West Ditch – Sevier River NWQI/MRBI Watershed Assessment

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1.0 Background and Purpose of the assessment

1.1 General Overview and location of the watershed assessment area

The West Ditch-Sevier River Watershed (HUC-160300010504) is approximately 11,663 acres in size. The watershed is located in Garfield County, directly north of the town of Panguitch. The upper reaches of the watershed consist of largely ephemeral gullies, with the lower sections of the watershed being mixed with irrigated hay and pastures.

The watershed is classified according to Hydrologic Unit Cataloging HUC). The West Ditch watershed is part of the Escalante Desert Sevier Lake (4th level HUC 16030001), and while it is found surrounded by the Upper and Lower Colorado Region, the watershed ends up draining to Sevier Lake, located near Delta, Utah. For a summary of the entire Upper Sevier Watershed refer to the Upper Sevier Watershed Management Plan https://deq.utah.gov/legacy/programs/water-quality/watersheds/docs/2015/08Aug/UpperSevier.pdf .

Elevation ranges from 6466 feet along the Sevier River to 8550 located at the top of the watershed at the base of Blind Spring Mountain. The West Ditch Watershed contains roughly 5.2 miles of the Upper Sevier River, which flows Northward through wetlands and pastures. Gentle rolling hills alongside high altitude forests are characteristic of the Paunsaugunt and Aquarius Plateaus in which the watershed resides.

Figure 1.1.a West Ditch-Sevier River Watershed

1.2 Specific water quality degradation resource concerns and impairments

The State of Utah has designated the Upper Sevier River as a coldwater (3A) fishery. In 2002, the Upper Sevier River was listed on the 303(d) list of impaired waters, as a result of elevated phosphorus levels in the river. The source of much of the phosphorous in the water column was associated with the high levels of Total Suspended Sediment (TSS) in the system.

As a result, a Total Maximum Daily Load (TMDL) was completed for the Upper Sevier River in 2004 to help reduce phosphorous levels and help it meet its beneficial use as a coldwater fishery. The TMDL identified the primary sources of phosphorous as: habitat degradation from agricultural activities, nonpoint source pollution from rangeland, summer home development, septic systems, recreational activities, and urban runoff.

Key issues identified for the West Ditch Watershed are: 1) Enhancement and Protection of Riparian Habitat; 2) Pasture Management; 3) Irrigation Water Management

Pasture Management

Grazing has been an integral part of lands within the West Ditch Watershed since pioneers first settled the area around Hatch (~1872). Today's grazing practices are much better than those of the past: better pasture management increases productivity, maintains vegetation diversity, discourages native weed introduction, and leaves critical riparian areas intact. Effective pasture management practices include developing pasture management plans, rotating animals through pastured areas, limiting herd size, fencing livestock from riparian areas, maintaining browse species diversity, and leaving trees and shrubs within pastures and near stream banks.

Enhancement and Protection of Riparian Habitat

Woody plant species and late seral herbaceous species are lacking along many riparian corridors, particularly along the Sevier River and its tributaries. In addition, most of the water within this section is removed and used for irrigation. In areas throughout the watershed, where woody plant species (willow and cottonwood) are present, recruitment of young plants is limited; the majority of plants are in a mature stage. Bank erosion has resulted in higher width/depth ratios along many stream corridors and increased head cuts on the upstream ends.

Riparian areas are of critical importance to birds, fish, amphibians, aquatic invertebrates and other wildlife species. They provide critical breeding habitat for many southwestern neotropical birds, as well as water, shade, food and shelter for other wildlife. Riparian areas also provide migratory routes for many bird species, and sheltered pathways to other habitats for other wildlife species.

Irrigation Water Management

Historically, much of the irrigated farmland in the Upper Sevier Watershed was irrigated through flood irrigation. Flood irrigation can result in higher than desired return flows to the river, resulting in elevated levels of sediment, animal waste, and fertilizer in the system. Flood irrigation has also proven to decrease crop yield when compared to crops that are irrigated using improved irrigation methods. Ideally, all fields that are irrigated by wild flood irrigation should be converted to some other type of flood irrigation practice such as pressurized irrigation systems or gated pipe.

1.3 Constituents of Concern

The State of Utah has designated the Upper Sevier River as a coldwater (3A) fishery. In 2002, the Upper Sevier River was listed on the 303(d) list of impaired waters, as a result of elevated phosphorus levels in the river. The source of much of the phosphorous in the water column was associated with the high levels of Total Suspended Sediment (TSS) in the system. These high levels of phosphorous can result in reduced oxygen levels in the river, which can stress the aquatic organisms present. The elevated concentrations of TSS can impact the aquatic communities, while degrading water quality as well.

While there are various point sources located throughout the Upper Sevier watershed that contribute to the phosphorous impairment, the over all purpose of this plan is to help reduce phosphorus concentrations in the West Ditch Watershed by addressing nonpoint source pollution.

Phosphorus loads are highest during April and May, which corresponds with the spring runoff. The sharp drop in loading in the middle and lower river during June may reflect the effect of irrigation diversions reducing flows and concentrations due to land application. Loads remain low in the upper river the remainder of the year while higher loads in the lower river reflect irrigation return flows and streambank erosion from higher fall stream flows. In addition, levels may increase in downstream reaches as a result of over-wintering of livestock in the Panguitch Valley.

Primary mechanisms of phosphorus delivery from cattle to streams include direct deposition in streams and on streambanks and return flows from flooding of pasture utilized for grazing and/or fertilized with manure. In an effort to estimate contributions of total phosphorus from grazing, cattle numbers were obtained from the landowners in the watershed and were divided by subwatershed (Dodds, 2003). The total number of animals in each watershed varies by season as cattle are moved from summer to winter range, as well as into and out of the watershed.

Dissolved phosphorus appears in surface waters usually from sources of organic nutrient enrichment such as a wastewater treatment plant, animal feedlot waste, or other point source discharge.

Nonpoint sources of phosphorus include natural background sources from the weathering of parent material and organic matter delivered to the streams as soil and plant litter. The movement of nutrients such as phosphorus through a watershed is a complex process since plant and algal uptake plays a strong role in the cycling of nutrients. In addition, the nature of the Sevier River watershed is such that

water is continually diverted and land applied and returning to the channel via overland flow and shallow groundwater return flows. In the process, phosphorus (as well TSS) loads and concentrations can be reduced when irrigation water from the river is distributed to crops.

1.4 Opportunities and objectives for meeting water quality goals

While the larger watershed plan for the Upper Sevier River identifies many resource concerns, the purpose of this plan is to improve water quality in the main stem of the Upper Sevier River as required in the TMDL developed by the Division of Water Quality. These plans identify four goals and accompanying objectives that will help achieve the goal of reducing sediment and phosphorous loading into the main stem of the Sevier River in the West Ditch Watershed.

Grazing Management

Goal: Better manage cattle to improve pasture conditions, reduce erosion, and increase wildlife habitat within the riparian corridor

Objectives:

- Use a combination of timing, duration, and fencing to improve pasture conditions and protect streambanks from trampling.
- Install fencing where appropriate to limit the introduction of animal waste into canals, ditches and streams.
- Install additional fencing to allow for improved pasture rotation and to protect sensitive areas allowing for longer rest periods of pastures and controlled access to forage.
- Install off-site watering or hardened access to allow cattle to drink, while reducing impacts to the riparian areas.
- Develop grazing management plans that identify the number of cattle present and the duration of the grazing period in pastures adjacent to riparian areas.

Stream Bank Restoration

Goal: Restore and re-vegetate stream banks, improving water quality and improving aquatic habitat.

Objectives:

- Restore streams to their proper hydraulic and channel geometry (pattern, profile, cross section dimensions).
- Stabilize eroding streambanks and install in-stream cover and structures.
- Establish woody riparian vegetation where needed.

Irrigation Water Management

Goal: Improve irrigation water management through improved efficiency and water conservation

Objectives:

- Assist landowners and obtain funding to convert wild flood irrigated pastures and farmland to more efficient irrigation practices.
- Work with local irrigation companies to develop infrastructure conducive to more efficient irrigation methods.

1.5 An assessment of NRCS's ability to help partners reach the watershed goals

NRCS can provide technical assistance, conservation planning and increased initiative funding through this initiative to the partners to help reach the watershed goals. Planned NRCS conservation practices that will be implemented are, but not limited to: streambank stabilization, fencing, prescribed grazing, watering facility, wetland restoration, and irrigation water management.

2.0 Watershed Characterization

2.1 Location of Watershed within the drainage network

The West Ditch-Sevier River Watershed (HUC 12) is within the Upper Colorado River major watershed in south-central Utah, on the eastern side of the HUC 8 Sevier River Watershed. It encompasses 11,658 acres.

2.2 Landscape characteristics of the MLRA in which the Watershed resides

The West Ditch-Sevier River Watershed lies entirely within the Wasatch and Uinta Mountains (MLRA 47), which stretches across the upper elevations throughout central and northern Utah. It includes all of Utah's higher-elevation mountain ranges, including the mountains on the west side of the East Bench-Sevier River Watershed.

Wasatch and Uinta Mountains, MLRA 47
The soils within the Wasatch and Uinta Mountains MLRA formed in arid or semi-arid conditions, are young soils with little development, are slightly more developed, or are more well-developed and fertile.

The soils in this MLRA have a frigid soil temperature regime on plateaus and the lower mountain slopes, and have a cryic soil temperature regime at the higher elevations. This means the mean annual soil temperature is above 0°C (32°F) and less than 8°C (46°F). Frigid and cryic

soils have the same mean annual soil temperature range, but frigid soils are warmer than cryic soils in the summer.

The soil moisture regime has moist, cool winters and warm, dry summers at the higher elevations and grades to a semiarid climate in the lower elevations. These soils may or may not need to be irrigated for agricultural production. Since they are mostly located at elevations where the temperature limits the growing season or are too steep for cropping, they are not usually used for developed agriculture other than for pasture, rangeland, and forestry.

The soils are typically formed as parent material that was washed down slope by water or gravity or developed as parent material decayed in place. They are derived from sedimentary and igneous rocks.

These soils can be very shallow to very deep. They are generally well drained, and loamy or loamy skeletal (rocky).

The soils in the West Ditch-Sevier River Watershed are similar to most soils found on the Colorado Plateau, in that they are directly tied to their geology of origin and the elevation, aspect, and slope upon which they have developed. The varying soil conditions of the area produce various challenges.

2.3 Climate

The West Ditch – Sevier River Watershed has a cool semi-arid climate with summers featuring hot afternoons and cold mornings, and cold winters. The high altitude and relatively high latitude means that mornings are cold throughout the year and freezing for most of it. The watershed receives the majority of precipitation in the form of snow during winter months. Although heavy thunderstorms are common throughout the summer months, causing increased overland erosion. Precipitation ranges from 9 inches in the lower elevation (6,500') to 19 inches in the upper elevation (above 7000').

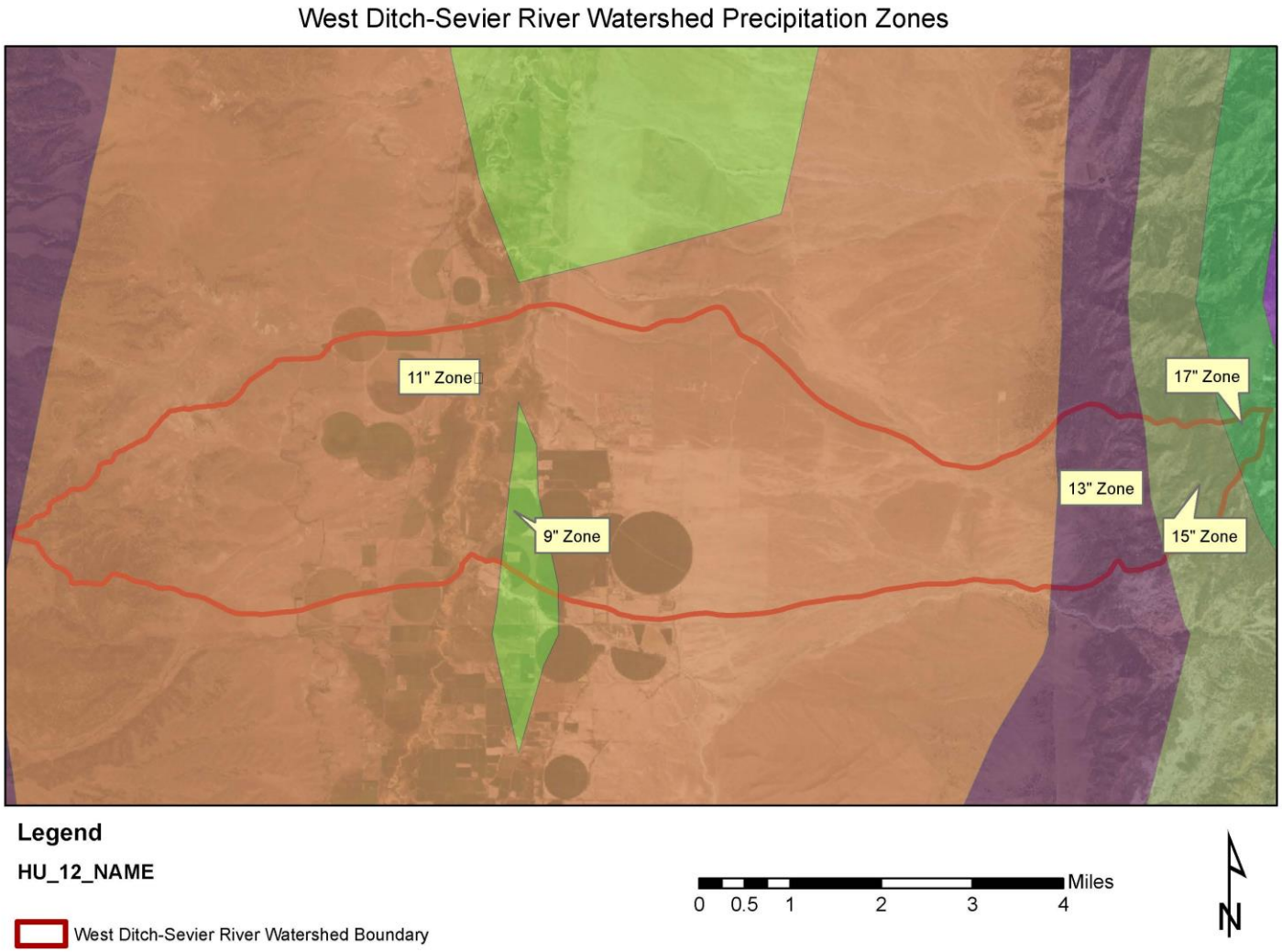


Figure 2.3.a Precipitation Zones

2.4 Topography

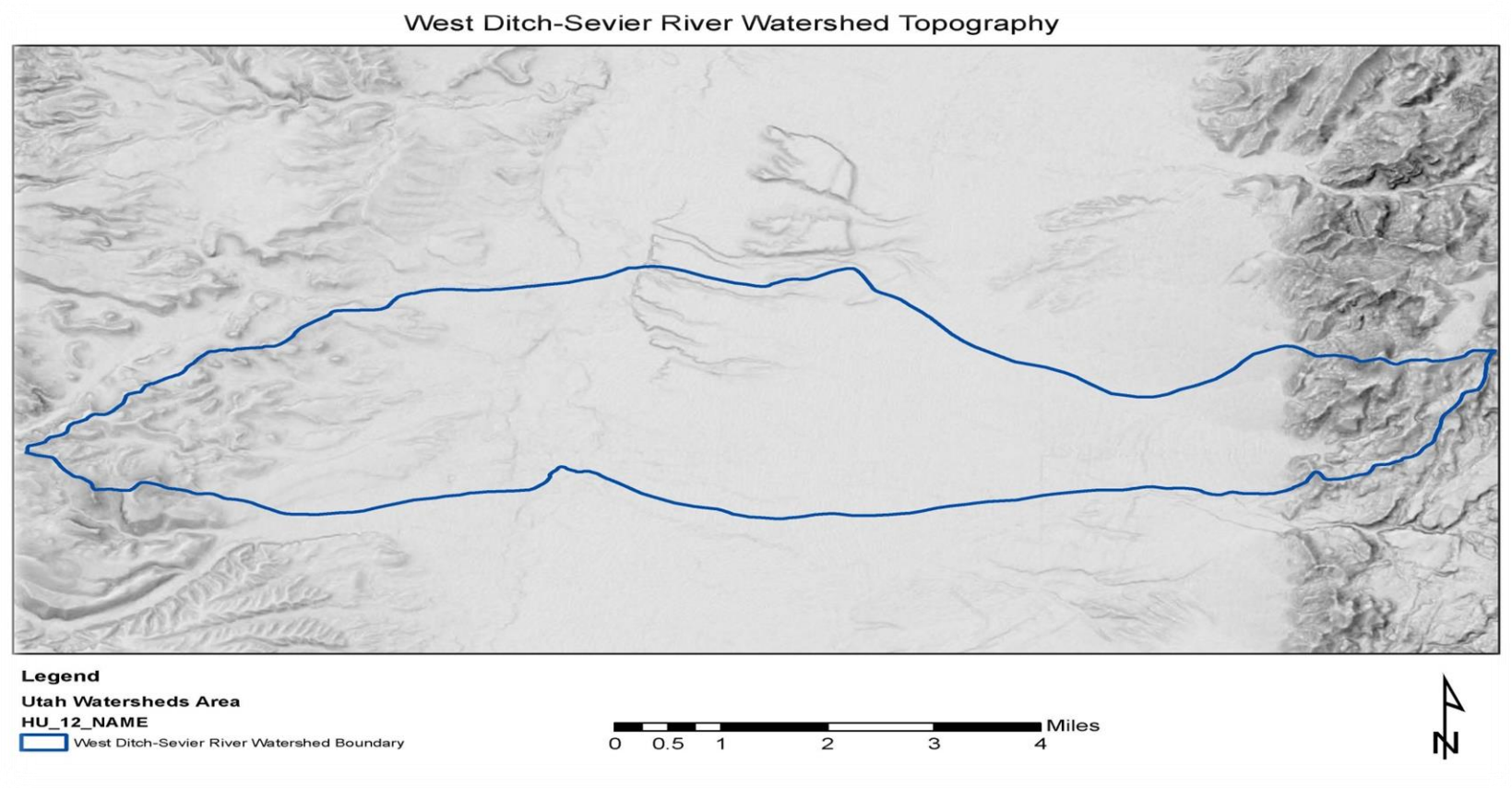


Figure 2.4.a Topography

2.5 Geology, Geomorphology, and Soils and Soil Interpretations

Geologically, the area consists of mixed volcanics (recent basalts, andesite, rhyolite, etc.) and Wasatch Limestone formation. Basalt flows are present at higher elevations, while the lower portion of the watershed consists of rounded hills and broad valleys.

The majority of the watershed (over two-thirds in the center) is Quaternary Unit age, alluvium rock type 1 and colluvium rock type 2. The western portion of the watershed is Tertiary Unit age, volcanic rock (aphanitic) rock type 1. A small part of the extreme northeastern part of the watershed is Late Oligocene to Middle Miocene Unit age, ash-flow tuff rock type 1 and Basalt Rock type 2. The small southeastern part of the watershed is Quaternary Unit age, alluvium rock type1 and colluvium rock type 2.

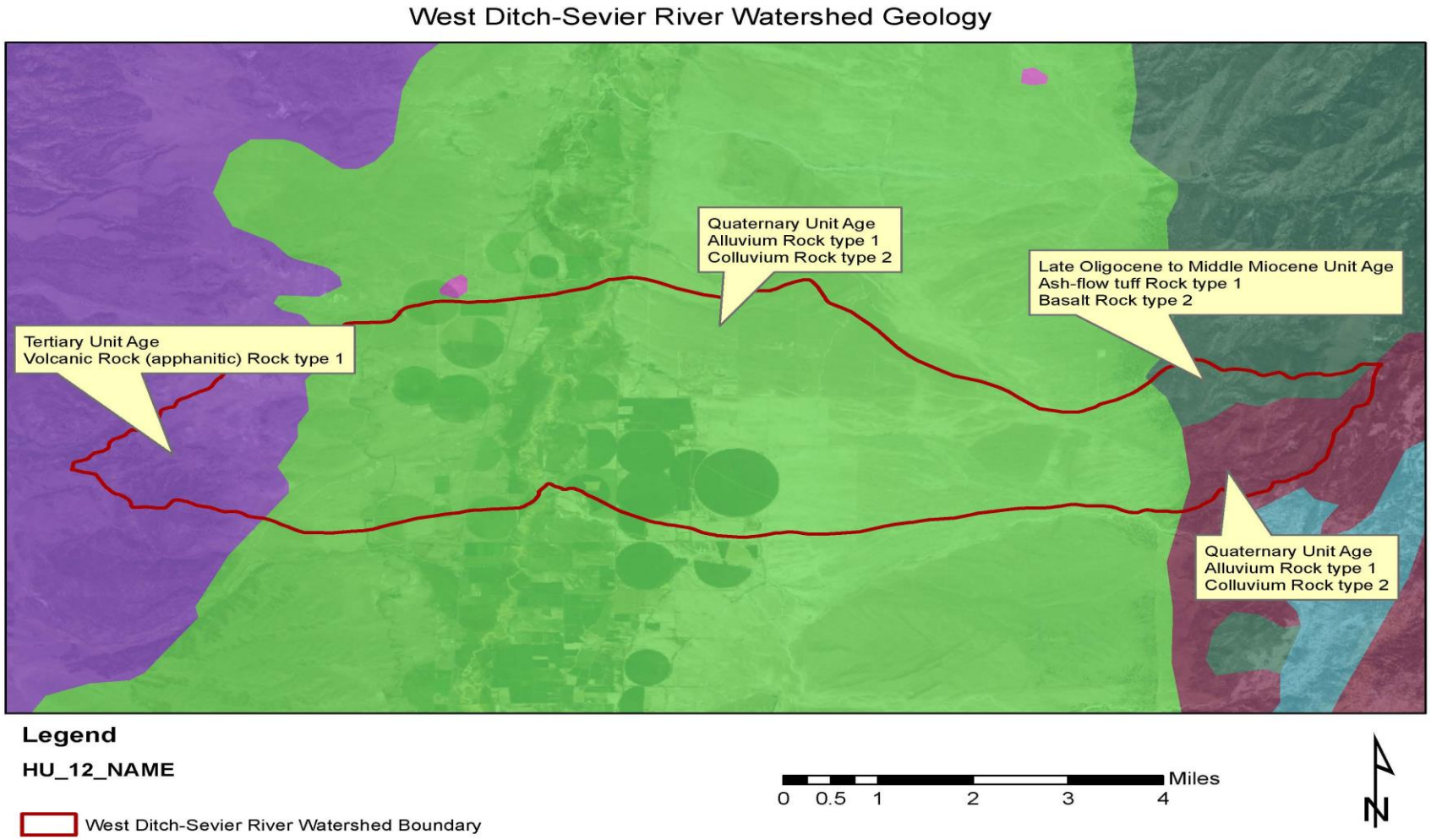
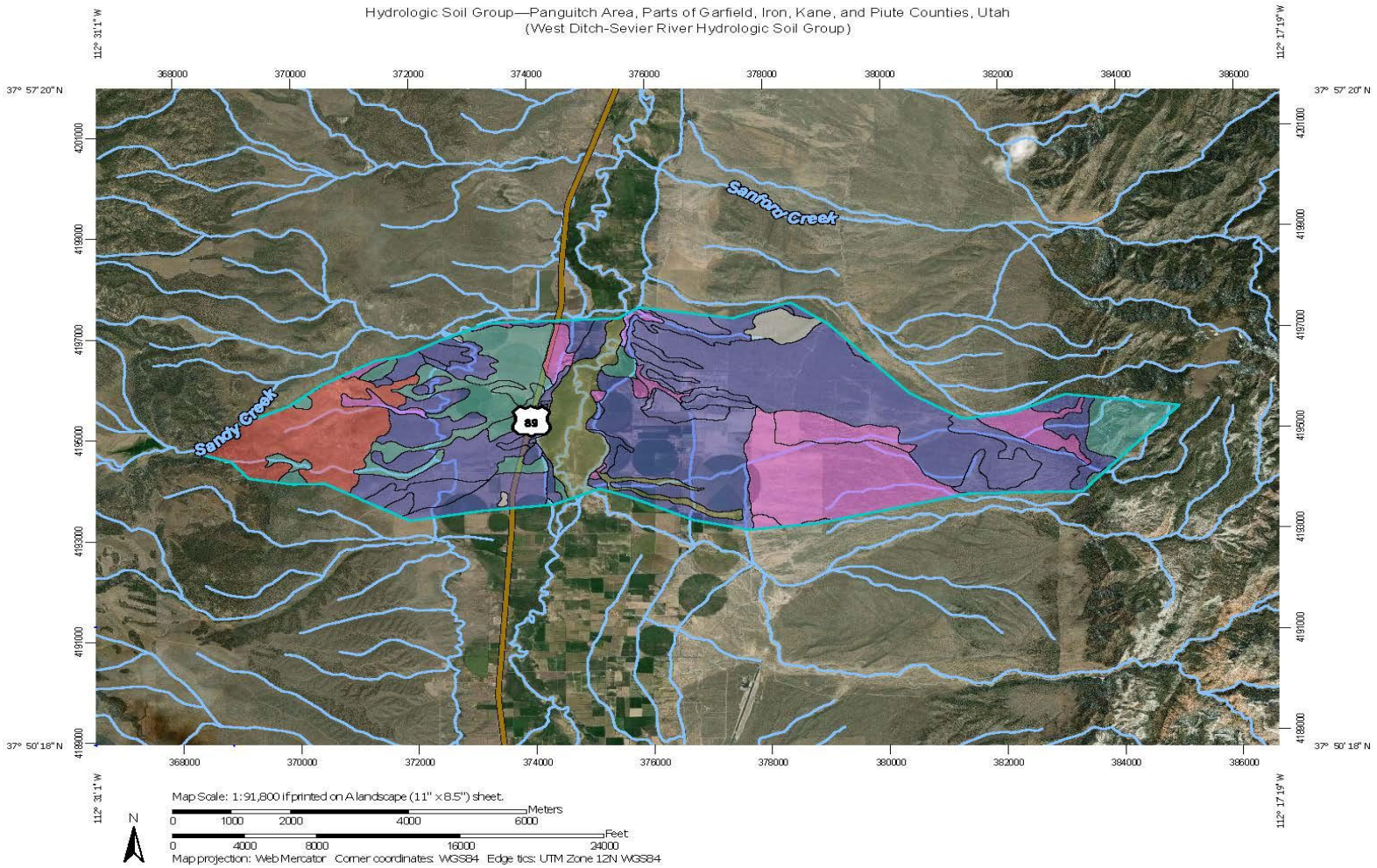


Figure 2.5.a West Ditch Watershed Geology

Soils


Hydrologic Soil Group—Panguitch Area, Parts of Garfield, Iron, Kane, and Piute Counties, Utah
(West Ditch-Sevier River Hydrologic Soil Group)
112° 31' 1" W
112° 17' 19" W
37° 57' 20" N
37° 50' 18" N
368000
370000
372000
374000
376000
378000
380000
382000
384000
386000
4201000
4199000
4197000
4195000
4193000
4191000
4189000
Sandy Creek
Sanford Creek
89
Map Scale: 1:91,800 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0
1000
2000
4000
6000
Feet
0
4000
8000
16000
24000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84
USDA
Natural Resources
Conservation Service
Web Soil Survey
National Cooperative Soil Survey
8/14/2019
Page 1 of 5

Hydrologic Soil Group—Panguitch Area, Parts of Garfield, Iron, Kane, and Piute Counties, Utah
(West Ditch-Sevier River Hydrologic Soil Group)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Panguitch Area, Parts of Garfield, Iron, Kane, and Piute Counties, Utah
Survey Area Data: Version 12, Sep 13, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 15, 2013—Nov 2, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Badland-Cannonville-Rock outcrop complex, 30 to 50 percent slopes		141.9	1.3%
19	Bruman loam, 2 to 5 percent slopes	B	116.7	1.1%
20	Bruman gravelly loam, 2 to 10 percent slopes	B	233.8	2.1%
23	Bruman very cobbly loam, 5 to 30 percent slopes	B	40.1	0.4%
34	Circleville-Rock outcrop complex, 25 to 60 percent slopes	C	304.9	2.8%
39	Comodore-Rock outcrop complex, 15 to 40 percent slopes	D	991.4	9.0%
48	Evanston very cobbly loam, 4 to 25 percent slopes	B	19.3	0.2%
55	Greenhalgh silt loam, 2 to 5 percent slopes	B	402.4	3.6%
56	Grimm sandy loam, 1 to 5 percent slopes	A	492.0	4.5%
69	Ipson cobbly loam, 8 to 25 percent slopes	B	11.2	0.1%
70	Ipson very cobbly loam, 25 to 60 percent slopes	B	202.5	1.8%
72	Jodero loam, 1 to 2 percent slopes	B	111.2	1.0%
97	Neto very fine sandy loam, wet, 0 to 2 percent slopes	A	58.1	0.5%
98	Notter loam, 1 to 4 percent slopes	C	513.9	4.7%
100	Notter loam, thick surface, 4 to 8 percent slopes	C	476.3	4.3%
101	Notter gravelly coarse sandy loam, 2 to 8 percent slopes	B	2,319.0	21.0%
103	Notter very cobbly loam, 4 to 25 percent slopes	B	269.4	2.4%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
113	Plite sandy loam, 2 to 8 percent slopes	A	203.7	1.8%
132	Shupert silty clay loam, wet, 0 to 1 percent slopes	C	65.9	0.6%
141	Tebbs sandy loam, 2 to 5 percent slopes	A	1,192.9	10.8%
142	Tebbs loam, 1 to 2 percent slopes	B	1,245.7	11.3%
146	Tridell loam, 2 to 4 percent slopes	B	31.3	0.3%
148	Tridell cobbly loam, 4 to 25 percent slopes	B	855.9	7.8%
154	Villy family silty clay loam, 0 to 2 percent slopes	C/D	663.6	6.0%
155	Waltershow extremely cobbly loam, 8 to 40 percent slopes	C	57.8	0.5%
174	Water		4.1	0.0%
175	Pits, gravel		9.3	0.1%
Totals for Area of Interest			**11,034.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

The Hydrologic soil group map shows that 1945 acres are in Group A, which have a high infiltration rate (low runoff potential). The majority of the watershed (5859 acres) is in Group B, which has good permeability.

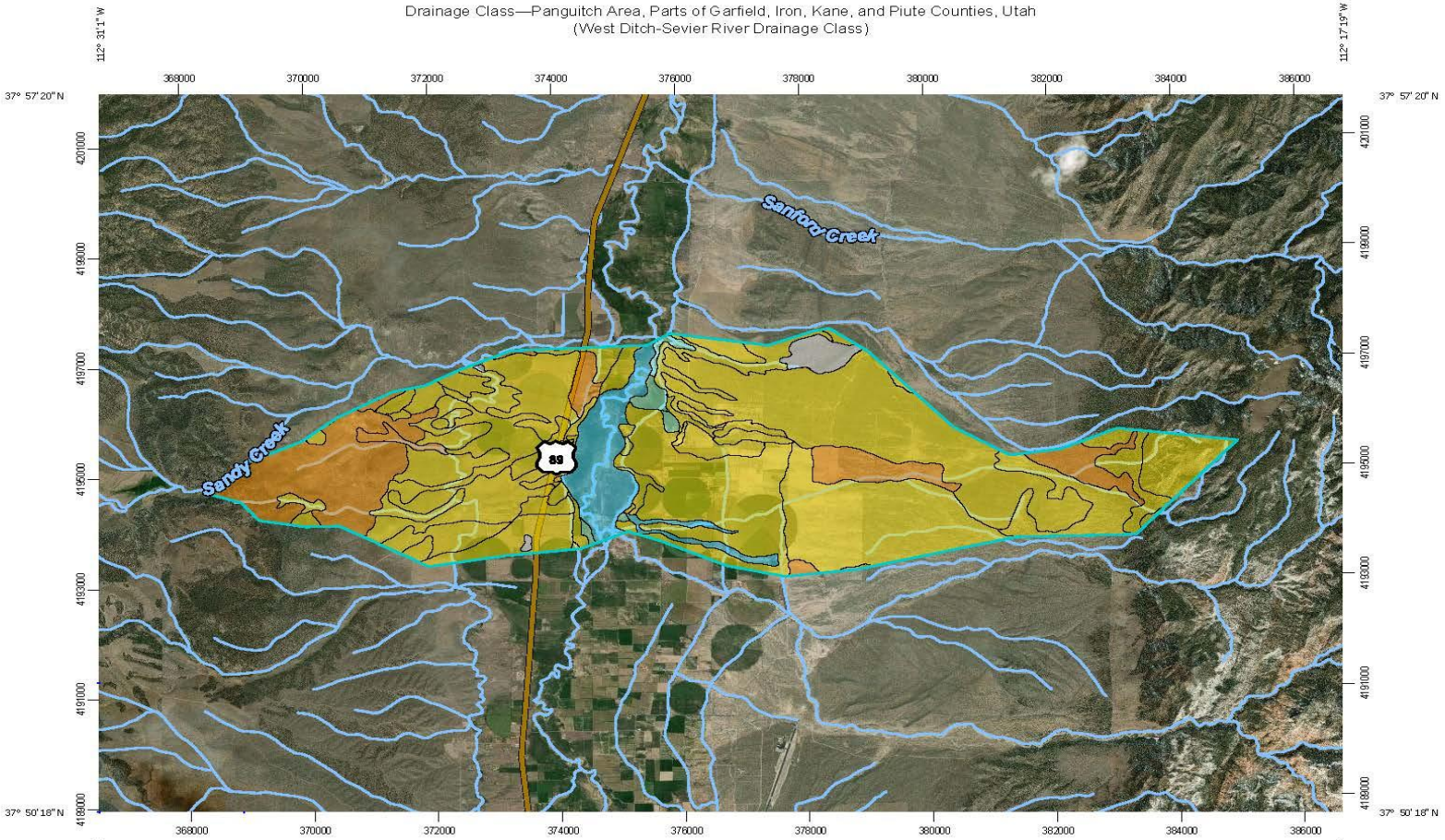
Those soils in Group C (1361 acres) have a slow infiltration rate when they are thoroughly wet, occur where there is a higher water table, and are finer textured soils. These soils are on the valley floor, where it is flat so they don't cause a large runoff problem.

On the western side of the watershed there are 991 acres of soil in Hydrologic Group D, they have a very slow infiltration rate (high runoff potential) when thoroughly wet. There is a restrictive layer on these soils in the watershed that is less than 33 centimeters, and according to the local NRCS soil scientist, this layer is like a "sidewalk".

On the eastern side of the watershed there are 664 acres in Hydrologic Group C/D are included in Group C for drained areas and Group D for undrained areas.

Irrigation runoff is probably the biggest contributor of water back to the Sevier river in the watershed.

Drainage Class—Panguitch Area, Parts of Garfield, Iron, Kane, and Piute Counties, Utah
(West Ditch-Sevier River Drainage Class)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Lines
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Soil Rating Points
- Excessively drained
- Somewhat excessively drained
- Well drained
- Moderately well drained
- Somewhat poorly drained
- Poorly drained
- Very poorly drained
- Subaqueous
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 12, Sep 13, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 15, 2013—Nov 2, 2017

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Drainage Class

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
8	Badland-Cannonville-Rock outcrop complex, 30 to 50 percent slopes		141.9	1.3%
19	Bruman loam, 2 to 5 percent slopes	Well drained	116.7	1.1%
20	Bruman gravelly loam, 2 to 10 percent slopes	Well drained	233.8	2.1%
23	Bruman very cobbly loam, 5 to 30 percent slopes	Well drained	40.1	0.4%
34	Circleville-Rock outcrop complex, 25 to 60 percent slopes	Well drained	304.9	2.8%
39	Comodore-Rock outcrop complex, 15 to 40 percent slopes	Somewhat excessively drained	991.4	9.0%
48	Evanston very cobbly loam, 4 to 25 percent slopes	Well drained	19.3	0.2%
55	Greenhalgh silt loam, 2 to 5 percent slopes	Well drained	402.4	3.6%
56	Grimm sandy loam, 1 to 5 percent slopes	Somewhat excessively drained	492.0	4.5%
69	Ipson cobbly loam, 8 to 25 percent slopes	Well drained	11.2	0.1%
70	Ipson very cobbly loam, 25 to 60 percent slopes	Well drained	202.5	1.8%
72	Jodero loam, 1 to 2 percent slopes	Well drained	111.2	1.0%
97	Neto very fine sandy loam, wet, 0 to 2 percent slopes	Somewhat poorly drained	58.1	0.5%
98	Notter loam, 1 to 4 percent slopes	Well drained	513.9	4.7%
100	Notter loam, thick surface, 4 to 8 percent slopes	Well drained	476.3	4.3%
101	Notter gravelly coarse sandy loam, 2 to 8 percent slopes	Well drained	2,319.0	21.0%
103	Notter very cobbly loam, 4 to 25 percent slopes	Well drained	269.4	2.4%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
113	Plite sandy loam, 2 to 8 percent slopes	Somewhat excessively drained	203.7	1.8%
132	Shupert silty clay loam, wet, 0 to 1 percent slopes	Somewhat poorly drained	65.9	0.6%
141	Tebbs sandy loam, 2 to 5 percent slopes	Well drained	1,192.9	10.8%
142	Tebbs loam, 1 to 2 percent slopes	Well drained	1,245.7	11.3%
146	Tridell loam, 2 to 4 percent slopes	Well drained	31.3	0.3%
148	Tridell cobbly loam, 4 to 25 percent slopes	Well drained	855.9	7.8%
154	Villy family silty clay loam, 0 to 2 percent slopes	Poorly drained	663.6	6.0%
155	Waltershow extremely cobbly loam, 8 to 40 percent slopes	Well drained	57.8	0.5%
174	Water		4.1	0.0%
175	Pits, gravel		9.3	0.1%
Totals for Area of Interest			**11,034.4**	**100.0%**

Description

"Drainage class (natural)" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized-excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

The drainage class map and data show that this watershed is well drained for the most part. The majority of these soils in the watershed are well drained, only 124 acres are somewhat poorly drained, 664 acres are poorly drained, and 1687 acres somewhat excessively drained out of 11,034 total acres.

The resource concerns with regards to the poorly drained riparian area is to keep it vegetated and protected so that the soils will be stabilized.

United States Department of Agriculture, Natural Resources Conservation Service. 2014. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/

2.6 Drainage Network

The watershed lies in the Wasatch Plateau, the furthest west subset of the Colorado Plateau; however, many consider it transitory to the Basin and Range Provence.

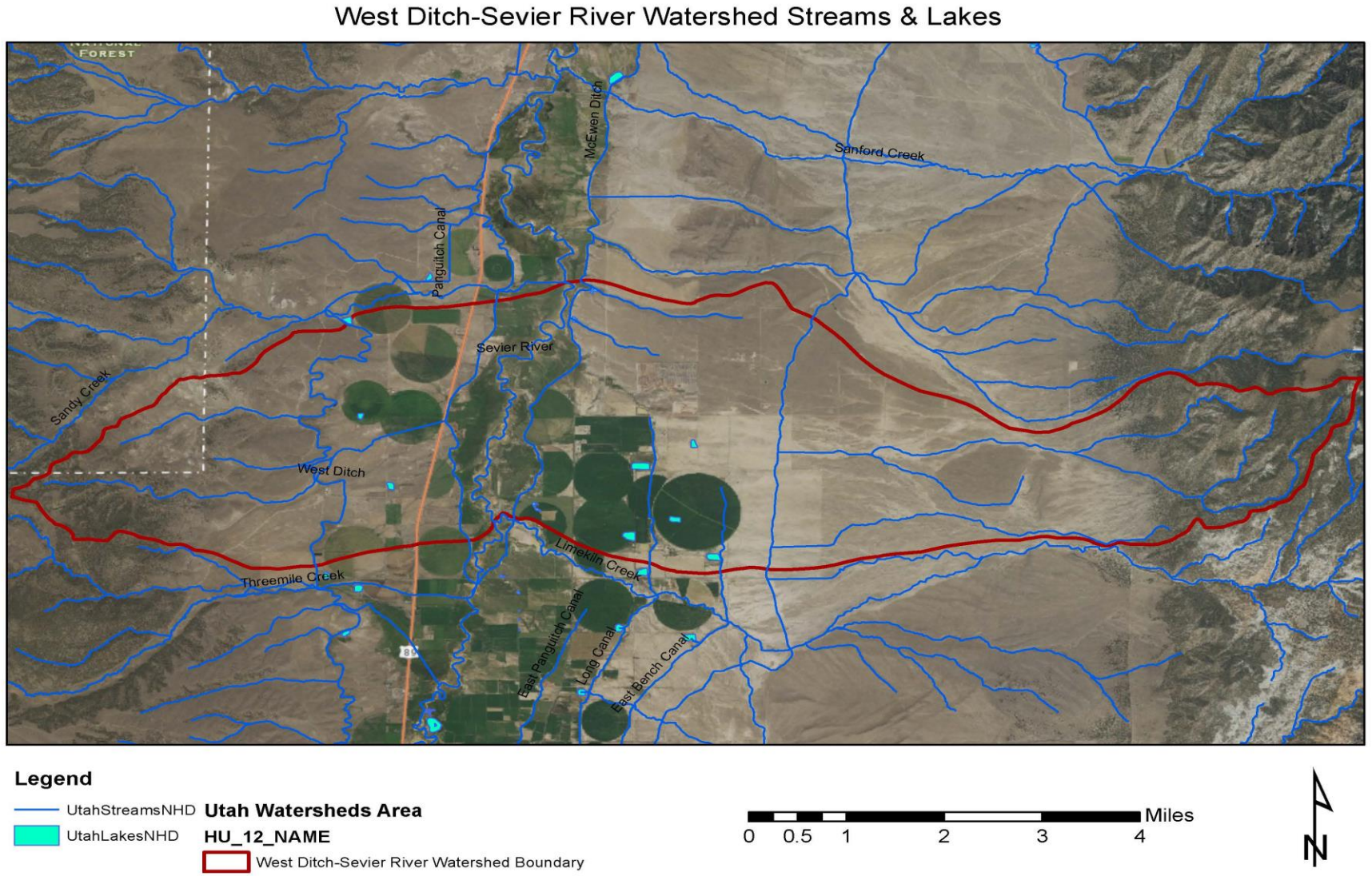


Figure 2.6.a Lakes & Streams (Flow Network)

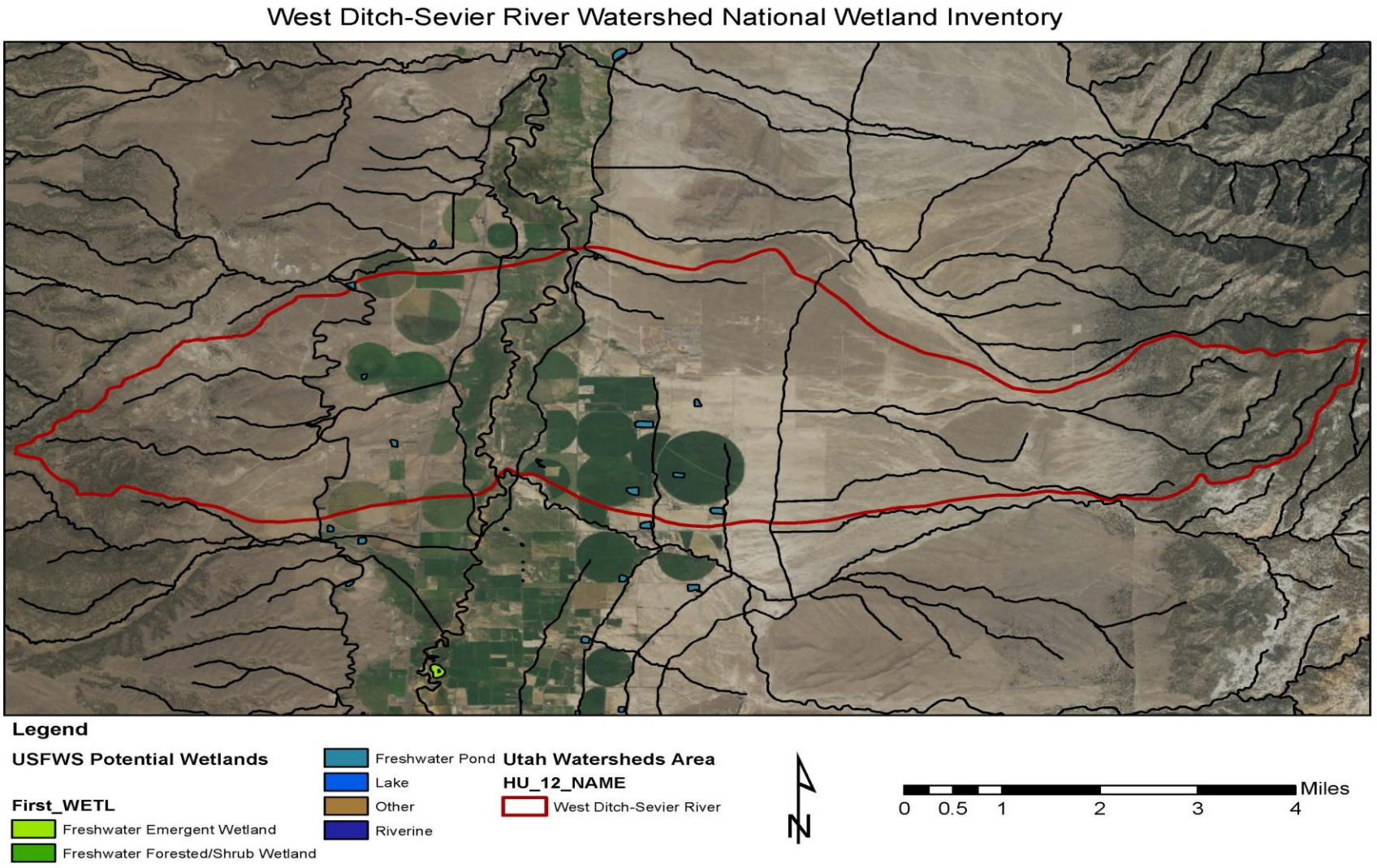


Figure 2.6.b National Wetland Inventory

2.7 Land Cover and Land Use

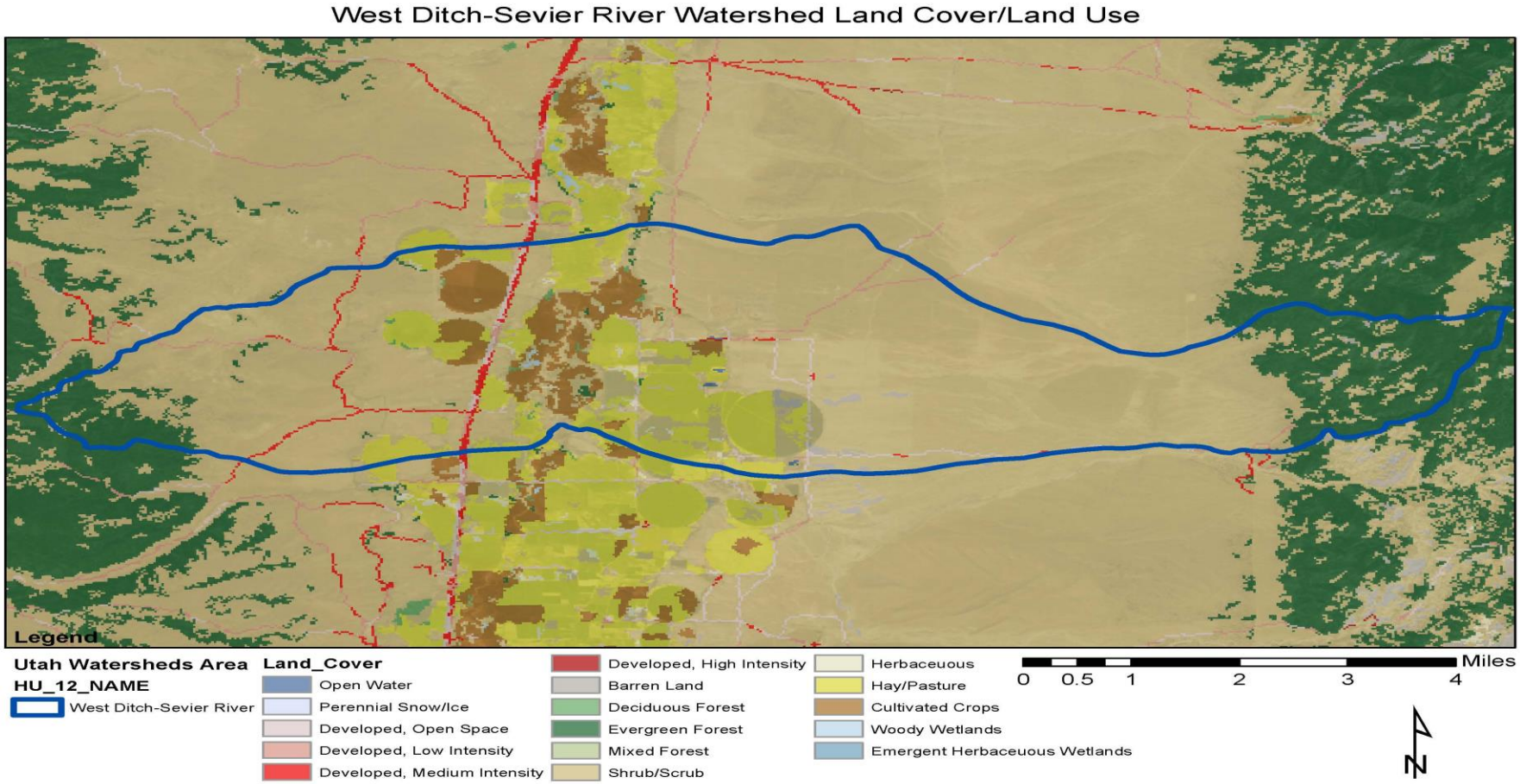


Figure 2.7.a Land Cover and Use

The predominant land use in the watershed is pasture and alfalfa hay production. Livestock grazing also occurs on the shrublands and forested areas.

2.8 Socioeconomic Conditions

Paleoindians (12,000-5,000 B.C.) were the first inhabitants to roam the land within the East Bench-Sevier River Watershed. Remains and artifacts from this culture can be found within the watershed. Evidence suggests that these Indians traveled in small groups, depending on large game and to some degree, small game and fish as a food source. However, there is no evidence to suggest that this group participated in any form of agriculture (Hinton, 1997).

Archaic people entered the area about 9000 B.C. and migrated with the seasons, utilizing berries, seeds, badger, beaver, deer, sheep, small rodents and different types of vegetation as food. The highly mobile Archaic people were more advanced than their predecessors, utilizing animal bones for needles and constructing clothing, footwear and shelter. Most remnants of this population disappeared around 1500 B.C.

Fremont Indians lived along the Sevier River from about 800 to 1200 A.D. Within the area, the Fremont Cultures were the first to have a strong agricultural base, growing such crops as beans, corn, and squash. Distinctive pictographs of triangular-shaped humans, wearing extravagant necklaces and clothing alongside pictographs of deer, sheep, rattlesnakes and other animals they may have harvested, suggest this group placed importance on big game harvest. The Fremont disappeared from the basin between 1200 and 1300 A.D, possibly fleeing because of drought or just evolving into other tribes within the area.

The Numic people composed of the Ute and Southern Piute Indians made the area their home from 1300 A.D. to present. Both Utes and Piutes took advantage of what the land had to offer by hunting a lot of small game, including rodents, rabbits, squirrels, prairie dogs, and beaver. Trout from the river supplemented a large portion of their diet, while pinenuts were gathered and stored for use in winter months.

In the 1500's Spanish conquistadors began to visit areas within the southwestern United States, and most likely the Upper Sevier River basin. Spanish explorers and traders introduced horses to the Ute Indians, making big game easier to obtain. In addition, Spanish traders kidnapped Ute women and children and sold them into slavery back in the New Mexico Territory. In turn, Ute Indians kidnapped Paiute Indians, creating hostile conditions within the basin.

The greatest force in non-Indian settlement of the Sevier River drainage was Mormon Church colonization.

Mormon settlement along the Sevier River drainage during the late 1840's to early 1860's was based on agriculture, with dairy and open-range beef cattle within co-operative herds. From the early 1850's to mid-1870's dairy and open cattle ranging practices were disrupted by Indian conflicts and settlers lost considerable livestock.

Cattle numbers remained low until the late 1860's and early 1870's when settlers realized the profits available within the cattle industry. Railroad transportation arrival in 1869 heralded an era of rapid expansion within the cattle industry and prior community co-operative holdings were superseded by individual holdings.

Areas within the basin continue to be shaped by agriculture and livestock industries today, and many families continue to make a living in the same manner as their ancestors.

The East Bench Sevier River Watershed is important to the city of Panguitch and other local communities for commodity production as well as for recreational opportunities. People from urban areas such as the Wasatch Front (Salt Lake City area) and Las Vegas use the area mainly for recreation,

while livestock grazing is among one of the oldest land uses in the region, contributing important cultural and social values to the area. Tourism is the number one industry in the watershed area and agriculture is number two. The Mean Adjusted Gross Income (MAGI) for Panguitch City is $39,617.

2.9 Other

There is no digital soil survey information for the higher elevation portions of the watershed, it is located on the Dixie National Forest and no digital data is available there.

3.0 Hydrologic and Water Quality Characterization

3.1 Available Data and Resources

The headwaters of the Upper Sevier River primarily originate from the high Markagunt Plateau and are formed by the confluence of Asay and Mammoth Creeks near the town of Hatch. From there the river flows generally north through the Panguitch Valley, through Circleville Canyon and into Circleville Valley where it is fully utilized for irrigation. Inflows to Piute Reservoir are primarily composed of flow from the East Fork Sevier River and recharge in the channel of the Sevier River.

Water quality is one of the most central issues in the management of natural systems in the 21st century. Adequate quantity and quality of water for endangered fish and other species, and for human consumption and use has been mandated under the Clean Water Act (CWA), Endangered Species Act (ESA) and numerous state and federal agency plans. Water quality is a major focus under the Upper Sevier Management Plan. Those areas where water quality standards are not being met, as well as that area where current conditions accelerate erosion and habitat degradation were given the highest ratings, and will continue to receive a great deal of focus in this plan.

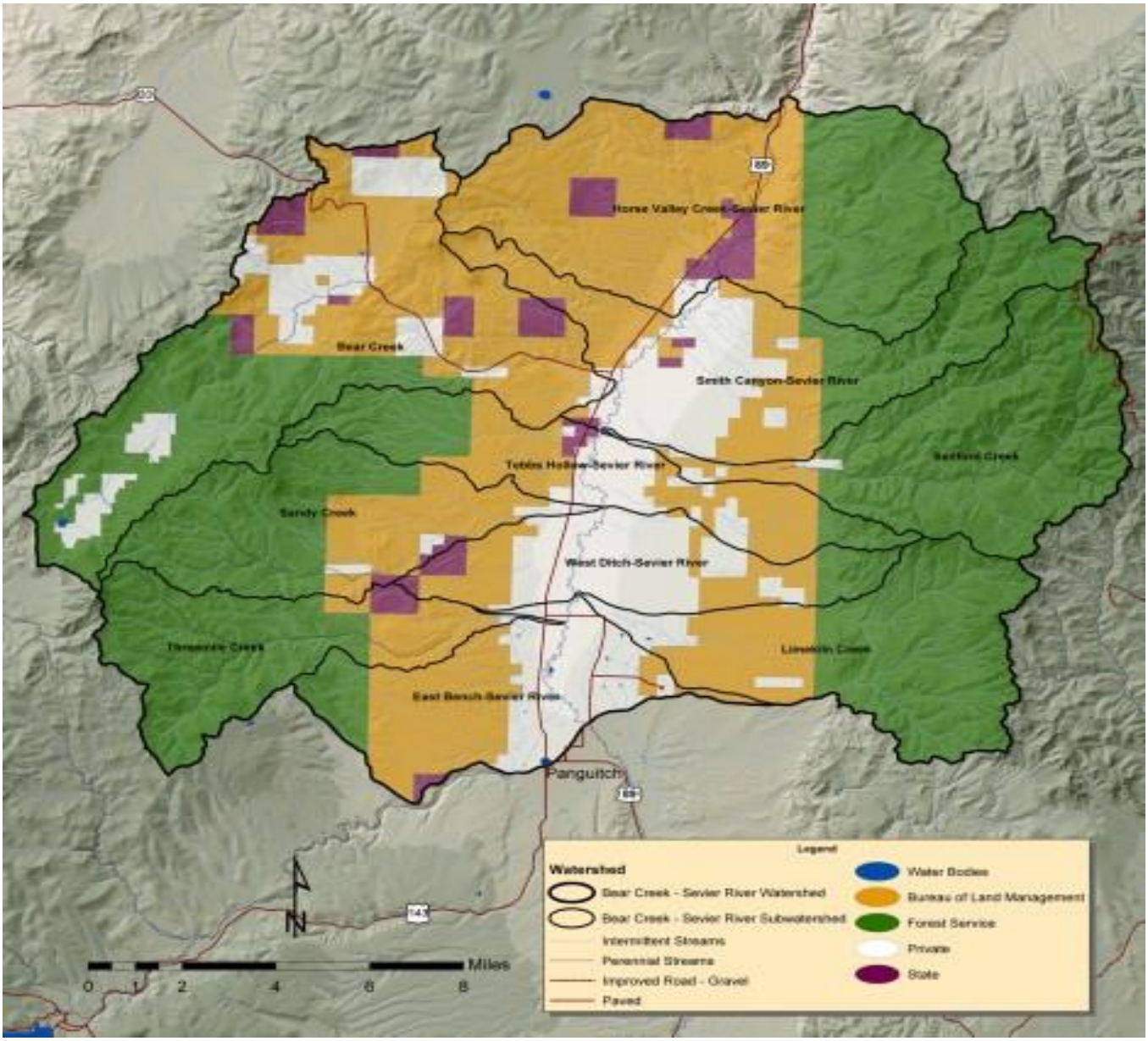
Individual categories rated:

- Summer home development and associated impacts (i.e., ground/surface water contamination, erosion, recreation, etc.)
- Accelerated erosion, grazing management, recreation use, roads
- TMDL listed and potentially listed water bodies due to nutrients, sediment, phosphorous, habitat alteration, or temperature

The main stem of the Sevier River is currently listed as impaired by the Department of Water Quality, Division of Water Quality, for high levels of phosphorous, sediment and habitat alteration (2004, Utah Dept. of Environmental Quality).

Excessive phosphorus causes an increase in algae growth, thereby decreasing the dissolved oxygen available for cold water fish species, while high levels of sediment from erosion impairs fish habitat and their ability to spawn.

Figure 3.1.a East Bench and West Ditch Sub-Watersheds



3.1.1 Available Resources of Information Compiled by Others

Flow data is available from the USGS at two locations in the larger watershed.
The Utah Department of Natural Resources completed a water study in 1993.
The Utah Division of Water Quality provides water chemistry, Biological and physical data. A TMDL was also developed for the larger Upper Sevier Watershed.
The local workgroup completed a Watershed Plan.

3.1.2 Gaging Stations

USGS 10183500 SEVIER RIVER NEAR KINGSTON, UT	October 1, 1986 to August 21, 2019 and October 1, 2007 to current
USGS 10174500 SEVIER RIVER AT HATCH, UT	October 1, 1986 to current

Historic Data

USGS 10180000 SEVIER RIVER NEAR CIRCLEVILLE, UT	May 10,1912 to September29, 1995

3.1.3 Surface and Groundwater Quality Sampling Sites

Table 3.1.1 Utah Division of Water Quality monitoring locations

4947780	Sevier R @ Partridge Property (UT09ST-734)
4949640	SEVIER R @ SANFORD ROAD XING
4949642	Sevier R @ Roundy Property (UT09ST-750)
4949670	SEVIER R @ PANGUITCH AIRPORT RD XING
4949710	Sevier R bl USU Farm @ Sandwash Rd Xing

A TMDL for the Upper Sevier Watershed was developed in 2004. Water quality standards are established to maintain or improve existing water quality and protect the beneficial use of each water body. The designated use of a body of water is based on goals adopted by the state to protect public health or welfare, enhance water quality, and protect its assigned beneficial uses. Numeric standards and criteria are science-based and incorporate the most recent understanding of human health, healthy ecosystem behavior, and response to pollutants. Narrative standards protect water quality from pollutants that are not suited for numeric criteria or haven't developed criteria so far. Pollution

indicators are used in combination with standards to evaluate parameters that are not directly harmful (e.g. phosphorus) but contribute to a response and condition that can degrade water quality (e.g. algal blooms).

Defining a water quality standard for nutrients can be complex due to interactions that produce varying responses to nutrient inputs. In most situations, degradation occurs through a cascading effect that begins with high nutrient concentrations followed by impacts on algae, dissolved oxygen, and ultimately aquatic communities (i.e. animals and plants). Nutrient concentrations can be a particular concern where a transition occurs from moving water (e.g. rivers) to an impounded water body (e.g. lakes) due to a change in reaeration and mixing. Aesthetic values should also be considered for waters that have a designated recreational use, such as the Upper Sevier River.

Utah does not yet have numeric nutrient criteria, but the state is in the process of developing them. Screening criteria for total phosphorus are currently used until water quality standards (i.e. numeric criteria) are in place. The screening criteria (not to be considered binding water quality criteria) were developed during the 2008 303(d) listing cycle to determine if an assessment unit needed further study to determine impairment. Any water body with a mean total phosphorus concentration greater than 0.06 milligrams per liter (mg/L), and more than 10 percent of samples, exceed the 0.05 mg/L pollution indicator level is designated as one that needs further study (Toole 2010).

3.1.4 Biological Monitoring

An extensive survey using the Stream Visualization Assessment Protocol or SVAP (USDA, 1998) was completed in October of 2002 on a total of 65 stream miles on the Upper Sevier River. In addition to SVAP additional erosion information was derived using the Streambank Erosion Condition Index or SECI (USDA). SECI is an erosion hazard index used to estimate bank erosion in combination with simple measurements such as bank height, length, and soil bulk density. In addition waterbody assessments were developed by the Watershed Steering Committee in 1997. These assessments rated the current conditions and feasibility for restoration and recommended BMPs for improvement of water quality and habitat.

Two components of the SVAP address the biology of the system. "Fish Cover" measures availability of physical habitat for fish. The potential for the maintenance of a healthy fish community and its ability to recover from disturbance is dependent on the variety and abundance of suitable habitat and cover available. The average score for fish cover for reaches on the Sevier River was 3.7 (Poor). This average reflects a typical stream reach which would have 3-4 types of fish cover, and for reaches on the Sevier River these would typically include riffles, undercut banks, boulder/ cobbles, and occasional deep pools and large woody debris. Similar to fish cover, "invertebrate habitat" measures the number of substrates available for insects and invertebrates to occupy. Substrate refers to the stream bottom, woody debris, or other surfaces on which invertebrates can live. Optimal conditions include a variety of substrate types within a relatively small area of the stream. The average score for insect habitat for reaches on the

Sevier River was 4.3 (Poor), which would translate to approximately 3 types of substrate, comprised primarily of coarse gravel, cobble, and undercut banks.

3.1.5 NRCS and Partner Sampling. During the 1-year assessment period, could ad hoc water quality monitoring be undertaken? YES

The Division of Water Quality does an intensive monitoring rotation throughout the state. The Sevier River is scheduled for intensive monitoring starting in October 2019 and running through September 2020. Additional sites and timeline can be added if necessary.

3.2 Runoff and Streamflow Hydrology and Irrigation

3.2.1 Methods Used in Analysis

3.2.2 Runoff and Streamflow Generation Processes

The Sevier River is one of the most utilized rivers in the United States. Diversion of water in the basin began in the early 1900's and continues today. Water is diverted at several points along the main stem, East Fork, and several of the smaller tributaries. Water is stored and released at Panguitch Lake, Tropic Reservoir and Otter Creek Reservoir.

Flow regimes in the Sevier River and the East Fork have changed dramatically during the past century due to diversions and water storage in reservoirs. Water is usually diverted and released from reservoirs during the irrigation months. The timing and magnitude of runoff events has been affected by reservoirs, diversions, road construction and urban development.

High rankings were given to those areas where flow regimes have been altered from historic conditions and potential for restoration exists and/or to those areas that have documented water quality issues.

Individual categories rated:

- Dewatering and altered flow regimes
- Releases from Otter Creek Reservoir may be causing bank erosion along East Fork Sevier River
- Diversion of water from Castle Creek to Deer Creek has caused severe channel degradation
- Diversions along the Sevier River may be affecting sediment transport capacity and channel equilibrium
- Loss of riparian vegetation has resulted in reduced bank storage and summer stream flows

Dominant hillslope processes include sheetwash and shallow rill erosion. Accelerated erosion occurs in areas where vegetation conditions have been removed from historic conditions. Historic grazing practices, urban development, fire suppression, road development and increased recreational use have contributed to accelerated erosion in upland areas. High rankings were used for those areas and activities having most impact within the particular sub-watershed.

Individual categories rated:

- Accelerated erosion on high elevation meadows
- Accelerated erosion in pinyon-juniper and sagebrush stands
- Accelerated erosion associated with urban development
- Accelerated erosion associated with roads
- Rill and gully erosion on hillslopes
- Accelerated erosion associated with illegal ATV use

The Upper Sevier Basin contains a wide variety of stream channel types, and are categorized based on Rosgen, 1996. Many channels in the watershed have incised (downcut) sometime in the past, but are evolving back to their previous morphology. Bank erosion has accelerated in portions of the watershed, resulting in higher width/depth ratios and headcuts on upstream ends.

Individual categories rated:

- Active channel adjustments (vertical or lateral)
- Accelerated bank erosion
- Channelization

3.2.3 Precipitation-Runoff Budget

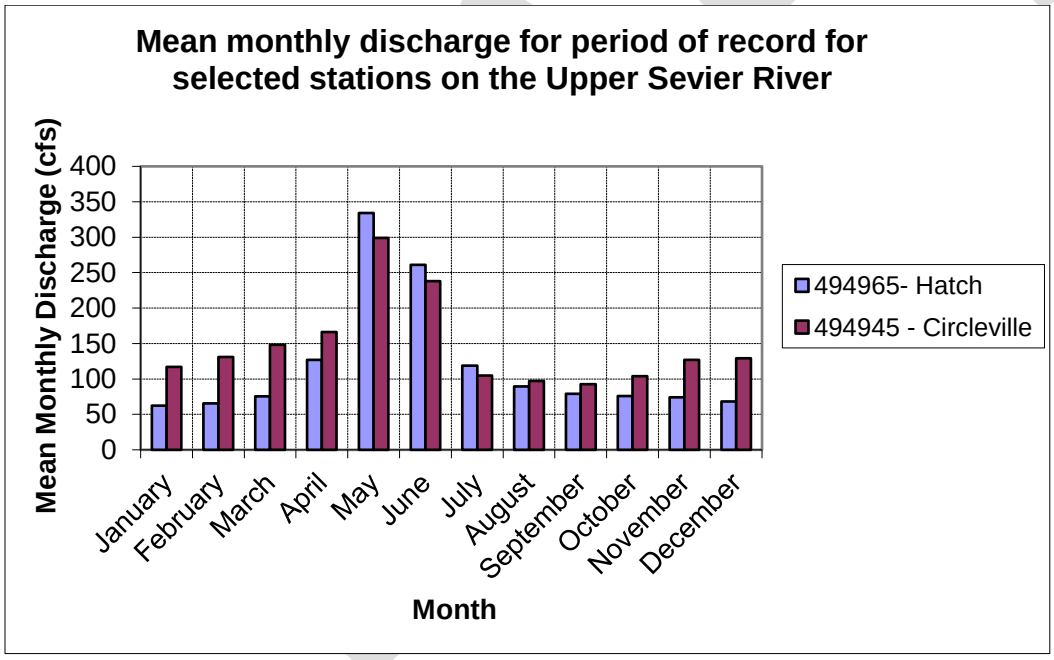
Precipitation ranges from 5 inches in lower elevations (~5,000 to ~6,500 ft) to more than 40 inches per year near Brian Head Peak (11,307 ft) - one of the highest points in the watershed. Although heavy thunderstorms are common throughout summer months, causing increased overland erosion, most of the annual precipitation falls as snow during winter months. Information regarding annual average maximum/minimum temperatures, annual average snowfall and precipitation is available through the Western Regional Climate Center for seven points within the watershed.

3.2.4 Spatial Distribution of runoff

3.2.5 Temporal Distribution of Streamflow

Available flow data for the Upper Sevier River are summarized in the figure below which shows the mean monthly discharge for two stations on the river located near Hatch in the upper watershed and the lower river in Circleville Canyon. With the exception of the irrigation season, flows are greater at the downstream station near Circleville. An average of approximately 68,400 acre-ft of water is diverted from the river and its tributaries in the Panguitch Valley during the irrigation season. According to a study by the Utah Department of Natural Resources (1993), of this irrigation water, approximately 33% or 22,950 acre-feet is consumed by crops. The remaining irrigation water discharges to streams and groundwater as tailwater, valley fill recharge and leakage from canals (11,110 acre-ft, 21,500 acre-ft, and 12,840 acre-ft, respectively). With the exception of a small stream section near Hatch, the length of the Upper Sevier River through Panguitch Valley is a gaining stream. The river is heavily influenced by irrigation diversions particularly near Panguitch, where several complete diversions are operated.

Figure 3.2.a Mean monthly discharge for selected stations on the Upper Sevier River.



Source: United States Geological Survey.

3.3 Water Quality Conditions in the Watershed

Water Quality Standards

This section addresses water quality impairments for streams and lakes within the Upper Sevier Basin through the establishment of Total Maximum Daily Loads (TMDLs) for pollutants and sources of concern. Segments of the Upper Sevier River have been listed on the 2002 303(d) list of impaired waters. The State of Utah has designated these waterbodies as coldwater (3A) fisheries and impairment of this designated use exists due to a number of pollutants and sources, including habitat alteration, total phosphorus (TP), and total suspended sediments (TSS) and low dissolved oxygen (DO). Upper Sevier River waterbodies and their associated impairment are listed in Table 5-1. The primary sources are habitat degradation from agricultural activities, nonpoint source pollution from rangeland, summer home development, septic systems, recreational activities, and urban runoff.

Impaired Waters

Utah's Year 2002 303(d) list identifies three segments of the Sevier River as being impaired due to water quality numeric exceedences. Impaired waterbodies and pollutants of concern are listed below.

Table 3.3.1 Impaired waterbodies and pollutants of concern (2002 303d List).

Waterbody	Waterbody ID	Impaired Use	Cause of Impairment
Sevier River and tributaries from Circleville Irrigation Diversion upstream to Horse Valley Diversion	UT16030001-005	3A	Habitat Alteration, TSS, TP
Sevier River and tributaries from Horse Valley Diversion upstream to Long Canal Diversion excluding Panguitch Creek, Bear Creek, and their tributaries	UT16030001-007	3A	Habitat Alteration, TSS, TP
Sevier River and tributaries from Long Canal to Mammoth Creek confluence	UT16030001-012	3A	Habitat Alteration, TSS, TP

Table 3.3.2 Utah Water Quality Criteria for Class 3A Waters

Target Parameters	Criterion Maximum Concentration

Total Suspended Solids*	35 mg/L
Total Phosphorus*	
-Streams	0.05 mg/l
-Lakes	0.025 mg/l
Dissolved Oxygen	
-Lakes	4.0 mg/l

*Pollution Indicators. TSS criterion no longer part of the State of Utah Water Quality Standards.

The listings are based on an intensive water quality survey completed in 1996-1997 by DWQ. The beneficial uses, as designated by the State of Utah (DWQ, 2000b), for the Sevier River are:

2B- Protected for secondary contact recreation such as boating, wading, or similar uses;

3A - Protected for cold water species of game fish and other coldwater aquatic life, including the necessary aquatic organisms in their food chain.

3C - Protected for nongame fish and other aquatic life, including the necessary aquatic organisms in their food chain;

3D - Protected for waterfowl, shore birds and other water-oriented wildlife not included in Classes 3A, 3B, or 3C, including the necessary aquatic organisms in their food chain

4 - Protected for agricultural uses including irrigation of crops and stock watering

The table below lists the monitoring stations and the number and percentage of samples exceeding the criterion of 0.05 mg/l for total phosphorus. This information was compiled from data collected during 1996-97.

Table 8. Exceedence report for total phosphorus for selected stations 1996-97.

STORET	Location	Number Exceeding Criterion	Number of Samples	% Exceeded	Mean Conc. (mg/l)	Support
4949450	Circleville Canyon	11	20	55 %	.090	Non-Support
4949640	Sevier above Sanford Ck.	7	16	44 %	.079	Non-Support
4949660	Sevier R. East of Panguitch	4	14	29 %	.075	Non-Support
4949630	Sevier R. at U12 Crossing	6	18	33 %	.063	Non-Support

3.3.1 General Concentrations and Loads of Major Constituents and How They Vary

3.3.2 Sediment

The average Biotic Condition Index for the site near Circleville (STORET # 4949450) was 65.5 or "Poor" rating, indicating tolerance to sediment and nutrients which supports the water chemistry data. Impairment based on "Habitat Alteration" was determined by the Upper Sevier Watershed Steering Committee as the primary cause of in-stream impairment and potential sources of sediment from streambank erosion. Sedimentation and siltation affect fisheries and aquatic resources by covering and eliminating gravel spawning beds, covering fish eggs (which reduces oxygen supply and survival of eggs and fry), and reducing the amount of habitat available for aquatic invertebrates that are an important part of the food chain.

Land erosion in the Sevier River watershed was estimated using the Universal Soil Loss Equation (USLE). The USLE (Wischmeier and Smith, 1978) is the most common and best known method to estimate gross annual soil loss from upland erosion. The USLE is an index method having factors that represent how climate, soil, topography, and land use affect soil erosion caused by raindrop impact and surface runoff.

Figure 3.3.a Estimated load reduction for impaired river segments (units in kg/yr).

Waterbody	Current Load	Up-stream Reduction	Point Source	Septic Systems	Grazing/ Animal Waste	Streambank Erosion	Upland Erosion	Loading Capacity
Sevier River from Long Canal to Mammoth Creek	1871	382			116	63		1528
Sevier River from Horse Valley Diversion to Long Canal Diversion	3999	275			841	403	402	2078

Sevier River -Circleville Irrigation Diversion to Horse Valley Diversion	5846	1921			401	554	387	2583

* Currently no load reduction is recommended due to insufficient data. The load reductions are therefore distributed among other sources of nonpoint sources.

Estimated load reduction for impaired river segments (units in kg/yr).

Rather than explicitly representing the fundamental processes of detachment, deposition, and transport by rainfall and runoff, the USLE represents the effects of these processes on soil loss. These influences are described in the USLE with the equation:

$A = (R)\,(K)\,(LS)\,(C)\,(P)$

Where, A is estimated soil loss in tons/ hectare for a given storm or period; R is a rainfall energy factor; K is a soil erodibility factor; LS is a slope-length, slope steepness factor; C is vegetative cover factor; and P is a conservation practice factor. Bear Creek sediment load using the USLE = 27933 Mt/yr.

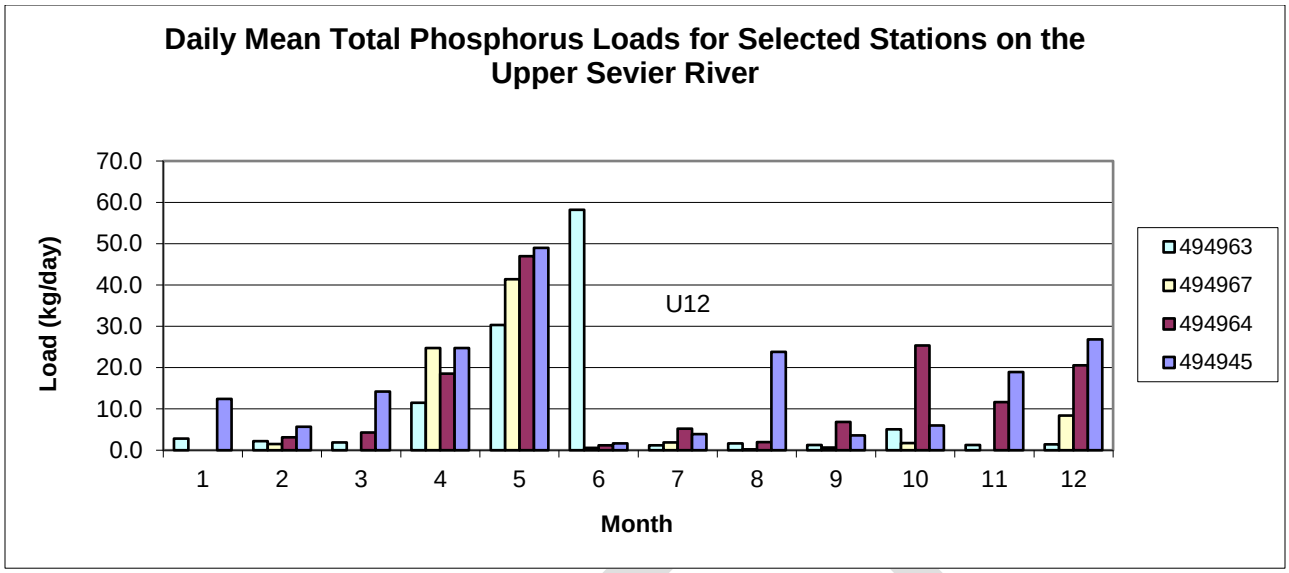
The USLE factor for the Bear Creek watershed was estimated based on available GIS data. The 30-meter digital elevation model was used to derive slope-length and slope steepness and the NRCS STATSGO soils database was used to derive the soil erodibility factor.

3.3.3 Nutrients

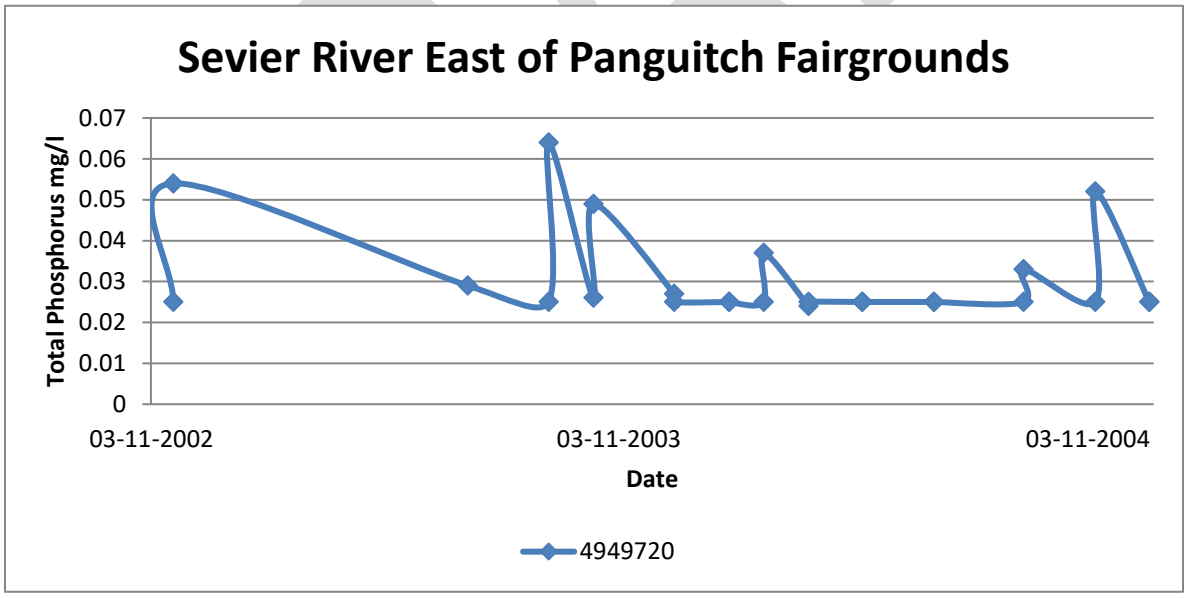
Total Phosphorus

Mean total phosphorus concentrations and loads were calculated by sorting data by month and obtaining monthly averages. The figure below indicates that loads are highest during April and May, which corresponds with the spring runoff. The sharp drop in loading in the middle and lower river during June may reflect the effect of irrigation diversions reducing flows and concentrations due to land application. Loads remain low in the upper river the remainder of the year while higher loads in the lower river reflect irrigation return flows and streambank erosion from higher fall stream flows. In addition, levels may increase in downstream reaches as a result of over-wintering of livestock in the Panguitch Valley.

Figure 3.3.b Mean TP loads for selected stations on the Upper Sevier River

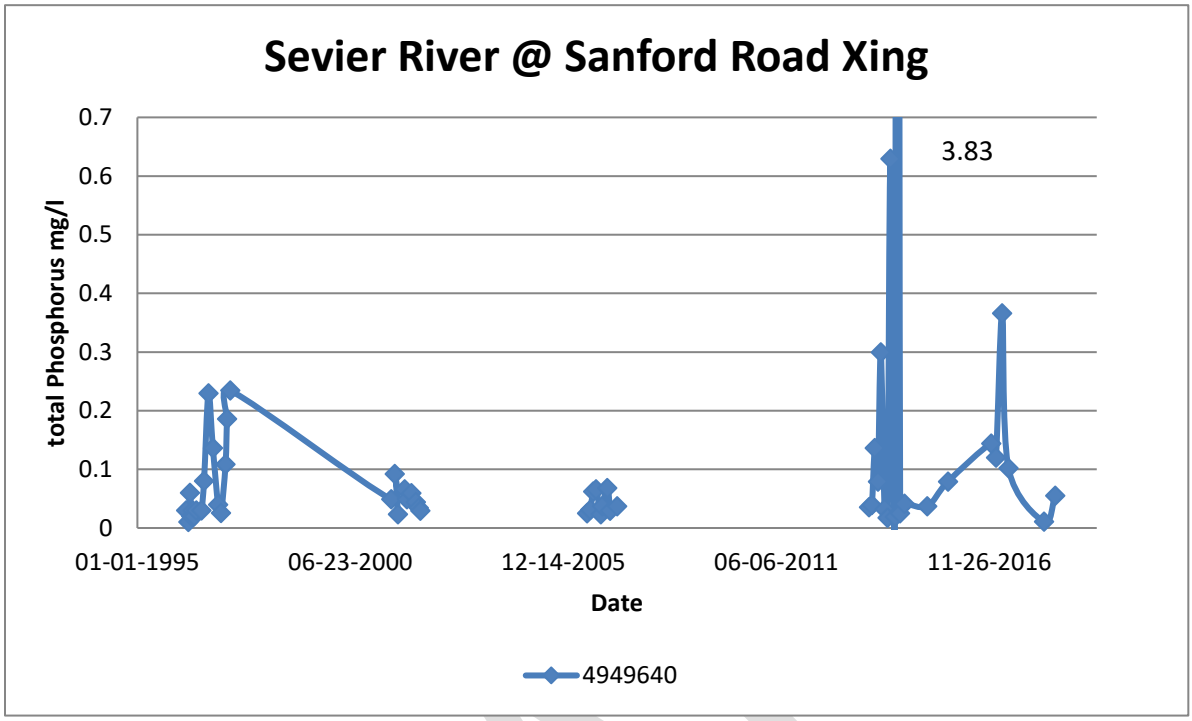


Annual loads were calculated by averaging monthly loads and multiplying by 365 days in the year. In general, loads increase with downstream reach. The exception to this trend occurs at 4949630 (Sevier River at U12 Crossing) in June which may be due to higher flows in this reach which is located upstream from major irrigation diversions. The site 4949660 (Sevier River East of Panguitch) is located below a major diversion which accounts for the lower TP loads observed at this site.



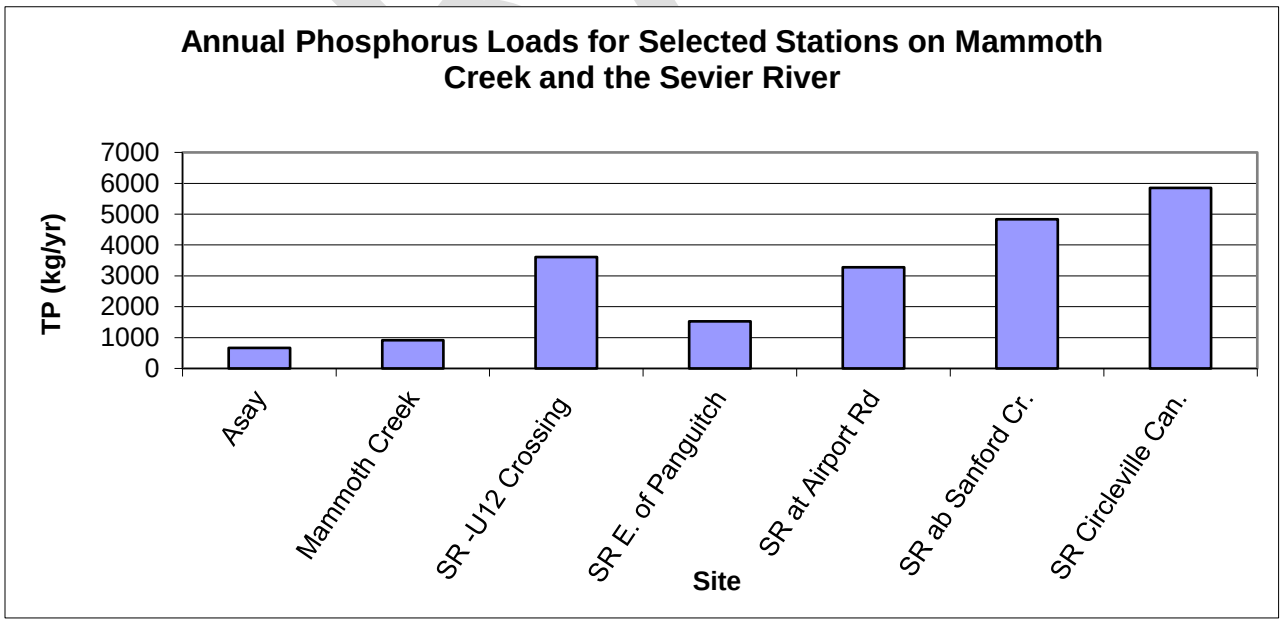
The Sevier River East of Panguitch Fairgrounds (site 4949720) is located in approximately the middle of the West Ditch Watershed. Total Phosphorus exceeds the standard 3 out of 21 samples from 2002 thru 2004 or 14% of the time. Current data for this site will be collected during the next intensive monitoring

cycle.



The Sevier River at Sanford Road Xing (site 4949640) located downstream of both the East Bench and the West Ditch Watersheds. Total Phosphorus exceeds the standard 10 out of 20 samples since 2013 or 50% of the time.

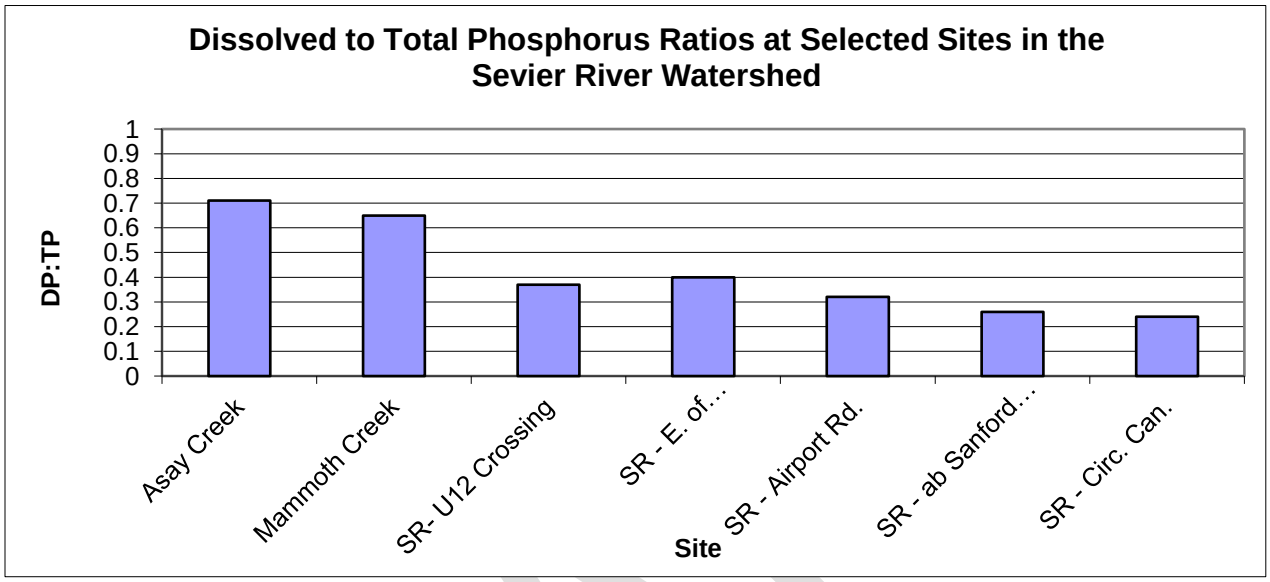
Figure 3.3.c Annual TP loads for selected stations



Dissolved phosphorus appears in surface waters usually from sources of organic nutrient enrichment such as a wastewater treatment plant, animal feedlot waste, or other point source discharge.

Examination of ratios of dissolved to total phosphorus concentrations can be used to indicate whether sources are predominantly organic in nature as is the case when high ratios are found in surface water. Ratios were calculated for selected sites on the Upper Sevier River.

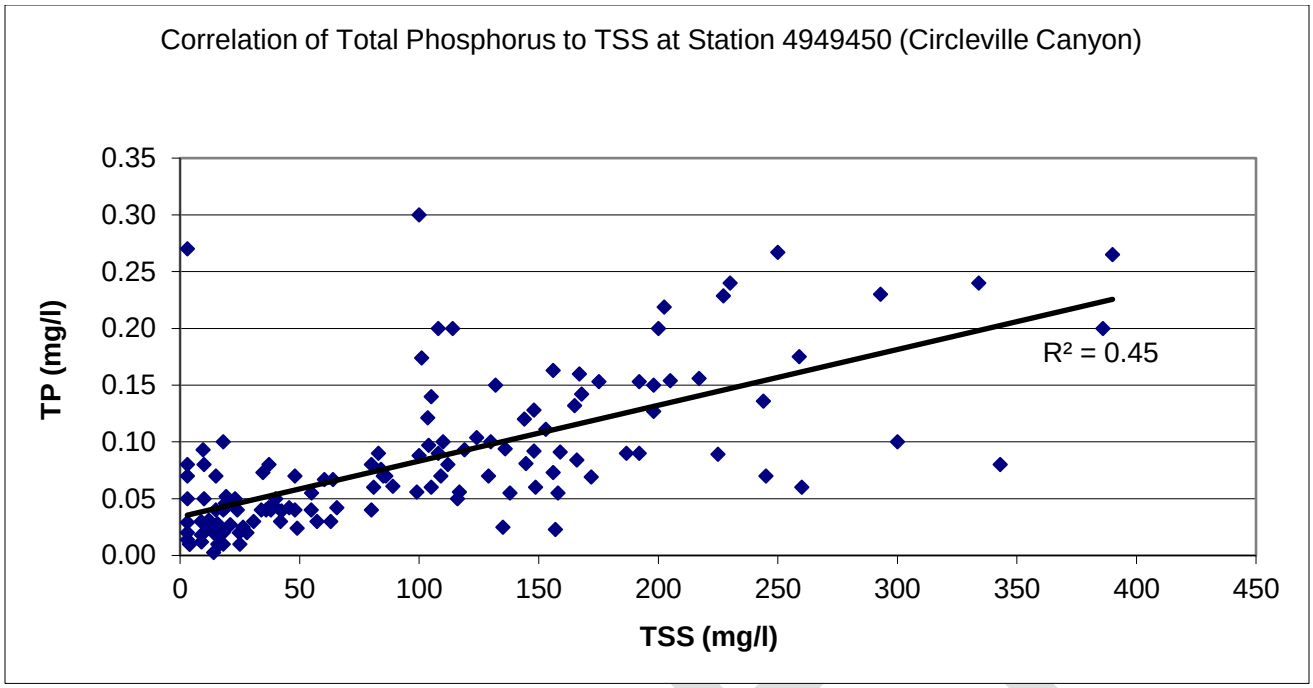
Figure 3.3.d Dissolved and total phosphorus ratios



Ratios of DP to TP were low (0.24) in the lower river suggesting that TP was not readily bioavailable but adhered to soil or sediment particles. Conversely ratios in Mammoth and Asay Creeks were high (0.65) indicating organic enrichment related to sources such as the Mammoth Fish Hatchery, grazing and high numbers of septic systems from home development in both the Asay and Mammoth creek watersheds.

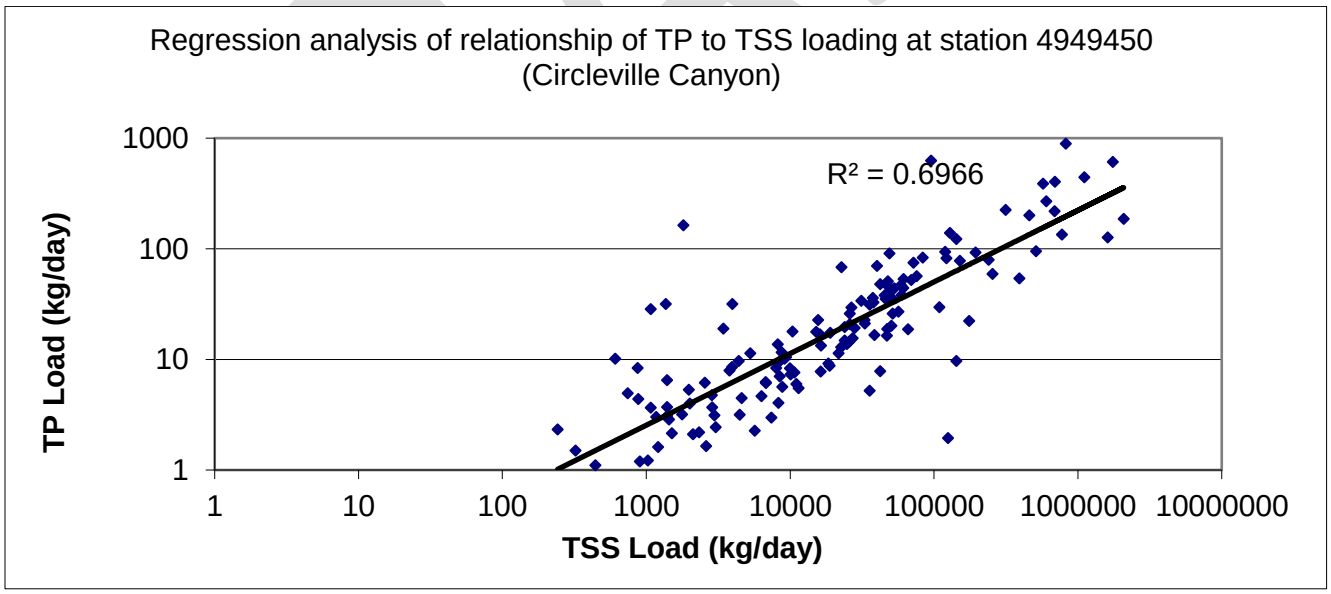
In addition to dissolved to total phosphorus ratios, correlations between TP and Total Suspended Solids (TSS) were graphed. While the relationship between TSS and TP is not particularly strong for the entire dataset (R^2= .45) the majority of high phosphorus measurements (> 0.05 mg/l) occur when TSS is also high.

Figure 3.3.e Correlation o to TSS at station 4949450



In addition, regression analysis of the relationship between TP load and TSS load provides stronger evidence that high loads of TP are flow related and associated with high sediment loads.

Figure 3.3.f Regression analysis of TP and TSS Loads for Station 4949450

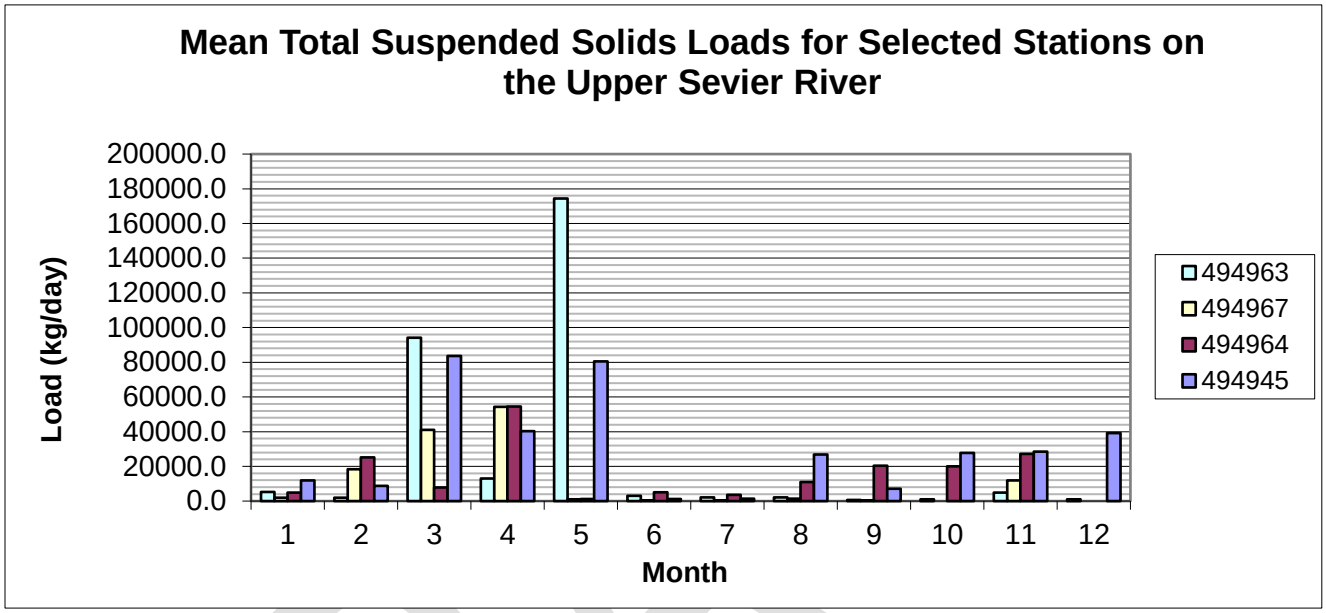


TSS

Mean total suspended solids (TSS) concentrations and loads were calculated by sorting data by month and obtaining monthly averages. The figure below indicates that loads are highest during April and May,

which corresponds with the spring runoff. The sharp drop in loading in the middle and lower river during June may reflect the effect of irrigation diversions reducing flows and concentrations due to land application of river water. Loads remain low in the upper river the remainder of the year while higher loads in the lower river reflect irrigation return flows and streambank erosion from higher fall stream flows.

Figure 3.3.g TSS loads at selected stations on the Upper Sevier River



As is typical of stream with snowmelt dominated hydrograph, TSS values generally peak in the months of spring runoff as tributary inflows and bank erosion from high flows contribute sediment to the system. A notable exception can be seen in May values, where irrigation withdrawals not only affect discharge but the TSS load. Peaks in TSS load early in March and April may be a result of low elevation snowmelt mobilizing sediment from valley bottoms and foothill rangeland. The lower river (represented by 4949640 and 4949450), exhibits an increase in TSS load as stream flows increase in the lower river after irrigation season. In this situation, streambank and in- channel erosion is most likely occurring from increased flows from groundwater recharge and fall storm events. However, analysis of the correlation between flow and TSS concentrations for the period of record at 4949450 did not show TSS to be well correlated to flow (R^2 =.28)

TSS Concentrations at 4949630 were highly variable from year to year. Data from 1996-7 averaged 46 mg/l while 2001-2 data averaged 1008 mg/l TSS (with several dates exceeding 1500 mg/l). It is not recommended that TMDLs be based on TSS data for waters in this basin. TSS doesn't actually reflect the overall sediment load present in the stream and therefore, TMDL endpoints related to TSS will not be established in this study.

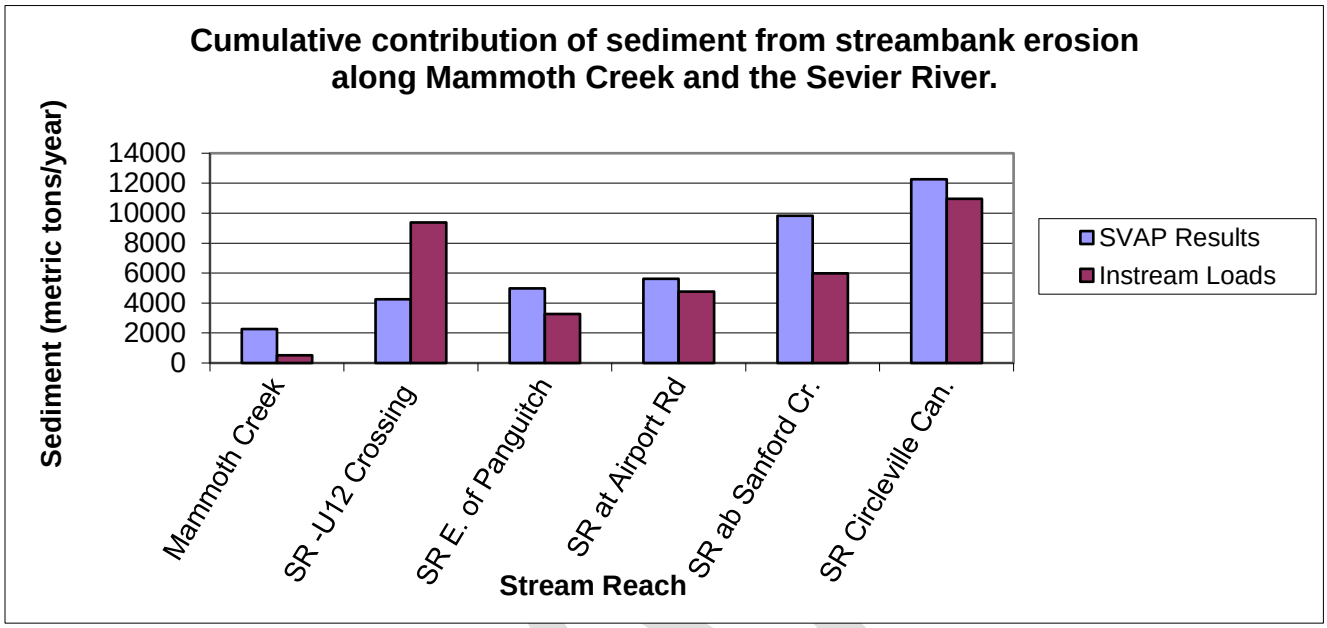


Figure 3.3.h Estimated sediment loads from streambank erosion

Relative increases in sediment as TSS as measured in in-stream loads from water quality data mirror the increases predicted during the survey using SECI protocol. While the SECI estimates the total amount of sediment delivered to the stream from the volume of material being lost each year, TSS only measures the suspended fraction of sediment transported in the stream. The estimates of streambank erosion would be expected to be higher since not all of the material entering a stream would be suspended in the water column but comprise bed load as well. Since the SECI survey was incomplete and did not include other tributaries we would expect the sediment contribution to be much greater. The site at SR at U12 crossing exhibited extremely high TSS values in the 2001-02 intensive sampling season which is responsible for the spike in TSS load at this site. In addition, numerous irrigation withdrawals in the area upstream of Panguitch may regulate the amount of TSS in the river since in some cases the withdrawals are complete dry dams and the water is flooded onto fields to the east of the Valley. The monitoring station 4949660 (Sevier River East of Panguitch) is one such site, located below a complete diversion which had resulted in lower observed stream flow and loads for both TSS and phosphorus.

3.3.4 Other

Pollution Assessment

Natural Sources

Within natural forested landscapes mass erosion such as geological creep, and to a lesser degree slump and debris avalanches, are the dominant upland erosion processes. After intense wildfire, surface erosion is a dominant factor. In valley bottoms, stream channel erosion, including both bed and bank erosion, may deposit materials into the channel, where transport, storage and deposition may influence stream integrity. Prior to European settlement, stream channels in this watershed were most likely in dynamic equilibrium, and experienced natural erosion processes. Stream riparian habitat most likely consisted of mosaics of thick willows and late seral grasses. Cottonwood and willow communities were present at lower elevations along the Sevier River. Expansive and diverse riparian grasses, along with willow and cottonwood, helped reduce sediment influx, maintained coarser stream substrate, contributed to cooler stream temperatures, and supported normal flow regimes. As with sediment, natural sources of nutrients exist in every watershed, derived from parent material, sediment and inputs from organic matter deposited in or near streams. While headwater streams tend to be less productive than lower elevation rivers, historical accounts of the Upper Sevier River watershed suggest streams and lakes in the area were productive and contained abundant fish.

Human Sources

As early settlers moved into the Upper Sevier River Watershed, surface erosion processes have become more prevalent in areas where road constructing, mining, timber harvest and grazing occur. Roads have increased surface and mass erosion rates beyond those associated with natural watershed disturbances. An extensive network of roads constructed in areas such as stream bottoms and un-stable land types has resulted in large scale mass erosion. Like roads, livestock grazing and silviculture can alter the hydrology of a watershed, reducing protective vegetation and infiltration, and increasing the magnitude of runoff events. Grazing and recreation in stream channels and riparian areas reduces the stability of banks and results in erosion of bank materials to the channel and receiving waterbodies. In addition to sources from erosion, nutrient enrichment from livestock waste can result from grazing in the stream channel, flood irrigation of pasture land and runoff from animal feeding operations.

A major concern in the upper watershed tributaries is the concentration of summer home development near streams and lakes. The Human Uses work group for the Upper Sevier Community Watershed Project identified key issues associated with human uses in the watershed. The group estimated approximately 4,163 developed lots in the Strawberry Valley (841), Duck Creek (1450), Swain's Creek (1,107, and Strawberry Point - Zions View (765) subwatersheds, all currently using septic tanks. In the Mammoth Creek watershed they identified approximately 1,114 developed lots in the Ireland Meadows (36), Meadow Lakes Estates (445), Rainbow Meadows (90), and Tommy Creek (194) areas. As development continues to increase, impacts to surface and groundwater from poorly designed, located and installed septic systems may be a potential problem particularly since the claron-limestone and volcanic substrates present from Duck Creek to Panguitch Lake are not suitable and conducive to septic system use. Dispersed recreation associated with these developments, in areas where few or no sanitary facilities exists, may also potentially impact surface and groundwater. While local effects of these developments may occur in surface waters, monitoring data are inadequate to determine loading to

tributaries and the effects to the mainstem of the Sevier River is uncertain. In addition, use of tributary flow for irrigation (e.g. Panguitch and Mammoth Creek) may reduce the loading from these sources.

4.0 Resource Analysis and Source Assessment

4.1 Causes of Resource Problems

While there are various point sources located throughout the Upper Sevier watershed that contribute to the phosphorous impairment, the overall purpose of this plan is to help reduce phosphorus concentrations in the watershed by addressing nonpoint source pollution.

Phosphorus loads are highest during April and May, which corresponds with the spring runoff. The sharp drop in loading in the middle and lower river during June may reflect the effect of irrigation diversions reducing flows and concentrations due to land application. Loads remain low in the upper river the remainder of the year while higher loads in the lower river reflect irrigation return flows and streambank erosion from higher fall stream flows. In addition, levels may increase in downstream reaches as a result of over-wintering of livestock in the Panguitch Valley.

Primary mechanisms of phosphorus delivery from cattle to streams include direct deposition in streams and on streambanks and return flows from flooding of pasture utilized for grazing and/or fertilized with manure. In an effort to estimate contributions of total phosphorus from grazing, cattle numbers were obtained from the landowners in the watershed and were divided by subwatershed (Dodds, 2003). The total number of animals in each watershed varies by season as cattle are moved from summer to winter range, as well as into and out of the watershed.

Dissolved phosphorus appears in surface waters usually from sources of organic nutrient enrichment such as a wastewater treatment plant, animal feedlot waste, or other point source discharge.

Nonpoint sources of phosphorus include natural background sources from the weathering of parent material and organic matter delivered to the streams as soil and plant litter. The movement of nutrients such as phosphorus through a watershed is a complex process since plant and algal uptake plays a strong role in the cycling of nutrients. In addition, the nature of the Sevier River watershed is such that water is continually diverted and land applied and returning to the channel via overland flow and shallow groundwater return flows. In the process, phosphorus (as well TSS) loads and concentrations can be reduced when irrigation water from the river is distributed to crops.

4.2 Potential Tools to Use

This watershed plan has identified three main resource concerns linked to degraded water quality in the West Ditch Watershed. These four resource concerns are:

1. Grazing management: This could include a combination of timing, duration, and fencing to protect streambanks from trampling and limit the introduction of animal waste into canals, ditches and streams. Riparian fencing and pasture rotation are appropriate practices to protect sensitive areas and allow for controlled access to forage. Off-site watering could be provided for cattle that congregate in or near streams or other channels adjacent to pastures.

2. Streambank restoration: The re-establishment of woody, deep-rooted vegetation such as willows and sedges is recommended for the majority of the Sevier River from its headwaters to Circleville Canyon. The potential for bank stabilization and erosion control is high since the water table is typically high throughout the year. Practices could include willow pole planting, willow mats, temporary juniper revetments, and other soft bio-engineering techniques. These restoration projects would have to be coupled with grazing management, development of offsite water sources, and permanent or temporary electric fencing to allow for recovery of riparian vegetation. In some cases which were identified during an SVAP, completed for the Upper Sevier TMDL, bank erosion was so severe that the installation of hard structures such as rock barbs or weirs rock may be necessary to direct flow away from re-vegetating stream banks.

3. Irrigation efficiency and buffers: In order to reduce the amount of runoff containing sediment and nutrients from field under flood irrigation, it is recommended that irrigation efficiency projects be implemented on fields and pasture adjacent to the Sevier River and its tributaries. Where applicable, vegetative buffers should also be developed to filter nutrients and moderate loss of flood irrigation.

Section one of this plan goes into greater detail regarding how these goals will be achieved, and what potential tools may be used to help each specific resource concern mentioned above.

4.3 Preliminary Analysis to address the Problem With Available Tools

The purpose of this watershed plan is to identify resource concerns related degraded water quality in the West Ditch Watershed. This includes identifying the locations of areas where best management practices are needed, and also identifying the water quality benefit that will be achieved through the implementation of these practices. To do this the Spreadsheet Tool for Estimating Pollutant Load 4.4 (STEPL) was used to calculate current loading, and potential loading reductions.

STEPL employs simple algorithms to calculate nutrient and sediment loads from different land uses and the load reductions that would result from the implementation of various best management practices

(BMPs). It computes watershed surface runoff; nutrient loads, including nitrogen, phosphorus, and 5-day biological oxygen demand (BOD5); and sediment delivery based on various land uses and management practices. For each watershed, the annual nutrient loading is calculated based on the runoff volume and the pollutant concentrations in the runoff water as influenced by factors such as the land use distribution and management practices. The annual sediment load (sheet and rill erosion only) is calculated based on the Universal Soil Loss Equation (USLE) and the sediment delivery ratio. The sediment and pollutant load reductions that result from the implementation of BMPs are computed using the known BMP efficiencies.

4.4 Analysis of Treatment and Opportunities

The phosphorous TMDL that was written for the Upper Sevier River breaks the Upper Sevier River into four reaches, and identifies required load reductions for each reach. The West Ditch Watershed is located in the reach between the Horse Valley Diversion and the Long Canal Diversion. The West Ditch Watershed only accounts for 16 percent of this reach. To better calculate the actual load reduction needed within the West Ditch Watershed, it was assumed that only 16% of the required load for this reach should come from the West Ditch Watershed. Table 4.4.1 identifies the load reductions that are required for each pollutant source in the watershed based on 19% of the total load from the Horse Valley Diversion to the Long Canal Diversion.

Table 4.4.1 Estimated Load Reduction required by TMDL

Reach	Stream Bank Erosion lbs/year	Grazing/Animal Waste lbs/year	Irrigation Improvements	Total Load lbs/year
Sevier River from Horse Valley Diversion to Long Canal Diversion	886.6	1850.2	-	2736.8
Upper Sevier River Located in West Ditch Watershed (STEPL)	141.9	296.0	-	437.9
Load from previously completed projects (STEPL)	42.6	0*	130.6	173.2
Load reductions required for West Ditch Watershed	99.3	296.0	-	395.3

**STEPL calculates Stream bank work and fencing together*

To assist with the quantification of resource needs, a visual assessment of aerial imagery, as well as windshield surveys were conducted to help obtain an estimate of the number of practices needed, and the location of those practices. Table 4.4.2 shows the results of this survey.

Table 4.4.2 West Ditch Conservation Practices Summary

Parameter	Quantity
Linear feet of river in the present in the watershed	27,000
Linear feet of stream bank already treated	2,000
Linear feet of river requiring treatment	25,000
Number of cattle in watershed	1,555
Number of cattle with access to the river	850
Acres of irrigated farmland	3,340
Acres of improved irrigation practices	1,166
Acres needing irrigation improvements	2,174

STEPL was used to calculate load reduction estimates for the needed practices needed in Table 2. These load reduction estimates show the amount of phosphorous load reductions that could be achieved if all of the Best Management Practices (BMPs) Identified within the watershed were implemented. The load reductions required for the West Ditch Watershed were also calculated, as well as the load reductions that have already been achieved through previous implementation work. As a result of the project work that has already been implemented in the West Ditch Watershed, only 51% of the remaining practices will need to be implemented to help meet the endpoints of the Upper Sevier TMDL.

Table 4.4.3 Available Load Reductions vs. Required Load reductions

Practice	Quantity	Estimated Load Reduction
Fencing and Stream Bank Stabilization	25,000 linear feet	532.9 lbs/year
Irrigation Improvements	2174 acres	243.5 lbs/year
Total Load Reduction Available		776.4 lbs/year
Total Load Reduction Required		395.3 lbs/year
Percentage of Practices to be Implemented		51%

4.4.1 Current level of Treatment in the Watershed

The NRCS and the Division of Water Quality have been working in the West Ditch Watershed for many years. Over the past several years 2,000 linear feet of stream bank has been restored. This includes the installation of a riparian fence that will help rest the riparian area, and allow riparian vegetation to increase.

In addition to the riparian improvements, the NRCS has been working with producers to install improved irrigation systems. These systems include gated pipe to better control water movement across flooded fields, as well as pressurized irrigation systems, such as sprinkler systems.

With the practices that have been installed an estimated 173.2 lbs/year of phosphorous has already been removed from the system (see table 1). This is approximately 6.3% of the total load reduction required by the Upper Sevier TMDL.

4.4.2 An Analysis of Producers Available and Their Willingness to Participate

Producers in the Upper Sevier Watershed have long been willing to work with state and federal partners to implement conservation practices. One of the reasons that the West Ditch watershed was selected as a National Water Quality Initiative (NWQI) watershed was the demand for funding. Many of the landowners in the watershed have already committed to implement the desired BMPs.

According to FSA records there are9 landowners that have land that is located in an area of concern in the Watershed. Of those 14 landowners, 1 of them has already implemented relevant projects, while an additional 3 landowners have agreed to apply for NWQI or Environmental Quality Improvement Program (EQIP) funding, and 5 landowners have still not been contacted.

4.4.3 Assessment of How Critical Area Treatment is Balanced With Participation to Achieve the Most Effective Prioritization of Implementation

While three of the landowners have agreed to work with the NRCS to implement waters quality projects, the remaining landowners will need to be contacted. The local watershed coordinator is hopeful that many of the remaining landowners will be willing to participate in the NWQI program. All the remaining landowners will be contacted, and hopefully all of the high priority projects will be implemented, as has been the case in previous NWQI watersheds in the Upper Sevier.

4.4.4 Set of Preferred Practices, Locations, Responsible Parties, Costs, and Time Lines Descriptions

The following maps show the irrigated acres along the stream, the potential treatment areas, those that have been restored along the stream, and those that are planned to be restored.

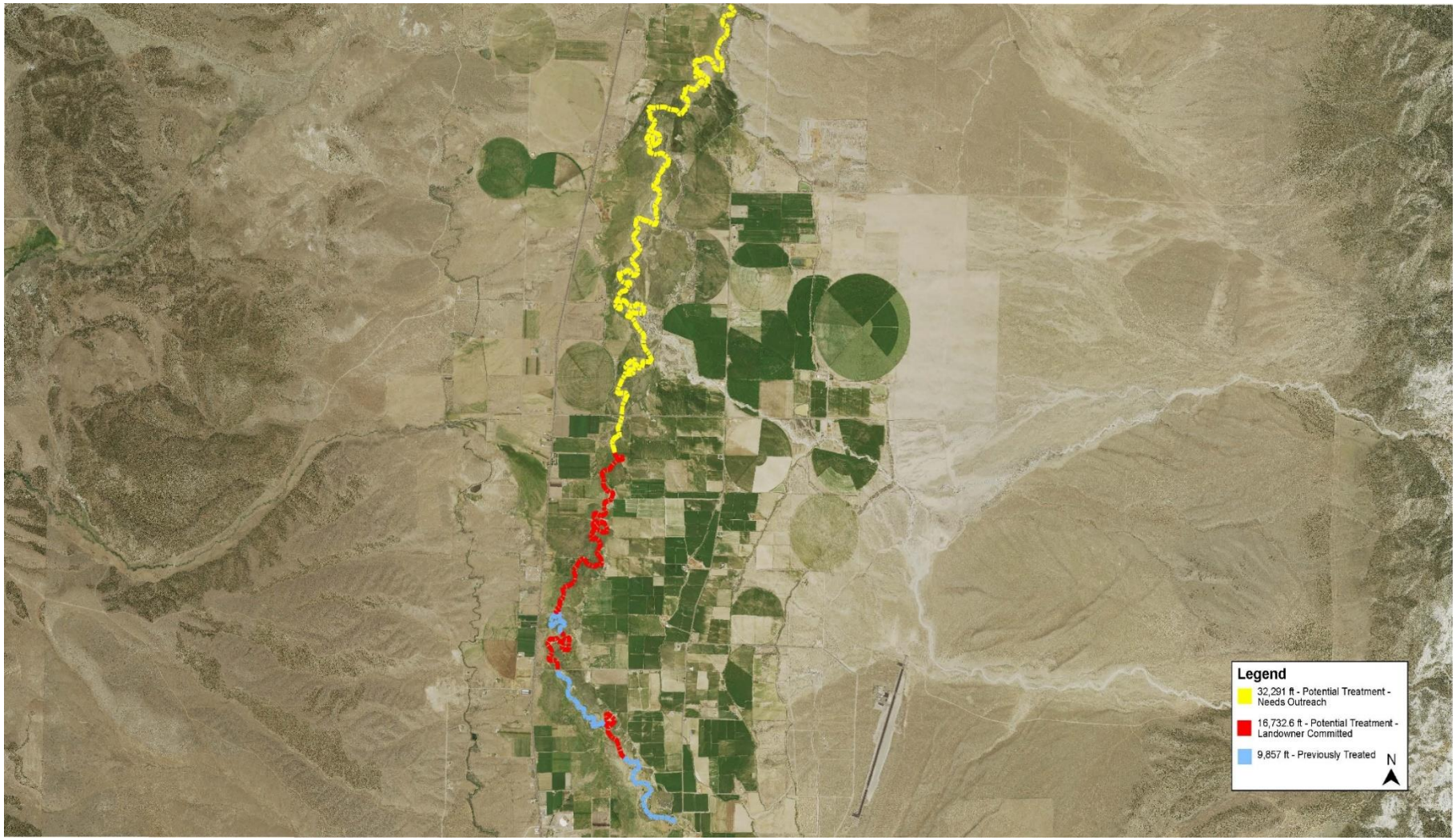


Figure 4.4.a Treatment Areas

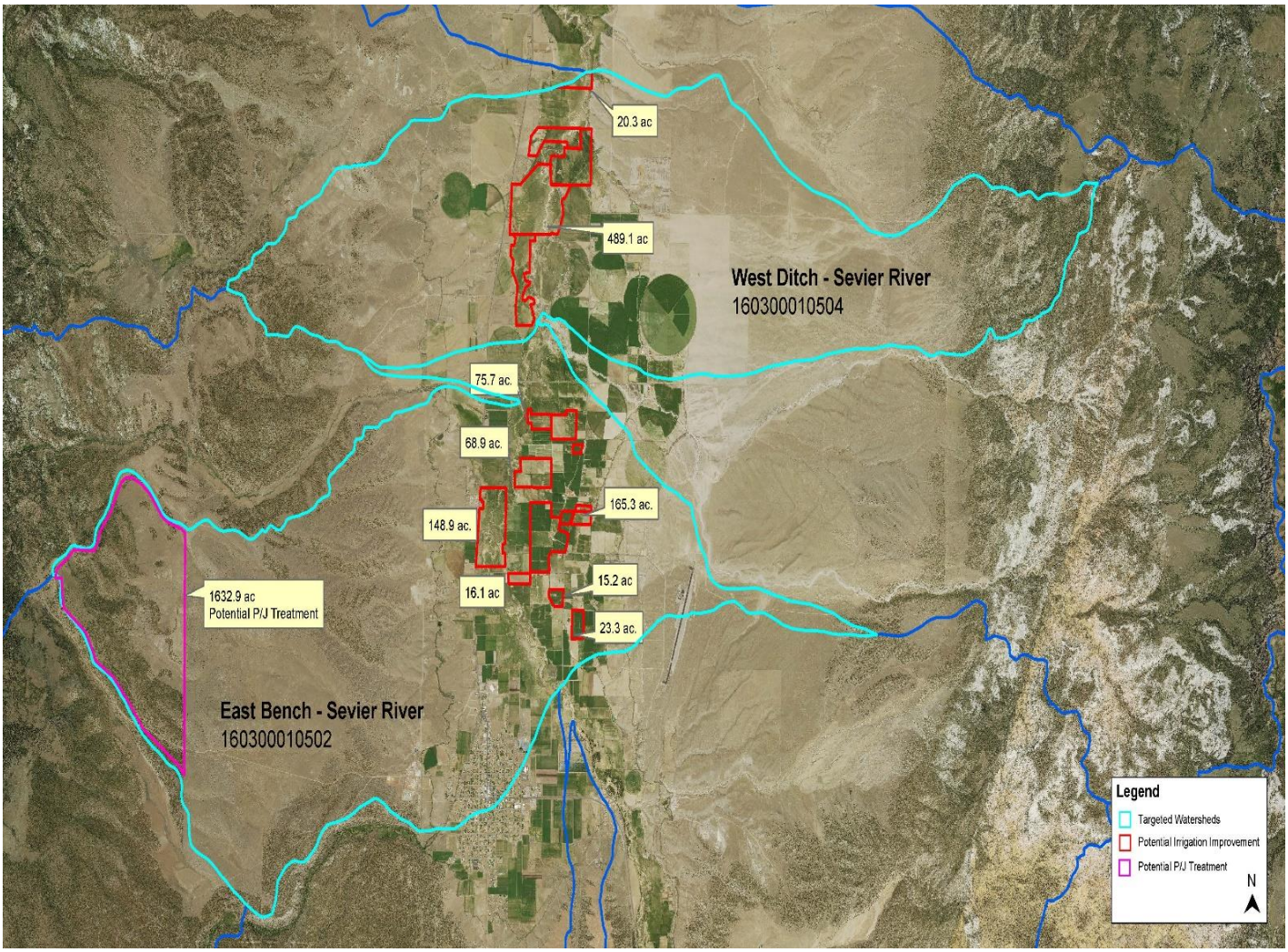


Figure 4.4.b Potential Treatment Areas

Table 4.4.4 Practice Quantities and Cost Estimates for West Ditch Watershed

Practice	Cost	Unit	Quantity	Total Cost
Grazing Management Plan (110)	$4,333.42	ea	9	$39,000.74
Fence (382)	$2.05	ft	50,000	$10,2307.70
Tree/shrub Establishment (612)	$216.72	ac	70	$15,170.620
Sprinkler System (442)	$278.48	ac	2174	$605,408.80
Stream Bank and Shoreline Protection (580)	$17.49	ft	50,000	$874,615.40
Total Cost				**$1,636,503.00**

Resources

Dodds, W. (2003). *Personal Communication*. Upper Sevier Soil Conservation District.

Utah Division of Water Quality (2004). *Upper Sevier River, Total Maximum Daily Load and Water Quality Management Plan.* Retrieved from, https://documents.deq.utah.gov/water-quality/watershed-protection/total-maximum-daily-loads/DWQ-2015-006609.pdf

Utah Division of Water Quality (2004). *Upper Sevier Watershed Management Plan*. Retrieved from, https://deq.utah.gov/legacy/programs/water-quality/watersheds/docs/2015/08Aug/UpperSevier.pdf.

Natural Resource Conservation Service (2019) *NRCS Programmatic Cost Share List*

Environmental Protection Agency (2018) *User's Guide-Spreadsheet Tool for the Estimation of Pollutant Load (STEPL).* Retrieved from: http://it.tetratech-ffx.com/steplweb/STEPLmain_files/STEPLGuide404.pdf

5.0 Summary and Recommendations

5.1 Water Quality Impairments Description

The water quality impairments to the beneficial use of a cold water fishery is total phosphorus and habitat alteration.

5.2 Goal and Practice Efficiencies Description

509.4 acres of irrigation improvement in the watershed.

5.3 Interim Metrics to Track Progress

The practices for implementation will be 3-fold. Grazing management, streambank restoration, and irrigation water management. Monitoring trends will be evaluated using chemical field measurements at monitoring sites. Measurements will be collected with a calibrated multi-parameter probe and results submitted to the Utah Division of Water Quality (DWQ) cooperative monitoring coordinator. Measurements will include:

1. Dissolved oxygen (mg/L and % saturation)
2. pH
3. Specific conductance (in µS/cm)
4. Water Temperature (℃)
5. Discharge (cfs)

5.4 Locations of Critical Source Areas or Vulnerable Areas Needing Treatment

Map provided in Section 4.4 (Figure 4.4d2) shows the location of critical source areas that need treatment. Section 4, Table 3 shows all estimated load reductions and required load reductions for streambank stabilization, and irrigation improvements.

5.5 Description and Evaluation of Planned Practice Scenarios and Alternatives That Meet the Water Quality Objectives

The planned practice scenarios are grazing management, streambank stabilization and fencing, irrigation water management. The cost estimates are listed in Section 4, Table 4.

5.6 NEPA Documentation

USDA NRCS — NRCS-CPA-52 4/2013

ENVIRONMENTAL EVALUATION WORKSHEET

A. Client Name: West Ditch-Sevier River Watershed Area

B. Conservation Plan ID # (as applicable): East Bench Area Plan
Program Authority (optional):

C. Identification # (farm, tract, field #, etc as required):
Agricultural lands in the West Ditch Watershed area including crop, pasture, and grazing lands

D. Client's Objective(s) (purpose):
Implement a fully coordinated approach to reduce erosion on uplands and sedimentation in the Sevier River and its tributaries. Improve water quality (reduce Total P loading), riparian habitat, irrigation water management and grazing management.

E. Need for Action:
Existing TMDL shows the need to reduce Total Phosphorus from habitat degradation from agricultural activities, and nonpoint source pollution from rangeland.

H. Alternatives

No Action	√ If RMS ☐	Alternative 1	√ If RMS ☐	Alternative 2	√ If RMS ☐
Existing erosion along streambank and upland areas will persist.		Progressive Conservation System Alternative with the implementation of the following Practices; streambank and shoreline protection, pasture & rangeland management (Grazing management plans), fencing, brush management, tree and shrub establishment, sprinkler system, range planting, and irrigation water management.			

Resource Concerns

"In Section "F" below, analyze, record, and address concerns identified through the Resources Inventory process. (See FOTG Section III - Resource Planning Criteria for guidance). "

F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	I. Effects of Alternatives — No Action: Amount, Status, Description (Document both short and long term impacts)	√ If does NOT meet PC	Alternative 1: Amount, Status, Description (Document both short and long term impacts)	√ If does NOT meet PC	Alternative 2: Amount, Status, Description (Document both short and long term impacts)	√ If does NOT meet PC
SOIL: *EROSION*						
Sheet, Rill & Wind Erosion - Crop Not a Resource Concern.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Sheet, Rill & Wind Erosion - Pasture Erosion is greater than T on some fields where continuous grazing along the streambank occurs.	No Action	☐ NOT meet PC	Erosion will be addressed to tolerable levels by implemented practices.	☐ NOT meet PC		☐ NOT meet PC
Sheet, Rill & Wind Erosion - Farmstead Not a Resource Concern.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Sheet, Rill & Wind Erosion - Associated Ag Land Not a Resource Concern.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Sheet, Rill & Wind Erosion - Forest Site is unstable and has visible signs of erosion in heavily grazed areas.	Continued concerns with erosion without NRCS assistance.	☐ NOT meet PC	Site will become stable without visible signs of erosion with installed practices.	☐ NOT meet PC		☐ NOT meet PC
Sheet, Rill & Wind Erosion - Range Sheet, Rill and Wind erosion is a concern. RHA – Soil & Site Stability Rating is slight to moderate or Rangeland Planned Trend is not positive.	Continued concerns with erosion without NRCS assistance.	☐ NOT meet PC	RHA soil site stability will improve to slight or moderate with installed practices.	☐ NOT meet PC		☐ NOT meet PC
Concentrated Flow - Ephemeral Gully Erosion - Crop Not a Resource Concern. Ephemeral gullies are not occuring.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Concentrated Flow - Classic Gully Erosion- Crop Not a Resource Concern. Classic gullies are not present.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Concentrated Flow - Classic Gully Erosion - Pasture Not a Resource Concern. Classic gullies are not present.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Concentrated Flow - Classic Gully Erosion - Farmstead Not a Resource Concern. Classic gullies are not present.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Concentrated Flow - Classic Gully Erosion - Assoc Ag Land Not a Resource Concern. Classic gullies are not present.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Concentrated Flow - Classic Gully Erosion - Forest Not a Resource Concern. Classic gullies are not present.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Concentrated Flow - Classic Gully Erosion- Range Not a Resource Concern. Classic gullies are not present.		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Excessive Bank Erosion - Crop Not a Resource Concern. Streams, shorelines or water conveyance channels are not on or adjacent to cropland field(s).		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Excessive Bank Erosion - Pasture Banks are NOT stable. Muddy livestock river crossings and bank erosion is evident. Alternative water sites are not present.	Continued concerns with bank erosion without NRCS assistance.	☐ NOT meet PC	Banks will become stable, protected by roots or natural vegetation, wood, or rock or a combination of materials with little erosion or bank failures by implemented practices.	☐ NOT meet PC		☐ NOT meet PC
Excessive Bank Erosion - Farmstead Not a Resource Concern. Streams, shorelines or water conveyance channels are not on or adjacent to farmstead field(s).		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Excessive Bank Erosion - Assoc Ag Land Not a Resource Concern. Streams, shorelines or water conveyance channels are not on or adjacent to field(s).		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Excessive Bank Erosion - Forest Not a Resource Concern. Streams, shorelines or water conveyance channels are not on or adjacent to forest field(s).		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
Excessive Bank Erosion - Range		☐		☐		☐

Not a Resource Concern. Streams, shorelines or water conveyance channels are not on or adjacent to the rangeland.		NOT meet PC		NOT meet PC		NOT meet PC
SOIL: SOIL QUALITY DEGRADATION						
Organic matter depletion - Crop		☐		☐		☐
Not a Resource Concern. Permanent ground cover is greater than 80%.		NOT meet PC		NOT meet PC		NOT meet PC
WATER: EXCESS / INSUFFICIENT WATER						
Insufficient (inefficient use of irrigation water)	No change in irrigation efficiency without NRCS assistance.	☐	The irrigation system components and management will meet state specific efficiency criteria.	☐		☐
The planned land units are irrigated, and the system DOES NOT meet the the state-specific irrigation efficiency criteria.		NOT meet PC		NOT meet PC		NOT meet PC
WATER: WATER QUALITY DEGRADATION						
Excess nutrients in surface and ground waters - Crop		☐		☐		☐
Not a Resource Concern. Nutrient amendments are being applied according to soil/plant test recommendations and conservation practices are in place to minimize surface and ground water impacts.		NOT meet PC		NOT meet PC		NOT meet PC
Excess nutrients in surface and ground waters - Pasture	Continued concerns with nutrient transport to ground and surface waters concerns without NRCS assistance.	☐	Minimized surface and groundwater impacts due to practices implemented.	☐		☐
Continuous grazing along the Sevier River in the watershed contributes P to the River		NOT meet PC		NOT meet PC		NOT meet PC
Excess nutrients in surface and ground waters - Farmstead		☐		☐		☐
Not a Resource Concern. Conservation practices and managements are in place to minimize impacts to surface and groundwater AND surface and groundwater are protected from contamination due to runoff and leaching from storage sites, spills, and other concentrated sources.		NOT meet PC		NOT meet PC		NOT meet PC
Excess pathogens and chemicals from manure, bio-solids or compost applications - Crop		☐		☐		☐
Not a Resource Concern. Potential sources of pathogens or pharmaceuticals are not applied on the land.		NOT meet PC		NOT meet PC		NOT meet PC
Excess pathogens and chemicals from manure, bio-solids or compost applications - Pasture		☐		☐		☐
Not a Resource Concern. Potential sources of pathogens or pharmaceuticals are not applied on the land.		NOT meet PC		NOT meet PC		NOT meet PC
Excess pathogens and chemicals from manure, bio-solids or compost applications - Farmstead		☐		☐		☐
Not a Resource Concern. Potential sources of pathogens or pharmaceuticals are not applied on the land.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive sediment in surface waters - Crop		☐		☐		☐
Not a Resource Concern.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive sediment in surface waters - Pasture	Continued concerns with sediment transported to ground and surface waters without NRCS assistance.	☐	Heavy use areas will be stabilized, SVAP2 bank condition score will improve to ≥5 and upslope treatment and/or practices will address sediment delivery to the river.	☐		☐
Streams or shorelines are adjacent to the site, and banks, livestock or vehicle water crossings ARE NOT stable.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive sediment in surface waters - Farmstead		☐		☐		☐
Not a Resource Concern.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive sediment in surface waters - Assoc Ag Land		☐		☐		☐
Not a Resource Concern.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive sediment in surface waters - Forest		☐		☐		☐
Not a Resource Concern.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive sediment in surface waters - Range	Continued concerns with sediment transported to ground and surface waters without NRCS assistance.	☐	Heavy use areas will be stabilized, SVAP2 bank condition score will improve to ≥5 and upslope treatment and practices will address sediment delivery to river.	☐		☐
There are untreated sources of erosion and there are no streams or shorelines adjacent to the site.		NOT meet PC		NOT meet PC		NOT meet PC
AIR: AIR QUALITY IMPACTS						
PLANTS: DEGRADED PLANT CONDITION						
Undesirable plant productivity and health - Pasture		☐		☐		☐
Not a Resource Concern. Plant production and health is not a client concern.		NOT meet PC		NOT meet PC		NOT meet PC
Undesirable plant productivity and health - Range	Continued concerns with Plant-production and health without NRCS assistance.	☐	Range trend will improve with implementation of practices.	☐		☐
Trend is negative.		NOT meet PC		NOT meet PC		NOT meet PC
Inadequate structure and composition - Range	Continued concerns with plant communities' diversity, composition and structure concerns without NRCS assistance.	☐	Practices will be implemented to attain plant communities with adequate diversity, composition and structure to support desired ecological functions.	☐		☐
Trend is negative.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive plant pest pressure - Pasture		☐		☐		☐
Not a Resource Concern. Plant productivity is not limited from pest pressure.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive plant pest pressure - Forest		☐		☐		☐
Not a Resource Concern. Plant productivity is not limited from pest pressure.		NOT meet PC		NOT meet PC		NOT meet PC
Excessive plant pest pressure - Range		☐		☐		☐
Not a Resource Concern. Plant productivity is not limited from pest pressure.		NOT meet PC		NOT meet PC		NOT meet PC
ANIMALS: INADEQUATE HABITAT / FISH & WILDLIFE						
Habitat degradation - quantity and quality of food - Wildlife Modifier	Continued concerns with Habitat degradation without NRCS assistance.	☐	Quantity, quality and connectivity of food, water, space and cover in the planning area will support the life cycle requirements for fish & wildlife species after establishment of practices.	☐		☐
Conservation practices and management ARE NOT in place to meet or exceed species habitat model thresholds.		NOT meet PC		NOT meet PC		NOT meet PC
Habitat degradation - quantity and quality of water - Wildlife Modifier	Continued concerns with Habitat degradation without NRCS assistance.	☐	Quantity, quality and connectivity of food, water, space and cover in the planning area will support the life cycle requirements for fish & wildlife species after establishment of practices.	☐		☐
Streams ARE present on this site. Banks are degraded with continuous livestock grazing.		NOT meet PC		NOT meet PC		NOT meet PC
Habitat degradation - quantity and quality of cover/shelter - Wildlife Modifier		☐		☐		☐

Not a Resource Concern.		NOT meet PC		NOT meet PC		NOT meet PC
Habitat degradation - habitat continuity/space - Wildlife Modifier		☐		☐		☐
Not a Resource Concern.		NOT meet PC		NOT meet PC		NOT meet PC
ANIMALS: *LIVESTOCK PRODUCTION LIMITATION*						
Inadequate feed and forage - Grazing Modifier		☐		☐		☐
Not a Resource Concern. Feed and forage meets the needs of the livestock and supplemental feed needs are addressed.		NOT meet PC		NOT meet PC		NOT meet PC
Inadequate livestock shelter - Grazing Modifier		☐		☐		☐
Not a Resource Concern. Shelters MEET animal health and client needs.		NOT meet PC		NOT meet PC		NOT meet PC
Inadequate livestock water - Grazing Modifier		☐		☐		☐
Not a Resource Concern. Water quality and quantity IS adequately distributed to meet animal needs.		NOT meet PC		NOT meet PC		NOT meet PC
ENERGY: *INEFFICIENT ENERGY USE*						
HUMAN: *ECONOMIC & SOCIAL CONSIDERATIONS*						
Land Use						
Land use is currently livestock grazing along the riparian area and alfalfa hay production above the riparian area. Grazing also occurs on the uplands above the hay production.	No change in land use is expected.		Land use will not change on private lands. The area with the brush treatment will require a rest period to establish the range planting and grazing management plan.			
Capital						
Each client's ability to implement the proposed alternative will be determined on an individual basis.	No Effect		Client ability to install practices will be determined on an individual basis.			
Public Health and Safety						
Currently there are problems with Phosphorus loading into the Sevier River. wildlife and fishery habitats have deteriorated because of streambank damage by livestock grazing.	There may be negative effects for the clients involved and the community because of continued streambank damage.		Effects will be positive on the clients and community with the installation of proposed practices. No hazards have been identified.			

G. Special Environmental Concerns (Document existing/ benchmark conditions)	J. Impacts to Special Environmental Concerns — No Action: Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action	Alternative 1: Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action	Alternative 2: Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action
•Clean Air Act *Guide Sheet FS1 FS-2* No Nonattainment or Maintenance areas designated for non-attainment of air quality standards AND there are no Class 1 areas nearby. Source: EPA Non Attainment map.	No Effect Not applicable	☐ needs further action	No Effect Not applicable	☐ needs further action		☐ needs further action
•Clean Water Act / Sec 404 Waters of the U.S. *Guide Sheet* *Fact Sheet* The Sevier River are potential Waters of the US present in the planning area.	No Effect Not applicable	☐ needs further action	No Effect No discharge or placement of dredged or fill material into potential Waters of the US is planned or likely to occur from implemented practices.	☐ needs further action		☐ needs further action
•Clean Water Act / Sec 303 Impaired Waters *Guide Sheet* *Fact Sheet* Upper Sevier River TMDL completed in 2004 listed stream for Total Phosphorus and Habitat Alteration.	No Effect Not applicable	☐ needs further action	No Effect Practices will reduce degradation of 303(d) listed stream segment by stabilizing streambanks, and getting cattle off of the Sevier River	☐ needs further action		☐ needs further action
•Clean Water Act / Sec 402 National Pollutant Discharge Elimination *Guide Sheet* *Fact Sheet* No point-source discharges occur in planning area based on planner observation of field conditions.	No Effect Not applicable	☐ needs further action	No Effect No point source discharges will occur from planned practices.	☐ needs further action		☐ needs further action
•Coastal Zone Management *Guide Sheet* *Fact Sheet* No Coastal Zone Management Areas are in or near the planning area.	No Effect Not applicable	☐ needs further action	No Effect Not applicable	☐ needs further action		☐ needs further action
Coral Reefs *Guide Sheet* *Fact Sheet* No coral reefs or associated water bodies (e.g. embayment areas) are present in or near the planning area.	No Effect Not applicable	☐ needs further action	No Effect Not applicable	☐ needs further action		☐ needs further action
•Cultural Resources / Historic Properties *Guide Sheet* *Fact Sheet* There may be cultural resources or historic properties present in the Area of Potential Effect. See documentation in case file.	No Effect Not applicable	☐ needs further action	May Effect Consultation with SHPO will be completed and no adverse effect to cultural resources or historic properties is anticipated in the proposed APE	☐ needs further action		☐ needs further action
•Endangered and Threatened Species *Guide Sheet* *Fact Sheet* The Utah Praire Dog, Burrowing Owl, Northern Goshawk, Leatherside Chub, Greater Sage Grouse, Pygmy rabbit, the Bonneville Cutthroat trout and/or their habitats are present in proximity to the planning area, based on: the Utah List of Threatened, Endangered, and Sensitive Species; Panguitch Quad.	No Effect Not applicable	☐ needs further action	No Effect See attached documentation.	☐ needs further action		☐ needs further action
Environmental Justice *Guide Sheet* No low-income or minority populations or Indian Tribes live in proximity to the planning area.	No Effect Not applicable	☐ needs further action	No Effect Not applicable	☐ needs further action		☐ needs further action
•Essential Fish Habitat *Guide Sheet* *Fact Sheet* No essential fish habitat is in the planning area.	No Effect Not applicable.	☐ needs further action	No Effect Not applicable.	☐ needs further action		☐ needs further action
Floodplain Management *Guide Sheet* *Fact Sheet* The Panguitch Utah City area is in the FEMA floodplain map #4900700001B. The proposed practices will not encourage development of the floodplain or take away from the conservation goals of the Upper Sevier Watershed Plan of 2004	No Effect Not applicable	☐ needs further action	No Effect No increased flood hazard or other adverse effect to the existing natural and beneficial values of the floodplain or lands adjacent or downstream is likely because the proposed practices will enhance the ability of the floodplain to recover from flood events with the stabilization of the river bank.	☐ needs further action		☐ needs further action

Invasive Species Guide Sheet / Fact Sheet Rabbitbrush, Scotch Thistle and Cheatgrass, ARE present in or near the planning area. Source : DC Kristi Westwood.	No Effect Not applicable	☐ needs further action	No Effect Not applicable	☐ needs further action		☐ needs further action
•Migratory Birds/Bald and Golden Eagle Protection Act Guide Sheet / Fact Sheet There is migratory bird habitat and Golden Eagle habitat in the planning areaa.	No Effect Not applicable	☐ needs further action	No Effect No take of any migratory bird, nest, or egg is expected to occur because planned practices will not take place during their nesting period of March 1 August 31. There will be no take or disturb eagles because practices will not disturb any nesting or roosting areas.	☐ needs further action		☐ needs further action
Natural Areas Guide Sheet / Fact Sheet There are no designated natural areas present in or near the planning area.	No Effect Not applicable	☐ needs further action	No Effect Not applicable	☐ needs further action		☐ needs further action
Prime and Unique Farmlands Guide Sheet / Fact Sheet Prime farmlands (only if irrigated) and farmlands of statewide/local importance are present in the planning area.	No Effect No effect due to no change in land use.	☐ needs further action	No Effect No conversion of farmland to nonagricultural use is planned.	☐ needs further action		☐ needs further action
Riparian Area Guide Sheet / Fact Sheet Riparian areas along the Sevier River are present in the planning area.	No Effect Not applicable	☐ needs further action	No Effect Practices will maintain or improve water quality, water quantity, and fish and wildlife benefits provided by the riparian area(s).	☐ needs further action		☐ needs further action
Scenic Beauty Guide Sheet / Fact Sheet The area surrounds the Sevier River and has pastures adjacent to the river with alfalfa hay farms above the pastures, sagebrush grasslands above the hay farms and on the upland sites there are deciduous forests	No Effect No change from benchmark conditions.	☐ needs further action	No Effect Planned practices will blend into the scenic quality of the general landscape and not adversely affect the upper Sevier River watershed.	☐ needs further action		☐ needs further action
•Wetlands Guide Sheet / Fact Sheet Wetlands may be present in the planning area, but no official designation of wetlands has been made.	No Effect No impact to wetlands is expected without NRCS assistance.	☐ needs further action	No Effect No effect on wetlands in or near the planning area is expected because the planned practices should enhance wetlands.	☐ needs further action		☐ needs further action
•Wild and Scenic Rivers Guide Sheet / Fact Sheet No Federal or State designated Wild, Scenic, or Recreational river segments or rivers listed in the Nationwide Rivers Inventory (NRI) are present in or near the planning area.	No Effect Not applicable	☐ needs further action	No Effect Not applicable	☐ needs further action		☐ needs further action

K. Other Agencies and Broad Public Concerns	***No Action***	***Alternative 1***	***Alternative 2***
Easements, Permissions, Public Review, or Permits Required and Agences Consulted. A 404 Permit will be obtained from the Utah Division of Water Rights and the Army Corps of Engineers before the installation of any practices. The NRCS State Cultural Resources Specialist will also be consulted before any practices are implemented on individual farms or public lands. Land management agencies (BLM, USFS) will also be consulted when practices occur on land managed by them.	None Required	404 Permit, USACE; 401 Certification, State Agency Section 106 review, SHPO	
Cumulative Effects Narrative (Describe the cumulative impacts considered, including past, present and known future actions regardless of who performed the actions) No known cumulative effects.	None	None	
L. Mitigation (Record actions to avoid, minimize, and compensate) **Any mitigation measures will be considered as the planning continues into individual conservation plans for affected landowners.**			
M. Preferred Alternative (√ preferred alternative)	☐	☑	☐
Describe impacts (+ or -) on any resources not identified above:			
Supporting reason	This alternative meets the Sevier River Watershed Plan goals and furthers the recommended actions of the Upper Sevier TMDL of 2004. The proposed practices will stabilize the riverbank, improve water quality, and make better use of forage resources and wildlife habitat.		

N. Context (Record context of alternatives analysis) — regional | Watershed

The significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality

O. Determination of Significance or Extraordinary Circumstances

Intensity: Refers to the severity of impact. Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

If you answer ANY of the below questions "yes" then contact the State Environmental Liaison as there may be extraordinary circumstances and significance issues to consider and a site specific NEPA analysis may be required.

Yes	No	
☐	☑	• Is the preferred alternative expected to cause significant effects on public health or safety?
☐	☑	• Is the preferred alternative expected to significantly affect unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?
☐	☑	• Are the effects of the preferred alternative on the quality of the human environment likely to be highly controversial?
☐	☑	• Does the preferred alternative have highly uncertain effects or involve unique or unknown risks on the human environment?
☐	☑	• Does the preferred alternative establish a precedent for future actions with significant impacts or represent a decision in principle about a future consideration?
☐	☑	• Is the preferred alternative known or reasonably expected to have potentially significant environment impacts to the quality of the human environment either individually or cumulatively over time?
☐	☑	• Will the preferred alternative likely have a significant adverse effect on ANY of the special environmental concerns? Use the Evaluation Procedure Guide Sheets to assist in this determination. This includes, but is not limited to, concerns such as cultural or historical resources, endangered and threatened species, environmental justice, wetlands, floodplains, coastal zones, coral reefs, essential fish habitat, wild and scenic rivers, clean air, riparian areas, natural areas, and invasive species.
☐	☑	• Will the preferred alternative threaten a violation of Federal, State, or local law or requirements for the protection of the environment?

P. To the best of my knowledge, the data shown on this form is accurate and complete:

In the case where a non-NRCS person (e.g. a TSP) assists with planning they are to sign the first signature block and then NRCS is to sign the second block to verify the information's accuracy.

Signature (TSP if applicable)	Title	Date
Wayne Urie	Watershed Coord.	8/27/19
Signature (NRCS)	Title	Date

If preferred alternative is not a federal action where NRCS has control or responsibility and this NRCS-CPA-52 is shared with someone other than the client then indicate to whom this is being provided.

The following sections are to be completed by the Responsible Federal Official (RFO)

NRCS is the RFO if the action is subject to NRCS control and responsibility (e.g., actions financed, funded, assisted, conducted, regulated, or approved by NRCS). These actions do not include situations in which NRCS is only providing technical assistance because NRCS cannot control what the client ultimately does with that assistance and situations where NRCS is making a technical determination (such as Farm Bill HEL or wetland determinations) not associated with the planning process.

Q. NEPA Compliance Finding (check one)

The preferred alternative:		Action required
☑	1) is not a federal action where the agency has control or responsibility	Document in "R 1" below. No additional analysis is required
☐	2) is a federal action ALL of which is categorically excluded from further environmental analysis AND there are no extraordinary circumstances as identified in Section "O".	Document in "R 2" below. No additional analysis is required
☐	3) is a federal action that has been sufficiently analyzed in an existing Agency state, regional, or national NEPA document and there are no predicted significant adverse environmental effects or extraordinary circumstances.	Document in "R 1" below. No additional analysis is required
☐	4) is a federal action that has been sufficiently analyzed in another Federal agency's NEPA document (EA or EIS) that addresses the proposed NRCS action and its' effects and has been formally adopted by NRCS. NRCS is required to prepare and publish its own Finding of No Significant Impact for an EA or Record of Decision for an EIS when adopting another agency's EA or EIS document. (Note: This box is not applicable to FSA)	Contact the State Environmental Liaison for list of NEPA documents formally adopted and available for tiering. Document in "R 1" below. No additional analysis is required
☐	5) is a federal action that has NOT been sufficiently analyzed or may involve predicted significant adverse environmental effects or extraordinary circumstances and may require an EA or EIS.	Contact the State Environmental Liaison. Further NEPA analysis required.

R. Rationale Supporting the Finding

R.1 Findings Documentation	Conservation Planning, up to and including engineering design, is not a federal action; as long as there is no federal control.
R.2 Applicable Categorical Exclusion(s) **(more than one may apply)** 7 CFR Part 650 *Compliance With NEPA*, subpart 650.6 *Categorical Exclusions* states prior to determining that a proposed action is categorically excluded under paragraph (d) of this section, the proposed action must meet six sideboard criteria. See NECH 610.116.	

I have considered the effects of the alternatives on the Resource Concerns, Economic and Social Considerations, Special Environmental Concerns, and Extraordinary Circumstances as defined by Agency regulation and policy and based on that made the finding indicated above.

S. Signature of Responsible Federal Official:

Signature	Title	Date

Additional notes

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6.0 Appendix: Follow Up

The practices that are installed and implemented will be tracked and evaluated in all areas of the watershed with an emphasis placed on the critical areas. Monitoring of the water quality through sampling shown in the interim metrics (Section 5.3 above) and loading to the Sevier River within the watershed will allow the effectiveness of the practices to be assessed. The practices offered will include fencing livestock off of the riparian area and providing alternate watering facilities, streambank stabilization, Pinyon-Juniper treatment (Brush Management), tree establishment, range planting, sprinkler systems, and irrigation water management.

The local NRCS office in cooperation with the UDWQ and Utah Department of Agriculture and Food (UDAF) have a great history of working together to stabilize sections of the Sevier River in the past and will continue these efforts with continued NWQI watershed assessment funding.

Outreach Plan

To engage local agricultural producers in the West Ditch Watershed, the Panguitch field office, in conjunction with the UDAF Watershed Coordinator, will create opportunities for one on one contact with those landowners in the critical areas identified in the watershed plan, as well as the entire watershed. The Upper Sevier Watershed Coordinator will contact each producer in the respective watershed to gauge interest in implementing projects identified in the watershed plan. Past outreach campaigns conducted in adjacent watersheds have proven that one on one contact has the greatest success rate when implementing a watershed plan. Through the use of GIS tools, a map has been created to identify landowners within the watershed that have not been contacted to improve their property through a watershed project.

Initial Contact: The Upper Sevier Watershed Coordinator and NRCS staff will make personal contact with each cooperator to inform them that some or all of the land that they manage is located within an active watershed management area. This will help establish personal relationship between operators and NRCS field staff. This will also allow NRCS and UDAF staff to make contact with operators who have not engaged with conservation planners in the past; since most contact has historically been made through cooperator office visits.

Personal visits to their farms: After initial contact is made, appointments will be scheduled for staff to meet with operators/landowners on their property to further discuss the goals of the watershed and the opportunities available to them. During visits, the expectation will be that operators/landowners, NRCS staff, and the local watershed coordinator can walk the property managed by the landowner and discuss

the conservation practices that could be implemented on the landscape to help address resource concerns. Additional visits will be scheduled as needed to complete the necessary planning of the identified conservation practices identified to address the resource concerns.

Field Days/Informational Meetings: Annually, each fall, a watershed tour is planned and conducted by the Upper Sevier Watershed Committee and NRCS. This will tour allows landowners, operators, and the local community to learn about the progress being made in the watershed, technical and financial resources available to implement similar projects on their property, and to promote new innovate conservation practices and concepts. This tour will also allow attendees to network with their neighbors, the Panguitch NRCS Field Office staff and the Upper Sevier Field Office staff.