San Pitch River Watershed

Water Quality Management Plan

April 2017

Prepared for:

Division of Water Quality

Prepared by:

SANPETE CONSERVATION DISTRICT
Leading the way forward

Sanpitch Watershed Stewardship Group

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Abbreviated Words

Ac- acre
AFO- Animal Feeding Operation
ATV- All Terrain Vehicle
BMPs- Best Management Practices
BOR- Bureau of Reclamation
CAFO- Confined Animal Feeding Operation
Cfs- Cubic feet per second
CWA- Clean Water Act
DWSP- Drinking Water Source Protection
DWQ- Division of Water Quality
EPA- Environmental Protection Agency
M&I- Municipal and Industrial
MSE- Millennium Science and Engineering
NEPA- National Environmental Protection Agency
NRCS- Natural Resource Conservation Service
OHV- Off Highway Vehicle
PJ- Pinyon/ Juniper
SAR- Sodium Absorption Ration
SCD- Soil Conservation Service
SECI- Stream Erosion Condition Index
SSCD- Sanpete County Soil Conservation District
STATSGO- State Soil Geographical Database
STORET- Storage and Retrieval
SVAP- Stream Visualization Assessment Protocol
TDS- Total Dissolved Solids
TMDL- Total Maximum Daily Load
TP- Total Phosphorus
UACD- Utah Association of Conservation Districts
UDWRe- Utah Division of Water Resources
UDWR- Utah Division of Wildlife Resources
UDWRt- Utah Division of Water Rights
USDA- United States Department of Agriculture
USDI- United States Department of Interior
USFS- United States Forest Service
USGS- Utah State Geological Survey
WQMP- Water Quality Management Plan
WQS- Water Quality Standards
WWTP- Waste Water Treatment Plant

1 INTRODUCTION

1.1 Executive Summary

This document presents the revised Water Quality Management Plan (WQMP) for the San Pitch River Watershed located in Central Utah. To see the WQMP that was accomplished in 2006 see **Appendix 4**. The Sanpete County Soil Conservation District developed this WQMP with assistance from San Pitch River Watershed Stewardship Group. In February 2003, Millennium Science & Engineering assessed the water quality impairments of the San Pitch River, quantified loadings for limiting water quality parameters, and developed Total Maximum Daily Loads.

The purpose of this WQMP is to recommend a series of specific actions and management strategies to improve natural resource condition in the San Pitch River Watershed. If implemented, these recommendations are expected to reduce the introduction of salinity, sediment, and phosphorus into the San Pitch River each year **(Table 1)**. This would result in improvements to water quality, fisheries and aquatic wildlife, riparian and upland habitat, recreation, groundwater quality, storm water quality, sensitive species, source protection, and agricultural productivity while minimizing the effects of weeds, pests, and urban development.

Table 1 Executive Summary Table

Waterbody ID	**San Pitch River & Tributaries**	
Location	**Sanpete County, Central Utah**	
Pollutants of Concern	**Total Dissolved Solids**	
Impaired Beneficial Uses	**Class 4: Agricultural uses including irrigation of crops and stock watering**	
Loading Assessment		
TMDL Target		
Load	**Total Dissolved Solids**	
- Middle San Pitch River	**35,329 tons/yr.**	
- Lower San Pitch River	**19,197 tons/yr.**	
Load Reduction		
- Middle San Pitch River	**3,997 tons/yr.**	
- Lower San Pitch River	**4,401 tons/yr.**	
	• **Improve irrigation techniques on 300 acres** • **10 miles of streambank restoration** • **Improve 128,290 acres of rangeland/pasture with BMPs**	
Implementation Strategy	**BMPs**	**Irrigation Water Mgt.**
	Streambank Stabilization	**Nutrient Mgt.**
	Riparian Rehabilitation	**Range/Pasture Mgt.**

This watershed plan will target site-specific needs of individual landowners, while adhering to the overall goals and objectives of the San Pitch River Watershed Stewardship Group. The building blocks of the WQMP are conservation plans. Conservation plans target the site-specific needs of individual landowners, while adhering to the goals and objectives of the WQMP **(Table 19)**. The conservation plans include projects, management strategies

and implementation timetables with the intent of conserving natural resources and improving water quality and agriculture production.

1.2 EPA Nine Element Summary

To ensure that Section Clean Water Act (319) projects funded with incremental dollars make progress restoring waters impaired by nonpoint source pollution, watershed-based plans that are developed or implemented with Section 319 funds to address 303(d)-listed waters must include these nine elements listed below. Also, listed below are brief description on how this document meets each of the nine elements. These elements will help provide reasonable assurance that the nonpoint source load allocations identified in the Nonpoint Source TMDL will be achieved. The nine elements come from the EPA Supplemental Guidelines for the Award of Section 319 Nonpoint Source Grants to States and Territories in FY 2003 (EPA 2002).

a) *Identify causes and sources of pollution into the watershed.* In February 2003, Millennium Science & Engineering assessed the water quality impairments of the San Pitch River, quantify loadings for limiting water quality parameters, developed Total Maximum Daily Loads. **Section 3.2** describes the causes and sources that are attributing to the TDS loading in the San Pitch River Watershed. Also described in this section is how those causes and sources were identified. For a list of causes and sources see **Table 13.**
b) *Estimate pollutant loading into the watershed and the expected load reductions.* Load reductions are needed to ensure that the beneficial use of the San Pitch River will be meet. **Table 13** estimates the loading and the expect load reductions needed to meet TMDL endpoints. Quantities for each pollutant are described in **Section 3.2.1 Point Sources** and **Section 3.2.2 Nonpoint Sources.** These load reductions will result in decrease in salinity, sediments, phosphorus, and have other benefits to water quality and quantity.
c) *Describe management measures that will achieve load reductions and targeted critical areas.* Best Management Practices (BMPs) will be implemented to achieve load reductions and attain water quality goals and targets. BMPs are listed in **Table 20.** These BMPs will have improvements on irrigation systems, riparian, and other natural resources. For a map of the targeted areas for the San Pitch River Watershed see **Figure 7.**
d) *Estimate amounts of technical and financial assistance and the relevant authorities needed to implement the plan.* Financial assistance for this WQMP will come from a variety of sources. The key to successful implementation of projects is the participation of all the partners with funding, administration, technical assistance, equipment, and time. More is described in **Section 5.1.** There are many technical assistance and authorities needed to implement projects. The San Pitch River Watershed Coordinator will coordinate between agencies and parties to ensure operations are continually moving forward. More on technical assistance is described in **Section 5.2**.
e) *Develop an information and education component.* This element is described under **Section 4.3.** The Watershed Group and Conservation District have had an enormous effect on informing and educating the public and it is one of the major objectives of the San Pitch Watershed Plan. There will be tours of conservation projects, seminars to educate landowners, brochures, media information, and presentations at the Annual Watershed Education Day for students and other interested parties
f) *Develop a project schedule.* Schedule of projects being implemented depending on funding and time of year. For streambank and channel restoration projects usually will be implemented when water levels are low to minimize impacts to water quality. Other projects will be implemented based on availability of funding. See **Table 20** in **Section 5.3** for more details.
g) *Describe the interim, measurable milestones*. See **Table 21** in **Section 5.3** for more details for measurable milestones. Milestones will be achieved after each projects implementation. These milestones show the willingness and the cooperation of many individuals and parties improving the quality of life in the San Pitch River Watershed.
h) *Identify indicators to measure progress.* This element is described under **Section 5.4.** Project success will be demonstrated through monitoring efforts. Indicators that will be used to show progress will be a project scale basis. Monitoring strategies are listed in **Table 22** under *"Project Scale Monitoring".*
i) *Develop a monitoring component.* This element is described under **Section 5.4.** A Sampling and Analysis Plan was completed in 2013 by the Utah Division of Water Quality and includes a number of partners helping in

data collection and reporting. See **Table 22** for schedule of roles and responsibilities for monitoring **(Appendix 2)**.

1.3 Lead Sponsor

The San Pitch Watershed Stewardship Group and the Sanpete County Soil Conservation District are the lead sponsors in the watershed work and they have completed a tremendous amount of work implementing projects in the San Pitch River Watershed.

1.4 Local Support

Thanks to the many individuals representing private interests, and federal, state and local government agencies who have cooperated to bring this document to completion. Under the leadership of the Sanpete County Soil Conservation District (SSCD), the members of the San Pitch River Watershed Stewardship Group have provided technical assistance, editorial support, report preparation, data collection and analysis in this plan. A list of contributors is provided in **Appendix 3**.

2 WATERSHED CHARACTERIZATION

2.1 Physical and Natural Features

2.1.1 Watershed Location and Boundary

The San Pitch River Watershed is almost entirely within the Sanpete County. A few small areas of land on the west side of the watershed are within Juab County. The San Pitch River Watershed drains approximately 282,100 acres (440.7 sq. miles) and flows through the Sanpete County, located in central Utah, roughly 90 miles south of Salt Lake City. The San Pitch River flows generally from north to south through the central part of Sanpete Valley and at the south end of the watershed it curves west to its confluence with the Sevier River (**Figure 1**).

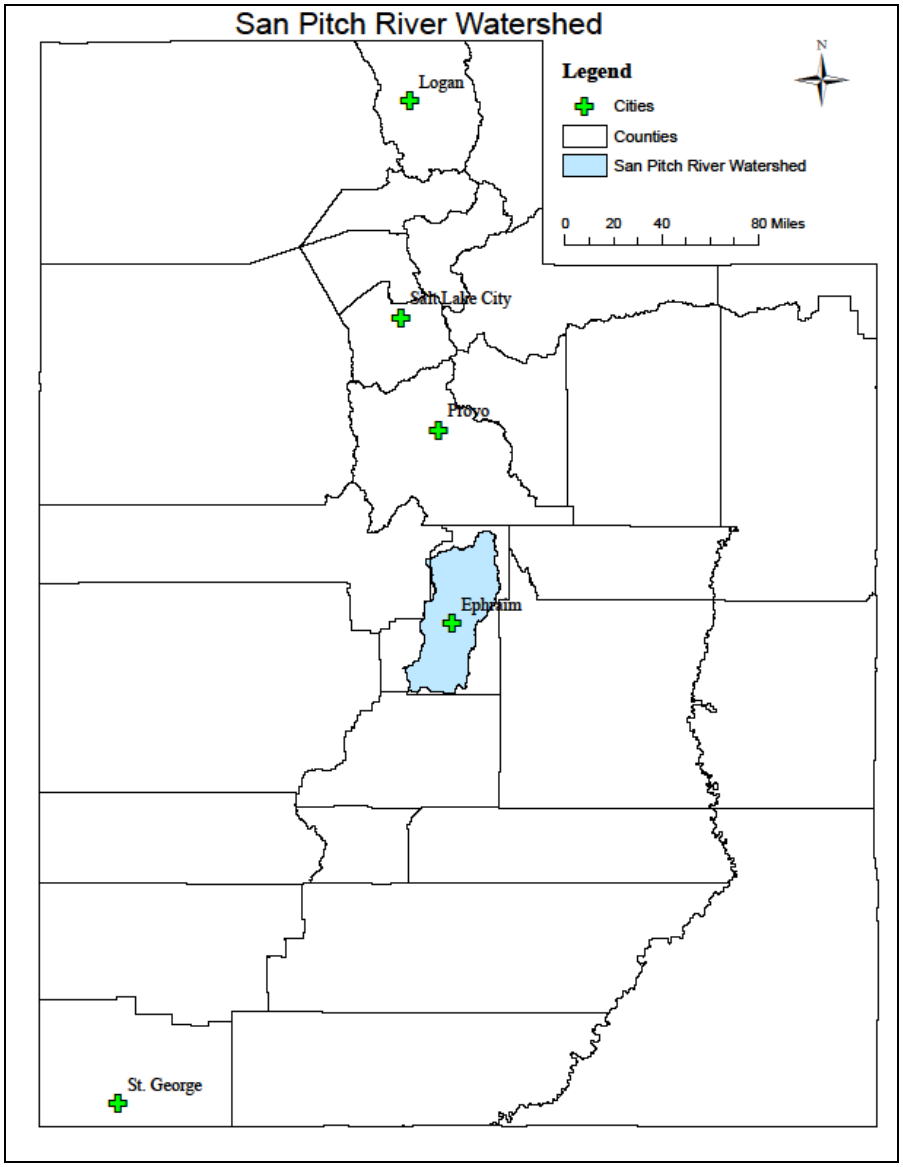

Figure 1 Location of the San Pitch River Watershed

The San Pitch River Watershed boundary is defined by the USGS HUC #16030004. HUC numbers are based on mostly topographic ridgelines and geography. It has been noted that HUC numbers do not take into account actual hydrologic conditions and water usage. The San Pitch Watershed boundary has been changed to include areas of Gunnison, Centerfield and Axtell for this document (**Figure 1**).

Gunnison, Centerfield, and Axtell do not have natural drainage areas supplying irrigation water to nearby farms. To overcome this, irrigation companies in these areas have created irrigation ditches that supply irrigation water from Twelve Mile Canyon. According to the HUC number designation, Twelve Mile Canyon lies within the San Pitch River Watershed boundary, but Centerfield and Axtell areas are not included within this boundary. Based on this knowledge, the Watershed Stewardship Group has adopted HUC boundaries as well as looking at hydrologic conditions and water usage. This decision was based on water quality issues and usage of irrigation water.

2.1.2 Surface Water Hydrology

The majority of the water in the river originates from snowmelt from the Wasatch Plateau in the east. The tributaries draining the San Pitch Mountains on the west and north are not a significant source of spring snowmelt but do contribute flows during isolated storm events.

Approximately 11,000 acre feet per year (acre-ft. /yr.) of water from the Colorado River Basin are brought into the San Pitch River drainage basin via 13 tunnels and ditches (Wilberg and Heilweil, 1995). The number of transbasin diversions represents less than 10 percent of the cumulative average annual streamflow (Wilberg and Heilweil, 1995). The major transbasin diversions include the Ephraim, Fairview, Manti, and Spring City tunnels; some of this water is from Fairview Lakes and Lower Gooseberry Reservoir (Wilberg and Heilweil, 1995). An additional transbasin diversion, the Narrows Project, has been planned to bring supplemental water supply to water users in north Sanpete County, Utah.

Most surface water inflow in Sanpete Valley is diverted for irrigation purposes. San Pitch River is managed according to the 1936 Cox Decree, which sets forth all the water rights for the Sevier River system. Flows in the San Pitch River are regulated for irrigation, storage, and release. Segments of the river are dewatered to various degrees. Consequently, the best available flow information is collected at the water diversion gages operated by Division of Water Rights. Where the river is completely diverted, these diversion gages provide the best estimate of the flow in the river prior to diversion. The diversion locations are listed in (**Table 2**).

Table 2 Division of Water Rights Gauging Stations

SEGMENT	DIVERSION
Middle San Pitch River	Upper Rock Dam
	Lower Rock Dam
	Bagnal Canal
	West Point Canal
	East Drainage Canal
	West Drainage Canal
	San Pitch River West of Manti
Lower San Pitch River	San Pitch River Below Old Field Canal
	Old Field Canal

2.1.3 Groundwater Hydrogeology

Groundwater hydrogeology refers to the occurrence and movement of water below the Earth's surface. Four main sources of recharge to the groundwater reservoir have been estimated by Wilberg and Heilweil (1995) including: 1) tributaries, 2) seepage from the San Pitch River, 3) deep percolation of unconsumed irrigation water, and 4) precipitation. Recharge from tributaries occurs where the streams flow across alluvial fans. Sanpete Valley area obtains groundwater from unconsolidated deposits of the valley-fill aquifer (Wilberg and Heilweil, 1995). However, fractured-rock aquifers are important sources of water in Sanpete Valley; they yield water to springs and some wells in Sanpete Valley (Wilberg and Heilweil, 1995).

The primary source of water for irrigation is surface water; however, groundwater is pumped when surface water supplies are inadequate. Nearly all of the groundwater from well withdrawals is applied and is an important source for irrigation water in Sanpete Valley (Wilberg and Heilweil, 1995). Some groundwater from wells has yielded water that is saline and not suitable for culinary use **(Appendix 1)**. Southwest of Manti (near STORET 494645) the Sanpete Valley narrows and is constrained by bedrock outcrops which impede most groundwater flow out of the valley (Lowe, 2000; Wilberg and Heilweil, 1995; Robinson, 1971). In this area, confined groundwater is forced to the surface and forms a large marshy area extending as far north as Manti, about 2 miles north of the north end of Gunnison Reservoir (Lowe, 2000; Wilberg and Heilweil, 1995; Robinson, 1971). Therefore, the only outlet for this groundwater is the San Pitch River.

The valley-fill aquifer is the principal source of drinking water for residents of Sanpete Valley, although springs along the valley margins are also used as a drinking water source. Preservation of good groundwater quality is a critical issue for land-use planning and resource management in Sanpete County. The Wasatch Plateau's foothills are an important area for groundwater recharge and have been identified as sensitive areas for groundwater protection. The valley bottoms from Moroni south to Gunnison Reservoir are predominantly wet meadows in the region of groundwater discharge. Water quality of the Sanpete Valley groundwater has been studied extensively by Lowe (2000); Wilberg and Heilweil (1995); and Robinson (1971). Additional groundwater quality data were collected by the Utah Geological Survey (UGS) from 107 wells during the summer and autumn of 1996 and spring of 1997 to evaluate TDS (Lowe et.al, 2000).

2.1.4 Geology and Soils

The San Pitch River is in the Basin and Range-Colorado Plateau transition zone (Stokes, 1988). Geologic units exposed in the Sanpete Valley area range from Jurassic to Quaternary in age (**Figure 2**). Geology and soil that is in the San Pitch River Watershed are an important natural source of TDS loading to groundwater beneath the Sanpete Valley and the San Pitch River. The Arapien shale is the leading contributor, which is mined west and south of Sanpete Valley for salt, can be seen between some of the ridges (Chronic, 1990). Many authors attribute the cause of increased groundwater salinity/TDS beneath the Sanpete Valley to the evaporites from the Arapien Shale, and the Green River and Crazy Hollow Formations (Utah Division of Water Resources, 1999; Lowe, 2000; Wilberg and Heilweil, 1995; Robinson, 1971; and Richardson, 1907).

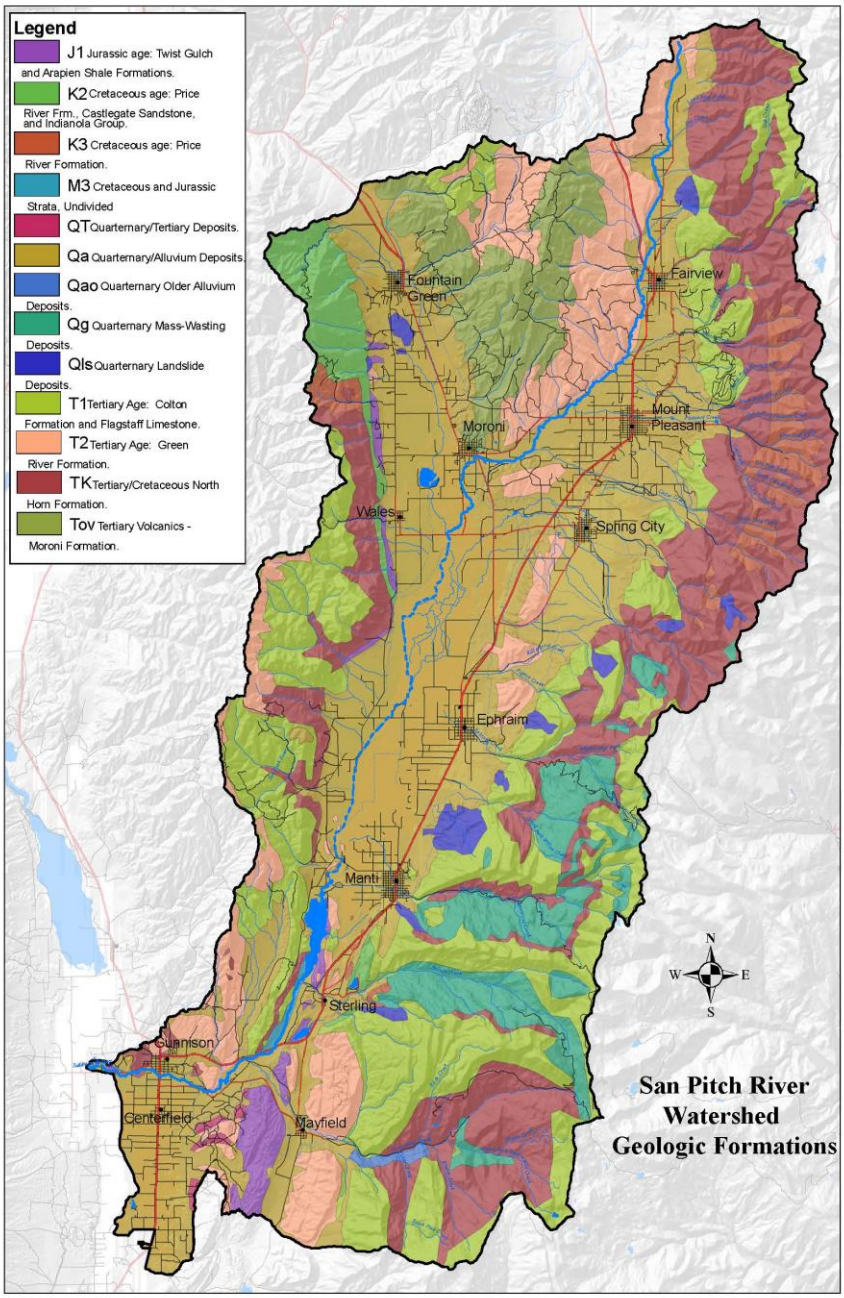

Figure 2 Geologic Formations in San Pitch River Watershed

Soil data for the Sanpete Valley were collected from the USDA Soil Conservation Service (USDA SCS, 1981) and the State Soil Geographic Database (STATSGO) dataset. The USDA Soil Conservation Service also perform a Soil Survey of Sanpete Valley (USDA SCS, 1981) which provided a general soil map and a detailed soil maps drawn on aerial photographs with detail descriptions of each soil type (**Figure 3 and Appendix 1**).

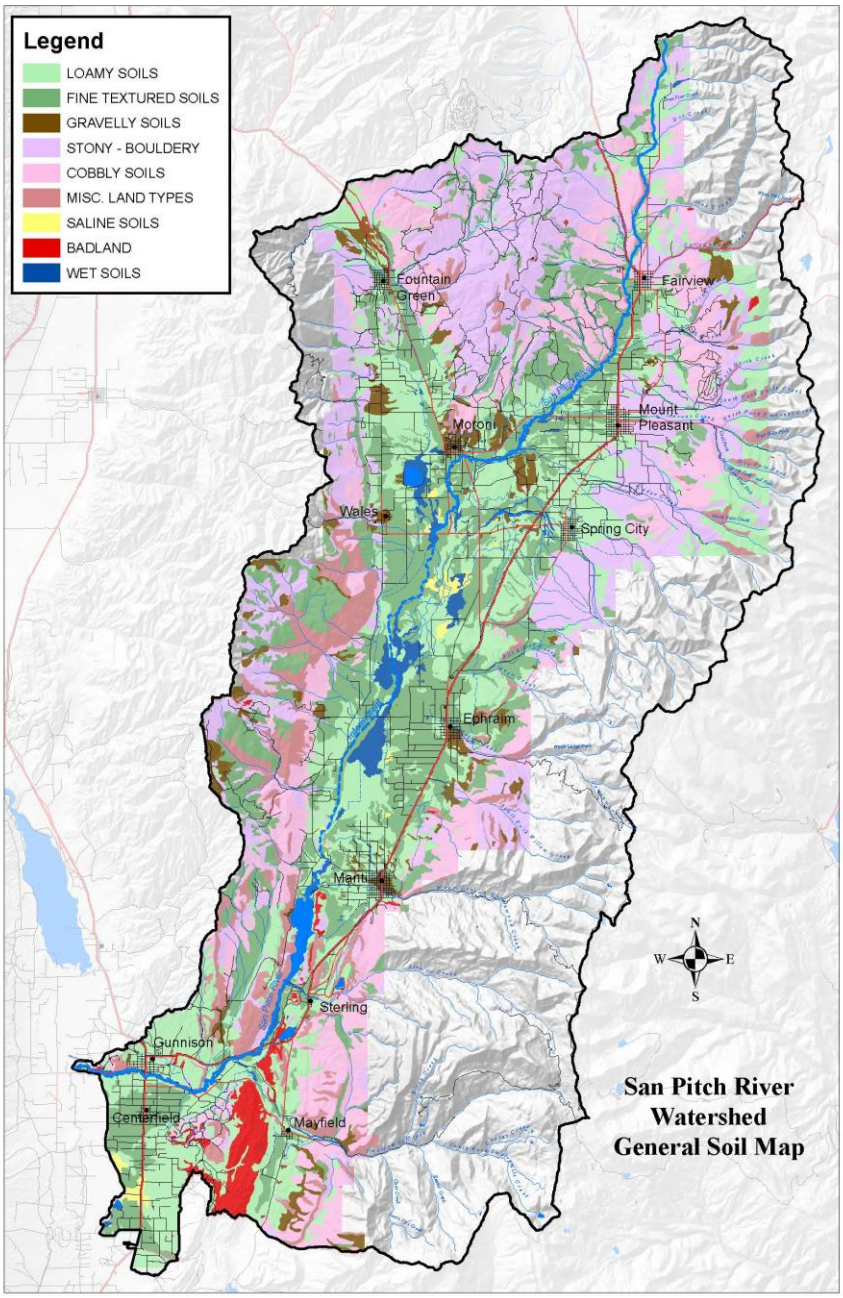

Figure 3 General Soil Formations in San Pitch River Watershed

2.1.5 Climate

The climate is influenced by the large variations in topography. Elevation of the Sanpete valley floor ranges from 5,040 to 7,400 feet above sea level. Despites its high elevation, the Sanpete Valley climate is semi-arid with annual precipitation ranges from approximately 8 inches in the lower valley to more than 30 inches in the higher mountains. Most of the precipitation in the San Pitch River Watershed falls as snow in the mountains, particularly the Wasatch Plateau, from November to April (Robinson, 1971). **Table 3** summarizes the annual temperature and precipitation for Sanpete County, Utah.

Table 3 Climate and Precipitation for Sanpete County, Utah. Data collected from the US climate data.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Average Max. Temperature (˚F)	34	40	50	58	69	80	88	86	76	63	48	35	61
Average Min. Temperature (˚F)	10	14	23	28	35	43	50	49	40	29	20	10	29
Average Total Precipitation (in)	0.94	1.06	1.38	1.22	1.26	0.79	0.75	0.87	1.18	1.42	1.06	1.18	13.1

2.1.6 Biology and Vegetation

Biology

San Pitch River Watershed supports a diverse wildlife community. Year around habitat exists throughout all or part of the watershed for elk, mule deer, etc. However, limited winter forage for the number of wildlife is present. The watershed's riparian corridor provides habitat for many migratory birds. Sanpete County's wildlife according to DWR includes, but is not limited to:

Table 4 Sanpete County's Wildlife

Sanpete County's Wildlife	
Band-tailed Pigeon	Black Bear
Blue Grouse	Cougar
Elk	Bobcat
Moose	Black-tailed Jackrabbit
Mule Deer	Cottontail Rabbit
Ruffed Grouse	

Note: There are also historic documents that Sage Grouse inhabited Sanpete County.

DWR has classified most of the San Pitch River and its tributaries according to their ability to produce sport fish and other aquatic life (DWR, ~1980). Fish species present in the San Pitch River include: Rainbow Trout (RT), Bonneville Cutthroat Trout (CTBV), Brown Trout (BN), Brook Trout (BK), Carp (CC), Leatherside Chub (CBLS), Red Side Shiner (SKMT), Speckled Dace (DCSP), Mountain Sucker (SKMT), Mottled Sculpin (SCMT), which are all mentioned in **Table 5** and their locations. This table also summarizes the San Pitch River and its tributaries for species, stream classification, and fishery type as the following:

Stream Classification:

1 Blue ribbon trout stream, high productivity, aesthetics, and accessibility.
2 Excellent trout streams, they lack only one element compared to class 1
3 Support the bulk of stream fishing pressure in Utah
3B Spawning and nursery habitat
4 Typically poor in quality with limited sport fish
5 Of little value to sport fishery
6 Dewatered for significant amount of time.

Table 5 San Pitch River Watershed Stream and Species Classification

Stream	Stream Reach	Miles	Class	Species
San Pitch River	Sevier River-Div. E. Gunnison	5.7	6	

San Pitch River	Div. E Gunnison-Gunnison Res.	7.5	4	CC, CBLS, DCSP, SRRS, SCMT
San Pitch River	Gunnison Res.- Br. W Manti	2	4	CC
San Pitch River	Br. W Manti-Div. 1mile E U132	22.5	6	
San Pitch River	Div. 1mile E U132-s Spring Cr.	9.8	3	RT, BN, BK, SCMT ,CBLS
San Pitch River	S. Spring Creek-Milburn	5.8	3B	RT, BN, BK
San Pitch River	Milburn- Div. 1mile N	1	6	
San Pitch River	Div.- N Fk. San Pitch River	3	3	CTBV, SCMT
Twelve Mile Creek	San Pitch - Gunnison Canal Div.	0.9	6	
Twelve Mile Creek	Gunnison Canal Div.-N, S Fk.	7.8	4	RT, BK, SCMT
N Fk. Twelve Mile Creek	Twelve Mile Creek- HW	5.8	4	RT
S Fk. Twelve Mile Creek	Twelve Mile Creek- HW	5.8	4	RT, CTBV
Six Mile Creek	San Pitch- Beaver Creek	8.8	4	RT, CTBV
Six Mile Creek	Beaver Creek- HW	5.5	4	RT, CTBV, BK
S Fk. Six Mile Creek	Six mile Creek- HW	4	4	
Manti Creek	San Pitch- Div. 1st S. Manti	4.4	6	
S. Fk. Manti Creek	Manti Creek- HW	3.5	3	CTBV
N Fk. Manti Creek	Manti Creek- HW	3.9	4	CTBV
Willow Creek	San Pitch- Div. Canyon Mouth	5	5	
Willow Creek	Div. Canyon Mouth-HW	5.6	5	
Ephraim Creek	San Pitch- 2nd W. 1st N Ephraim	5.3	6	
Ephraim Creek	2nd W 1st N Ephraim- HW	8.6	4	CTBV, RT, BK
New Canyon Creek	Ephraim Creek- HW	4	4	
Oak Creek	San Pitch-U30 Spring City	7	6	
Oak Creek	U30-Power Plant	3.9	4	RT, CTBV, BN, BK
Oak Creek	Power Plant Div.- HW	4.1	4	
Canal Creek	Oak Creek- Div. Canyon Mouth	6.5	6	
Canal Creek	Div. Canyon Mouth-HW	7.2	4	
Cedar Creek	San Pitch- HW	1	3	RT, BN, BK
Pleasant Creek	San Pitch-Power Plant	7	4	RT, BK
Pleasant Creek	Power Plant- HW	4.8	4	RT
Coal Fork Creek	Pleasant Creek- HW	2.1	4	BK
Cove Creek	San Pitch River- HW			
Birch Creek	San Pitch- Div. Shares Dev.	4.2	6	
Birch Creek	Div. Shares Development- HW	5.3	3	RT, CTBV, BN
S. Fk. Birch Creek	Birch Creek- HW	3.6	3	RT, CTBV, BN, BK

S. Spring Creek	San Pitch- HW	1.3	3	RT, CTBV, BN, BK, SCMT
Cottonwood Creek	San Pitch- Div. 4th S. Fairview	1.2	6	
Cottonwood Creek	Div. 4th S Fairview-HW	5	3	RT, CTBV, BN, BK
L Fk. Cottonwood Creek	Cottonwood Creek- HW	1.8	4	RT, CTBV, SCMT
Oak Creek	SR-Div. Canyon Mouth	2	6	
Oak Creek	Div. Canyon Mouth- HW	7	3B	RT, CTBV
Dry Creek	Div. Canyon Mouth- HW	1.5	6	
Silver Creek	Wales Res.- HW	1.5	4	CC, SKMT
Fountain Green Creek	Div.- HW	1.1	4	RT, CTBV

Species found in impounded (lakes and reservoirs) waters in the San Pitch River Watershed include: Rainbow Trout (RT), Bonneville Cutthroat Trout (CTBV), Brown Trout (BN), Brook Trout (BK), Channel Catfish (CF), Black Bullhead (BB), Carp (CC), Utah Chub (CBUT), Largemouth Bass (BSLM), Bluegill (SFBG), and Yellow Perch (PYCL). The following **Table 6** summarizes all the impounded water bodies, with their species identification, and water quality classification:

Table 6 San Pitch River Watershed Impounded Waters and Species Classification

Impounded Waters Section	Fishery Type	Species
Beaver Dam Reservoir	Cold Water	RT, CTBV, BK
Blue in the Corner	Cold Water	RT, CTBV, BK
Community Lake	Cold Water	RT
Deep Lake	Cold Water	RT
Fairview Reservoir	Cold Water	RT,BK
Gunnison Reservoir	Warm Water	CF, CC, CBUT, BSLM, SFBG, PYCL
Island Lake	Cold Water	CTBV
Logger Lake	Cold Water	RT, BK
Love ridge Flat Pond	Cold Water	RT, CTBV, BK
New Canyon Reservoir	Cold Water	RT
Nine Mile Reservoir	Cold Water	RT, CTBV, BN
Palisade Reservoir	Cold Water	RT
Lower Pete's Reservoir	Cold Water	RT, CTBV, BK
Shingle Mill Reservoir	Cold Water	RT, CTBV, BK
Strate Pond	Cold Water	RT, BK, BB
Towne Reservoir	Cold Water	RT, BK, CBUT
Twin Lake	Cold Water	RT, BN, BK
Yearns Reservoir	Cold Water	RT

Note: Should be noted that fish in most water bodies do not survive thru the winter, and are restocked yearly

There are several sensitive species with potential habitat within the San Pitch River Watershed. These include:

Table 7 Sensitive Species with potential habitat within the San Pitch River Watershed

Sensitive Species in San Pitch River Watershed	
Bald Eagle	Kit Fox
Bonneville Cutthroat Trout	Leatherside Chub
Brown (Grizzly Bear)	Lewis's Woodpecker
Burrowing Owl	Nine Mile Pryg (mollusk)
Canada Lynx	Northern Goshawk
Colombia Spotted Frog	Southern Bonneville Spring snail
Ferruginous Hawk	Three-toed Woodpecker
Grasshopper Sparrow	Utah Prairie-dog
Greater Sage-Grouse	Western Toad

Vegetation

There are five general vegetation types that occur within the San Pitch River Watershed from the mountain plateaus that are located above 8,000 feet and receive 20-35 inches of precipitation annually; to the valley floors that receive less than 8 inches of precipitation annually (**Table 8)**.

Table 8 Five general vegetation types that occur within the San Pitch River Watershed

Elevation (ft.)	Precipitation (inches)	Vegetation Species
8,000 +	20 - 35	White fir, Douglas fir, Ponderosa pine, Spruce, Quaking Aspen, and Sagebrush
7,500 - 8,500	18 - 25	Gamble oak, Serviceberry, Curl leaf mountain mahogany, and Sagebrush
5,000 - 7,500	10 - 20	Pinyon pine, Utah Juniper, brush, grasses, Forbes, and Sagebrush
4,500 - 5,000	8 - 10	Northern desert shrub and Sagebrush

Other types of important vegetation include Indian rice grass, needle and thread grass, winter fat, black greasewood, and shad scale. Most of these are found in the low lands where soils are affected by salts. In addition, barren areas include desert playas, recent extrusions of volcanic basalt, and areas covered predominantly with annual weeds such as pickle weed and gray Molly (Utah Division of Water Resources, 1999). In 1971, Robinson estimated the phreatophytes in Sanpete Valley, principally salt grass, wiregrass, greasewood, and rabbit brush, in the mid-1960s to cover about 45,200 acres in an area southwest of Manti.

Pests and Weeds

Noxious weeds are undesirable, invasive, and are very difficult to control. These plants tend to reduce vegetation productivity, promoting upland soil erosion. Noxious weed populations change drastically over growing seasons, and are very difficult to control.

Currently there are thousands of acres of weeds in the watershed that are treated annually with herbicides. Manual treatment is used when site conditions warrant it. Currently, a Weed Management Group within the county is conducting study's using goats to control Russian Knapweed. Some noxious weeds have very shallow root systems which may lead to excess soil erosion, nutrients, and TDS to the San Pitch River and its tributaries.

Local working groups within Sanpete County, San Pitch Coordinated Weed Management Area, have formed to help map out the noxious weed populations in the area. Noxious weeds of concern in the area are listed in **Table 9.** Because pest control methods change so rapidly, check the weed management handbook for up to date information

(Cooperative Extension Services, 2007). Also, licensed pest control personnel can recommend the best control methods to use.

Table 9 Noxious Weeds in Sanpete County, Utah

Noxious Weeds		
Black Henbane	Leafy Spurge	Scotch thistle
Canada thistle	Morning Glory	Small White top
Dalmatian toad flax	Musk thistle	Spotted knapweed
Dyer's woad	Quack grass	Tall White top
Hounds tongue	Russian knapweed	Velvet leaf

2.2 Economy and Demographics

2.2.1 Population

The first white settlers in Sanpete Valley were Mormons who arrived in the area in 1849. Sanpete County was created in the 1850 with Manti as the county seat. United States Census Bureau estimates the population of Sanpete County to be 27,822 in April 2010 and 28,778 in July 2015 giving Sanpete County a growth rate of 3.4% every five years (United Sates Census Bureau, 2015). You can access specific demographic information for each city within the watershed area at: www.utah-demographics.com.

2.2.2 Land Use/Land Cover

Nearly all of the land within the San Pitch River Watershed is presently used for some designated activity and most areas have several concurrent uses **(Figure 4)**. The primary land uses in Sanpete County are grazing and agriculture. Sanpete County has an area of 1,079,535 acres which is covered and used by mainly: federal, state, military, and private lands **(Table 10 and 11)**.

Table 10 Land Ownership and Use Statistics

Land Ownership/Use	Acres	Percent (%) of Total
Forest	390,889	36.2
BLM	136,729	12.7
Military	769	0.1
State	59,788	5.5
Private	434,427	40.2
Other Use	56,933	5.3
County Total	1,079,535	100.0

Table 11 Land Cover/Use Statistics

Land Cover/Use	Acres	Percent (%) of Total
Forest	390,889	36.2
Grain Crops	57,000	5.3
Conservation Reserve Program	0	0.0
Grass/Pasture/Hay lands	429,200	39.8

Row Crops	25	0.0
Shrub/Rangeland	180,700	16.7
Water	2,500	0.2
Wetlands	6,521	0.6
Developed	12,700	1.2
County Total	1,079,535	100.0

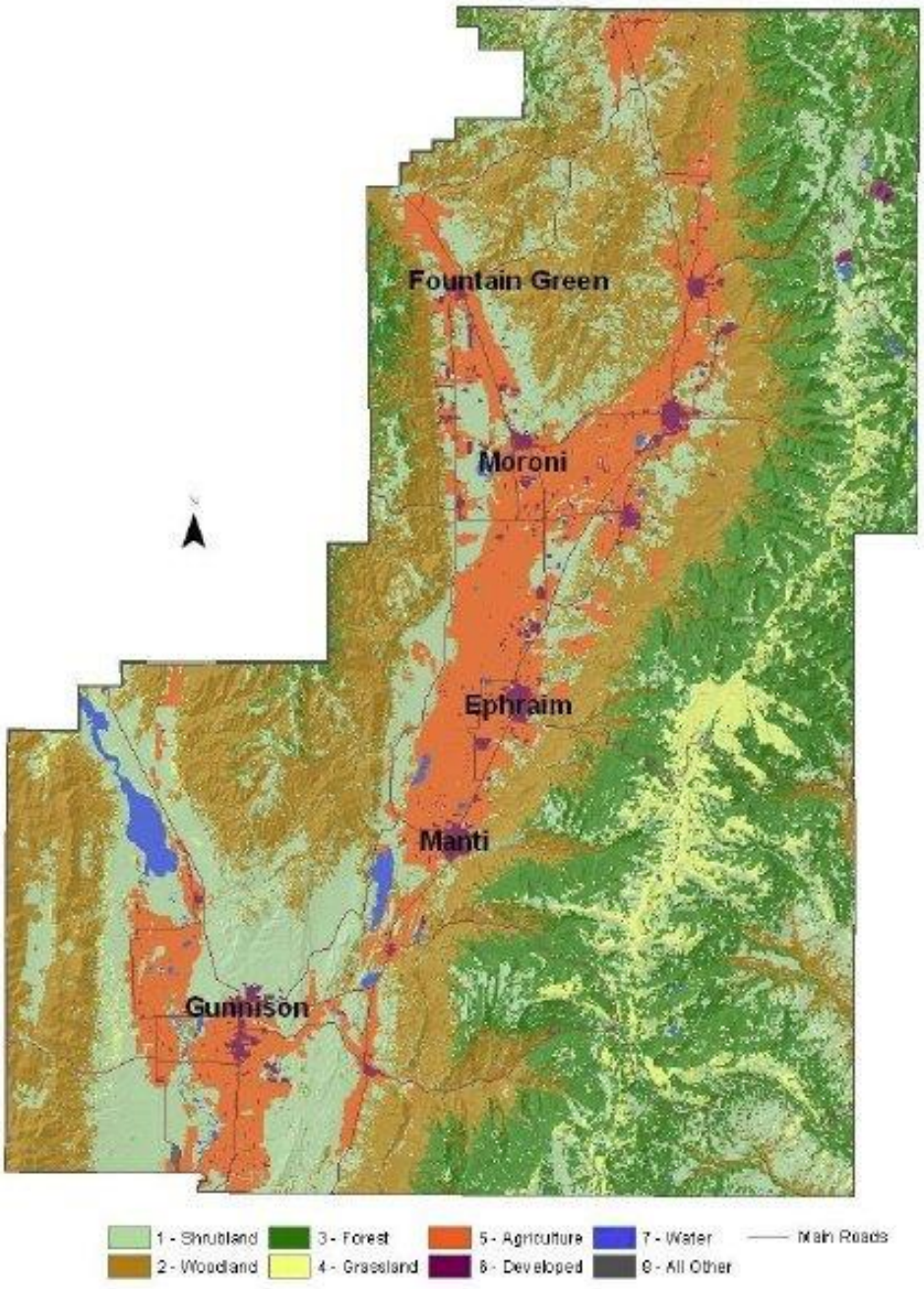

Figure 4 Land Cover/Use of Sanpete County

3 WATERBODY

3.1 303(d) reports and TMDLs

The central objective of the Clean Water Act (CWA) is to, "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (CWA, 1972). To meet this objective, section 303(d) of the CWA requires each state to develop a list of waters that are not attaining water quality standards (40 CFR 130). These regulations also require that the states develop TMDLs for those targeted waterbodies. A TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards (EPA, 1999).

Based on an intensive water quality survey completed in 1996-1997 by DWQ, the San Pitch River exceeds the numeric criteria for TDS at several locations. The beneficial uses, as designated by the State of Utah (Utah Division of Water Quality, 1999), for the San Pitch River are:

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

Table 12 State Beneficial Use Classification and Description

Class 1	**Protected for use as raw water source for domestic water Systems.**
	Class 1C: Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.
Class 2	**Recreational use and aesthetic**
	Class 2A: Protected for primary contact recreation such as swimming.
	Class 2B: Protected for secondary contact recreation such as boating, wading, or similar uses.
Class 3	**Protect for use by aquatic wildlife.**
	Class 3A: Protected for cold water species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
	Class 3B: Protected for warm water species of game fish and other warm water aquatic life, including the necessary aquatic organisms in their food chain.
	Class 3C: Protected for nongame fish and other water aquatic life, including the necessary aquatic organisms in their food chain.
	Class 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 these food chain.
	Class 3E: Severely habitat-limited waters. Narrative standards will be applied to protect these waters for aquatic wildlife.
Class 4	**Protected for agricultural uses including irrigation of crops and stock watering.**
Class 5	**The Great Salt Lake.** Protected for primary and secondary contact recreation, aquatic wildlife, and mineral extraction.

In 2002, the San Pitch River was listed on Utah's 303(d) list (DWQ, 2002) and was considered for immediate TMDL development. On November 18, 2003 EPA approved a TMDL/Water Quality Management Plan written by Millennium Science and Engineering, Inc. The Water Quality Management Plan will identify goals and objectives consistent with the TMDL that will result in an improved watershed. To see the San Pitch River TMDL see **Appendix 1**.

3.2 Source Assessment and Load Reductions (element a and b)

Utah's 303(d) list identifies two segments of the San Pitch River as being impaired due to exceedances of the agricultural water quality standard for TDS (DWQ, 2002) **(Table 13)**. These segments are described as:

San Pitch River – 1 (lower San Pitch River): San Pitch River and tributaries from confluence with Sevier River to tail-water of Gunnison Reservoir (excluding tributaries above USFS boundary). Hydrologic Unit Code (HUC) 16030004-001. Water body size: 15.82 miles.

San Pitch River – 3 (middle San Pitch River): San Pitch River and tributaries from Gunnison Reservoir to U132 crossing below USFS boundary. HUC 16030004-005. Water body size: 59.46 miles.

Table 13 Allocation of Loading. Showing the causes and sources of pollution with estimated pollutant loading into watershed and expected load reductions

		TDS Loading Estimates (tons) Middle San Pitch River	TDS Loading Estimates (tons) Lower San Pitch River
Causes/Sources			
Background	*Upstream Load*	6,898	*
Natural Sources	*Groundwater Inflow*	10,228	*
	Springs	450	*
	Upland and Streambank Erosion	4,788	*
Human-Caused Sources	*Irrigation Tracts*	12,647	*
	Moroni WWTP	318	*
Loading in the San Pitch			
Existing Load		**35,329**	**19,197**
Target Load		32,981	15,574
Waste Load Allocation		318	0
Load Allocation		31,014	14,796
Margin of Safety		1,649	779
Load Reduction		3,997	4,401
% Reduction		**11**	**23**

Note: *An evaluation of the geology, soils, hydrology, and irrigation systems provides strong evidence that high TDS concentrations are due to natural sources.

TDS is listed as a criterion for protection of agricultural uses because of the negative effect of high salinity on crop production. Salinity reduces crop growth by reducing the ability of plant roots to absorb water, and is evaluated by the relationship of salt tolerance to crops. A TMDL study of the San Pitch River Watershed **(Appendix 1)** has identified the primary sources of TDS **(Table 13)**. The TMDL has developed a site specific standard of 2400 mg/L for the lower San Pitch River, see **Table 14** for current criteria for Class 4 Waters.

Table 14 Utah Water Quality Criteria

Parameter	Criterion Maximum Concentration
Class 4 – Agricultural Uses*	

Total Dissolved Solids	1,200 mg/L
Class 3A – Coldwater Fishery	
Total Phosphorus	0.05 mg/L

Note: *Utah WQS clarify that TDS limits may be adjusted if such adjustment does not impair the designated beneficial use of the receiving water.

3.2.1 Point Sources

Point Sources for Sanpete County can be found on http://enviro.deq.utah.gov/. Summary of current NPDES permits are shown in **Figure 5**.

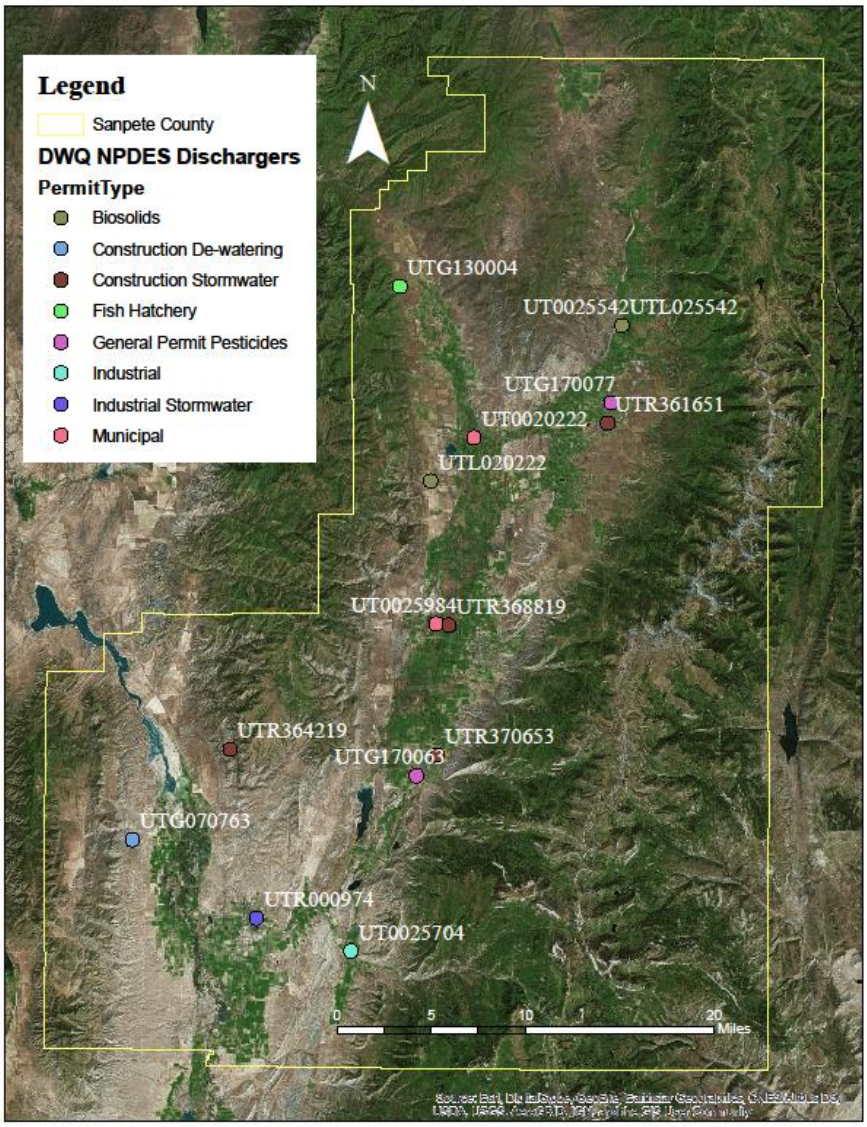

Figure 5 Locations of NPDES Dischargers in Sanpete County, UT

3.2.2 Nonpoint Sources

Nonpoint sources of pollution include sources that reach a waterbody by way of surface runoff or subsurface flow to groundwater. Nonpoint sources in the San Pitch River Watershed are both natural and human-caused. Natural

sources are often referred to as "background" and include naturally occurring salts in local soils, geology, and springs. Human-caused nonpoint sources of pollution in the San Pitch River Watershed include irrigated and non-irrigated lands used for grazing and crop production.

Natural Sources

There are many natural sources that occur in the San Pitch River. The underlying geology contributes to increased salinity in the groundwater in the Sanpete Valley. In fact, the Arapien shale is mined for salt in the southwest of the valley. There are also highly mineralized springs that occur at the surface within the middle and lower sections of the San Pitch River that contribute to TDS loads. Groundwater inflows account for a significant source of TDS to the San Pitch River. Groundwater is used during irrigation season when flows are low in the San Pitch River. TDS concentrations in shallow wells range from 234 to 2,490 mg/L, with an average of 602 mg/L (Lowe et.al, 2000). Using a groundwater inflow rate of 30 cfs and an average TDS concentration of 602 mg/L results in a TDS load of 10,228 tons to the San Pitch River from groundwater input.

Flood Irrigation

Flood irrigation tracts are located on a variety of soil units. These soil units are comprised primarily of silt loams and silty clay loams with moderate to strong salinity. Flood irrigation increases the salinity of soil pore water by dissolving and transporting the salts in the underlying saline soils and geologic formations (USDA, 1997). Approximately 15,000 acres are flood irrigated along the middle San Pitch River only during high flows, due to the river being dewatered in this area. Irrigation return flows have not been measured for the San Pitch River; however, assuming 30% efficiency for flood irrigation at a rate of 4 inches per acre (0.3 acre-feet), the return flows can be estimated at 3,465 acre feet. Using these average values, a rough estimate of 12,647 tons of TDS loading into the middle San Pitch River can be attributed to return irrigation flows during the entire irrigation season.

Erosion from Uplands and Streambanks

Saline soils are present on the western foothills and streambanks of the San Pitch River **(Appendix 1)**. The area usually receives less than 8 inches of precipitation a year; however storm events do occur. Thunderstorms can cause short term flooding on the western foothills potentially washing saline soils into the San Pitch River. This potential TDS load is considered natural and not due to grazing or some other human-caused mechanism. The prospects of revegetating uplands to reduce this type of erosion are very slight. There are more structural practices available to trap and retain floodwaters and sediment flows that arise from thunderstorms but their high cost may be prohibitive. However, there are opportunities to reduce streambank erosion.

Animal Manure

Turkey and cow manure is applied to lowlands of the San Pitch Watershed. Salts from manure could be transported to the San Pitch River by several transport mechanisms: erosion, overland surface water flow, and percolation to groundwater. This could result in nutrient loading to the San Pitch River. Also, there are a number of septic systems in this area and could contribute to nutrient loading (Robinson, 1971). Total phosphorus is the primary water quality concern in the upper San Pitch River for its effect on the potential for a viable coldwater fishery. The upper San Pitch River has been identified, from Fairview to Moroni, by the Division of Water Quality as requiring further study due to excess total phosphorus (TP). The criterion of 0.05 mg/l TP has been adopted as a narrative criteria and additional information such as dissolved oxygen data, periphyton biomass, and macroinvertebrate sampling may be necessary to determine an appropriate stream concentration necessary to maintain a healthy ecosystem and fishery.

3.3 Waterbody Monitoring Data

3.3.1 Water Quality and Flow

STORET sampling locations on the San Pitch River (SPR) and its tributaries are listed below in **Tables 15, 16, and 17** and **Figure 6** for locations. The tables below show the averages, maxes, and mins for TDS, flow, and phosphorus. Although the San Pitch River is not listed for phosphorus, it is still a pollutant of concern for the San Pitch Watershed

Group and the Sanpete County Soil Conservation District. Please note that only phosphorus results shown in **Table 17** have 40 or more samples taken. Also, please note that only the STORET sampling locations that had exceedances for TDS are listed in **Table 15.** In each dataset, locations and segment of river (seg.) are listed from upstream to downstream. The upper San Pitch River is U, the middle San Pitch River is M, and the lower San Pitch River is L.

Table 15 TDS Averages, Maxes, and Mins in the San Pitch River Watershed. Also, showing the number of samples taken (#) and the number of samples that exceeded (# of Exd) 1,200mg/L.

STORET #	Station Name	Begin Date	End Date	#	# of Exd	Min TDS	Ave. TDS	Max TDS	% TDS Exd	Seg.
4946670	Silver Creek above SPR at U-117 crossing	11/14/01	5/13/14	9	6	800	1,435	2,542	66.7%	M
4946520	Johnson Spring north at Johnson Road crossing	4/25/96	4/9/97	5	1	442	956	1,750	20.0%	M
4946530	Johnson Spring south at Johnson Road crossing	4/25/96	6/24/97	12	1	560	836	1,984	8.3%	M
4946545	SPR west of Ephraim	2/16/12	4/15/14	7	1	250	675	1,312	14.3%	M
4946540	SPR northwest of Manti	4/2/96	4/11/02	18	3	468	1,002	3,774	16.7%	M
4946450	SPR west of Manti above Gunnison Reservoir	6/12/90	9/16/14	110	38	214	1,161	2,912	34.5%	M
4946360	Six Mile Creek above SPR northwest of Sterling	4/2/96	9/16/14	53	2	214	423	2,614	3.8%	M
4946150	SPR 2 miles east of Gunnison at U137 crossing	1/9/90	9/15/14	123	99	496	1,867	3,228	80.5%	L

Table 16 Flow in the San Pitch River showing average, maxes, and mins

STORET #	Station Location	Begin Date	End Date	Min Flow	Ave. Flow	Max Flow	Segment
4946790	SPR at US89 crossing north of Fairview	4/2/96	9/17/14	0	6.1	70	U
4946840	SPR above Fairview WWTP	11/13/03	9/16/14	2.2	9.1	40.39	U
4946756	SPR below Fairview WWTP	7/27/06	9/16/14	1.86	10.5	43.11	U
4946750	SPR 2.5 miles west of Mt. Pleasant at U-116 crossing	1/9/90	9/17/14	2	24.2	141.8	U
4946980	SPR at bridge below Moroni WWTP	10/30/13	9/17/14	0.2	15.7	50	M
4946650	SPR 1 mile west of Chester at U-117 crossing	5/6/93	9/16/14	0.5	24.7	200	M
4946545	SPR west of Ephraim	10/29/13	9/16/14	0	4.9	28	M
4946450	SPR west of Manti above Gunnison Reservoir	8/1/90	9/16/14	0	24.7	175	M
4946150	SPR 2 miles East of Gunnison at U-137 crossing	1/9/90	9/15/14	0	28.2	488.1	L

Table 17 Phosphorus averages, maxes, and mins in the San Pitch River and tributaries

STORET #	Station Location	Begin Date	End Date	#	Min	Ave.	Max	Segment

4946790	SPR at US89 crossing north of Fairview	4/2/96	7/16/14	44	0.00	0.01	0.06	U
4946760	Pleasant Creek at Hydroelectric Power Building Outfall	4/2/96	11/19/13	40	0.01	0.03	0.52	U
4946750	SPR 2.5 miles west of Mt. Pleasant at U-116 crossing	1/9/90	9/17/14	130	0.00	0.04	0.24	U
4946960	SPR above Moroni WWTP	1/9/90	11/10/09	53	0.01	0.08	0.41	M
4946650	SPR 1 mile west of Chester at U-117 crossing	4/2/96	9/16/14	61	0.03	0.33	3.12	M
4946570	Ephraim Creek below Forest Service boundary	4/2/96	9/16/14	51	0.00	0.05	0.53	M
4946370	Manti Creek at Forest Service boundary	4/2/96	9/16/14	52	0.01	0.03	0.15	M
4946450	SPR west of Manti above Gunnison Reservoir	6/12/90	9/16/14	91	0.01	0.10	0.69	M
4946360	Six Mile Creek above SPR northwest of Sterling	4/2/96	9/16/14	49	0.01	0.05	0.30	M
4946160	Twelve Mile Creek at U-137 crossing	4/2/96	6/26/07	41	0.01	0.16	0.93	L
4946150	SPR 2 miles of Gunnison at U-137 crossing	1/9/90	9/15/14	118	0.00	0.06	0.91	L

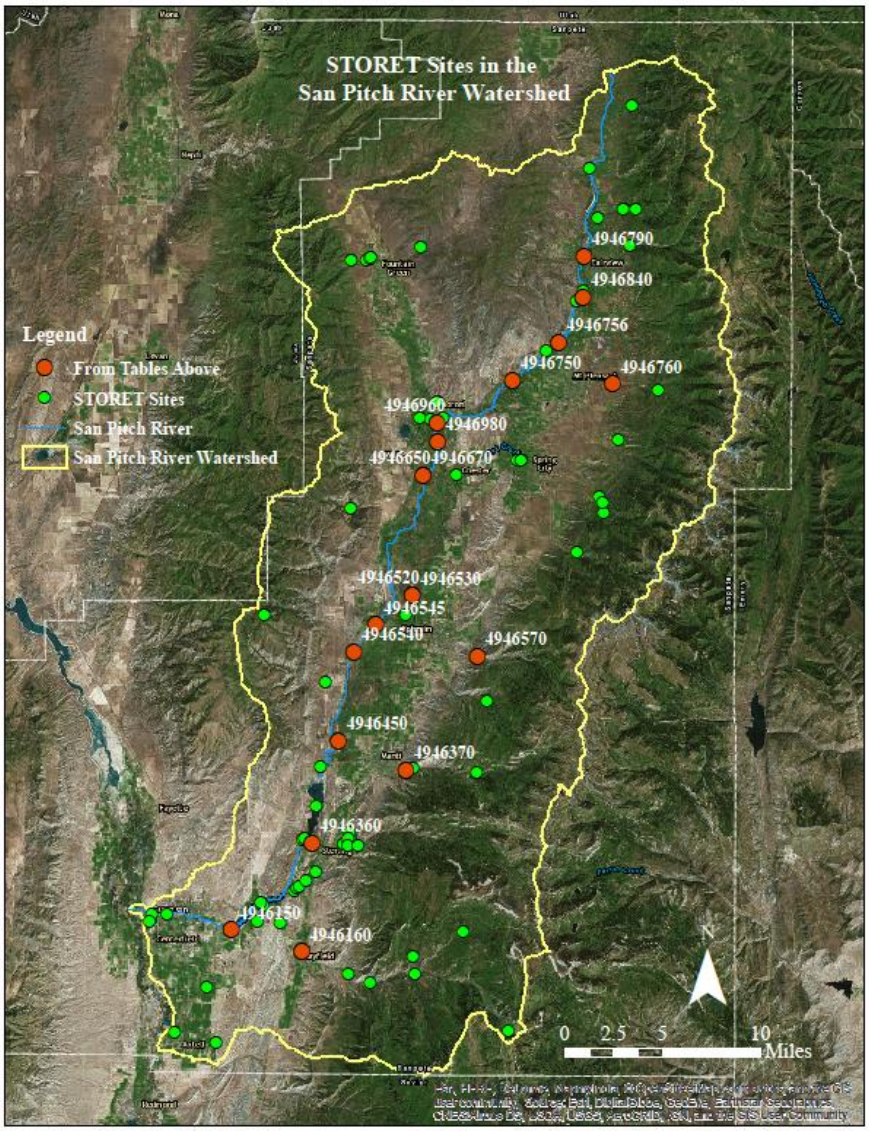

Figure 6 STORET Locations within the San Pitch River Watershed

4 OBJECTIVES AND SOLUTIONS TO THE PROBLEM

4.1 Objectives and Task(s)

Tasks to achieve each planning objective will be implemented through voluntary participation by developing conservation plans with individual or groups of landowners. Plans will be tailored to address the specific resource problems and opportunities that pertain to each particular property. Implementation of the conservation plan will result in improved water quality, increased agricultural production and other resource benefits. When outside funding is available, it can be used to assist private landowners and agency personnel to implement the conservation plan **(Table 18)**.

Table 18 Objectives and Action Item(s) for the San Pitch River Watershed

Objective	Task(s)	Result(s)
Reduce Total Dissolved Solids (TDS) loading in the San Pitch River in order to meet TMDL endpoints.	Focusing on the middle San Pitch River where the highest impairment occurs, work with landowners to improve their irrigation water management and efficiency of the irrigation systems.	Reduce TDS loading to the San Pitch River by 11% (~4000 tons/year) Maintain water quality standards for its designated beneficial uses of agriculture in the middle San Pitch River. Improve irrigation techniques on 4,000 acres.
	Reseed irrigated lands to reduce salt loading into the river.	
	Use Best Management Practices (BMPs) to re-seed rangeland to reduce sediment and nutrient loading into the river.	
Reduce nonpoint source nutrient pollution to improve water quality through implementation of comprehensive nutrient management plans (CNMPs).	Work with land owners to properly store and utilize manure. Develop a nutrient management plan for animal feeding operations (AFO's).	Help improve water quality within the San Pitch River Watershed by managing nutrients and reducing erosion of excess nutrient to the San Pitch River.
	Prevent runoff from corrals into surface waters and recharge areas.	
	Help landowners upgrade technology software to help manage manure application.	
	Provide financial assistance for manure testing, and help determine rates of manure in areas.	
	Develop grazing management plans in combination with riparian restoration to reduce nutrient loading to the upper San Pitch River.	
Reseed pastures with large root mass species and control noxious weed population.	Get involved with partnering agencies to map and control noxious weed populations.	Better control of noxious weed populations by about 70%.
	Coordination and involvement with the San Pitch CWMA to control noxious weed population's throughout entire watershed.	

Improve stability of the stream channel and tributaries to enhance the riparian corridor and buffer zones to proper functioning condition.	Improve San Pitch River by stabilizing banks to reduce erosion and planting appropriate vegetation.	Improve 10 miles of the San Pitch River by stabilizing banks with BMPs to reduce erosion. Decrease streambank erosion by 50 tons and reduce nutrient and TDS loading to the river.
Inform and educate landowners and citizens concerning nonpoint pollution sources and BMPs.	Conduct tours of conservation projects, hold seminars to educate landowners, send out brochures, media information, and present Watershed Education Days for students and other interested parties.	Increased knowledge of concerns, successes, and ongoing progress within the watershed Annually educate fourth grade classes in county, interested parties, etc., and supply material for science curriculum.
Track individual progress, matching contributions, team efforts, and generate reports and data as needed.	Sanpete County Soil Conservation District (SSCD) will employ a full time Watershed Coordinator to carry out work group meetings, track grants and project implementation, and develop conservation plans.	Better coordination of all activities of watershed partners to achieve best results of their efforts.
Obtain funding to implement BMPs for greatest improvement in the San Pitch River Watershed.	Research and apply for available funding and develop agency and stake holder partnerships.	Maximize all available resources to ensure necessary projects can be implemented to restore the San Pitch River Watershed.
Assist communities in developing and implementing source water protection and storm water plans integrating aquifer classification.	Classify Sanpete Valley Aquifer.	Establish baseline conditions for the management of groundwater recharge areas and drinking water protection. Quality drinking water and less untreated storm water entering the San Pitch River.
	Assist communities with implementing source water protection and storm water plans.	
	Stay involved with local community and county leaders in land use planning for the watershed.	
Improve and conserve wildlife habitat in the watershed.	Develop partnerships between landowners, state and federal land management agencies, and private organizations to improve communication and cooperation, leverage technical and financial resources, and develop innovative approaches to solving problems in critical riparian and shrub-steppe communities.	Enhanced water quality through improved watershed conditions, improved habitat for big game and sensitive species, and improved rangeland conditions for livestock. Improve 20,000 acres of pasture Improve 50,000 acres on rangeland.
	Assist partners in implementing habitat projects within riparian and sagebrush-steppe communities, to improve overall rangeland conditions for wildlife and livestock production. This could include planning, funding, equipment, and technical assistance.	

4.2 BMPs and Target Areas (element c)

BMPs

Best Management Practices (BMPs) are presented in this section to attain water quality goals and targets. The BMPs list in **Table 20** addresses salt load entering the San Pitch River and number of acres and feet that will be improved. The largest reduction in TDS load to the San Pitch River would be realized by improved irrigation methods. By improving the efficiency of irrigation methods, return flows and the associated TDS load to the middle San Pitch River would be reduced or eliminated. Other BMPs will include but are not limited to streambank and shoreline protection, pasture reseeding, irrigation pipelines, fences, and livestock pipelines and water facilities.

Targeted Areas

For both the middle and lower San Pitch River TMDL, the first step of the analysis included identification of the critical season. The critical period for TDS contribution and effects on the beneficial use (agricultural use) is the irrigation season. Water for irrigation and stock water is the beneficial use of concern, which is potentially impacted by increased salinity. For the purposes of comparing year-to-year loads, the irrigation season is standardized to the time period March 01 to September 30. Areas shown in **Figure 7** are define by the watershed as targeted areas and will have the greatest impact on reductions. **Figure 8** defines where works has already taken place along the San Pitch River, current projects, and where future projects will take place.

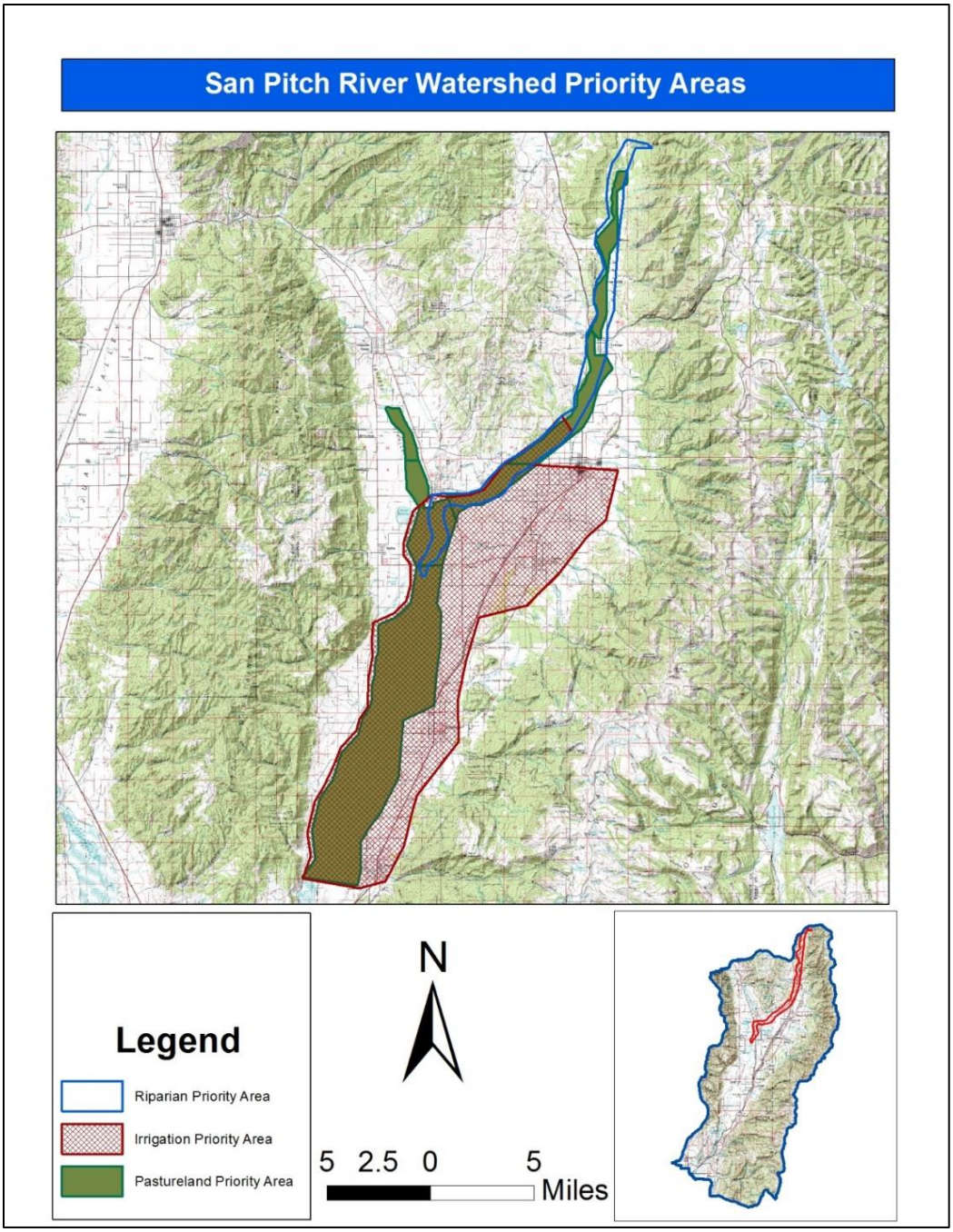

Figure 7 San Pitch Water Quality Management Plan Priority Areas

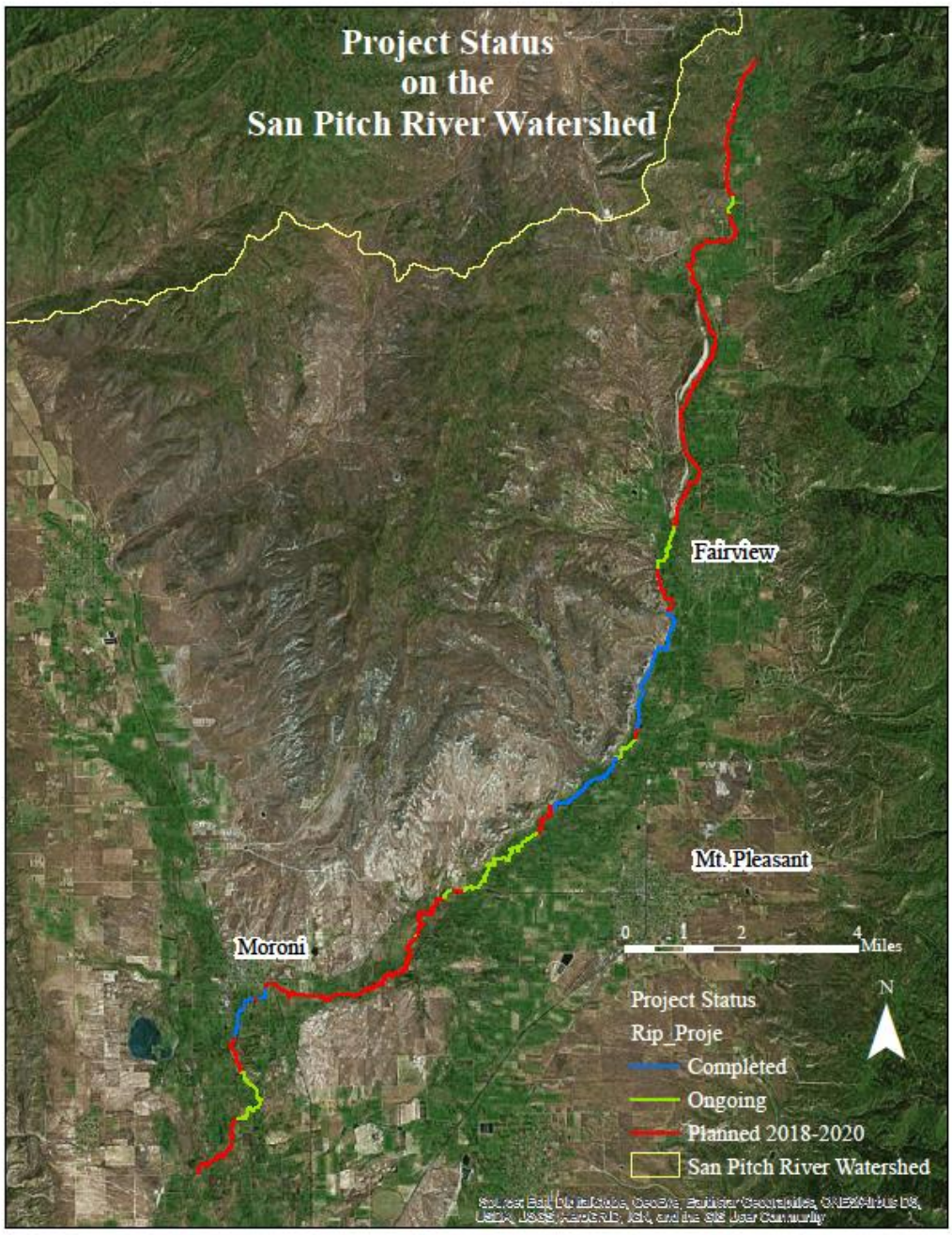

Figure 8 The status of the San Pitch River and where projects have already been implemented

4.3 Information and Education (element e)

The San Pitch River Watershed Stewardship Group is currently involved in the state-wide Sage-Steppe initiative to help conserve Sage Grouse and other Sage-Steppe wildlife species within the watershed. The Watershed Group is also involved with the Comprehensive Weed Management Group to help manage weeds within the watershed. These partnership groups help outreach local landowners to teach them the importance of conservation efforts within the watershed.

The Watershed Group and Conservation District have had an enormous effect on informing and educating the public, and one of the major objectives of the San Pitch Watershed Plan is to help the community and stakeholders

understand the importance of maintaining and improving water quality within the watershed. Since 2005, the Conservation District has sponsored an annual Watershed Education Day focused on 4th grade students. Approximately 400 4th graders from North and South Sanpete School Districts come to attend where they learn about soils, invasive species, wildlife, water quality, and important characteristics to a watershed. The classes rotate through all the different presentations. Partners include Utah Division of Water Quality, Utah Division of Water Resources, NRCS, Forest Service, USU Extension, Snow College, UDAF, Rural Water, DWR/DNR, FFSL, and Sanpete Soil Conservation District.

In addition to Watershed Education Day there are tours conducted throughout the watershed to help educate and teach stakeholders the importance of management. Another addition to the watershed outreach is to provide supplies, equipment, and technical assistance for monitoring project success and is where Utah Water Watch will help train individuals to assist the watershed coordinator in data collection **(Appendix 2)**.

5 PROJECT IMPLEMENTATION PLAN

5.1 Financial Assistance (element d)

Funding for implementation of BMPs will originate from a variety of sources depending on several factors including where implementation occurs, whether loading is from nonpoint or point sources. The key to successful implementation projects is the participation of all the partners with funding, administration, technical assistance, equipment, and time. Sources of funding **(Table 19)**, Section 319 programs, State Revolving Funds, USDA's Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant federal, state, local, and private funds that may be available to assist in implementing projects.

5.2 Technical Assistance (element d)

Landowners and stakeholders play an important role and contribute greatly to the technical assistance that is needed. The Sanpete County Soil Conservation District (SCSCD) will provide leadership with the assistance of the San Pitch River Watershed Stewardship Group. Permits might need to be attained before implementation of specific projects. The San Pitch River Watershed Coordinator will coordinate between agencies and parties to ensure operations are continually moving forward. UDWQ and NRCS will give significant amount of assistance when possible. Other federal, state, and local agencies will also provide technical assistance **(Table 19)**.

Table 19 Technical and Financial Assistance for the San Pitch River Watershed

Project	Description	Budget	Funding &Technical Assistance
Irrigation Improvements	Based on prioritization, implemented more efficient irrigation management practices	$ 650,000.00	State NPS; EPA 319; NRCS-EQIP; SCSCD;
Streambank & channel Restoration	Based on prioritization, implement streambank and channel restoration work to reduce TDS loads from erosion	$ 1,414,200.00	UDWR; State NPS; EPA 319; NRCS-EQIP; SCSCD; FWS
Pasture Improvements	Implement grazing management plans and pasture planting	$ 216,000.00	State NPS; EPA 319; NRCS-EQIP; SCSCD; USFS; UDWR; FWS
Rangeland Improvements	Implement grazing management plans and rangeland planting	$ 264,000.00	State NPS; EPA 319; NRCS-EQIP; SCSCD; USFS; UDWR; FWS
Monitoring	Implement ongoing water quality monitoring program to assess if implementation activities are achieving TMDL endpoints	$ 64,000.00	UDWR; Snow College; UDWQ; State NPS; EPA 319
Information & Education	Implement an ongoing I&E program targeted to minimize contributions of TDS and nutrients from residential sources	$ 100,000.00	UDWR; USFS; NRCS; Snow College; UDWQ; State NPS; EPA 319; SCSCD;
Total Estimated Funds		**$ 2,708,200.00**	

5.3 Milestone and Schedule (element f and g)

Table 20 Schedule Plan for the San Pitch River Watershed

BMPs	Schedule and Result of BMPs Implemented																																							
	Jan-2017	Apr-2017	Jul-2017	Oct-2017	Jan-2018	Apr-2018	Jul-2018	Oct-2018	Jan-2019	Apr-2019	Jul-2019	Oct-2019	Jan-2020	Apr-2020	Jul-2020	Oct-2020	Jan-2021	Apr-2021	Jul-2021	Oct-2021	Jan-2022	Apr-2022	Jul-2022	Oct-2022	Jan-2023	Apr-2023	Jul-2023	Oct-2023	Jan-2024	Apr-2024	Jul-2024	Oct-2024	Jan-2025	Apr-2025	Jul-2025	Oct-2025	Jan-2026	Apr-2026	Jul-2026	Oct-2026
Irrigation Improvements			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X
Irrigation Systems, pipeline, Ditch and canal lining, sediments basin, water control structure, pumping plant, irrigation pit, dams, and irrigation reservoirs	**4,000 acres** improved by: decreasing irrigation induced erosion, reducing tail water runoff, and increasing yields																																						
Streambank and Channel Restoration	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X			X
Channel vegetation, clearing and snagging, critical area planting, fencing, filter strip, grade stabilzation structure, streambank and shoreline protection, channel stablization, and water control structure	**10 miles** improved by: reducing streambank erosion, reducing incising or widening of stream channels which can lower water tables and effect vegetation																																						
Pasture Improvements		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X
Brush management, prescribed burning, fencing, pasture planting, prescribed grazing, livestock pond, use exclusion, livestock water pipeline, pumping plant for water control, spring development, watering tough/tank, water well, and pest management	**20,000 acres** improved pasture and **control 70% noxious weed populations** by: improving pasture erosion, improving management of livestock, increasing water infiltration and buffers sediment/nutrient loading of streams																																						
Rangeland Improvements		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X	X		X	X
Brush management, prescribed burning, fencing, pasture planting, prescribed grazing, livestock pond, use exclusion, livestock water pipeline, pumping plant for water control, spring development, watering tough/tank, water well, range planting, and pest management	**50,000 acres** improved rangeland and **control 70% noxious weed populations** by: improving rangeland erosion, improving management of livestock, increasing water infiltration and buffers sediment/nutrient loading of streams																																						

Table 21Milestones for the San Pitch River Watershed

Milestones	
Short Term (< 2 years)	Achieve 3% reduction in sediment loading on 800 acres of agricultural land in the San Pitch River Watershed by implementing irrigation improvements.
Mid Term (< 5 years)	Reduce streambank erosion and sediment loading rate by 25 tons by reestablishing vegetation and shoreline protection along 5 miles of the San Pitch River.

	Reducing TDS loading into the San Pitch River by improving 20,000 acres of rangeland and 10,000 acres of pasture
Long-Term (5 years or more)	Maintain water quality standards for its designated beneficial uses of agriculture in the middle San Pitch River.
	Control noxious weed populations by about 70%.

5.4 Monitoring (element h and i)

Monitoring is documented to show progress in achieving improved water quality conditions as nonpoint source control programs are implemented, and review effectiveness of BMPs. Studies that present water quality and stream health on a point-in-time basis, before and after project implementation, can be conducted quickly and relatively inexpensively. Statistically rigorous studies that can defensibly predict overall watershed health and trend are beyond the scope of this monitoring effort, and should be coordinated closely with the Division of Water Quality at the state level.

5.4.1 Determining Effectiveness

Project success will be demonstrated through monitoring efforts described in the San Pitch River Watershed Sampling and Analysis Plan (SAP) **(Appendix 2)**. Information collected can be used to meet a variety of objectives between partners. These objectives include the ability to demonstrate a decrease in total dissolved solids loading in the San Pitch River, future TMDL development, the long-term success of BMPs, fisheries improvements, and education of Natural Resources Students. For a list of monitoring strategies that will be used as indicators to show progress see **Table 22** under *"Project Scale Monitoring".* Each project will have a monitoring component before and after using this list of parameters that are suitable to the BMPs being used.

5.4.2 Operation

DWQ, UWW, Snow College, DWR, UDAF, NRCS, and Dedicated Hunters will collect credible data comprised of physical, chemical, and biological parameters according to the SAP. To ensure defensible and credible data, collection procedures for each parameter will be completed according to established quality assurance protocols established by each participating agency. The San Pitch River Watershed Coordinator will be responsible for directing and coordinating monitoring activities and preforming monitoring identified in **Table 22**.

The data from projects will be maintained in an accessible common database. Data will be compiled, analyzed and used in completing progress reports to the state NPS coordinator, Utah Water Quality Task Force, DEQ, EPA and others. This data will be available to all interested parties and organizations. Quality assurance and quality control (QA/QC) will be conducted according to the guidelines established in the Utah Water Quality Manual. Only data that meets QA/QC standards will be entered into the project database.

Table 22 SAP Roles and Responsibilities Timeline

Watershed Coordinator	Utah Water Watch	Snow College Internship	UDWR
UDWQ	UDAF GIP	Snow College Class Projects	

Responsibilities	Activity	Frequency	Jan-2017	Apr-2017	Jul-2017	Oct-2017	Jan-2018	Apr-2018	Jul-2018	Oct-2018	Jan-2019	Apr-2019	Jul-2019	Oct-2019	Jan-2020	Apr-2020	Jul-2020	Oct-2020	Jan-2021	Apr-2021	Jul-2021	Oct-2021	Jan-2022	Apr-2022	Jul-2022	Oct-2022	Jan-2023	Apr-2023	Jul-2023	Oct-2023
Coordination																													
Monitoring Plan Coordination	1	Monthly																											
Water Chemistry																													
Water Chemistry/Physical Parameters	2	Every 6 weeks																											
High Frequency Monitoring																													
Discharge	3	hourly																											
Water Temperature	4	hourly																											
Sonde Deployment (pH, temp, cond, turbidity, DO)	5	3-week synoptic																											
Biological Monitoring																													
Benthic Macroinvertebrates (UCASE)	7	Every 2 years																											
Fishery Survey	8	Every 3 years																											
Project Scale Monitoring																													
Photo Point Monitoring	9	Annually																											
Evaluate Schedule of Operations	10	Annually																											
Infrastructure Inspection	11	Annually																											
Cooperator Follow Up	12	Annually																											
Grazing Plan Evaluation	13	Annually																											
Rangeland Transect Surveys	14	Annually																											
Multiple Indicator Monitoring	15	Annually																											
Channel Cross Sections	16	Annually																											
Canopy Cover (densiometer)	17	Annually																											
Pasture Conditions	18	Annually																											
Return Flow Evaluation	19	Annually																											
Erosion Pins	20	Annually																											
Reporting																													
Data Summary Report	21	Annually																											
Documentation in Conservation Plan	22	Annually																											
Final Project Reporting	23	Completion of Project																											

6 CONCLUSIONS & RECOMMENDATIONS

6.1 Reviewing and Revising Plan

Review and revision of this document will be done on an as needed basis under the direction of the Sanpete County Soil Conservation District with the technical assistance of the San Pitch River Watershed Stewardship Group and many others. The Watershed Coordinator will coordinate with each agency and interested party. **Appendix 3** shows a list of all persons involved in the watershed planning process. To view the Water Quality Management Plan (WQMP) that was accomplished inn 2006 see **Appendix 4**.

6.2 Accomplishments

Table 23 List of accomplishment within the San Pitch River Watershed

Year	Spent	Funded	Sediment Reduction (tons/yr.)	Phosphorus Reductions (lb. /yr.)	Results/Improvements
FY 16	$ 1,078,645.00	$ 1,551,345.00	729	5089	3.1 miles of stream; 351.5 acres of irrigation; 3,124 acres of pasture; 1,722 acres of rangeland
FY 15	$ 888,729.00	$ 547,270.00	39.6	350.1	0.09 miles of stream; 1,223.2 acres of irrigation; 5,335 acres of pasture; 10,953 acres of rangeland
FY 14	$ 625,631.00	$ 473,558.00	46.4	179.6	1 mile of stream; 288 acres of irrigation; 387 acres of pasture; 9,042 acres of rangeland
FY 13	$ 633,681.00	$ 196,723.00	55.3	61.7	0.86 miles of stream; 40.5 acres of irrigation; 183 acres of pasture; 14,321 acres of rangeland
FY 12	$ 1,263,935.00	$503,146.00	251.1	349.9	1.12 miles of stream; 613 acres of irrigation; 2 AFO; 1,216 acres of pasture; 3,812 acres of rangeland; 53 acres of ag. waste
FY 11	$ 846,707.00	$ 696,707.00	277.9	347.4	0.64 miles of stream; 65 acres of irrigation; 3,004 acres of pasture; 677 acres of rangeland
FY 10	$ 748,969.00	$ 748,969.00			2.2 miles of stream; 357 acres of irrigation; 9,720 acres of pasture; 595 acres of rangeland
FY 09	$ 1,773,186.00	$ 1,414,319.00			0.41 miles of stream; 96 acres of irrigation; 729 acres of pasture; 938 acres of rangeland; 362 acres of ag. waste
FY 08	$ 2,066,952.00	$ 2,066,952.00			363 acres of irrigation; 1,310 acres of pasture; 860 acres of rangeland; 330 acres of ag. waste
FY 07	$ 744,920.00	$ 744.920.00			377 acres of irrigation; 1,317 acres of pasture; 3,587 acres of rangeland; 233 acres of ag. waste
FY 06 and before	$ 5,598,413.00	$ 5,644,447.00			2.1 miles of stream; 1 AFO; 1,059 acres of irrigation; 34,657 acres of pasture; 7,096 acres of rangeland; 2190 acres of ag. waste; rangeland drill was purchased

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8 APPENDICES

8.1 San Pitch River TMDL

8.2 San Pitch River Sampling and Analysis Plan

8.3 List of persons that contributed to the San Pitch River Watershed Management Plan

8.4 2006 San Pitch River Watershed Plan