USDA Natural Resources
Conservation Service

Ecological site GX070A01X010
Riparian

Last updated: 10/01/2021
Accessed: 05/17/2024

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.

MLRA notes

Major Land Resource Area (MLRA): 070A–High Plateaus of the Southwestern Great Plains

This site is only applicable to the Canadian Plateaus LRU of MLRA 70A (LRU 70A.1).

LRU notes

This site is only applicable to the Canadian Plateaus LRU of MLRA 70A (LRU 70A.1). Please refer to the following key:

Land Resource Unit (LRU) Key for MLRA 70A
– High Plateaus of the Southwestern Great Plains
1a. The site exists on a landform of volcanic origin, such as a basalt plateau, or is part of an escarpment system that rises directly to a volcanic structure. These escarpments are included if they have volcanic alluvium or colluvium (i.e. basalt, rhyolite, tuff, cinders) overlying non-volcanic residuum or bedrock (i.e. sandstone, shale). → VOLCANIC PLATEAUS LRU (VP)
User tip: Other alluvial or colluvial landform features extending below the escarpments are not included unless they have a predominance of volcanic fragments at the surface. Also, note that playas atop volcanic plateaus are included within the VP-LRU.
1b. All other sites. → 2
2a. The site exists in the annulus or floor of a playa. → CANADIAN PLATEAUS LRU (CP)
User tip: Small islands of playas occur within large areas of HP-LRU. These sites may be far from the nearest CP landform but will still key-out to the CP-LRU. The playa rim components, however, may key out to either LRU, so it is important to properly identify their soil properties.
2b All other sites. → 3
3a. The site is part of an escarpment landscape complex (defined below) or is within a canyon, valley, or small basin confined by such escarpments. At the upper boundary of the LRU, the soil surface meets at least 4 of the following 5 criteria:
I. Shallow or very shallow soils are present in at least 50% of the landform area;
II. Soils are underlain by sandstone bedrock of the Cretaceous Dakota Formation or older;
III. Presence or historical evidence of a conifer stand (≥ 2% canopy cover);
IV. The ground surface has a slope of at least 10%;
V. The landforms drain towards steep-walled escarpments or canyons below the Dakota sandstone (older Jurassic and Triassic Formations underlie this sandstone mesa cap).
→ MESOZOIC CANYONS AND BREAKS LRU (MCB)
User tip: The MCB sites also occur on any colluvial or alluvial bottomlands confined within escarpments or canyons. Some valleys transition from CP to MCB, or back to CP, and the turning point can be difficult to determine. Generally, the landforms are part of the MCB when confined between Dakota sandstone breaks or escarpments on both sides. Much of the acreage in the MCB is aproned by colluvial debris fans—composed of sandy materials with large sandstone fragments visible on the soil surface, including large stones or boulders. The soils in the bottoms of these confined valleys will also be in the MCB. When the valley opens, or there is only a single escarpment opening

to the plains, the landforms below the steeper, rockier escarpments will be members of the CP-LRU.
3b. Fewer than 4 of the above criteria are met. → 4
4a. The soil is on a plateau summit position (tread) and is within 50 cm to contact with either plateau bedrock (non-soil bedrock of cemented sandstone, limestone, or shale) or strath terrace cobbles, but not a petrocalcic contact (caprock or caliche of cemented calcium carbonate). → CANADIAN PLATEAUS LRU (CP)
4b. No plateau bedrock or strath terrace cobbles within 50 cm. → 5
5a. Fragments (>2 mm) are visible within the soil profile and/or on the surface. If fragments cannot be found in the profile, it is acceptable to look nearby on ant mounds or around burrows. If site is in a drainageway, one can look for fragments on landforms immediately upslope.→ 6
5b. Fragments are entirely absent. → 7
6a. Fragments are mostly petronodes or High Plains gravels. → HIGH PLAINS LRU (HP)
6b. Fragments are mostly plateau bedrock fragments. → CANADIAN PLATEAUS LRU
7a. All horizons in the upper 100 cm of soil have textures of sandy clay loam or sandier.
→ CANADIAN PLATEAUS LRU (CP)
7b. At least one horizon in the upper 100 cm of soil has a texture that is less sandy than sandy clay loam. → HIGH PLAINS LRU (HP)

Classification relationships

NRCS and BLM: Riparian Canadian Plateaus LRU Major Land Resource Area 70A, High Plateaus of the Southwestern Great Plains Land Resource Region G, Western Great Plains Range and Irrigated Region (United States Department of Agriculture, Natural Resources Conservation Service, 2006).

USFS: Riparian Sandy Smooth High Plains Subsection Southern High Plains Section Great Plains-Palouse Dry Steppe Province (Cleland, et al., 2007).

EPA: Riparian <26l Upper Canadian Plateau<26 Southwestern Tablelands (Griffith, et al., 2006).

Ecological site concept

Landforms that collect water are important ecological resources within semi-arid climates. In severe drought years, they can serve as critical refuges for foraging wildlife. They are also the last opportunity to retain moisture in the local landscape during significant rain events before its lost to surface water networks. Therefore, it is important that these areas are properly recognized and conserved in as high a functioning condition as possible.

The Riparian ecological site occurs on perennial stream floodplains (intermittent conditions can occasionally occur in drier years) and channels of the Canadian Plateaus (CP-LRU). They occur on broad to narrow valleys with floodplains and meandering single channels.

The Society for Range Management defines riparian zones with an ecological function as:
“A riparian area is a distinct ecological site or combination of sites in which soil moisture is sufficiently in excess of that available locally, due to run-on or subsurface seepage, so as to result in an existing or potential soil vegetation complex that depicts the influence of that extra soil moisture. Riparian areas may be associated with lakes, reservoirs, estuaries, springs, bogs, wet meadows, muskegs, and intermittent and perennial streams. The distinctive soil-vegetation complex is the differentiating criteria.”
The US Environmental Protection Agency takes a more systems approach and defines them this way:
“Riparian areas are vegetated ecosystems along a water body through which energy, materials and water pass. Riparian areas characteristically have a high water table and are subject to periodic flooding and influence from the adjacent waterbody. These systems encompass wetlands, uplands, or some combinations of these two land forms. They will not in all cases have all the characteristics necessary for them to be classified as wetlands.”
For the purposes of our LRU, both of these definitions are accurate in describing the function of riparian zones within the broader Canadian Plateaus. However, here we specifically limit the definition for “riparian” areas to riverine, or perennial stream systems so as not to confuse them with other run-on systems such as the Ephemeral Drainageways or Playas ecological sites.

The central concept for this Riparian ecosite is a broader stream valley system with subtle, down-valley relief that is inset into the Cretaceous Canadian plateau. Since these valleys are not carved down through Dakota Sandstone layers like the riparian sites of the Mesozoic Canyons and Breaks, there are no steeper box canyons but favor

terrace and floodplain formation (Rosgen Stream Classification: Valley Type VIII, “Wide, gentle valley slope with well-developed floodplain adjacent to river terraces” with B or C type channels). Stream stage is highest during spring snowpack melt-off but can also be high, and often exceed normal flood stages, following intense monsoonal storms in the summer months. In most cases, entrenchment and or incision of the channels has reduced the ability of the stream to access much of the historic floodplain during contemporary high flow events.

There is usually a water table within rooting depth for most woody plants and available soil moisture for grasses and forbs during the drier spring and winter months and sometimes during the dry autumn months.

Soils develop in deep alluvial materials alongside meandering channels that are slightly entrenched. Soil depth for the Riparian site is over 200 centimeters (cm) to root-restrictive layers with slope gradient ranging from 0 to 3 percent, causing aspect to have very little effect on site dynamics. Surface textures in the floodplains ranges from very cobbly loamy sands to silty clay.

Landscape: Plateaus
Landform: floodplains, perennial stream channels
Slope: 0 to 5 percent
Aspect: Aspect does not exert much influence on this ecological site.

Associated sites

GX070A01X008	**Ephemeral Drainageways** This site occurs on the channels and floodplains of ephemeral drainageways where salts have not accumulated. Drainageways may connect to low terraces in some places, and contribute moisture to the riparian system.
GX070A01X012	**Low Terraces** This site occurs on terraces above perennial streams where the flooding frequency interval is ≥ 10 years. This site is often used for hay and small grain production. Adjacent Clayey Uplands sites contribute water to this site via overland-flow and through-flow.
GX070A01X021	**Sandy** This site occurs in soils that are > 50 cm to a root restrictive layer and have surface textures of sandy loam or coarser and subsurface textures of sandy clay loam or sandier. Such sites typically occur on sand sheets and dunes leeward of playas and stream channels.
GX070A01X003	**Loamy Uplands** This site occurs on upland soils that may contribute sediment and moisture to Riparian sites.
GX070A01X004	**Shallow Loamy** This site occurs on upland positions where soils have paralithic contact within 50 cm.
GX070A01X005	**Limy** This site occurs on upland positions where soils surfaces have strong or violent effervescence and ≥ 5% calcareous rock fragments.
GX070A01X006	**Slopes** This site occurs on escarpments where soils are ≤ 50 cm to a root-restrictive layer and has slopes > 10%. This site may contribute water and sediment to this site via overland-flow.
GX070A01X014	**Lithic Limestone** This site occurs on upland positions where soils are ≤ 50 cm to lithic contact with limestone bedrock, and often supports oneseed juniper savannahs.
GX070A01X019	**Gravelly Terraces** This site occurs on old stream terraces. Soils are skeletal, and contain well-developed argillic horizons. Gravelly Terrace sites may occur right above the Riparian sites and contribute moisture to this site via overland-flow and subsurfacae-flow.

Similar sites

F070AY023NM	**Riverine Riparian** This legacy site does not have a developed concept but would most likely correlate closest to the Riparian ecological site.

R070AY004NM	**Bottomland** This run-on type site was written generally for drainageways, alluvial fans, and floodplains, none of which are affected by stream hydrology. We consider the soil systems that are impacted by stream hydrology to be significantly different, and yet ecologically important enough from these other types of bottomland soils to differentiate into a separate site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Legacy ID

R070AA010NM

Physiographic features

The Canadian Plateaus LRU exists on a plateau unit of the Great Plains Province landscape. The landforms that occur on this landscape include both erosional and depositional surfaces of plateaus and consist of alluvial fans, ridges, benches, playas, drainageways, breaks, terraces, stream channels and floodplains. The Canadian River Valley, primarily to the east, is the base level towards which the entire LRU is eroding and draining. As plateaus grade towards the Canadian River, the elevation drops from above 7,500 feet to below 5,000 feet over a distance of 30 to 40 miles. Because of this erosional gradient, the exposed strata are generally older as you move from west to east across this LRU. In the west, the younger rocks, such as the late Cretaceous shales and limestones, remain intact, a testament to their distance from the Canadian River Valley. To the east, the early Cretaceous Dakota sandstone provides a caprock that serves as the plateau rim.

The Riparian ecological site occurs as stream valley features on plateau surfaces across the Canadian Plateaus LRU. This site includes all the active flood lands within range of the permanent stream channel. It also includes floodplains where the contemporary stream channel has entrenched into the historic floodplains due to alterations in the regional hydrology, leaving floodplains and floodplain steps alike in a drier than historic condition. Often, the newly entrenched channel will form a miniature active floodplain with only a fraction of the formerly active acreage.

This site is not extensive in terms of acreage, but it can be found throughout all portions of the Canadian Plateaus where the plateau is not deeply dissected into Dakota Sandstone bedrock. This site is considered a run-on landform which receives additional moisture from surrounding uplands. This allows the site to behave as though in a wetter climate than expected based on rainfall alone.

Associated sites that occur on landforms and landform positions adjacent to the Riparian ecological site are the Sandy , Loamy Uplands, Clayey Uplands, Lithic Limestone, Lithic Sandstone, Limy, Shallow Loamy, and Ephemeral Drainageways.

For more detail on how the Riparian ecological site contrasts with and relates to other sites in the Canadian Plateaus, see the Ecological Site Key and Associated Sites section below.

Geology:
The geology of the CP consists primarily of Cretaceous rocks: shale, limestone, and sandstone of the Dakota, Graneros, Greenhorn, Pierre, and Niobrara Formations. Being widely distributed across this LRU, the Riparian ecological site occurs on each of these formations. The stream valleys are filled with deep deposits of alluvium from the surrounding uplands which are typically composed of sedimentary rocks but may favor the shale, limestone or sandstone depending on the surface geology of the nearest plateau surface. In areas closer to the foothills of the Rocky Mountains, gravelly or cobbly materials of mixed igneous or metamorphics can contribute significantly to the alluvial sediments.

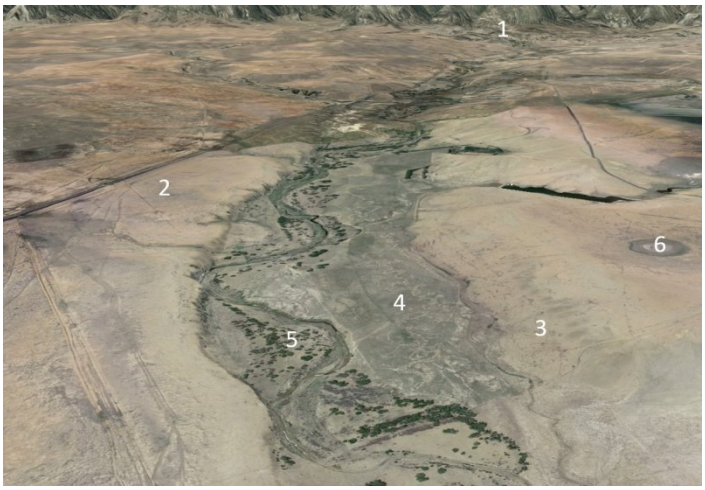


Figure 1. Landforms: 1 - Stream source; 2 - plateau summit surfaces; 3 - escarpment fans from plateaus; 4 - stream terraces; 5 - floodplain-channel complex; 6 - playa. A thin line marking the irrigation ditch is visible on the right margin of the stream terraces.

Table 2. Representative physiographic features

Landforms	(1) Plateaus or tablelands > Flood plain (2) Plateaus or tablelands > Channel
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Frequent to very frequent
Ponding frequency	None
Elevation	1,524–2,286 m
Slope	0–5%
Water table depth	13–152 cm
Aspect	Aspect is not a significant factor

Climatic features

The Canadian Plateaus are currently described as having an aridic-ustic and mesic soil climate regime. The estimated average annual soil temperature ranges from 49 to 58 F, supported by soil temperature measurements taken from May 2014 to July 2015. Rainfall occurs mostly during the summer months and ranges from 15 to 18 inches annually. An annual average range of 130 to 170 cumulative frost free days is common, with 150 days or fewer occurring above 7,000 feet.

Table 3. Representative climatic features

Frost-free period (characteristic range)	130-170 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	381-457 mm
Frost-free period (average)	150 days
Freeze-free period (average)	
Precipitation total (average)	406 mm

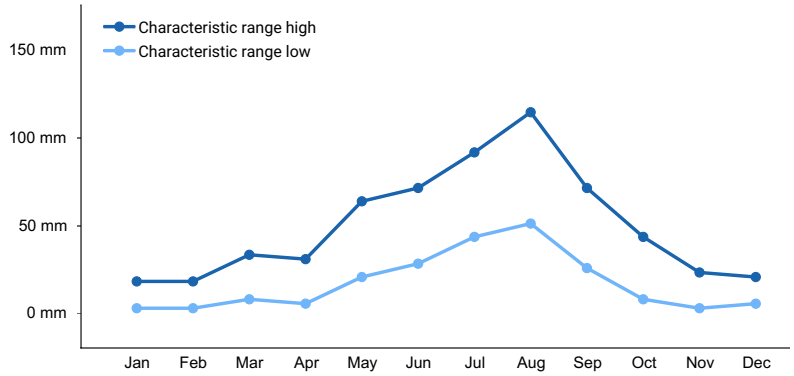


Figure 2. Monthly precipitation range

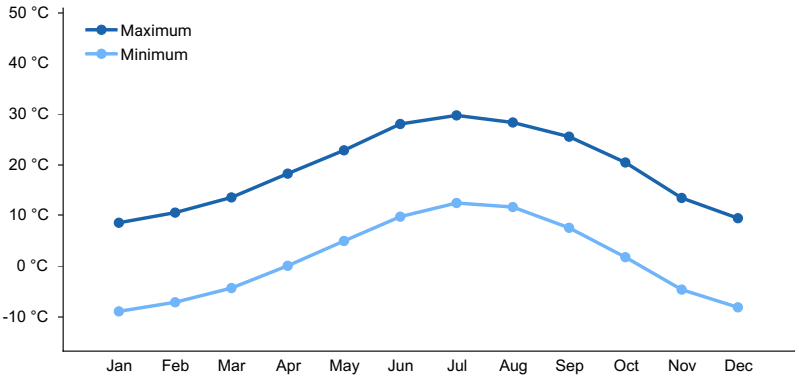


Figure 3. Monthly average minimum and maximum temperature

Climate stations used

- (1) DES MOINES [USC00292453], Des Moines, NM
- (2) LAS VEGAS WWTP [USC00294862], Las Vegas, NM
- (3) ROY [USC00297638], Roy, NM
- (4) SPRINGER [USC00298501], Springer, NM
- (5) VALMORA [USC00299330], Valmora, NM
- (6) LAS VEGAS MUNI AP [USW00023054], Las Vegas, NM
- (7) CIMARRON 4 SW [USC00291813], Cimarron, NM
- (8) MAXWELL 3 NW [USC00295490], Maxwell, NM

Influencing water features

Riparian ecological sites are perennial stream systems that receive run-on water from surrounding uplands by means of overland flow and throughflow. The sources of water for these streams is primarily runoff from the Rocky Mountains to the west but can also be fed by groundwater discharge from the upland landscapes. High stream stages are common for prolonged durations during spring snowmelt from April to June. During summer monsoonal rain events, it is common for localized heavy rains to provide surface overland flow into the channels that may cause short-duration flooding events.

The Riparian ecological site is associated with functioning wetland systems where the stream-stage controlled groundwater table moves slowly through floodplains near backwater areas or on point bars. Degradation of the riparian system often leads to a decreased acreage of wetlands due to entrenchment of the channel, therefore lowering the water table from the soil surface of floodplains. Isolated wetland areas can occur where water is stored behind or within smaller topographic features, near discharge seeps entering the stream valley, or where they have been created when roads and other manmade structures impound water.

The stream system of the Canadian Plateau are unique from neighboring LRUs by their stream valley type (Rosgen Valley Type VIII). They are characterized by unconfined gently sloping landscapes with well-developed floodplains and stream terraces. Some examples of the stream sections in this LRU are the following:
• Canadian River from Raton to where it crosses the Santa Fe Trail (before it entrenches into the canyon just south

of the Trail)
• Cimarron River between Cimarron and the confluence of the Canadian
• Ponil Creek downstream from Hwy 64
• Gallinas Creek From just below Montezuma to before it entrenches near the Las Vegas NWR
• Vermejo River between Dawson and the Canadian confluence
• Rayado Creek downstream from Miami
• Ocate Creek below the volcanic plateau
• Rio Sapello before it entrenches at the confluence with Arroyo Jara

Diversion of water from the stream channels is common in this LRU for the purpose of irrigation via acequia systems, ditches, or aqueducts. In most streams on the Canadian Plateau, a significant portion of the channel waters are routed onto stream terraces to irrigate crops or pastures or to fill storage for center pivot irrigation systems. This activity usually begins as early as March and may last until October, with the impact being impaired flow for most of the growing season along the riparian corridor. Downstream, a portion of the diverted waters will reenter the stream system via subsurface flow or drainage ditches before the streams enter bedrock controlled canyons within the Mesozoic Canyons and Breaks LRU (MCB).

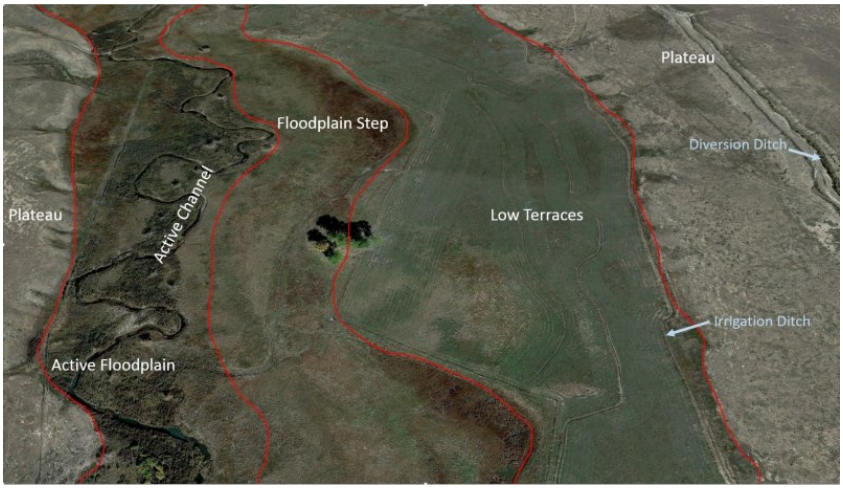


Figure 4. Typical Riparian landscape in the Canadian Plateaus LRU with the basic landforms identified.

Soil features

Every ecological site and associated soil component has static soil properties that help define the physical, chemical, and biological characteristics that make the site unique. The following soil profile information is a description of those unique soil properties for the Riparian ecological site. To learn about the dynamic properties of the soil components tied to this site, refer to the "Plant Communities" section of this ESD.

The Riparian ecological site is correlated to the components of several map units in the Canadian Plateaus LRU of 70A. These soils typically form in alluvium from mixed sources and compose three main landform features: active channels, a non-soil component which is submerged in most years and contains streambed sediments constantly in motion; active floodplains, which are Fluvents defined by the dynamic features of point bars and cut-banks; and floodplain steps which are Mollisols and Fluvents that are parts of the floodplain regularly accessed during overbank events. The differences between map units may be due to the variability in amounts of sandy or clayey materials in the floodplain soils or the presence of salts enough to alter the soil chemistry.

In normal years these soils are driest during the winter. They may be dry in some or all parts for over 90 cumulative days, but are moist in some or all parts for either 180 cumulative days or 90 consecutive days, during the growing season. The effect of run-on water to this site is significant and increases the available water in both amounts and duration. The soil moisture regime is ustic bordering on aridic, but plant-available moisture is often much more available than what falls as precipitation alone. The mean annual soil temperature is 49 to 55 degrees F; this range falls in the mesic soil temperature regime.

The soils of Riparian ecological sites are characterized by stratified layers of alternating textures such as silt loams and sandy loams or even clay loams and gravelly sandy loams. Organic matter content is typically higher on flood

plains than in active channels, and even higher yet in wetland areas with hydric soils.

TYPICAL PEDON: A floodplain soil along the Cimarron River on High Hope Ranch just east of Springer, NM. UTM: 13S 0539929 4021601; elevation 5,708 feet.

A-0 to 7 inches; grayish brown (10YR 5/2) sandy loam, dark grayish brown (10 YR 4/2) moist; weak medium granular structure; soft, very friable, non-sticky and slightly plastic; 5 percent rounded gravels; many fine roots; many fine tubular pores; slightly effervescent; slightly alkaline; clear smooth boundary.

C1-7 to 16 inches; grayish brown (10YR 5/2) extremely cobbly sandy loam, dark grayish brown (10YR 4/2) moist; single grain-structureless; very hard, very firm, sticky and plastic; common fine roots; many very fine irregular pores; few very thin clay films on faces of peds; slightly effervescent; slightly alkaline; clear smooth boundary.

C2-18 to 36 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; single grain-structureless; very hard, very firm, sticky and plastic; few fine roots; many very fine irregular pores; 5 percent, 10YR 5/6, medium, iron concentrations; slightly effervescent; slightly alkaline; clear smooth boundary.

C3-36 to 50 inches; pinkish gray (10YR 7/4) very gravelly sandy loam, brown (10YR 6/4) moist; single grain-structureless; very hard, firm, slightly sticky and slightly plastic; few fine roots; common fine irregular pores; 10 percent, 10 YR 5/6, medium, iron concentrations; slightly effervescent; slightly alkaline.

Parent Material Kind: mixed
Parent Material Origin: alluvial
Surface Texture Group very cobbly loamy sands through silty clay loams
Subsurface Texture Group: very cobbly loamy sands through silty clay loams

Figure 5. Typical stratified soil profile in the active floodplain of a Riparian ecological site.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loamy sand (2) Loam (3) Silty clay loam
Family particle size	(1) Fine-loamy (2) Coarse-loamy
Drainage class	Poorly drained to moderately well drained
Permeability class	Very slow to moderate
Soil depth	203–508 cm
Surface fragment cover <=3"	0–50%

Surface fragment cover >3"	0–15%
Available water capacity (0-152.4cm)	12.7–22.86 cm
Calcium carbonate equivalent (0-152.4cm)	0–1%
Electrical conductivity (0-152.4cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	0–2
Soil reaction (1:1 water) (0-152.4cm)	6.6–7.4
Subsurface fragment volume <=3" (Depth not specified)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0–30%

Ecological dynamics

Plant tables have not yet been developed for this site. Until such time as they can be updated, use the plant tables in the referenced in legacy literature that correlates to this concept. With respect to the imperfect alignment of such correlations, be aware of these shortcomings in their applicability to conservation planning.

Riparian systems are the most ecologically dynamic in a given landscape, capable of dramatic changes in brief timescales to the soil properties, biological composition, as well as hydrology and water table. There are no developed legacy ecological site concepts to reference, however, we have included the plant tables from the Bottomland site that has been correlated in the past to riparian landform positions. Be extremely cautious before using any legacy information as an analog for riparian sites.

Correlation to Current Ecological Sites:
Bottomland- R070AY004NM: This site was written for drainageways, alluvial fans, and floodplains, none of which are affected by stream hydrology. We consider the soil systems that are impacted by stream hydrology to be significantly different, and yet ecologically important enough from these other types of bottomland soils to differentiate into a separate site.

Riverine Riparian- F070AY023NM: This site does not have a developed concept but would otherwise have most likely correlated closest to the Riparian ecological site.

Tables from Bottomland (R070AY004NM)
Annual production by plant type
Plant Type----------Low(Lb/Acre) ----------Representative Value(Lb/Acre) ----------High(Lb/Acre)
Grass/Grasslike----------880----------2200----------3520
Forb----------80----------200----------320
Shrub/Vine----------30----------75----------120
Total----------990----------2475----------3960

Community 1.1 plant community composition
Common Name----------Symbol----------Scientific Name----------Annual Production (Lb/Acre)
GRASS/GRASSLIKE
1 alkali sacaton----------SPAI----------*Sporobolus airoides*----------625–750
2 western wheatgrass----------PASM--------*Pascopyrum smithii*----------500–625
3 vine mesquite----------PAOB--------*Panicum obtusum*----------500–625
4 blue grama----------BOGR2-------*Bouteloua gracilis*----------375–500
5 James' galleta----------PLJA----------*Pleuraphis jamesii*----------250–375
6 sideoats grama----------BOCU---------*Bouteloua curtipendula*-------250–375
7 silver bluestem----------BOSA----------Bothriochloa saccharoide----25–125
8 cane bluestem----------BOBA3---------*Bothriochloa barbinodis*------25–125

9 saltgrass----------DISP----------*Distichlis spicata*----------25–125
10 Canada wildrye----------ELCA4----------*Elymus canadensis*----------25–125
11 *Graminoid (grass or grass-like)*-2GRAM-*Graminoid (grass or grass-like)*-25–125
FORB
12 globemallow----------SPHAE----------Sphaeralcea----------25–125
13 Cuman ragweed----------AMPS----------*Ambrosia psilostachya*--------25–125
14 upright prairie coneflower-RACO3-------*Ratibida columnifera*----------25–125
15 *Forb, perennial*----------2FP---------- *Forb, perennial*----------25–125
16 *Forb, annual*----------2FA---------- *Forb, annual*----------25–125
SHRUB/VINE
17 fourwing saltbush-------ATCA2----------*Atriplex canescens*----------0–125
18 Apache plume----------FAPA----------*Fallugia paradoxa*----------0–125
19 *Shrub, deciduous*---------2SD---------- *Shrub, deciduous*----------25–125

State and transition model

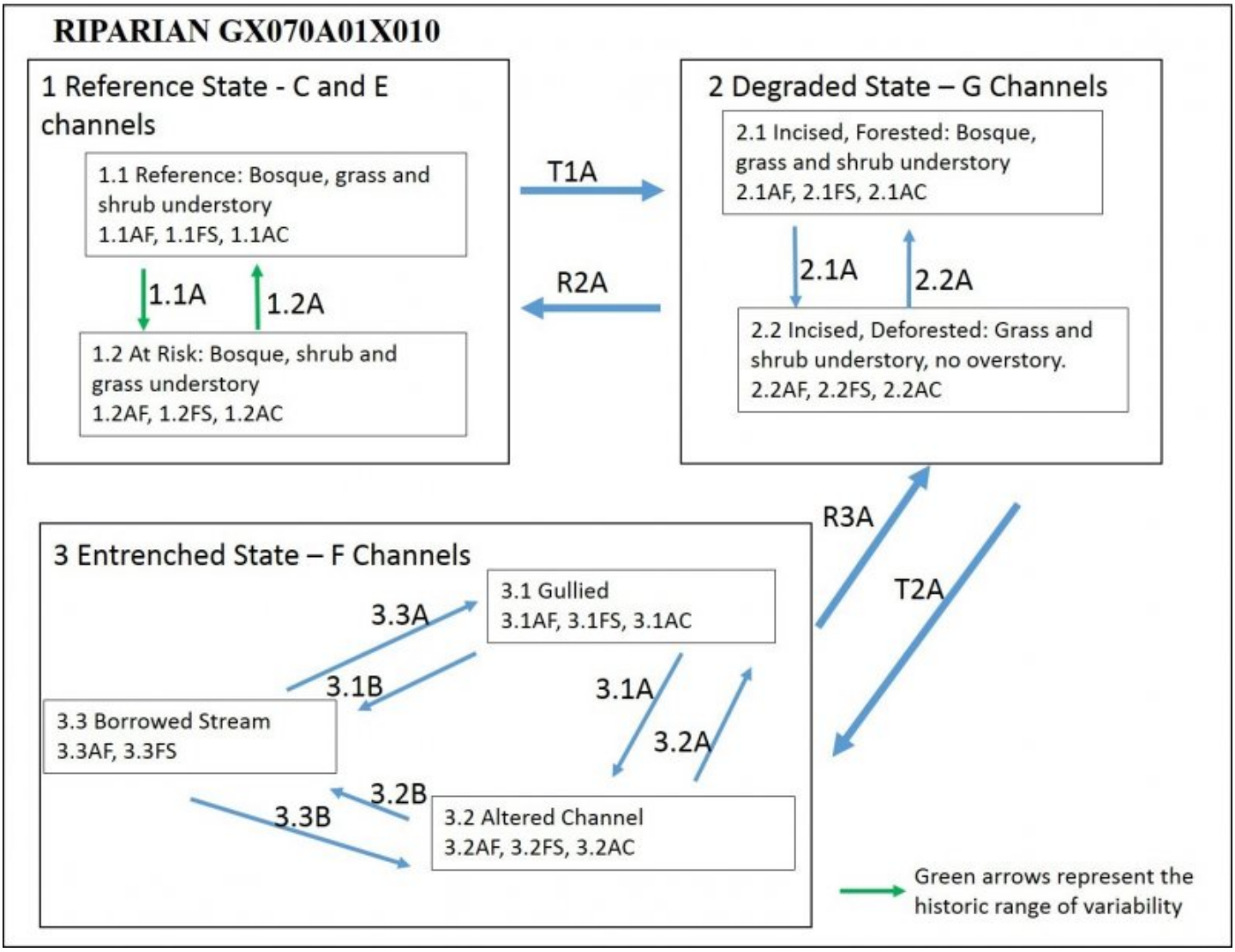


Figure 6. STM diagram for the Riparian ESD.

Figure 7. Riparian restoration along a section of formerly incised channel in the form of grade control structures such as 1-rock dams. Intended to reconnect parts of the floodplain to the water table.

State 1
Reference State

This represents the most late-seral state observed during ESD development, and does not necessarily reflect all Pre-Columbian plant communities. It assumes a dynamic system with regular periods of flooding associated with sediment transport and deposition that result in channel migration within its meandering active floodplain. The presence or absence of beaver plays a role in retention of sediment and thus retention or storage of water in the landscape that modulates peak flow and helps to maintain a more consistent baseflow. Active Floodplain (AF) - The active floodplain has the typical components of a meandering river channel; the point bar and cut-banks. These are dynamic landforms that may change position over time as the channel migrates naturally. The channel regularly accesses the active floodplain as water levels fluctuate with normal stream stage. These sediments are usually within a meter or less to the water table and seasonally are inundated. The substrate associated with these features will consist of recent deposited stratified materials that form soils such as Ustifluvents or Haplustolls. Hydric soil components are present as wetlands in these landforms where old cutoff channels form swales in the cutbank floodplain, or where water stagnates along the point bar. The latter condition is more common along downstream portions of the point bar, backwater swales, or where materials are less sandy and gravelly. Hydric soils make up 15 to 45 percent of this component. Stream channels are of the C and E types which are described as highly sinuous and meandering, low gradient, stable, lower width to depth ratios and with broader connected floodplains. Floodplain Step (FS) - The higher position floodplain step will still receive overbank flooding on a regular basis, but may only occur during extreme events, perhaps 10-year or 20-year cycles. These positions are characterized by loamier materials that exist in lower energy overbank waters and rarely have fragments within a meter of the soil surface. In the Reference State, flooding will occur seasonally or every few years during high stream stages resulting in erosion or aggradation of their margins during these events. The channel water has regular access to the floodplain during flood events which acts to disperse the energy across a greater surface area. Diversity of plant species and density of foliar and basal cover encourages the cycling of organic matter and therefore nutrients.

Infiltration is high, allowing more moisture to be retained in the landscape, and which encourages resilience to drought periods. Good canopy cover shades the ground, keeping it cooler, and armored from rain-splash erosion and during periods of flooding. Rates of organic matter cycling and storage are in long-term equilibrium and only fluctuate slightly with annual variation in climate and major flooding events. Fire is a natural cycle that also encourages recycling of nutrients and maintains a grass and forb advantage over shrub encroachment. Active Channel (AC) - The active channel course is not characterized by a soil profile, but is usually composed of interbedded gravels and sands with some areas of siltier deposits. During high flow stages, there may be some inundation of the point bar which results in a temporary subaqueous soil with emergent wetland vegetation. Channel stream shapes are best characterized by the Rosgen cross-section configurations C and E. Entrenchment ratios are relatively high, meaning the width of the floodplain accessed by an overbank event is at least twice the width of the channel at bank-full conditions. In addition, higher sinuosity and lower stream gradient are characteristic of these stream channel types.

Community 1.1
Diagnostic Plant Community

This site includes the active channel, active floodplain, and floodplain step. Bosque with grass and shrub understory. Total foliar cover is around 95 percent. Active Floodplain – The plant communities found on the point bar and cut banks are characterized by willows and cottonwoods with some box elder and should have a variety of shrub species such as wild rose, fourwing saltbush, skunkbush sumac, and Apache plume, and grass or graminoid species such as sedges, rushes, Canada wildrye, redtop, threesquare, and horsetail in locations with shallow water tables. In drier spots, western wheatgrass, buffalograss, and alkali sacaton are common grasses, along with giant sacaton, inland saltgrass, and vine mesquite with sand dropseed in sandier locations. Plant canopies are near 100 percent with little to no bare ground, and leaf and small woody litter as well as larger snags making up at least 30 percent of the ground cover. Beaver may be part of this ecosystem and are a good sign of a functioning riparian corridor. Multiple plant structures are present, with tree canopies consisting of mostly cottonwoods, scattered patches of willow, a mid-canopy of fourwing saltbush, skunkbush sumac, wild rose and other shrubs, and an understory with a large diversity of grasses, forbs, and graminoids. Floodplain Step - The plant community will be characterized by a typical bosque forest dominated by cottonwood species with possible stratified understory of shrubs such as Apache plume, fourwing saltbush, and wild rose; grasses such as western wheatgrass, buffalograss, alkali sacaton, brome, lovegrass, vine mesquite, inland saltgrass and sand dropseed; with a variety of annuals and forbs. Plant canopies are near 100 percent with little to no bare ground, and leaf and small woody litter as well as larger snags making up at least 30 percent of the ground cover. Active Channel: – 60 to 90 percent of stream channel is shaded by overstory, variety of emergent species along banks, connected to active floodplain by small channel step somewhere between 8 to 20 inches, depending on stream stage.

Dominant plant species

- cottonwood (*Populus*), tree
- willow (*Salix*), tree
- Woods' rose (*Rosa woodsii*), shrub
- fourwing saltbush (*Atriplex canescens*), shrub
- skunkbush sumac (*Rhus trilobata*), shrub
- Apache plume (*Fallugia paradoxa*), shrub
- sedge (*Carex*), grass
- rush (*Juncus*), grass
- Canada wildrye (*Elymus canadensis*), grass
- western wheatgrass (*Pascopyrum smithii*), grass
- alkali sacaton (*Sporobolus airoides*), grass
- vine mesquite (*Panicum obtusum*), grass

Community 1.2
At Risk: Bosque shrub and grass

A reduction in grasses, especially species that decrease due to grazing. Active Floodplain – In comparison to 1.1AF, this community will exhibit a lower diversity of grasses and some decreases in other plant types that provide desirable forage. A slight increase in presence of shrubs will occur, and should reflect the intensity and frequency of grazing. Areas of bare ground may be more prevalent as well as some loss of multi-stage canopy. Floodplain Step

– A decrease in grass species diversity with an associated increase in shrubs and forbs, which should reflect the intensity and frequency of grazing. Active Channel - 40 to 75 percent of channel shaded by overstory, a few emergent species growing along the channel banks, connected to active floodplain by channel step ranging from 20 to 39 inches, depending on stream stage.

Pathway P1.1A
Community 1.1 to 1.2

Represents a decrease of understory plants, primarily grass species diversity such as western wheatgrass and vine mesquite, due to grazing pressure. Possibly some shrubs are decreased as well, such as fourwing saltbush. Also possible is a conversion of the adjacent watershed to a degraded condition that may increase bareground, thereby increasing runoff and erosion and decreasing infiltration. This may adversely affect seasonal groundwater supply in the bottomlands and floodplains.

Pathway P1.2A
Community 1.2 to 1.1

Deferred grazing program will help restore range health by increasing the diversity of plant species and decreasing bare ground. A strong emphasis on managed livestock with dormant season grazing, pasture rotation, and periods of rest.

State 2
Degraded State – G Channels

Channel has been confined, straightened or watershed hydrology altered in terms of flooding frequency so that channel becomes incised or entrenched. This is a result of diverted waters for irrigation purposes or installation of flood control and water storage structures upstream that negatively impact seasonal baseflow and flooding events. As a result, the water table drops and bank storage decreases. Some other scattered encroachment or connection to road crossings, diversion ditches, or other structures along and into the riparian zone. It is likely that the stream terraces connected to these riparian zones have been utilized for crop production which involves plowing, irrigation, drainage systems, as well as some access roads. Grazing of livestock is common within and along the corridor, without seasonal deferral or grazing plan designed to benefit riparian ecology. This may result in decreased flow, lower sinuosity, increased slope or stream velocity, and typically a lower entrenchment ratio. These hydrologic shifts result in a deterioration of environmental services such as: lowered baseflow of stream during dry periods, increased severity of drought periods, increased erosion of stream banks and associated formation of lateral gullies, and loss of wetland acreage. Loss of wetlands reduces ecological services such as: storage of organic matter in the soils which provide increased water holding capacity and nutrient retention; scrubbing pollutants from upland waters before reaching the stream through denitrification of organic N (reduced to gaseous N compounds such as N2); providing habitat for rare hydrophytic plants that tend to be good forage for wildlife and livestock and habitat for rare and endangered species. The change in water table height may cause a shift or reduction in riparian habitat along the banks, plants such as willows may struggle to exist. In these situations, the banks may become un-vegetated or under-vegetated in some areas and susceptible to erosion during flood events. This destabilization of channel banks will release sediments that will not only increase turbidity in the water, and silt up downstream water storage structures, but it will cause a change in the channel/floodplain dynamics such as width to depth ratios or entrenchment ratios. Active Floodplain (AF) - Often a decrease of willow species occurs with an increase in blue grama, smooth brome, inland saltgrass and annuals such as bindweed, lambsquarters, and kochia. Encroachment of exotic species such as salt cedar and Russian olive occurs, watch for presence of cocklebur as a sign of further degradation. Associated resources are compromised relative to the reference state which include a decrease in functioning wetland acreage and a decrease in infiltration and storage of groundwater. The hydric soils are only a fraction of their historic size, ranging from 5 to 20 percent of the component. Hydric soils are constrained as smaller narrow wetlands along margins of point bars, depressions from old oxbow cutoffs, or very narrow micro floodplains along entrenched channel while stream stage is low. Loss of tree cover due to removal of bosque for wood products, or to increase understory production. It is also possible that the tree community has disappeared over time due to lowering of water table from altered flow and diversions upstream. Recruiting and regeneration has been unsuccessful over time, resulting in total loss of bosque ecosystem. Floodplain Step (FS) – Optimized for access to pasture grazing, often roads or other disturbances or cropland are along edge or within this area. Active Channel (AC) – Associated with managed-altered riparian system, the channel will respond with a greater width to

depth ratio due to erosion of the banks and deposition of sediment in the channel. This, in addition to loss of bosque structure and willows along the banks will increase the temperature of the stream water which adds stress to some native aquatic populations.

Community 2.1
Incised, Forested; Bosque, Grass and Shrub Understory

Figure 8. Active channel (2.1AC). Destabilization of the banks has widened the channel causing a high width to depth ratio, which is an unstable parameter for resisting further erosion during flood events.

2.1FS - Typically left high and dry, now functions more as a stream terrace. Can still flood under most extreme events, maybe 50 year floods. This landform has likely been plowed and planted in crops at some point historically. Adjacent stream terraces are likely still managed as irrigated cropland. There is a loss of bosque structure in this area. Tree species such as cottonwoods and willows are present but struggle to regenerate, most living trees are older than 30 years. Some increase in juniper species. Understory has a predominance of blue grama, western wheatgrass, and some lovegrass with an increase in sand dropseed, sleepygrass and even ring muhly with an increase in various annuals. Overbank flood events rarely access this floodplain. 2.1AC Entrenched channel, rarely interacts with floodplains, native wildlife struggles for habitat. Some parts of the channel may shift from E or C type channels to F type channels due to increasing width to depth ratios common of channel entrenchment in erodible parent materials. These channel types are characterized by higher, unstable bank erosion rates. 2.1AF - Channel incision causes lowering of channel with respect to floodplains and therefore detachment of local hydrology. Overbank events are less frequent, maybe once every few years. Sediments are less likely to be transported and redeposited, channel no longer migrates, cannot avulse. Loss of functioning hydric soil and therefore wetland acreage.

Dominant plant species

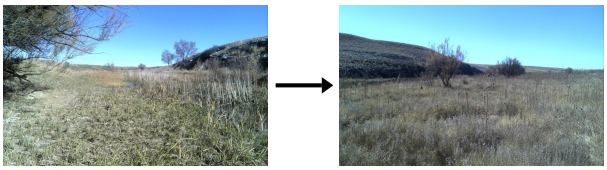
- cottonwood (*Populus*), tree
- willow (*Salix*), tree

Community 2.2
Incised, Deforested: Grass and Shrub Understory, No Overstory.

Figure 9. Typical Riparian ecological site on a floodplain (2.2AF) on what used to be the active floodplain, prior to entrenchment of the stream channel, but is now the floodplain step.

2.2FS –The resulting plant community tends to favor upland plants. In addition, typical understory plants that benefit from some shading will be outcompeted by upland plants that benefit from extra sun exposure and higher temperatures. 2.2AC The decreased canopy shading will increase the solar insolation on any streamflow waters and help to raise water temperatures. This has an impact on aquatic wildlife and on some emergent and aquatic vegetation. 2.2AF - The resulting plant community tends to increase upland plants. In addition, typical understory plants that benefit from some shading will be outcompeted by upland plants that benefit from extra sun exposure and higher temperatures. Shrubs may also increase.

Pathway P2.1A
Community 2.1 to 2.2

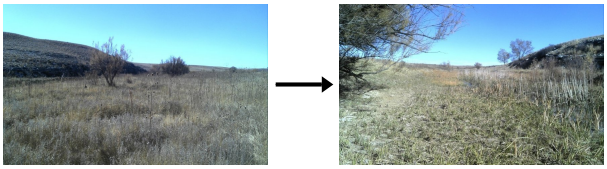


Incised, Forested; Bosque, Grass and Shrub Understory

Incised, Deforested: Grass and Shrub Understory, No Overstory.

After a considerable period in which water table is too low to allow establishment of trees, the overstory disappears as old trees die.

Pathway P2.2A
Community 2.2 to 2.1



Incised, Deforested: Grass and Shrub Understory, No Overstory.

Incised, Forested; Bosque, Grass and Shrub Understory

Reconnection of the water table to the floodplains sufficient to allow successful revegetation of cottonwoods and other tree species to occur through natural processes (long-term) or planting programs (short-term).

State 3
Heavily Impacted and Entrenched State – F Channels

Active Floodplains (AF) – Highly impacted by engineered channeling, near transportation corridors, highly diverted water from channel into irrigation structures characterize the geomorphic changes to this riparian zone. Bank-full

flood stages rarely access this floodplain due to significant entrenchment of channel. Some widely scattered cottonwoods and willows but significant exotic woody species will have encroached in wetter areas, and mostly shrubs and upland grasses or forbs in drier areas. Formerly incised channels have eroded the banks and increased the width to depth ratio in return. A new miniature floodplain system may have developed in this widened bottom, a small fraction of the former riparian corridor. The water table may still be seasonally accessible due to discharge of upland landscape moisture during normal or wetter years, but can be absent on drier years. This will prevent willows from growing here, but not other upland shrubs such as fourwing saltbush and Apache plume. Floodplain Step (FS) –Characterized by upland plant communities due to history of plowing for crops or for pasture grazing, with an increase in bare ground and annuals. Bank-full flood stages never access this floodplain, it's essentially abandoned and acts as a stream terrace, absent a restoration plan to reconnect the hydrology. Arguably the historic active floodplain is now the floodplain step, but is limited in acreage in comparison. Soils will likely be excessively drained since they commonly have subsurface horizons that are a minimum sandy but usually gravelly or cobbly textures. They act to further drain the upland hydrology more efficiently than historic catena functions. Storage of organic matter in the soils has declined due to erosion and/or the change from a high species diversity with canopy of 80 to 100 percent cover to a low diversity with a canopy ranging from 50 to 100 percent cover. Production has declined due to less consistent access to soil moisture from a seasonally fluctuating water table to a rarely accessible water table. Active Channel (AC) – Entrenched or seasonally dry due to diverted stream waters. Stream channel type G with low entrenchment ratios and width to depth ratios, increased stream slope and bank erosion rates.

Community 3.1
Gullied

Figure 10. An abandoned floodplain of the Cimarron River (3.1AF) in an urban area of the town of Springer. The channel is now entrenched about 7 feet below this floodplain.

3.1AF – Gullied - Only small patches and narrow strips of floodplain along incised channel remain active and receive annual flooding events. Areas of former historic active floodplain are now elevated from current channel and act as the current functioning floodplain step. Willows replaced by Russian olive and salt cedar. Sedges, horsetail, and rushes are found here as well. 3.1FS – Gullied - Cottonwoods may still be present but failing to regenerate. In their place, exotics such as salt cedar, Russian olive, and Siberian elm trees may comprise the overstory canopy. Other understory plants that encroach or increase in this state include smooth brome, foxtail barley, cocklebur, Kentucky bluegrass, and prairie sagewort. 3.1AC – Gullied - Highly eroding channel, with unstable banks and multiple gullies cutting back into channel banks. Possibly 3 to 10 feet relief from channel to floodplain.

Dominant plant species

- Russian olive (*Elaeagnus angustifolia*), tree
- tamarisk (*Tamarix*), tree
- Siberian elm (*Ulmus pumila*), tree
- smooth brome (*Bromus inermis*), grass
- foxtail barley (*Hordeum jubatum*), grass
- Kentucky bluegrass (*Poa pratensis*), grass

Community 3.2

Altered Channel

3.2AF – Altered Channel – the former active floodplain is now elevated well above any seasonal flooding zone. It will be dominated by upland plants and may possibly be invaded by exotic species. Where tree canopy still exists, a wider diversity of understory species will occur. However, the canopy may be dominated by exotic woody species such as Siberian elm or saltcedar. Where there is no remaining overstory canopy, only limited upland plan communities will occur. 3.2FS – Altered channel – Typically the forested canopy has been removed, and possibly replaced by exotic species such as mentioned in 3.1FS. The understory plant community is mostly upland plants dominated by annuals and shrubs. 3.2AC Altered Channel - Channel engineered via straightening or impoundment, or other structures. Highly managed channel will have low sinuosity and high gradient relative to its historic condition. It is confined and unlikely to have dynamic properties except for rare flooding events that are likely to cause damage to infrastructure.

Dominant plant species

- tamarisk (*Tamarix*), tree
- Siberian elm (*Ulmus pumila*), tree

Community 3.3
Borrowed Stream

Figure 11. 7 An example of a dried out borrowed stream (3.3AF and 3.3FS) where decades of water diversion and groundwater withdrawal in the area have left this stream dry.

3.3AF -- Borrowed Stream - Where the historic waters of the stream have been either diverted into irrigation networks or pumped from groundwater tables for irrigation, municipal, or industrial uses, has rendered the stream ephemeral with irregular seasonal flow. The former channel is now the active floodplain. Wetter areas may have some hydrophytic species such as willows, rushes, and sedges. Drier locations, those on micro-highs or on small steps, have more upland plants such as western wheatgrass, blue grama and mat muhly. The woody overstory canopy is unlikely to occur but what remains may be dominated by exotic species. 3.3FS - Borrowed stream – The former floodplain now acts as a floodplain step or even a stream terrace with significant channel entrenchment ranging from 7 to 14 feet, and high relief due to major erosion of banks. Without restoration the flood stages may not access this landform every decade. It is common for this landform to have a dominance of annuals with greater than 50 percent bare ground.

Pathway P3.1A
Community 3.1 to 3.2

Alteration of a stream channel by straightening or restricting natural channel migration dynamics for the purpose of protecting infrastructure such as roads, buildings, or equipment.

Pathway P3.1B
Community 3.1 to 3.3

Gullied Borrowed Stream

Alteration of natural and historic streamflow volumes due to diversion of waters away from the channel, or pumping from local water tables, for irrigation or municipal purposes, to the extent that surface flow is no longer perennial. In severe cases, diversion of streamflow causes the channel to be dry except for during flood events, similar to an ephemeral drainageway.

Pathway P3.2A
Community 3.2 to 3.1

To restore the natural sinuosity of a straightened or otherwise impaired channel, a comprehensive riparian restoration plan must be in place. The plan should include the removal of infrastructure or other assets along the floodplain such that the acreage can be re-designated as “land subject to natural dynamic processes”. This plan should have some temporal commitment and consider the long-term effects of this investment.

Pathway P3.2B
Community 3.2 to 3.3

Alteration of natural and historic streamflow volumes due to diversion of waters away from the channel, or pumping from local water tables, for irrigation or municipal purposes, to the extent that surface flow is no longer perennial. In severe cases, diversion of streamflow causes the channel to be dry except during flood events, similar to an ephemeral drainageway.

Pathway P
Community 3.3 to 3.1

Borrowed Stream Gullied

Pathway P
Community 3.3 to 3.2

Transition T1A
State 1 to 2

Stream Corridor Degradation – Concentrated grazing for extended periods can lead to severe riparian degradation through loss of vegetative diversity, compaction, and trampling of streambanks. These processes can all lead to destabilization of the stream banks, accelerated erosion, and elevated instream sediment loads. This leads to a lowering of the stream channel through incision, effectively lowering the water table within the entire riparian zone, and detaching the vegetative communities from their historic sources of perennial moisture (Szaro 1989). In addition, diversion of upstream waters (acequias) can decrease the frequency and duration of flooding events, which in turn decreases the ability to maintain the water storage in the floodplains, and lowered water tables.

Restoration pathway R2A
State 2 to 1

Stream Restoration - Deferred grazing will help to restore plant community diversity and abundance, which should in turn help to stabilize some floodplain banks. Following changes in management, riparian restoration may be needed to increase sinuosity and reduce water velocity, which may induce deposition of sediment along point bars. Only then can there be a chance to reconnect the water table to the floodplain ecosystem and restore its historic

ecological function. Reevaluation of stream water diversion systems may be necessary to achieve goals.

Context dependence. Annual and seasonal changes in stream flow tied to snowpack, other runoff variables such as storm intensities and frequencies can all be contributors or inhibitors to success in stream restoration activities. For instance, low spring runoff could cause upstream irrigation diversions to capture most if not all the surface flow in any given year. Water tables will also respond to such seasonal conditions, complicating vegetative response to riparian plantings. Restoration plans should include the possibility of delays due to these circumstances.

Transition T2A
State 2 to 3

Stream Corridor Gullying and Entrenchment – Severe diversion of stream water from channel for irrigation or municipal supplies will cause stream flow to decrease enough so that ecosystem no longer has access to historic moisture supply. Regeneration of cottonwoods and willows is no longer viable, possible exotic encroachment by tamarisk and Russian olive, and other upland species. Proximity of infrastructure such as roads, canals, railroad tracks, and other structures changes local hydrology to concentrate water in runoff events, and subsequently induce gullying on floodplains and stream banks.

Restoration pathway R3A
State 3 to 2

Riparian Restoration – Major changes to watershed management, diversion of irrigation water from channel, and relocation of infrastructure such as roads away from riparian corridors or rerouting bridges or low-water crossings to integrate better with stream function. Possible restoration activities may be needed to restore channel function such as inducing meanders via lateral controls: baffles, vanes, and other structures; as well as raising of channel depth via vertical controls: weirs, one-rock dams Zuni bowls etc.; (Zeedyke, 2009). Other more drastic measures may be needed to restore channel function.

Additional community tables

Animal community

Habitat for Wildlife:
(From Bottomlands-RO70AY004NM)* This site provides habitats which support a resident animal community that is characterized by coyote, badger, black-tailed jackrabbit, plains pocket gopher, marsh hawk, horned lark, magpie, western racer, and Great Plains skunk.

The pronghorn antelope and mule deer will make seasonal use of these habitats. Red-wing blackbirds breed in these habitats.
*Note that this list comes from a non-riparian site, which is merely the closest fit among existing sites.

Hydrological functions

SOIL HYDROLOGY AND INFLUENCING WATER FEATURES
Riparian ecological sites are perennial stream systems that receive run-on water from surrounding uplands by means of overland flow and throughflow. The sources of water for these streams is primarily runoff from the Rocky Mountains to the west but can also be fed by groundwater discharge from the upland landscapes. High stream stages are common for prolonged durations during spring snowmelt from April to June. During summer monsoonal rain events, it is common for localized heavy rains to provide surface overland flow into the channels that may cause short duration flooding events.

The Riparian ecological site is associated with functioning wetland systems where the stream-stage controlled groundwater table moves slowly through floodplains near backwater areas or on point bars. Degradation of the riparian system often leads to a decreased acreage of wetlands due to entrenchment of the channel, therefore lowering the water table from the soil surface of floodplains. Isolated wetland areas can occur where water is stored behind or within smaller topographic features, near discharge seeps entering the stream valley, or where they have been created when roads and other manmade structures impound water.

The stream system of the Canadian Plateau are unique from neighboring LRUs by their stream valley type (Rosgen Valley Type VIII). They are characterized by unconfined gently sloping landscapes with well-developed floodplains and stream terraces. Some examples of the stream sections in this LRU are the following:
• Canadian River from Raton to where it crosses the Santa Fe Trail (before it entrenches into the canyon just south of the Trail)
• Cimarron River between Cimarron and the confluence of the Canadian
• Ponil Creek downstream from Hwy 64
• Gallinas Creek From just below Montezuma to before it entrenches near the Las Vegas NWR
• Vermejo River between Dawson and the Canadian confluence
• Rayado Creek downstream from Miami
• Ocate Creek below the volcanic plateau
• Rio Sapello before it entrenches at the confluence with Arroyo Jara

Diversion of water from the stream channels is common in this LRU for the purpose of irrigation via acequia systems, ditches, or aqueducts. In most streams on the Canadian Plateau, a significant portion of the channel waters are routed onto stream terraces to irrigate crops or pastures or to fill storage for center pivot irrigation systems. This activity usually begins as early as March and may last until October, with the impact being impaired flow for most of the growing season along the riparian corridor. Downstream, a portion of the diverted waters will reenter the stream system via subsurface flow or drainage ditches before the streams enter bedrock controlled canyons within the Mesozoic Canyons and Breaks LRU (MCB).

In most cases, entrenchment and or incision of the channels has reduced the ability of the stream to access much of the historic floodplain during contemporary high flow events. Many factors can lead to incision or entrenchment; industrious alterations to the hydrologic system; changes in type or amounts of vegetative structure within this site that has historically attenuated floodwaters and supported banks; changes in soil surface condition or soil health, or in the type or amounts of vegetative cover in the upland parts of the watershed that may lead to changes in infiltration/runoff behavior following rainstorm events.

Wood products

Drier portions of this site often support trees such as plains cottonwood, saltcedar, Russian olive, and Siberian elm.

Other information

Correlated NASIS Pedon and Vegetation Plot Sites:
S2015NM007016, S2015NM007017, S2015NM007018, S2015NM007019, S2015NM047007, S2017NM033009, S2017NM033010, S2017NM033011, S2017NM033012, S2017NM033083, S2017NM033085, S2017NM047016, S2017NM047070, S2017NM047072, S2017NM047074

Data points from NWCA:
05PonilC007.0
05Cimarr046.4
05Cimarr048.4
07MoraRi104.0
07MoraRi108.3
07MoraRi126.1
07Sapell039.1

Future Work:
This site has no soil pedons in any manuscript; it has historically been correlated to miscellaneous land types. There is also no existing ecological site documentation to contribute. There will be a great amount of effort needed to get this site established.
A large amount of data need to be collected to complete tier 1 sampling and data analysis before development of the STM can begin. A complete pedon for this ecological site needs to be collected and used for the representative. A few delineations of NM630-UF are mapped in the MCB LRU.

ESD Workgroup:

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Contributors

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Approval

Curtis Talbot, 10/01/2021

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.

Author(s)/participant(s)	
Contact for lead author	
Date	05/17/2024
Approved by	Curtis Talbot
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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:

    Sub-dominant:

Other:

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
