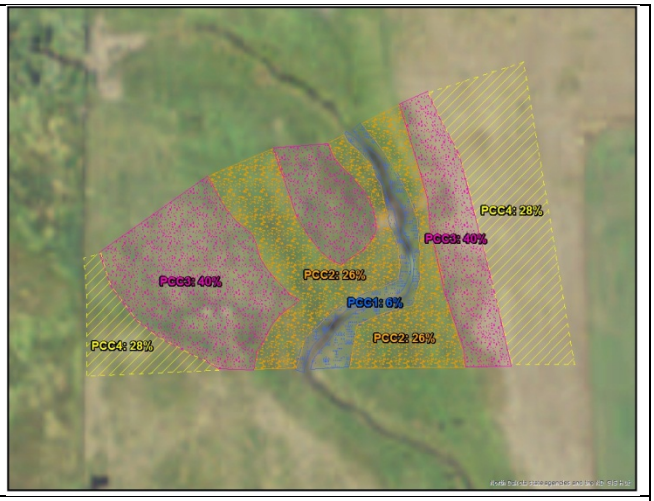


Photo 2. *Aerial view of C5channel (phase 3.2), showing arrangement of community components.*

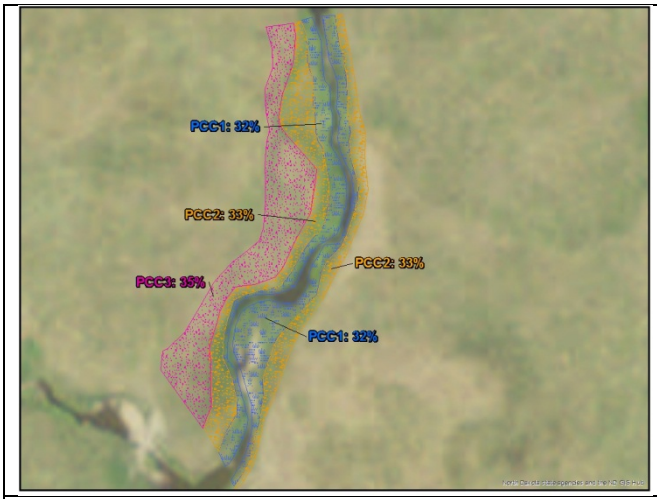


Photo 3. *Aerial view of phase 3.3, E5 stable analog, showing arrangement of community components.*

Photo 4. *Veiw of Bc5 channel (phase 3.1). This site has a parabolic channel with a narrow floodplain.*

Photo 5. *Veiw of C5 channel in phase 3.2. this channel is slightly entrenched with a moderate width to depth ratio.*

Photo 6. *View of E5channel (phase 3.3). This site has an entrenchment ratio of 6.5 and low width to depth ratio.*

Photo 7. *PCC1 and PCC2 in state 3 subject to invasion by reed canarygrass.*

Photo 8. *PCC1 occupies the floodplain, at or just above bankfull elevation, and PCC2 is found on the floodplain step.*

State 3 Community Phases

Community Phase Number	3.1
Community Phase Name	B5c Channel – first stable analogue (at-risk)
Community Phase Narrative	This phase represents the channel evolution from F5 to B5c resulting from a reduction in the near vertical, unstable banks associated with the F5 channel to somewhat more stable, parabolic shaped B5c channel. The lack of an established floodplain and associated stabilizing vegetation makes this phase unstable "At-Risk" phase which can quickly transition to the F5 channel via transitional pathway T3A. Further rehabilitation of this phase may be limited by intense farming activities (to the stream's edge), inappropriate livestock grazing, invasive species, or other disturbances (drought, large floods). If the native vegetation is not present or sources are not locally available, the phase is considered to be at-risk of crossing a threshold (T3A) to state 2.

Plant Community Components

PCC	Plant Association	Fluvial Surface/Landform[1/]	Composition (%)
1	Obligate Sedge Sp./Prairie Cordgrass	Floodplain	5-15
2	Prairie Cordgrass/Sedge/Western wheatgrass	Floodplain Step	5-15
3	Big bluestem/ Green needlegrass	Low Terrace (Loamy Overflow)	15-30
4	Western wheatgrass/ Green needlegrass	High Terrace (Loamy)	50-75

[1/] Corresponds to fluvial surfaces/landforms in the Physiographic Features and Representative Soil Features sections.

Community Phase Number	3.2
Community Phase Name	C5 Channel (stable analogue)
Community Phase Narrative	This phase represents the channel change from B5 to C5 post-entrenchment that develops a new floodplain, moves laterally creating cut banks, and depositional areas on the insides of channel bends. Riparian vegetation is able to return to the newly cut/deposited floodplain. Incipient vegetation which does not have superior bank holding attributes can make this an "At-Risk" channel. Disturbances that remove vegetation and affect bank stability (i.e. excessive trampling, farming practices, and prolonged flood) can result in a transition to one of the phases in State 2. Careful management allowing natural forces to shape the channel and adequate seed sources for more desirable, deep rooted riparian bank vegetation can move this phase towards the stable analog, phase 3.3. If the native vegetation is not present or sources are not locally available, the phase is considered to be at-risk of crossing a threshold (T3A) to state 2.

Plant Community Components

PCC	Plant Association	Fluvial Surface/Landform[1/]	Composition (%)
1	Obligate Sedge Sp./Prairie Cordgrass	Floodplain	5-20
2	Prairie Cordgrass/Sedge/Western wheatgrass	Floodplain Step	10-35
3	Big bluestem/ Green needlegrass	Low Terrace (Loamy Overflow)	20-60
4	Western wheatgrass/ Green needlegrass	High Terrace (Loamy)	20-60

[1/] Corresponds to fluvial surfaces/landforms in the Physiographic Features and Representative Soil Features sections.

Community Phase Number	3.3
Community Phase Name	Entrenched E5 Channel (stable analogue)
Community Phase Narrative	This phase represents the best combination of attributes and values possible after the original E5 channel and floodplain have been altered by entrenchment and accelerated lateral movement. This phase almost always forms from Phase 3.2 (C5 entrenched channel). The original plant community components of the floodplain are rehabilitated, although constrained by the entrenchment, limiting their lateral extension. The local water table is able to rise and extend the groundwater influence laterally to the terraces.

	This rehabilitated channel is probably not possible without careful management of livestock grazing, limiting water diversions, and conservation farming practices.

Plant Community Components

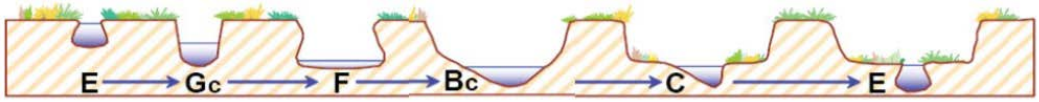
PCC	Plant Association	Fluvial Surface/Landform[1/]	Composition (%)
1	Obligate Sedge Sp./Prairie Cordgrass	Floodplain	15-25
2	Prairie Cordgrass/Sedge/Western wheatgrass	Floodplain Step	20-40
3	Big bluestem/ Green needlegrass	Low Terrace (Loamy Overflow)	20-40
4	Western wheatgrass/ Green needlegrass	High Terrace (Loamy)	15-45

[1/] Corresponds to fluvial surfaces/landforms in the Physiographic Features and Representative Soil Features sections.

Community Phase Comparisons – Geomorphic Evaluation Criteria

Narrative

Beaver and Buffalo Creek (and other intermittent streams in MLRA 55B with sand dominated bed) comparison of states and phases. E → G → F → Bc →C → E succession scenario (phases 1.1, 2.1, 2.2, 3.1, 3.2, and 3.3). Phase 1.1 is the reference.



The metric in the Table below demonstrate the degree of departure from reference condition (Phase 1.1) for each phase and is designed to aid in the identification of threshold.

*Generalizations were made for the metrics of phases 1.1 and 2.1 for stream type within MLRA 55B, since these phases have not been observed in the field.

Phase	ER	Degree of Channel Incision (BHR)		W/D Ratio State (W/D / W/Dref)			Degree of Confinement (MWR / MWRref)		
		BHR	Rating	W/D	Ratio	Rating	MWR	Ratio	Rating
1.1*	20	1.0	Stable	5.4	1.0	Stable	15.0	1.0	Unconfined
2.1*	1.1	2.0	Deeply Incised	10.1	0.53	Unstable	1.0	0.06	Severly Confined
2.2	1.25	1.8	Deeply Incised	27.4	5.07	Highly Unstable	1.3	0.09	Severly Confined
3.1	1.8	1.4	Mod. Incised	17.8	3.85	Highly Unstable	1.5	0.10	Confined
3.2	6.5	1.3	Slightly Incised	10.1	1.53	Unstable	7.0	0.47	Mod. Confined
3.3	13	1.0	Stable	5.4	1.0	Stable	8.6	0.57	Mod. Confined

PLANT COMMUNITY COMPONENTS

Narrative	Plant community components described for this site represent the closest approximation to the characteristic plant communities associated with fluvial surfaces. Plant communities on new sand bars, floodplains or recently scoured areas develop incipient and pioneer vegetation that can subsequently develop into more stabilizing and characteristic plant communities. These plant communities exist on specific fluvial surfaces (PCC1 On floodplains, PCC2 on floodplain steps, PCC3 on low terraces, and PCC4 on high terraces). These communities exist over the entire length of the site and vary slightly to moderately in plant community composition; however, dominant plant associations can always be identified. Plant community components are numbered from stream side outward to edge of riparian complex.

PCC	Plant Association	Fluvial Surface/Landform	Phases
1	Obligate sedge/ Prairie Cordgrass	Floodplain	1.1, 2.2, 3.1, 3.2, 3.3
2	Prairie Cordgrass/Sedge/Western wheatgrass	Floodplain Step	1.1, 2.1, 2.2, 3.1, 3.2, 3.3
3	Big bluestem/ Green needlegrass	Low Terrace (Loamy Overflow)	1.1, 3.1, 3.2, 3.3
4	Western wheatgrass/ Green needlegrass	High Terrace (Loamy)	2.1, 2.2, 3.1, 3.2, 3.3

Plant Community Component 1

Narrative	This plant community is critical to maintaining the characteristic E channel morphology. The fibrous rooted functional groups (grasses and grass-likes) provide bank stability and a measure of shading to the narrow, deep channels. Most plants in potential condition are obligates; the soils are saturated most of the growing season on the floodplain immediately adjacent to the channel. Non-native species such as Kentucky bluegrass, smooth brome, quackgrass, and reed canarygrass may also be present. These non-native species replace the native sedges and grasses that comprise the fibrous rooted functional groups within the reference plant community. Wetland indicator status is from the PLANTS database (http://plants.usda.gov/wetland.html) for USFWS Region 4 (ND, SD, MT - eastern, WY - eastern).

[PCC1] Plant Type – Woody Plant Overstory/Understory **0% of Community Composition**

Plant Symbol	Common Name	Scientific Name	Over-story (%)	Avg. DBH (in.)	Percent Canopy Cover		Avg. Canopy Height (feet)	
					Low	High	Bottom	Top
	none							

[PCC1] Plant Type - Grass/Grasslike **95% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
1	Perennial grasses	CASTI3	Northern reedgrass	*Calamagrostis stricta*	FACW	0	50	0	5
		SPPE	Prairie cordgrass	*Spartina pectinata*	FACW	500	6,500	25	75
		HOJU	Foxtail barley	*Hordeum jubatum*	FACW	0	50	0	5
		PHAR3	Reed canarygrass	*Phalaris arundinacea*	FACW+	0	1,000	0	50
		POPR	Kentucky bluegrass	*Poa pratensis*	FACU	0	25	0	5
		ELRE4	Quackgrass	*Elymus repens*	FAC	0	50	10	50
		PAVI2	Switchgrass	*Panicum virgatum*	FAC	0	50	0	5
		SPCOC2	Composite dropseed	*Sporobolus compositus*	FACU	0	50	0	5
		GLGR	American mannagrass	*Glyceria grandis*	OBL	10	100	0	5
2	Grass-likes	SCPU10	Common threesquare	*Schoenoplectus pugens*	OBL	100	500	0	50
		ELPA3	Common spikerush	*Eleocharis palustris*	OBL	50	250	0	20
		CAPE42	Woolly sedge	*Carex pellita*	OBL	500	2,000	5	75
		JUARL	Mountain rush	*Juncus arcticus*	OBL	0	50	0	5
		SCTA2	Softstem bulrush	*Schoenoplectus tabernaemontani*	OBL	0	25	0	5
		CAAQ	Water sedge	*Carex aquatilis*	OBL	500	6,000	5	95

		SCFL11	River bulrush	*Schoenoplectus fluviatilis*	OBL	10	100	0	5
		SPEU	Broadfruit bur-reed	*Sparganium eurycarpum*	OBL	50	350	0	5

[PCC1] Plant Type - Forbs **5% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
1	Forbs	EQLA	Smooth horsetail	*Equisetum laevigatum*	FACW	0	50	0	1
		PONO3	Norwegian cinquefoil	*Potentilla norvegica*	FAC	0	50	0	1
		POAM8	Water knotweed	*Polygonum amphibium*	OBL	0	50	0	5
		RUCR	Curly dock	*Rumex crispus*	FACW	0	50	0	5
		RUSAM	Mexican dock	*Rumex salicifolius var. mexicanus*	FACW	0	50	0	1
		ZIAP	Meadow zizia	*Zizia aptera*	FACW-	0	50	0	1
		PLMA2	Common plantain	*Plantago plantain*	FAC	0	50	0	1
		RACY	Alkali buttercup	*Ranunculus cymbalaria*	OBL	0	50	0	1
		ARAN7	Silverweed cinquefoil	*Argentina anserina*	OBL	0	50	0	1
		MEAR4	Wild mint	*Mentha arvensis*	FACW	10	50	0	5
		GLLE3	American licorice	*Glycyrrhiza lepidota*	FACU	0	50	0	1
		LYAM	American water horehound	*Lycopus americanus*	OBL	10	50	0	1
		SYLAL4	White panicle aster	*Symphyotrichum lanceolatum*	FAC	25	100	5	15
		RAAQ	White water crowfoot	*Ranunculus aquatilis*	OBL	0	50	0	1

[PCC1] Plant Type - Shrubs **T% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
1	Shrubs	SYOC	Western snowberry	*Symphoricarpos occidentalis*		0	50	0	1

[PCC1] Plant Type – Other; Ferns, Mosses, etc **0% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Percent Canopy Cover		Percent Foliar Cover	
No.	Name					Low	High	Low	High
	None								

[PCC1] Annual Production by Plant Type Table

	Annual Production (air-dry lbs/ac) [1/]		
Plant Type	**Low**	**RV**	**High**
Grass/Grasslikes	1,710	6,500	14,000
Forbs	50	250	750
Shrubs/Vines	0	25	50
Trees	0	0	0
Totals	1,760	6,775	14,800

[1/] NI = Not Inventoried: annual weight not determined.

[PCC1] Percent Canopy and Ground Cover by Material Type

Summary Category	Low	High
Foliar Cover	95	100
Bare Ground	0	5
Basal Cover	0	5
Total Ground Cover	95	100
Ground Cover Between-Plant Cover	0	5
Ground Cover Under-Plant Cover	0	0
Total Litter	25	75

[PCC1] Soil Surface Cover

Soil Surface Category	Low	High
Soil	95	100

Plant Community Component 2

Narrative	This plant community is on floodplain steps only slightly higher in elevation than the saturated plant community, PCC1. This community is dominated by facultative wet and facultative with some facultative upland plants. Dominant graminoid species include prairie cordgrass, clustered field sedge, woolly sedge, and western wheatgrass with lesser amounts of Canada wildrye, switchgrass, big bluestem, porcupinegrass, northern reedgrass and mountain rush; various forbs include American licorice, manyflowered aster, Norwegian cinquefoil, silverweed cinquefoil, smooth horsetail, and Canadian anemone. Non-native species such as Kentucky bluegrass, smooth brome, quackgrass, reed canarygrass, black medick, and sweetclover (both yellow and white) may also be present. The non-native grass species replace the native sedges and grasses that comprise the fibrous rooted functional groups within the reference plant community. Wetland indicator status is from the PLANTS database (http://plants.usda.gov/wetland.html) for USFWS Region 4 (ND, SD, MT - eastern, WY - eastern).

[PCC2] Plant Type – Woody Plant Overstory/Understory **0% of Community Composition**

Plant Symbol	Common Name	Scientific Name	Over-story (%)	Avg. DBH (in.)	Percent Canopy Cover		Avg. Canopy Height (feet)	
					Low	High	Bottom	Top
	none							

[PCC2] Plant Type - Grass/Grasslike **90% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
1	Warm-season perennial grasses	SPPE	Prairie cordgrass	*Spartina pectinata*	FACW	250	1000	25	75
		PAVI2	Switchgrass	*Panicum virgatum*	FAC	50	250	5	15
		CASTI3	Northern reedgrass	*Calamagrostis stricta*	FACW	0	50	0	5
		ANGE	Big bluestem	*Andropogon gerardii*	FACU	100	500	10	50
2	Cool-season perennial grasses	ELCA4	Canada wildrye	*Elymus Canadensis*	FACU	0	50	0	5
		ELRE4	Quackgrass	*Elymus repens*	FAC	0	50	0	20
		PASM	Western wheatgrass	*Pascopyrum smithii*	FACU	100	500	10	50
		BRIN2	Smooth brome	*Bromus inermis*		0	250	0	20
		POPR	Kentucky bluegrass	*Poa pratensis*	FACU	500	1500	50	90
		NAVI4	Green Needlegrass	*Nassella viridula*		10	50	5	15
		HECO26	Needle and Thread	*Hesperostipa comata*		10	50	0	5
		HESP11	Porcupinegrass	*Hesperostipa spartea*		10	50	0	5
3	Grass-likes	CAPR5	Clustered field sedge	*Carex praegracilis*	FACW	50	100	0	10
		CAPE42	Woolly sedge	*Carex pellita*	OBL	100	500	10	50
		JUARL	Mountain rush	*Juncus arcticus*	OBL	0	50	0	5

[PCC2] Plant Type - Forbs **5% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
1	Forb	GLLE3	American licorice	*Glycyrrhiza lepidota*	FACU	0	50	0	5
		PONO3	Norwegian cinquefoil	*Potentilla norvegica*	FAC	0	50	0	5
		ARAN7	Silverweed cinquefoil	*Argentina anserina*	OBL	0	50	0	5

		POAM8	Water knotweed	*Polygonum amphibium*	OBL	0	100	0	10
		TAOF	Common dandelion	*Taraxacum officinale*	FACU	0	50	0	10
		PLMA2	Common plantain	*Plantago major*	FAC	0	50	0	1
		SOCA6	Canada goldenrod	*Solidago Canadensis*	FACU	10	150	0	5
		CIFL	Flodman's thistle	*Cirsium flodmanii*	FAC	0	50	0	1
		CIAR4	Canada thistle	*Cirsium arvense*	FACU	0	50	0	10
		EQLA	Smooth horsetail	*Equisetum laevigatum*	FACW	0	50	0	1
		MELU	Black medick	*Medicago lupulina*	FACU	0	50	0	10
		SYLAL4	White panicle aster	*Symphyotrichum lanceolatum*		0	50	0	5
		SYERP2	Manyflowered Aster	*Symphyotrichum ericoides*	FAC	0	50	0	1
		RAMA2	Macoun's buttercup	*Ranunculus macounii*	OBL	0	50	0	1
		VIAM	American vetch	*Vicia Americana*		0	10	0	1
		ARLU	White sage	*Artemisia ludviciana*	UPL	0	50	0	10
		ANCA	Canadian anemone	*Anemone Canadensis*	FACW	0	50	0	1
		ZIAP	Meadow zizia	*Zizia aptera*	FAC	0	10	0	1
		ACMI2	Common yarrow	*Achillea millefolium*	FACU	0	10	0	1

[PCC2] Plant Type - Shrubs **5% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
1	Shrubs	SYOC	Western snowberry	*Symphoricarpos occidentalis*		0	150	0	15
		ROWO	Woods' rose	*Rosa woodsii*	FACU	0	50	0	5

[PCC2] Plant Type – Other; Ferns, Mosses, etc **0% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Percent Canopy Cover		Percent Foliar Cover	
No.	Name					Low	High	Low	High
	none								

[PCC2] Annual Production by Plant Type Table

	Annual Production (air-dry lbs/ac) [1/]		
Plant Type	**Low**	**RV**	**High**
Grass/Grasslikes	1,450	3,200	4,700
Forbs	50	550	950
Shrubs/Vines	0	50	150
Trees	0	0	0
Totals	1,500	3,800	5,800

[1/] NI = Not Inventoried: annual weight not determined.

[PCC2] Percent Canopy and Ground Cover by Material Type

Summary Category	Low	High
Foliar Cover	95	100
Bare Ground	0	5
Basal Cover	0	5
Total Ground Cover	95	100
Ground Cover Between-Plant Cover	0	5
Ground Cover Under-Plant Cover	0	0
Total Litter	95	100

[PCC2] Soil Surface Cover

Soil Surface Category	Low	High
Organic Litter	0	5
Soil	95	100

Plant Community Component 3

Narrative	The plant community occurs on low terraces adjacent to PCC2 and has been described as a loamy overflow ecological site. This community is dominated by big bluestem and green needlegrass. Non-native species such as Kentucky bluegrass, smooth brome, quackgrass, reed canarygrass, black medick, leafy spurge, and sweetclover (both yellow and white) may also be present. The non-native grass species replace the native sedges and grasses that comprise the fibrous rooted functional groups within the reference plant community. Wetland indicator status is from the PLANTS database (http://plants.usda.gov/wetland.html) for USFWS Region 4 (ND, SD, MT - eastern, WY - eastern).

[PCC3] Plant Type – Woody Plant Overstory/Understory **0-5% of Community Composition**

Plant Symbol	Common Name	Scientific Name	Over-story (%)	Avg. DBH (in.)	Percent Canopy Cover		Avg. Canopy Height (feet)	
					Low	High	Bottom	Top
ACNE2	Boxelder	*Acer negundo*						
CEOC	Common hackberry	*Celtis occidentalis*						
FRPE	Green Ash	*Fraxinus pennsylvanica*						
OSVI	Hophornbeam	*Ostrya virginiana*						
PODE3	Eastern cottonwood	*Populus deltoids*						
SALIX	Willow	*Salix*						
TILIA	Basswood	*Tilia*						
ULAM	American elm	*Ulmus americana*						

[PCC3] Plant Type - Grass/Grasslike **90% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
1	Tall Warm-season Grasses	ANGE	Big bluestem	*Andropogon gerardii*	FACU	760	1520		
		PAVI2	Switchgrass	*Panicum virgatum*	FAC	76	380		
		SONU2	Indiangrass	*Sorghastrum nutans*	FACU	76	380		
2	Needlegrass	ELCA4	Canada wildrye	*Elymus canadensis*	FACU	38	190		
		HESP11	Porcupine grass	*Hesperostipa spartea*	UPL	38	380		
		NAVI4	Green needlegrass	*Nassella viridula*	UPL	114	570		
3	Mid Cool-season Grasses	CASTI3	Northern reedgrass	*Calamagrostis stricta ssp. inexpansa*	FACW	0	190		
		ELTR7	Slender wheatgrass	*Elymus trachycaulus*	FACU	76	380		
		ELTRS	Bearded wheatgrass	*Elymus trachycaulus spp. Subsecundus*	FACU	76	380		
		PASM	Western wheatgrass	*Pascopyrum smithii*	FACU	76	380		
4	Warm-season Grasses	BOCU	Sideoats grama	*Bouteloua curtipendula*	UPL	0	190		
		SCSC	Little bluestem	*Schizachyrium scoparium*	FACU	0	190		
		SPHE	Prairie dropseed	*Sporobolus heterolepis*	UPL	0	190		
5	Other Native Grasses	BOGR2	Blue grama	*Bouteloua gracilis*	UPL	38	114		
		KOMA	Junegrass	*Koeleria macrantha*	UPL	0	38		
		2GRAM	Other Grasses			0	114		
6	Grass-likes	CAREX	Sedge	*Carex*		38	152		
		2GL	Other Grass-likes			0	76		

[PCC3] Plant Type - Forbs **5% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
7	Forbs	ACMIO	Western yarrow	*Achillea millefolium*	FACU	38	76		
		AMPS	Cuman ragweed	*Ambrosia psilostachya*	FAC	38	76		
		ANCA8	Canadian anemone	*Anemone canadensis*	FACW	0	76		
		ARLU	White sagebrush	*Artemisia ludoviciana*	FACU	38	76		

		CIUN	Wavyleaf thistle	*Cirsium undulatum*	FAC	38	76		
		COTI3	Golden tickseed	*Coreopsis tinctoria*	FAC	0	38		
		DAPU5	Purple prairie clover	*Dalea purpurea*	UPL	38	76		
		GLLE3	American licorice	*Glycyrrhiza lepidota*	FACU	38	114		
		HEMA2	Maximilian sunflower	*Helianthus maximiliani*	FACU	38	114		
		HEPA19	Stiff sunflower	*Helianthus pauciflorus*	UPL	38	76		
		LIPH	Wood Lily	*Lilium philadelphicum*	FAC	0	38		
		ONBEB	Soft-hair marbleseed	*Onasmodium bejariense var. bejariense*	UPL	0	38		
		POTEN	Cinquefoil	*Potentilla*		38	76		
		PEAR6	Silverleaf Indian breadroot	*Pediomelum argophyllum*	UPL	38	76		
		RACO3	Upright prairie coneflower	*Ratibida columnifera*	UPL	38	76		
		SENEC	Ragwort	*Senecio*		38	76		
		SOLID	Goldenrod	*Solidago*		38	76		
		SOMI2	Missouri goldenrod	*Solidago missouriensis*	UPL	0	38		
		SYER	White heath aster	*Symphyotrichum ericoides*	FACU	38	76		
		VIAM	American vetch	*Vicia Americana*	NI	38	76		
		2FN	Native Forb			38	190		

[PCC3] Plant Type - Shrubs **5% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Annual Production (Lbs./Acre)		Percent Foliar Cover	
No.	Name					Low	High	Low	High
8	Shrubs	AMCA6	Leadplant	*Amorpha canescens*		38	76		
		CRATA	Hawthorn	*Crataegus*		0	38		
		PRAM	American plum	*Prunus Americana*	UPL	38	114		
		PRVI	Chokecherry	*Prunus virginiana*	FACU-	0	114		
		ROAR3	Prairie rose	*Rosa arkansana*	NI	38	76		
		SYMPH	Snowberry	*Symphoricarpos*		38	190		
		2SHRUB	Shrub (>.5m)			0	190		

[PCC3] Plant Type – Other; Ferns, Mosses, etc **0% of Community Composition**

Group		Plant Symbol	Common Name	Scientific Name	Wetland Indicator Status	Percent Canopy Cover		Percent Foliar Cover	
No.	Name					Low	High	Low	High
	None								

[PCC3] Annual Production by Plant Type Table

	Annual Production (air-dry lbs/ac) [1/]		
Plant Type	**Low**	**RV**	**High**
Grass/Grasslikes	2470	3173	3775
Forbs	165	285	450
Shrubs/Vines	165	285	450
Trees	0	57	125
Totals	2800	3800	4800

[1/] NI = Not Inventoried: annual weight not determined.

[PCC3] Percent Canopy and Ground Cover by Material Type

Summary Category	Low	High
Foliar Cover	95	100
Bare Ground	0	5
Basal Cover	95	100
Total Ground Cover	95	100
Ground Cover Between-Plant Cover	95	100
Ground Cover Under-Plant Cover	0	5
Total Litter	85	95

[PCC3] Soil Surface Cover

Soil Surface Category	Low	High
Embedded Litter		
Rock Fragment		
Soil	95	100
Stones		

Plant Community Component 4

Narrative	The plant community occurs on high terraces that are disconnected from the riparian complex due to past entrenchment. The most common upland site documented on the high terraces is a loamy ecological site. The plant community associated with the loamy ecological site is dominated by western wheatgrass and green needlegrass.

ECOLOGICAL SITE INTERPRETATIONS

Management Implications

The potential natural channel or reference channel that is documented in Sate 1 is rarely found due to past disturbances and the extreme level of entrenchment and widening of the stream system. To recover State 1 connectivity between the channel and the original floodplain would need to be reestablished. This will not happen naturally within this site and would only be accomplished through a significant input of time and resources that is not economically feasible. Thus, management goals should be directed at maintaining the stable channels documented in State 3 and not at recovering the reference state.

Grazing management to maintain stable analogue channels found in State 3. Control the timing, frequency, and intensity of grazing animals. When developing a plan timing needs to consist of shorter grazing periods, and allow for adequate periods of rest to maintain sufficient stubble height and riparian vegetation to shield and stabilize banks during high flow events. Another aspect of timing that needs to be addressed in a plan is season of use. Spring grazing can be beneficial to riparian ecosystems when located in pastures that also include upland ecological sites, as upland vegetation is more palatable at this time, resulting in more uniform utilization. Fall and winter grazing also promotes the health of riparian ecosystems as bank compaction is not generally a concern at this time since banks are either dry or froze. When grazing in the fall and winter it is critical to monitor utilization to maintain adequate stubble height. It is important to monitor utilization of woody species when grazing in the fall and winter as use of these species is increased due to increased palatability. To mitigate for soil compaction and other negative impacts to riparian ecosystems when in pastures with upland ecological sites off site water and supplements need to be included in the management plan. It is important to understand that overgrazing results in reduced root mass of native species and shifts the competitive advantage to shallow rooted introduced graminoid species: including Kentucky bluegrass and quackgrass. This invasion results in decreased bank stability and infiltration, increasing sedimentation and runoff. Exclusion of grazing from riparian ecosystems also favors shallow rooted introduced graminoid species: including smooth bromegrass, reed canarygrass, and Kentucky bluegrass.

Grazing management to facilitate the transition from State 2 (unstable channels) to State 3 (stable analogue channels). Utilizing a grazing system with high stock density and low frequency helps break down the streambanks of the F channel and facilitates the development of a new floodplain within the entrenchment. Spring grazing is recommended to aid in the development of the new floodplain. It is critical to manage grazing during new floodplain development to promote the growth of riparian species and the return of PCC1 to stabilize banks. Sufficient recover period is essential to allow for the return of riparian species. This could be achieved through deferment, rest, or the creation of separate riparian pastures. However, it is important to maintain grazing activity within the adjacent uplands to prevent the spread of introduced species.

Animal Community

The channels that make up both State 1 and State 3 (the stable analogues) are utilized by a variety of terrestrial and aquatic wildlife species. The channels in States 1 and 3 have a well developed floodplain that supports riparian plant communities comprised of a variety of plant lifeforms including graminoids, shrubs, and occasionally trees. The diversity in plant species and communities associated with these sites provides higher value habitat for a greater diversity of wildlife species. Terrestrial species utilize the site for water, food, and cover. The healthy riparian community associated with this site supports obligate sedges and prairie cordgrass which hang over the narrow E channel providing instream cover and habitat for aquatic species. In State 3 PCC1 is susceptible to invasion by reed canarygrass or smooth bromegrass when excess nutrients are present or by Kentucky bluegrass when overgrazed, resulting in bank destabilization and loss of instream habitat. The uplands associated with State 3 are vulnerable to invasion by the non-native graminoid species Kentucky bluegrass and smooth bromegrass, which have been linked to a decrease in plant community diversity and a decline in wildlife habitat. When these species become established within the floodplain there is a decrease in bank stability and water quality, resulting in decreased suitable habitat for aquatic species. In addition these non-native grasses tend to outcompete native species forming a monoculture, compromising wildlife habitat by decreasing habitat structure and available food sources.

The following species have been observed utilizing channels in State 3 associated with this site:

- Avian: great egret, great-blue heron, blue-winged teal, mallard, northern flicker, western meadow lark, western flycatcher, grasshopper sparrow, horned lark, American robin, red-tailed hawk, and killdeer
- Mammals: white-tailed deer, raccoon, American mink, and coyote.
- Insects: mayflies
- Crustaceans: crayfish

- Mollusks: freshwater mussels, freshwater snails
- Reptiles: western painted turtle, plain garter snake
- Amphibians: northern leopard frog
- Fishes: fathead minnow

The State 2 stream channels have lost connectivity with the floodplain making them difficult for terrestrial wildlife species to access. PCC1 is lost in State 2; the loss of PCC1 is accompanied by a loss of instream habitat due to decreased shading. Channels in State 2 Phase 2 which are classified as a F channel have shallow or dry stream beds providing less usable habitat for fish and other aquatic species. There is no floodplain associated with these sites; thus there is little to no shading of the stream from the adjacent plant community. The shallow water depths and loss of shade contribute to elevated water temperatures and a decline in suitable habitat for aquatic species.

The following species have been observed utilizing F channels associated with this site:

- Avian: western meadow lark, western flycatcher, grasshopper sparrow, horned lark and red-tailed hawk
- Mammals: white-tailed deer, raccoon, and coyote.
- Mollusks: freshwater mussels, freshwater snails
- Reptiles: plains garter snake
- Amphibians: northern leopard frog

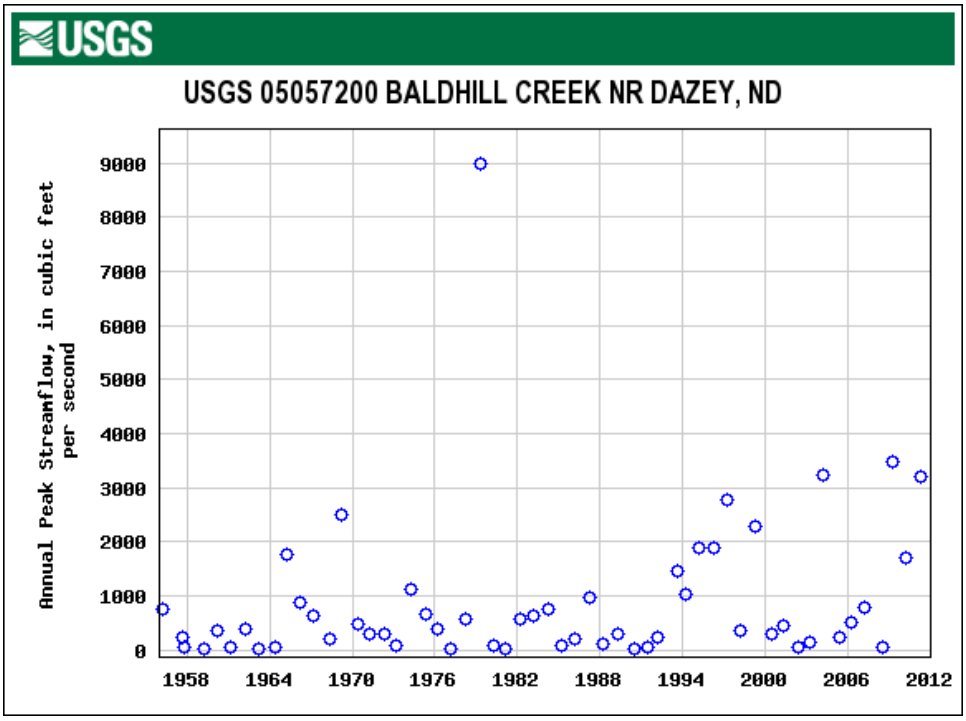
For additional information on wildlife species that utilize riparian ecosystems in North Dakota please refer to the following resources:

- Grondahl, C. and S. Gomes. No Date. Songbirds of North Dakota. NorthDakota Game and Fish Department, Bismarck, ND. Jamestown, ND: NorthernPrairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/songbird/songbird.htm
- Gomes, Scott. No Date. Marshbirds and shorebirds of North Dakota. North Dakota Game and Fish Department, Bismarck, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/marshbrd/index.htm
- Gomes, Scott. No Date. Hawks, eagles, and falcons of North Dakota. North Dakota Game and Fish Department, Bismarck, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/birds/hawks/index.htm
- North Dakota Game and Fish Department. 1986. Fishes of North Dakota. North Dakota Game and Fish Department, Bismarck, ND. Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/fish/ndfishes/index.htm
- Hoberg, Ted and Cully Gause. 1992. Reptiles and amphibians of North Dakota. North Dakota Outdoors 55(1):7-19. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/herps/amrepnd/index.htm
- Seabloom, Robert W., Richard D. Crawford, and Michael G. McKenna. 1978. Vertebrates of southwestern North Dakota: Amphibians, reptiles, birds, mammals. Institute for Ecological Studies, University of North Dakota, Grand Forks, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/resource/mammals/mammswnd/index.htm
- http://www.mammalsociety.org/mammals-north-dakota
- http://gf.nd.gov/wildlife/fish-wildlife/id/mammals
- Hagen, Sandra K., Patrick T. Isakson, and Steve R. Dyke. 2005. North Dakota Comprehensive WildlifeConservation Strategy. North Dakota Game and Fish Department. Bismarck, ND. 454 pp. http://gf.nd.gov/gnf/conservation/docs/North-Dakota-Wildlife-Action-Plan.pdf

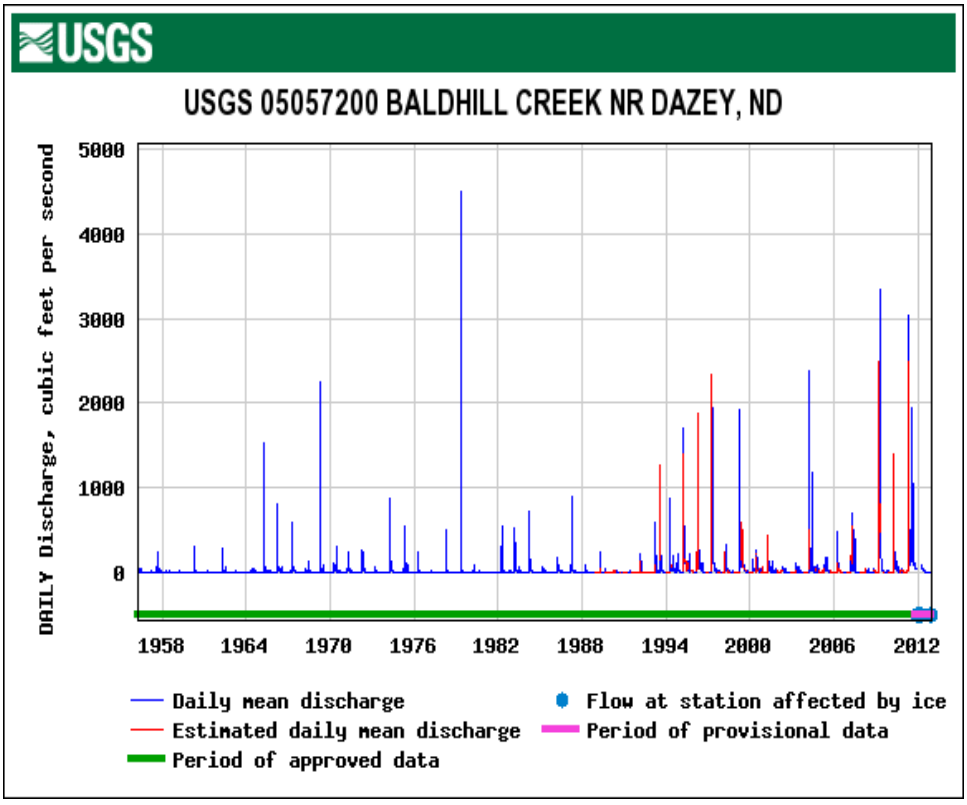
Hydrologic Regime

The Beaver Creek watershed drains an area of 212,705 acres of the Upper James River. These are prairie streams fed primarily by ground-water and runoff from the adjacent uplands. There are no stream gages located on Beaver Creek; however it is located within the same MLRA as Baldhill Creek and it is expected that both streams would have a similar historical flow regime. Peak flows typically occur in late March and early April in concurrence with snow-melt and spring rain. The last major flood on Baldhill Creek occurred in 1979; however, in recent years streamflow has been increased due to regulation of Baldhill Creek Dam. Flows on Beaver Creek are unregulated, thus fows have a flashy nature in response to snowmelt and precipitation events within the watershed.

USGS Streamflow Data is available from the Baldhill Creek gauge near Dazey, ND (05057200). The stream gauging station near Dazey has been in operation since 1956. Since construction of Baldhill Creek Dam was completed in 1951 streamflow data is not representative of historic conditions. Additional information is available at the USGS National Water Information Website: http://waterdata.usgs.gov/nwis/ .



Annual peak streamflow.



Daily discharge (cfs).

Recreational Uses

Due to the location of the majority of these streams on privately owned lands recreational uses are limited. However, areas along the stream are utilized by hunters.

SUPPORTING INFORMATION

Associated Sites

Site Name	Site Number	Narrative
Central Black Glaciated Plains, Intermittent Riparian Complex, Valley Type VIII, E5/6 Stream Type	055BY000ND	This site is associated with intermittent streams with a reference E channel and a bimodal substrate of silt/clay and sand.
Central Black Glaciated Plains, Perennial Riparian Complex, Valley Type VIII, E5 Stream Type	055BY001ND	This site is associated with perennial streams associated with this site that have a reference E channel and sand as the dominant channel material.
Loamy Overflow	R055BY059ND	This site develops on the low terraces associated with this site that are subject to flooding during high flow events.
Loamy	R055BY064ND	This site develops on the high terraces that are adjacemt to the site but are no longer hydrologically influenced by the stream.

Similar Sites

Site Name	Site Number	Narrative
Central Black Glaciated Plains, Intermittent Riparian Complex, Valley Type VIII, E5/6 Stream Type	055BY000ND	This site is associated with intermittent streams with a reference E channel and a bimodal substrate of silt/clay and sand.
Central Black Glaciated Plains, Perennial Riparian Complex, Valley Type VIII, E5 Stream Type	055BY001ND	This site is associated with perennial streams associated with this site that have a reference E channel and sand as the dominant channel material.

Inventory Data References (Narrative)

Information presented was derived from NRCS clipping data, literature, field observations (based on 6 sampled sites and observations from numerous others), and personal contacts with range-trained personnel (i.e., used professional opinion of agency specialists, observations of land managers, and outside scientists).

Inventory Data References

Data Source	# of Records	Sample Period	State	County
Carlson McCain/NRCS	2	9-10/2014	ND	Stutsman

State Correlation

State	Date	Narrative
		Not yet correlated

Type Location

	Degrees	Minutes	Seconds	Decimal
Latitude	46	42	11	779
Longitude	98	37	38	946
	Datum	**Zone**	**Northing**	**Easting**
UTM	NAD83	14	5172258	528477
State	ND	**Township**	**Range**	**Section**
County	Stutsman	137N	63W	3 and 10
General Description	Reference for Phase 2.2			

	Degrees	Minutes	Seconds	Decimal
Latitude	46	45	0	742
Longitude	98	47	42	159
	Datum	**Zone**	**Northing**	**Easting**
UTM	NAD83	14	5177426	515654
State	ND	**Township**	**Range**	**Section**
County	Stutsman	138N	64W	20
General Description	Reference for Phase 3.1			

	Degrees	Minutes	Seconds	Decimal
Latitude	46	43	5	236
Longitude	98	38	45	163
	Datum	**Zone**	**Northing**	**Easting**
UTM	NAD83	14	5173901	527063
State	ND	**Township**	**Range**	**Section**
County	Stutsman	138N	63W	33
General Description	Reference for Phase 3.1			

	Degrees	Minutes	Seconds	Decimal
Latitude	46	47	32	708
Longitude	98	50	56	414
	Datum	**Zone**	**Northing**	**Easting**
UTM	NAD83	14	5182107	511523
State	ND	**Township**	**Range**	**Section**
County	Stutsman	138N	65W	2
General Description	Reference for Phase 3.2; Collection point for vegetative data.			

	Degrees	Minutes	Seconds	Decimal
Latitude	46	42	3	126
Longitude	98	50	15	35
	Datum	**Zone**	**Northing**	**Easting**
UTM	NAD83	14	5171936	512415
State	ND	**Township**	**Range**	**Section**
County	Stutsman	137N	65W	12
General Description	Reference for Phase 3.3; Collection point for vegetative data			

	Degrees	Minutes	Seconds	Decimal
Latitude	46	43	17	788
Longitude	98	42	12	171
	Datum	**Zone**	**Northing**	**Easting**
UTM	NAD83	14	5174270	522667
State	ND	**Township**	**Range**	**Section**
County	Stutsman	138N	64W	36
General Description	Reference for Phase 3.3			

Relationship to Other Established Classifications

Utilizing Rosgen's Classification of Natural Channels to determine states, community phases, and the stream succession scenario.

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Stream Visual Assessment Protocol Ver. 2 (SVAP2) Reference Worksheet

Author(s)/Participant(s)	M. Meehan				
Contact For Lead Author	North Dakota State University – Fargo, ND				
Date	10/1/14	**Approval Date**		**Approved By**	
Notes	Assessment is based on best example of stable analogue (phase 3.3).				

Stream Assessment Reach. These descriptions apply to multiple reaches and represent the nominal reference or stable analogue conditions for the entire lotic riparian complex ecological site. Evaluate as many reaches as necessary to arrive at an assessment. The SVAP2 assessment for a reach should be completed during base flows when habitat feature limitations are likely to be most visible.

Stream Assessment Elements. These descriptions of assessment elements present a description of the potential of the site (either the reference or stable analogue state and community phase) and represent a score of 9 or 10 (excellent). Deviation from these conditions will indicate a lower score.

1. Channel Condition	Active channel and floodplain are connected throughout reach and flooded at regular intervals. CEM Stage I = 10, CEM Stage V = 9
2. Hydrologic Alteration	Bankfull or higher flows occur according to the flow regime that is characteristic of the site, generally every 1 to 2 years and no dams, dikes, or development in the flood plain, or water control structures are present and natural flow regime prevails.
3. Bank Condition (score left and right banks separately)	Banks are stable; protected by roots of natural vegetation, wood, and/or rock: No fabricated structures present on bank. No excessive erosion or bank failures. No uncontrolled or unprotected recreational or livestock access
4. Riparian Area Quantity (score left and right banks separately)	Natural plant community extends at least two bankfull widths or more than the entire active flood plain and is generally contiguous throughout property. (Streams in narrow, steep valleys with limited floodplains will have narrower riparian areas.).
5. Riparian Area Quality (score left and right banks separately)	Natural and diverse riparian vegetation with composition, density and age structure appropriate for the site. No invasive species or concentrated flows through area. Plant community has expected mix of native species (grasses, shrubs, and trees) of multiple age classes. In non-forested complexes, native grasses provide root masses that contribute to formation of undercut but stable banks; non-native invasive species are absent or small percentage of total cover
6. Canopy Cover	**Warm Water Streams** - 5% to 10% of water surface shaded within the length of the stream in landowner's property. (Do not score this element if the lotic riparian complex does not include woody shrubs and/or trees as components of the reference plant community.
7. Water Appearance	Water is very clear, or clarity appropriate to site (e.g., Plains and Southwestern streams contain relatively high loads of suspended sediments, thus streams are generally turbid during seasonal high flows. Similarly glacial-fed streams are naturally turbid. In such cases, water clarity should be scored according to suspended sediment conditions appropriate for the reference site. If streams have clear water under non-stormy conditions, submerged features in stream (rocks, wood) are visible at depths of 3 to 6 feet. No motor oil sheen on surface; no evidence of metal precipitates in streams.
8. Nutrient Enrichment	Clear water, or clarity appropriate to site, along entire reach, and moderate algal growth present.
9. Manure or Human Waste Presence	Livestock access to stream is controlled to protect site conditions and no discharge of animal waste or sewage enters stream directly. Note over-use of deer, elk or other wildlife as evidenced by loss of vegetation, especially willows and herbaceous species.
10. Pools	**Low-gradient streams (<2%)** - More than two deep pools/reach, each separated by riffle or fast water and with greater than 30% of the pool bottom obscured by depth, wood, or other cover. For small streams, pool bottoms may not be completely obscured by depth, but pools are deep enough to provide adequate cover for resident fish. Shallow pools also present.
11. Barriers to Aquatic Species Movement	No artificial barriers that prohibit movement of aquatic organisms during any time of the year.
12. Fish Habitat Complexity	Ten or more habitat features available, at least one of which is considered optimal in reference sites (single logs, wood accumulations or jams, deep pools, secondary pools, overhanging vegetation, large boulders, clusters of small boulders, turbulent water, undercut banks, thick root mats, aquatic plants, side-channels, floodplain wetlands, alcoves).
13. Aquatic Invertebrate Habitat	At least nine types of habitat present A combination of wood with riffles should be present and suitable in addition to other types of habitat (If woody debris is not a component, consider reference site's optimal habitat type needed for high score, such as cobble substrates, boulder clusters, turbulent water, undercut banks, root mats, aquatic plants, leaves and other plant material deposited in stream).
14. Aquatic Invertebrate Community	Invertebrate community is diverse and well represented by group I or intolerant species. One or two species do not dominate. (Mayflies, caddis flies, stoneflies, riffle beetles).
15. Riffle Embeddedness	Not applicable for sand-bed or naturally silty/clayey streams, characteristic of lowlands, prairies, and bottomlands.
16. Salinity (if applicable)	No wilting, bleaching, leaf burn or stunting of native riparian vegetation. No streamside salt-tolerant vegetation present unless naturally saline soils are present in the floodplain or terraces.