USDA Natural Resources Conservation Service

Ecological site R035XY020UT
Colorado Plateau Riparian Complex Perennial (Valley Type IV - B4C Stream Type)

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General information

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

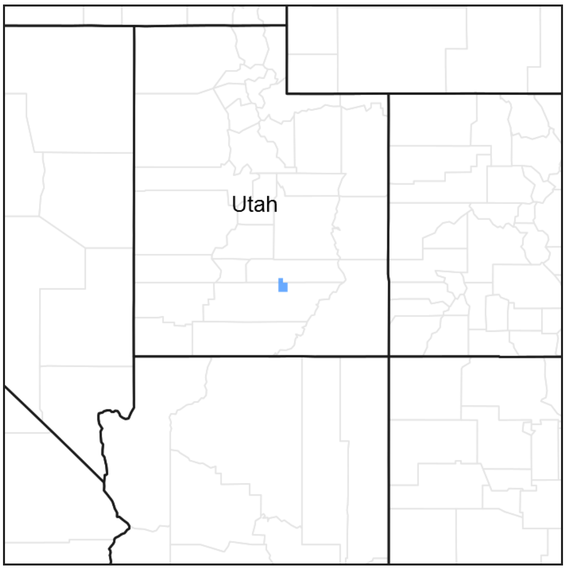

Figure 1. Mapped extent

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

Classification relationships

Vegetation Classification and Mapping Project Report, Capitol Reef National Park (Clark et al. 2009)
Plant Associations:
Salix exigua/Barren Shrubland (PCC1)
Eleocharis palustris (PCC1)
Juncus balticus (PCC1)
Schoenoplectus pungens (PCC1)
Populus fremontii/*Salix exigua* (PCC2)
Populus fremontii/Ericameria nauseosa (PCC2)
Populus fremontii/mesic graminoids (PCC2)
Phragmites australis (PCC2)
Map Class:
Fremont Cottonwood Woodland Complex (PCC1 and PCC2)
Willow Shrubland Complex (PCC1)

Ecological site concept

This site covers perennial riparian complexes in MLRA 35. Stream flow occurs year round with high water occurring during spring runoff and throughout the summer monsoon season. Episodic high flow duration is variable during the summer monsoon season and can vary on a daily or hourly basis depending on rainfall within the watershed. The episodic flooding of this site is typical of streams in the Colorado Plateau that are influenced by monsoonal climate patterns. This riparian complex has developed within a natural confined gorge/canyon (Valley Type IV) and has a narrow but continuous ribbon of riparian vegetation. The dominant vegetation is Fremont cottonwood (Populus fremontii) and Baltic rush (Juncus arcticus ssp. littoralis) and/or common threesquare (Schoenoplectus pungens). This complex is dependent on natural hydrology (i.e. annual and storm induced flooding).

This riparian complex is characterized by a B4c stream channel with bed material that is predominantly gravel with components of sand and cobble. Grade control in this site is present as bedrock within the channel. The canyon bottoms have a single thread channel with associated floodplains and floodplain step. There are two native plant community components that are generally found in a continuous narrow ribbon throughout the riparian corridor. The plant community component closest to the stream is predominantly composed of Baltic rush and coyote willow (*Salix exigua*). This plant community component is found within the bank zone at or below bankfull. The second plant community component is predominantly composed of Fremont cottonwood. This plant community is found within the over bank zone within the floodprone width (see Hoag et al. 2001 for zones).

Associated sites

R035XY021UT	**Colorado Plateau Riparian Complex Perennial (Valley Type VIII - B4C Stream Type)** This site generally occurs upstream, where the valley type is different. The potential State and Transition Model is different although the plant community components are similar.

Table 1. Dominant plant species

Tree	(1) *Populus fremontii*
Shrub	Not specified
Herbaceous	(1) *Juncus arcticus ssp. littoralis* (2) *Schoenoplectus pungens*

Physiographic features

This site is located in the Canyon Lands sections of the Colorado Plateau province of the Intermontane Plateaus. This site is characterized by narrow canyons and restricted riparian complex development. This site occurs on streambanks, flood plains, and flood-plain steps.

Table 2. Representative physiographic features

Landforms	(1) Flood plain (2) Flood-plain step
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Frequent to occasional
Ponding frequency	None
Elevation	1,676–1,737 m
Slope	1–5%
Water table depth	51–152 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by hot summers and cool to warm winters, which can be slightly modified by local topographic conditions, such as aspect. Large fluctuations in daily temperatures are common. Precipitation is variable from month to month and year to year, but averages between 7 and 10 inches. Most of the precipitation comes as rain march through October. On average, July through October are the wettest months. Much of the summer precipitation occurs as convective thunderstorms.

Table 3. Representative climatic features

Frost-free period (average)	178 days
Freeze-free period (average)	208 days
Precipitation total (average)	229 mm

Influencing water features

This site is a perennial fluvial system with surface and ground water influence. Water chemistry is neutral and non-saline (fresh).

Valley Type: Valley Type IV consists of canyons and gorges with gentle elevation relief and valley floor gradients. This valley is generally structurally controlled and incised in highly weathered material. Alluvial sediments occupy the valley floor. Sediment supply is generally moderate to high.

Reference Stream Type: The B4c stream type is found in systems that are moderately entrenched with a moderate gradient. They are typically riffle dominated with infrequently spaced pools. The channel bed material is dominated by gravels and the banks generally consist of finer materials. The B4c stream type is generally very stable in plan and profile with stable banks. The “c” notation after the stream type indicates that the slope is less than 2%.

Channel materials: Gravels found in the channel bed and sand/silts in the banks.

Stream Succession Scenario: B4c>G3>F4

Channel Evolution Stage: I>III>I

Delineative Criteria:
Entrenchment Ratio: 1.4-2.2
Width/Depth Ratio: 10.7-36.7
Sinuosity: 1.2-1.7
Slope Range: 0.002-0.02
Channel Materials D50: 16-24
Channel Materials D84: 64-96

Soil features

The soils within this site are alluvial deposits derived from sandstone and/or basalt. Livan family soils dominated on the flood plain-steps, which have high rock content and are somewhat excessively drained. Bowington soils are found on the flood plains and have variable rock content and are somewhat poorly drained. The soil texture is loamy fine sand on the surface for both features.

The tables below represent the ranges in soil characteristics from all fluvial surfaces.

Soils associated with this site:
Capitol Reef National Park Survey –
Bowington soils (MU 530, PCC1)
Livan Family soils (MU 530, PCC2)

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone
Surface texture	(1) Loamy fine sand
Drainage class	Somewhat poorly drained to somewhat excessively drained
Soil depth	152 cm
Surface fragment cover <=3"	0–35%

Available water capacity (0-101.6cm)	8.38–8.89 cm
Calcium carbonate equivalent (0-101.6cm)	1–3%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	8–8.2
Subsurface fragment volume <=3" (Depth not specified)	0–65%

Ecological dynamics

The natural gorges within MLRA 35 have low gradient B4c channels that have developed flood plains that are able to support cottonwoods. The streams within this site are perennial with regular spring runoff high flow and intermittent flash flooding during summer monsoon season. Instream large wood may also contribute to channel form, allowing sediment to accumulate and build banks. This process would occur when mature cottonwoods fall in the channel, or when large wood from upstream riparian trees are deposited on the bank after flooding. Beaver activity could also provide input of large wood, although no recent beaver activity was found on any riparian complexes within this ecological site.

Large magnitude floods may occur July through October within this MLRA. These floods are generally the result of heavy rain in the summer or fall. Channel morphology can remain stable with large floods, although vegetation can be scoured as a result. However, vegetation found in this type of flashy system is adapted to this type of disturbance. Coyote willow has very flexible stems that bend with the water and the dominant herbaceous vegetatior (Baltic rush, common threesquare, and common reed) grows up through fresh sediment deposits (McBride & Strahan 1984; Anderson 2006).

Historic land management practices may have influenced current channel morphology directly or indirectly through upland degradation, but the effects of the management practices have not been adequately documented to establish a cause and effect relationship within this site. Over use by livestock would have a similar effect in the uplands and if overuse occurred in the canyon bottoms, the removal of bank stabilizing vegetation could increase bank failure, accelerating bank erosion and undermining channel stability. Perennial water in this region is a rare and valuable resource and is often exploited for human use. Perennial channels in this region have commonly been altered by irrigation withdrawals, impoundments, and channelization. These uses can influence the channel geomorphology and vegetation structure of this ecological site. Altered hydrology can affect the establishment of cottonwoods because cottonwood germination is dependent on timing and magnitude of flooding (see next section). Channel geometry is also determined by hydrology. Bankfull events (1.5 to 2 year flood events) are what shapes the channel, if those channel forming flows are altered, the channel geometry will also change and adjust to the new hydrology.

The state and transition model is based on a customized (derived from documented scenarios) stream succession scenario of B4c > G4/F4. This may be due to bedrock controlling the stream grade; instead of the stream channel down cutting, the stream moves within the flood plain, creating a new channel.

General: This riparian complex is a low gradient (<0.02%), gravelly, B4c-type stream system with low to moderate sinuosity (about 1.1-1.5) and moderate (>12) width/depth ratio. The site extends throughout MLRA 35 including streams that have the same potential channel morphology, channel succession, bed and bank materials, fluvial surfaces, potential plant community components, and similar response to disturbance.

Plant Communities and Fluvial Surfaces: This system exhibits a complex of narrow streambanks, flood plains and flood-plain steps. The streambanks and flood plains are composed of alluvial sediment that is generally sandy. Vegetation composition is influenced by flood frequency, flow duration and length of inundation. Fluvial surfaces that are closer to the channel are inundated more frequently with floods, thus have less woody vegetation. The vegetation growing on the fluvial surfaces close to the channel have more access to ground water, allowing more obligate wetland species to dominate. Fluvial surfaces further from the channel are inundated less frequently and have greater woody vegetation cover and also have less access to ground water except through deep roots. Dominant vegetation in this ecological site is adapted to yearly variations in flow and sediment deposition, cottonwoods and willows particular to this site are adapted to frequent disturbance and are known to be aggressive colonizers of disturbed sites (Richenbacher 1984). The adaptations of willows and cottonwoods are: they produce a large number of seeds, the seedlings have a high growth rate, stem fragments can regenerate, and willow root systems are extensive and allow the plant to anchor and bind the soil (Karrenberg et al. 2002). Willows and cottonwoods also require fresh wet sediment that is devoid of other vegetation to germinate (Braatne et al. 1996). Yearly variations in flow and large floods that scour vegetation and deposit sediment on floodplains are ideal microsites for willow and cottonwood seeds. Cottonwoods and willows produce large amounts of wind and water dispersed seeds that are only viable for a short period of time after the seeds come in contact with moist soil (Braatne et al. 1996). Germination can occur quickly, usually in a 24 hour period (Karrenberg et al. 2002) and they will remain viable for 2 to 3 days (Braatne et al. 1996). Mortality of cottonwood and willow seedlings is very high ranging from 77 to 100% in the first year (Karrenberg et al. 2002). Mortality is often attributed to desiccation of the seedling and seedlings are at a great risk of subsequent summer floods that may scour the recently deposited sediment (Braatne et al. 1996; Karrenberg et al. 2002).

The stream banks/flood plains are very narrow and are correlated to plant community component 1 (PCC1). They are close enough to the water table and water in the channel to support obligate wetland vegetation. Plant communities that are found closest to the channel on the stream banks are rushes, common reed and mesic forbs. These rhizomatous plants have the ability to survive frequent high flow and can send stems up through freshly deposited sediment. Willows and mesic forbs often establish on the upper edge of the narrow flood plain away from the channel because it is an intermediate location between high flows and access to the water table. Coyote willows found in this community have flexible stems and are able to bend with high flow (Karrenberg et al. 2002; McBride & Strahan 1984). Native fish and other aquatic species, including frogs and aquatic insects, are present, utilizing floodplain wetlands for refuge during high flows, and deeper residual pools as drying occurs during the drier months of the year.

Flood-plain steps are not flooded as frequently and are dominated by a mix of facultative wet and upland vegetation (PCC2). The mesic species in these communities probably established when the water table was closer to the soil surface or established after a large flood in a wet year and the upland species establish between wet years or high flow events. The flood-plain steps support Fremont cottonwood generally with upland species in the understory such as basin big sagebrush, rabbitbrush, and Indian rice grass. Cottonwood survival is based on the proximity to water in the channel and in the water table. The establishment of cottonwoods and coyote willow is cyclical, typically after a flood. These events deposit the needed wet sediment for germination. The likelihood of cottonwoods reaching maturity decreases if they germinate closer to the channel, because of the susceptibility of the streambank to high flow and scouring.

Invasive Species: Tamarisk, Russian olive and Russian thistle are often found within this ecological site. Tamarisk is the most common invader and can readily replace the willows and cottonwoods. If the channel abandons floodplains and terraces, the groundwater influence decreases which can create a better environment for tamarisk to establish (Horton et al. 2001). Tamarisk is more tolerant of drought and salinity than native species (Horton et al. 2001). The timing of seed dispersal is also different for tamarisk than native shrubs. Tamarisk produces seed from April to October (Horton et al. 2001) and with high summer flows could be at a seed dispersal advantage over cottonwoods and willows, which produce seed from February to April (Braatne et al. 1996). Tamarisk seedlings can establish midsummer on fresh sediment deposits from runoff during summer rain storms, months after cottonwood and willows dispersed seed (Stromberg et al. 2007). Tamarisk invasion can create a feedback loop that is difficult to reverse. Once tamarisk invades and begins to replace willows and cottonwoods, bare soil begins to decrease and shade increases, further decreasing the chance that cottonwoods and willows will regenerate in the site.

Fire: Fire has not been found to be a major factor contributing to plant community change. The landscape is dissected by deep canyons and the uplands do not support high grass production that would allow a fire to spread. Fremont cottonwood is not as tolerant of fire as narrowleaf cottonwood, indicating that the dominant plant community is not adapted to frequent fire. Fremont cottonwood can be top killed even by a moderate fire and the cambium layer has been found to be damaged by a low severity fire, although it can sprout from the bole and roots (Taylor 2000).

Plant Community Components
These plant communities exist on specific fluvial surfaces (PCC1 on stream banks/flood plains and PCC2 on flood plain step). These communities may exist over the entire length of the site and vary slightly to moderately in plant community composition.

Plant Community Component 1
This community is frequently disturbed by flash flooding. Shrubs and trees are generally not found within this plant community because of the close proximity to the stream channel and scouring floods. Herbaceous plants can establish between flooding events and can often come up though sediment if they are buried during a flood event. Baltic rush is a sod forming, rhizomatous perennial graminoid that forms a dense root system that can bind non-cohesive stream bank sediment. Baltic rush can tolerate fluctuating hydrology. It is adapted to flooding and drought. It is also tolerant of a range of soil conditions, including mild to moderate salinity and alkaline to calcareous soils. Common threesquare is similar to Baltic rush, it is also rhizomatous and it tolerant of alkaline conditions. Coyote willow is often found on the upper edge within this community because it is able to expand through rhizomes and grow under conditions that it would not be able to germinate (Anderson 2006). Roots of graminoids and coyote willow hold the stream banks during typical flood events, but may be scoured during large floods. Willows have flexible branches that are able to bend with the force of water without much damage to the plant (Karrenberg et al. 2002; McBride & Stahan 1984). Coyote willow (*Salix exigua*) is drought resistant and very tolerant of flooding (Anderson 2006) an essential characteristic in the dry environment of southern Utah. Willow seeds are non-dormant and quickly loose viability. Seedlings generally establish close enough to a water supply and far enough from the channel to be protected from scouring during floods (Anderson 2006). Once established, vegetative clones can expand perpendicular to the stream channel, developing closer to the water source (Anderson 2006). Branches can resprout if buried by sediment and they may also regenerate vegetatively from broken stems and roots (Anderson 2006). Coyote willow is shade intolerant and is shaded out once cottonwoods grow tall enough to dominate the overstory (Karrenberg et al. 2002). Seedlings of willow and cottonwood require the same germination conditions, bare, moist soil so they often germinate together. Initially willows grow faster than cottonwood, but given time cottonwood overtops the willows. The reason cottonwood is not the dominant overstory plant in this plant community is because it is too close to the channel and is scoured before it can grow to maturity. Young cottonwood was found scattered on this fluvial surface but was not dominant.

This community initially develops on streambanks and may become established on exposed depositional sand bars. Establishment of this community depends on periodic flooding for maintenance and growth. As sediment and debris become trapped among woody stems, the bar becomes more stable. This community occurs on flood plains with sufficient sediment deposition. Downed wood is sparse.

Plant Community Component 2
Fremont cottonwood is the dominant overstory plant in this community. Narrowleaf cottonwood occurs within this community, but is not as prevalent as Fremont cottonwood. These two species are known to hybridize, creating the hybrid Populus xhinckleyana (Eckenwalder 1984). The vegetation is sparse within this plant community. It is dominated by a cottonwood overstory with various shrubs in the understory. Grasses and forbs are scattered, but not as dominant understory plants. Intermittent flooding maintains this flood-plain step. Due to the deep water table on the flood-plain step, understory species are not riparian obligates and only those species that are deep rooted, such as cottonwood, can access the water table.

Flooding generally reaches this terrace during high flows that occur in the summer monsoon season. Channels that are close to the canyon walls can receive large amounts of runoff from the surrounding uplands during flash flood conditions (see photo 6 under “State 1”). This occurrence may scour the flood-plain step more than spring flood events. Fluvial disturbance is essential in maintaining cottonwood communities. Fremont cottonwoods generally establish from seed and not asexual reproduction, and because of this they are generally found on channels that are affected by moderate flows (Rood et al. 2007). Seedlings and saplings have been observed in this plant community indicating that depositional events occur frequently. Fremont cottonwood flowers from February to early April allowing the seed to be dispersed late spring (May), optimally on the receding limb of the spring flood stage. Seeds established during this stage of flooding are not typically susceptible to subsequent flooding and the soil is generally moist enough to allow germination (Braatne et al. 1996, Rood et al. 2007). Germination may occur more often, but establishment and survival past seeding stage in to young stage is unlikely to occur every year. Cottonwoods generally only germinate on freshly deposited sediment and will generally not germinate in an area already covered by vegetation (Rood et al 2007). Fire is unlikely to be a driving force in this plant community because of the location in deep canyons and discontinuous vegetation along the channel. Fremont cottonwoods are not regenerated by fire and mature trees can be top-killed by moderate fires (Taylor 2000).

State and transition model

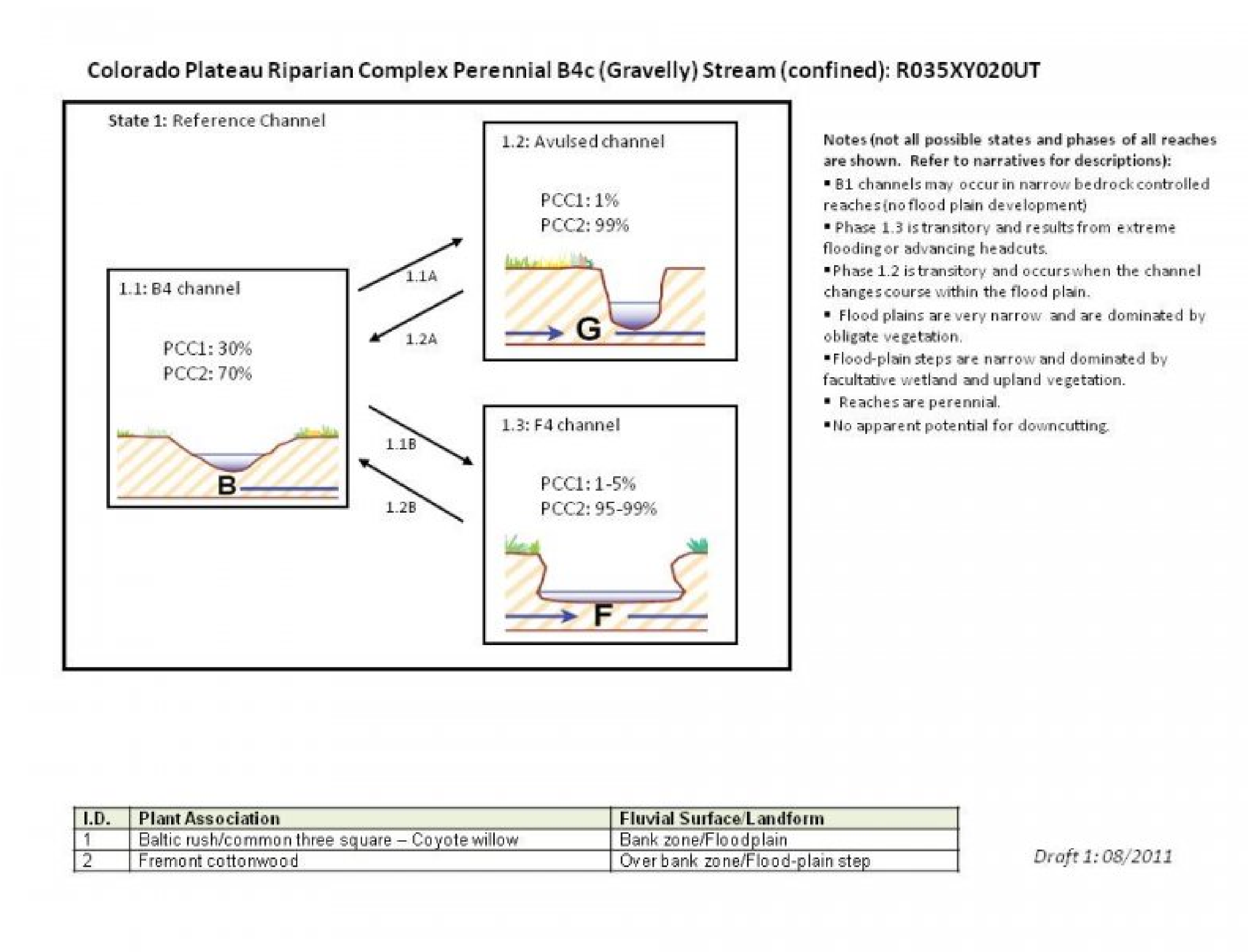

Figure 6. State and Transition Model

State 1
Reference Channel

The reference channel is a B4c channel. There is one phase identified in this state a B4c channel. Plant roots hold the fine bank sediment together and above ground the plant stems capture sediment and allow it to deposit on the banks. The freshly deposited sediment is colonized by plants either through seed or rhizomes. The material on the stream banks is fine material (sand) that is more susceptible to erosion when not held together by roots, especially from rhizomatous plants and shrubs. The channel can be a B1 channel where the canyon is narrow and there is exposed bedrock. These channels will not change due to the bedrock control.

Community 1.1
B4c Channel

Figure 7. Typical Cross Section

Figure 8. Plant community components 1 and 2

Figure 9. Site after summer rain storm

This phase represents a relatively stable combination of stream morphology and potential natural vegetation. This phase provides in stream habitat for aquatic species because it has pools and undercut banks. There are generally two major fluvial surfaces with distinct plant community components (PCC1 and PCC2) on each surface. Stream banks/floodplains have herbaceous and shrubby vegetation for stabilizing fine sediment soils on the stream banks and are below the flood prone area. Above the flood prone area within the flood-plain step are wider, flatter terraces with scattered cottonwood and shrubs with few grasses (PCC2). PCC1 - Baltic rush/Coyote willow - bank zone/floodplain -30% composition PCC2 - Fremont cottonwood - overbank zone/floodplain step - 70% composition

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	1681	2578
Shrub/Vine	56	336	785
Forb	56	336	560
Total	**224**	**2353**	**3923**

Table 6. Ground cover

Tree foliar cover	0-25%
Shrub/vine/liana foliar cover	0-10%
Grass/grasslike foliar cover	50-90%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0%
Litter	30-60%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0-1%
Water	0%
Bare ground	10-40%

Table 7. Soil surface cover

Tree basal cover	0%
Shrub/vine/liana basal cover	0%
Grass/grasslike basal cover	0%
Forb basal cover	0%
Non-vascular plants	0%
Biological crusts	0%
Litter	0-25%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-5%
Bedrock	0-1%
Water	0%
Bare ground	90-100%

Table 8. Woody ground cover

Downed wood, fine-small (<0.40" diameter; 1-hour fuels)	0-10% N*
Downed wood, fine-medium (0.40-0.99" diameter; 10-hour fuels)	0-1% N*
Downed wood, fine-large (1.00-2.99" diameter; 100-hour fuels)	0-5% N*
Downed wood, coarse-small (3.00-8.99" diameter; 1,000-hour fuels)	0-1% N*
Downed wood, coarse-large (>9.00" diameter; 10,000-hour fuels)	0-1% N*
Tree snags** (hard***)	–
Tree snags** (soft***)	–
Tree snag count** (hard***)	0-2 per hectare
Tree snag count** (hard***)	0-2 per hectare

*** Decomposition Classes: N - no or little integration with the soil surface; I - partial to nearly full integration with the soil surface.**

**** >10.16cm diameter at 1.3716m above ground and >1.8288m height--if less diameter OR height use applicable down wood type; for pinyon and juniper, use 0.3048m above ground.**

***** Hard - tree is dead with most or all of bark intact; Soft - most of bark has sloughed off.**

Table 9. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	2-5%	2-5%
>0.15 <= 0.3	–	–	10-15%	0-5%
>0.3 <= 0.6	–	5-10%	5-40%	5-10%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	10-25%	–	–
>4 <= 12	20-50%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Widened and/or Avulsed Channel

Figure 11. G3 Channel

This state occurs when disturbances remove bank stabilizing vegetation which leads to destabilization of banks and bed. The F4 channel evolves from the B4c channel by scouring bank sediments and widening the channel. This channel can also evolve from the “G” avulsed channel from laterally erosion on the stream banks that create a wider channel. Disturbances that could cause this include large floods that scour vegetation below flood prone area. Increased erosion of banks and bed result in some vertical instability and especially lateral instability. This site also has sections that are bedrock controlled that will not deepen vertically. In this situation the stream channel will erode laterally. In this state the stream becomes disconnected from the floodplains. Stream bank vegetation (PCC1) is removed and some floodplain vegetation is also removed (PCC2). This channel morphology may also be the result of a large sediment pulse that is deposited in the channel and that the intermittent flow is unable to carry downstream. Channel avulsion may also occur in this site where the channel abruptly changes course and cuts off a meander bend. The resulting channel is shorter and has a steeper slope. PCC1 is virtually absent from this phase because the new channel cut through the flood-plain step. Stream side vegetation may develop over time, or the channel may erode laterally before it begins rebuilding banks and PCC1. PCC1 - Baltic rush/coyote willow - bank zone/flood plain - 1% composition PCC2 - Fremont cottonwood - overbank zone/flood-plain step - 99% composition

Community 1.3
F4 channel

Figure 12. Typical F4 channel

Figure 13. F4 channel with bedrock control on left bank

This phase represents the channel after sediment has been scoured from banks, creating a wider, shallower channel. The flood-plain step (PCC2) is the predominant fluvial surface in this state; however PCC1 may be present in narrow and/or short sections where the banks have slumped. Stream banks/floodplains have some herbaceous and shrubby vegetation, but generally not enough for stabilizing fine sediment soils on the stream banks. Above the flood prone area are wider, flatter terraces with scattered cottonwood and shrubs with few grasses (PCC2). PCC1 - Baltic rush/coyote willow - bank zone/flood plain - 1-5% composition PCC2 - Fremont cottonwood - overbank zone/flood-plain step - 95-99% composition

Pathway 1.1A
Community 1.1 to 1.2

B4c Channel

Widened and/or Avulsed Channel

Meander cutoff, channel movement through coarser material

Pathway 1.1B
Community 1.1 to 1.3

B4c Channel

F4 channel

Channel widening due to bank erosion

Pathway 1.2A
Community 1.2 to 1.1

Widened and/or Avulsed Channel

B4c Channel

Channel narrowing, sediment deposition on banks and vegetation establishment

Pathway 1.3A
Community 1.3 to 1.1

F4 channel

B4c Channel

Channel narrowing, vegetation development and sediment deposition on banks

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
1	**PCC1**			56–673	
	narrowleaf willow	SAEX	*Salix exigua*	22–729	5–25
	yellow willow	SALU2	*Salix lutea*	6–28	1–5
2	**PCC2**			112–280	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	56–112	1–15
	narrowleaf willow	SAEX	*Salix exigua*	0–112	0–5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–112	0–5
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–56	0–2
	western white clematis	CLLI2	*Clematis ligusticifolia*	0–28	2–
	skunkbush sumac	RHTR	*Rhus trilobata*	0–11	0–2
Grass/Grasslike					
1	**PCC1**			560–2242	
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	112–2242	35–70
	common threesquare	SCPU10	*Schoenoplectus pungens*	11–224	5–20
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0–56	0–10

	Grass, perennial	2GP	*Grass, perennial*	0–56	0–10
	Nebraska sedge	CANE2	*Carex nebrascensis*	6–56	0–5
	sedge	CAREX	*Carex*	6–56	1–5
	common spikerush	ELPAP	*Eleocharis palustris var. palustris*	0–56	0–5
	swordleaf rush	JUEN	*Juncus ensifolius*	0–28	0–2
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	0–11	0–5
	saltgrass	DISP	*Distichlis spicata*	0–11	0–5
	Canada wildrye	ELCA4	*Elymus canadensis*	0–11	0–5
	foxtail barley	HOJU	*Hordeum jubatum*	0–6	0–2
2	**PCC2**			56–1121	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–336	0–10
	saltgrass	DISP	*Distichlis spicata*	6–224	1–15
	scratchgrass	MUAS	*Muhlenbergia asperifolia*	6–224	1–10
	Grass, perennial	2GP	*Grass, perennial*	11–112	1–5
	Grass, annual	2GA	*Grass, annual*	11–56	1–5
	mountain rush	JUARL	*Juncus arcticus ssp. littoralis*	0–56	0–5
	alkali cordgrass	SPGR	*Spartina gracilis*	0–11	0–5
	dropseed	SPORO	*Sporobolus*	0–11	0–5
	floating bur-reed	SPFL	*Sparganium fluctuans*	0–11	0–2
Forb					
1	**PCC1**			112–560	
	scouringrush horsetail	EQHY	*Equisetum hyemale*	56–224	1–25
	smooth horsetail	EQLA	*Equisetum laevigatum*	11–168	1–15
	field horsetail	EQAR	*Equisetum arvense*	11–112	1–10
	Forb, perennial	2FP	*Forb, perennial*	6–28	5–15
	Forb, annual	2FA	*Forb, annual*	0–22	0–2
2	**PCC2**			56–336	
	field horsetail	EQAR	*Equisetum arvense*	0–224	0–10
	Wyoming Indian paintbrush	CALI4	*Castilleja linariifolia*	0–168	0–10
	povertyweed	IVAX	*Iva axillaris*	0–73	0–10
	scouringrush horsetail	EQHY	*Equisetum hyemale*	0–56	0–5
	smooth horsetail	EQLA	*Equisetum laevigatum*	0–56	0–5
	Forb, annual	2FA	*Forb, annual*	6–28	1–10
	Forb, perennial	2FP	*Forb, perennial*	6–28	1–5
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–28	0–2
	Utah milkweed	ASLA	*Asclepias labriformis*	0–22	0–2
	milkvetch	ASTRA	*Astragalus*	0–21	9–2
	flatspine bur ragweed	AMAC2	*Ambrosia acanthicarpa*	0–17	0–2
	narrowleaf four o'clock	MILI3	*Mirabilis linearis*	0–11	0–5
	pale evening primrose	OEPA	*Oenothera pallida*	0–11	0–5
	copperweed	OXAC4	*Oxytenia acerosa*	0–11	0–2
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	0–11	0–2

	showy milkweed	ASSP	*Asclepias speciosa*	0–11	0–2
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0–11	0–2
	lesser wirelettuce	STMI13	*Stephanomeria minor*	0–11	0–2
	hoary Townsend daisy	TOIN	*Townsendia incana*	0–11	0–2
	milkweed	ASCLE	*Asclepias*	0–11	0–2
	gray aster	EUGL19	*Eurybia glauca*	0–11	0–2
	Cainville thistle	CICA10	*Cirsium calcareum*	0–11	0–2
	Canadian horseweed	COCA5	*Conyza canadensis*	0–11	0–2
	white prairie clover	DACA7	*Dalea candida*	0–11	0–2
	white sagebrush	ARLU	*Artemisia ludoviciana*	0–6	0–2
	fineleaf hymenopappus	HYFI	*Hymenopappus filifolius*	0–6	0–2
	scarlet gilia	IPAG	*Ipomopsis aggregata*	0–6	0–2
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	0–2

Table 11. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
Fremont cottonwood	POFR2	*Populus fremontii*	Native	1.5–7.6	25–80	5.1–20.3	–
boxelder	ACNE2	*Acer negundo*	Native	–	0–5	–	–
narrowleaf cottonwood	POAN3	*Populus angustifolia*	Native	–	0–5	–	–
Goodding's willow	SAGO	*Salix gooddingii*	Native	–	0–2	–	–
	POHI8	*Populus ×hinckleyana*	Native	–	0–2	–	–

Animal community

Fish and Wildlife:
This site provides habitat for all types of wildlife, including birds, large mammals, small mammals, fish, salamanders, reptiles, and both terrestrial and aquatic insects, because of the surface and groundwater present. Native fish species are adapted to these seasonally flooded streams, finding refuge in deep pools and slower water habitat adjacent to wood jams and boulders. Turbid water provides hiding cover for native fish species. Non-native fish compete for food and habitat with native species in addition to using them as a food source. Reference conditions were not available due to extensive recreational use and long term manipulation of streams in this MLRA for irrigation and road construction. Riparian vegetation provides structure for cover, nesting and breeding habitat, and a corridor for movement for wildlife that is not be available in the surrounding uplands (Levick et al. 2008). The plant communities help moderate soil and air temperatures and reinforce stream banks. Cottonwood specifically can provide habitat for avian and insect fauna as well as bats. Birds can nest in the crown, or create nests in the cavities and in the dead trunks and limbs (Taylor 2000). This site also provides some thermal cover and forage opportunities for mule deer and elk. Birds, bats, lizards, snakes and rodents are very common. Birds from several families are typically present, from hawks to sparrows. Several species of mammals forage and occupy this site, including desert cottontail, black tailed jack rabbit, Colorado chipmunk, white-tailed antelope squirrel, Apache pocket mouse, and several species of Peromyscus (deer mice). Coyotes and kit foxes will also forage in the area. Bats (Myotis, Pipisturellus, and others) can be observed in this ecological site.

Birds present, one day observation 5/25/2011: (see park website for a more extensive species list http://www.nps.gov/care/naturescience/birdchecklist.htm)
Western wood peewee
Black-headed grosbeak
Canyon Wren

Aquatic community:
Under reference conditions, MLRA 35 perennial stream have the potential of supporting native fishes of the Colorado River Basin. There are non-native and native fish present within MLRA 35. The list below is from the Capitol Reef National Park website (http://www.nps.gov/care/naturescience/fish.htm)

Trout & Charr
• brown trout (Salmo trutta) - native to Europe but introduced into the West before 1900; thrives in the Fremont River because of tolerance to warm water.
• rainbow trout (Salmo gairdnerii) - introduced from the Pacific Coast of the United States; lives well in both cold and warm water.
• cutthroat trout (Salmo clarkii) - native to Utah and the Intermountain Region; hybridizes with Rainbow trout, also requires cooler water temperatures.
• Eastern brook trout (charr)(Salvelinus fontinalis) - introduced to the West from the Northeastern part of the United States; found in some cold water streams that flow into the Fremont River.
Suckers
• flannelmouth sucker (Catostomus latipinnis) - native to the Colorado River system; herbivorous; ascends tributary streams in the spring to spawn.
• bluehead sucker (Pantosteus delphinus) - native to the Colorado River system; usually found in riffles of the streams; feeds on algae, slime, aquatic insect larvae.
Chubs, Dance, Minnows & Shiners
• speckled dace (Rhinichthys osculus) - native to the Fremont River where it is the most abundant fish; prefers rubble-strewn riffle areas; feeds on algae and other plant materials as well as small crustaceans, insect larvae, and small snails.
• Utah chub (Gila atraria) - introduced into the Fremont River as bait by fishermen; native habitat is the Bonneville Basin; generalized feeder, consuming higher plants, algae, terrestrial and aquatic insects, snails, crustaceans, and small fish; spawns during July.
• Leatherside chub (Gila copei) - found in the Fremont River; feeding and habits probably similar to the Utah chub.
• Redside shiner (Richardsonius balteatus) - introduced into the Fremont River, native to Bonneville and Columbia River basins; feeds on small aquatic insect larvae, crustaceans, and some plant debris; spawns in late June.
North American Catfishes
• black bullhead (Ictalurus melas) – (non-native) occasionally found in Halls Creek near the southern park boundary where it undoubtedly migrates from Lake Powell; black bullhead is adaptable to a wide range of aquatic conditions but shows preference for more quiet and muddier parts of a stream.
Sunfishes
• bluegill (Lepomis machrochirus) – (non-native) occasionally found in Halls Creek where it may migrate from Lake Powell; feeds on mollusks, crustaceans, insect larvae, and occasionally on small fish and aquatic plants.
Sculpins
• mottled sculpin (Cottus bairdi) - probably introduced into the Fremont River from the Bonneville system; carnivorous, a bottom feeder utilizing insect larvae, crustaceans, small fish and snails

Grazing:
This site provides good to excellent grazing conditions for livestock and wildlife during spring, summer and fall when in good ecological condition. This site also may provide water sources to livestock for some of the year. Care and close management should be focused to maintain native perennial grasses and shrubs because they are difficult to reestablish, especially willow and cottonwood seedlings that can be susceptible to livestock grazing (Taylor 2000). Reseeding and/or restoration are possible, but the major limiting factor is precipitation at critical plant growing periods. All plants within the riparian site need water table access to successfully establish as seedlings.

Hydrological functions

Channels in this site are perennial and groundwater fed. Many of the headwaters are found in the mountains found in MLRA 47B. The bed material is composed of a mix of material, predominantly gravel, but sand and cobbles are also found. Perennial streams are scarce in this MLRA and most of the streams have been altered due to irrigation withdrawls and small diversions or dams on the streams. Spring floods and summer monsoon floods continue to influence channel form and vegetation, despite hydrologic alterations.

USGS Streamflow Data is available from the Pleasant Creek gauge near Caineville, UT (09330210). The gauge on

Pleasant Creek was only active for three years. Yearly fluctuations in flow are apparent in the discharge graphs (see below). Flow is variable and can change rapidly, especially in the summer time.

Recreational uses

The narrow gorges are natural draws to recreationist year round. While established hiking trails may not exist, footpaths throughout these canyons are prevalent, evidence that they are frequented by human visitors. National Parks in this MLRA draw millions of people every year. There is also evidence of canyon dwelling cultures (ancestral Puebloans) and ruins that attract visitors.

The Bureau of Land Management and National Park Service manage most of areas that are within this ecological site. Some canyon bottoms are accessible to off-road vehicles on the established trails while other canyon bottoms allow only non-motorized forms of travel. Canyon bottoms in this MLRA are primarily visited in the spring and fall, although these sites are accessible year-round.

Wood products

Limited to no opportunity for wood products.

Other products

None identified.

Inventory data references

Information presented was derived from NRCS clipping data, literature, field observations (based on 4 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). This site has been observed on reaches of Pleasant Creek, Sulphur Creek, and Oak Creek in Capitol Reef National Park.

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Contributors

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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	
Approved by	
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:**
