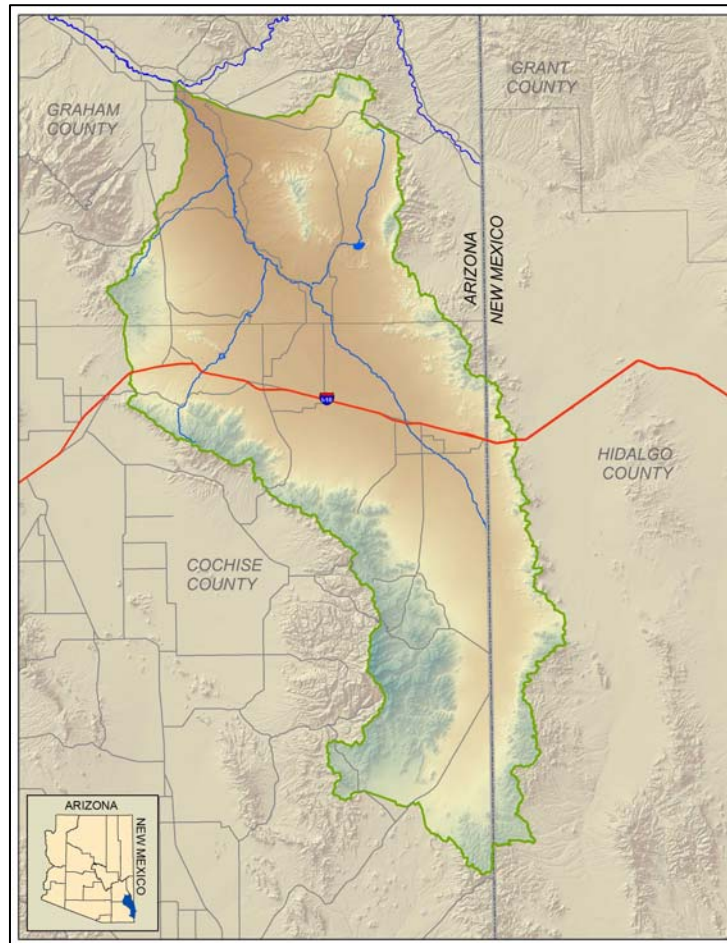


San Simon River Watershed – Arizona

Rapid Watershed Assessment

April 2007



The University of Arizona

Prepared by:

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Arizona Department of Environmental Quality
Arizona Department of Water Resources
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**San Simon River – 15040006
8-Digit Hydrologic Unit
Rapid Watershed Assessment**

Section 1: Introduction

Overview of Rapid Watershed Assessments

A Rapid Watershed Assessment (RWA) is a concise report containing information on natural resource conditions and concerns within a designated watershed. The "rapid" part refers to a relatively short time period to develop the report as compared to a more comprehensive watershed planning effort. The "assessment" part refers to a report containing maps, tables and other information sufficient to give an overview of the watershed and for use as a building block for future planning. RWAs look at physical and socioeconomic characteristics and trends, as well as current and future conservation work.

The assessments involve the collection of readily available quantitative and qualitative information to develop a watershed profile, and sufficient analysis of that information to generate an appraisal of the conservation needs of the watershed. These assessments are conducted by conservation planners, using Geographic Information System (GIS) technology, assessing current levels of resource management, identifying priority resource concerns, and making estimates of future conservation work. Conservation Districts and other local leaders, along with public land management agencies, are involved in the assessment process.

An RWA can be used as a communication tool between the Natural Resources Conservation Service (NRCS) and partners for describing and prioritizing conservation work in selected watersheds. RWAs provide initial estimates of conservation investments needed to address the identified resource concerns in the watershed. RWAs serve as a platform for conservation program delivery, provide useful information for development of NRCS and Conservation District business plans, and lay a foundation for future watershed planning.

General Description of the San Simon River Watershed

The San Simon Watershed is located along the San Simon River in Cochise and Graham Counties in southeastern Arizona, and in Hidalgo County in southwestern New Mexico (Figure 1-1). The Watershed comprises 1,440,265 acres (2250 square miles) and is located about 90% in Arizona (Cochise and Graham Counties) and 10% in New Mexico (Hidalgo County). Forty-one percent of the land is managed by the Bureau of Land Management (BLM), 26% is State Trust Land, 19% is private land and 13% is managed by the U.S. Forest Service.

The watershed includes the Cities of San Simon, Portal, Bowie and Apache. Conservation assistance is provided through four Natural Resource Conservation Districts: Wilcox-San Simon, Gila Valley, and Whitewater Draw NRCs in Arizona and Hidalgo SWCD in New Mexico. There are four U.S. Department of Agriculture (USDA) Service Centers in the area, located in

Willcox, Safford, and Douglas, Arizona and Lordsburg, New Mexico.

The major land use in the area is rangeland followed by forest and cropland. Rangeland can be grazed throughout the year in most areas of the watershed. Some land is under irrigation, and cotton, corn, alfalfa, small grains, and other farm crops are grown. In recent years, lettuce has been grown for the fall and spring markets.

Resource concerns in the watershed include soil erosion, rangeland site stability, rangeland hydrologic cycle, excessive runoff (causing flooding or ponding), inefficient water use on irrigated land, aquifer overdraft, harmful levels of pesticides in ground water and surface water, excessive nutrients and organics in ground water, excessive suspended sediment and turbidity in surface water, threatened or endangered plant and animal species, noxious and invasive plants, wildfire hazard, inadequate water for fish and wildlife, habitat fragmentation, inadequate stock water for domestic animals.

Section 2: Physical Description

Watershed Size

The San Simon River Watershed covers approximately 2250 square miles, representing about 1.8% of the state of Arizona and less than .2% of New Mexico. The watershed (including both Arizona and New Mexico) has a maximum width of about 40 miles east-west, and a length of about 93 miles north-south.

The San Simon River Watershed was delineated by the U.S. Geological Survey and has been subdivided by the NRCS into smaller watersheds or drainage areas. Each drainage area has a unique hydrologic unit code (HUC) number and a name based on the primary surface water feature within the HUC. These drainage areas can be further subdivided into even smaller watersheds as needed. The San Simon River Watershed has an 8-digit HUC of 15040006 and contains the following 10-digit HUCs:

- 1504000601 (San Simon Headwaters);
- 1504000602 (Cave Creek-San Simon River);
- 1504000603 (Happy Camp Wash);
- 1504000604 (East Whitetail Creek-San Simon River);
- 1504000605 (Whitlock Wash-Hospital Flat);
- 1504000606 (Tule Wells Draw-San Simon River);

- 1504000607 (Gold Gulch-San Simon River); and,
- 1504000608 (Slick Rock Wash-San Simon River) (Figure 1-2).

Geology

The San Simon River watershed lies within the Basin and Range Geologic Province. Within the Basin and Range Province, thousands of feet of alluvial fill have eroded from nearly vertical, block-faulted mountains with metamorphic cores. As the deep basins filled with debris and volcanic eruptions dammed streams and isolated drainage basins, thick layers of salt accumulated in the layered sediments. As the basins filled and drainages connected, most southern Arizona streams joined together as tributaries of the Gila River.

Less than five million years ago when the Colorado River became the master drainage of the region, the Gila River drainage network began downcutting to balance with the Colorado system. Within the last two million years, and in response to alternating wet and dry climate cycles, complicated arrays of terraces were eroded along the upper Gila River and its tributaries. These land forms are evident throughout the San Simon River Watershed.

The geology of the San Simon River Watershed consists of four major rock types: igneous, sedimentary, metamorphic, and alluvial surficial deposits (Figure 2-1). These geologic types make up approximately 45%, 24%, 2%, and 28% of the surficial geology (Chronic, 1983).

The surficial deposits are differentiated between younger, Holocene to middle Pleistocene, and older, middle Pleistocene to latest Pliocene, surficial deposits, with the older alluvium forming the broad valleys along the Gila River main drainage. The younger surficial deposits are found in isolated terraces along the mountain flanks, residuals of the downcutting that occurred when the regional drainage transferred from the Gila to the Colorado River system.

The igneous rocks are subdivided between extrusive lava flows and light-colored granitic intrusive magma. The igneous intrusions and volcanism permitted mineral-rich solutions to rise toward the land surface and solidify, resulting in most of Arizona's mineral deposits and rich mining history, and contributing to high concentrations of heavy metals in the water and sediments in these areas.

Soils

Soils within the San Simon River Watershed are diverse and formed as the result of differences in climate, vegetation, geology, and physiography. Detailed soils information for the watershed is available from the Natural Resources Conservation Service (NRCS) and the U.S. Forest Service (USFS). The USFS maintains Terrestrial Ecosystem Surveys on National Forest Lands within the watershed. Lands outside of National Forests are included within the following NRCS Soil Surveys: "Soil Survey of San Simon Area, AZ, Parts of Cochise, Graham, and Greenlee Counties" and "Soil Survey of Cochise County, AZ, Douglas-Tombstone Part." Soils data

and maps from these Soil Surveys can be accessed through the NRCS Web Soil Survey website:

<http://websoilsurvey.nrcs.usda.gov>.

Common Resource Areas

The USDA, Natural Resources Conservation Service (NRCS) defines a Common Resource Area (CRA) as a geographical area where resource concerns, problems, or treatment needs are similar (NRCS 2006). It is considered a subdivision of an existing Major Land Resource Area (MLRA). Landscape conditions, soil, climate, human considerations, and other natural resource information are used to determine the geographic boundaries of a Common Resource Area.

The San Simon River Watershed is comprised of three Common Resource Areas (Figure 2-2 and Table 2-1).

The lower portion of the watershed is comprised of CRA 41.2 "Chihuahuan – Sonoran Desert Shrubs" with elevations ranging from 2600 to 4000 feet and precipitation averaging 8 to 12 inches per year. Vegetation includes mesquite, palo verde, catclaw acacia, soap tree yucca, creosote bush, staghorn cholla, desert saltbush, Mormon tea, burroweed, snakeweed, tobosa, black grama, threeawns, bush muhly, and burrograss. The soils in the area have a thermic soil temperature regime and a typical arid soil moisture regime. The dominant soil orders are Aridisols, Vertisols and Entisols. Deep, coarse to moderately fine-textured, soils occur on floodplains and alluvial fans. Deep, well and moderately well-drained, medium and moderately fine-textured, soils occur on lower valley slopes and playas.

Deep, gravelly, medium to fine-textured, soils occur on fan terraces. Shallow, gravelly and cobbly, medium to fine-textured, soils occur on hills and mountains.

The middle portion of the watershed is comprised of CRA 41.3 “Chihuahuan – Sonoran Semidesert Grasslands” with elevations ranging from 3,200 to 5,000 feet and precipitation averaging 12 to 16 inches per year. Vegetation includes mesquite, catclaw acacia, netleaf hackberry, palo verde, fourwing saltbush, littleleaf sumac, sideoats grama, black grama, plains lovegrass, tobosa, threeawns, and Arizona cottontop and bush muhly. The soils in the area have a thermic soil temperature regime and an ustic aridic soil moisture regime. The dominant soil orders are Aridisols and Mollisols. Shallow, gravelly and cobbly, moderately coarse to moderately fine-textured, soils and rock outcrop occur on hills and mountains. Deep, moderately coarse to fine-textured, soils occur on uplands and in drainage ways.

The upper portion of the watershed is comprised of CRA 41.1 “Mexican Oak-Pine Forest and Oak Savannah” with elevations ranging from 4500 to 10,700 feet and precipitation averaging 16 to 30 inches. Vegetation includes Emory oak, Arizona white oak, one-seed juniper, alligator juniper, California bristlebush, skunkbush sumac, Arizona rosewood, wait-a-bit mimosa, sideoats grama, blue grama, wooly bunchgrass, plains lovegrass, squirreltail, and pinyon ricegrass. The soils in the area have a thermic to mesic temperature regime and an aridic ustic to typic ustic soil moisture regime. The dominant soil orders are Entisols and Mollisols.

Shallow, gravelly and cobbly, moderately coarse to moderately fine-textured, soils and rock outcrop occur on hills and mountains.

These three Common Resource Areas (CRA 41.3, 41.2, 41.1) occur within the Basin and Range Physiographic Province which is characterized by numerous mountain ranges rising abruptly from broad, plain-like valleys and basins. Igneous and metamorphic rock classes dominate the mountain ranges and sediments filling the basins represent combinations of fluvial, lacustrine, colluvial and alluvial deposits.

Table 2-1: San Simon Watershed – Common Resource Areas

Common Resource Area Type	Area (sq. mi.)	Percent of Watershed
41.2 Chihuahuan-Sonoran Desert Shrubs	1,258	55.89
41.3 Chihuahuan-Sonoran Semidesert Grasslands	483	21.48
41.1 Mexican Oak-Pine Forest and Oak Savannah	509	22.63

Data Sources: GIS map layer “cra”. Arizona Land Information System (ALRIS 2004), Natural Resource Conservation Service (NRCS 2006). New Mexico Resource Geographic Information (RGIS 2007)

Slope Classifications

Slope, as well as soil characteristics and topography, are important when assessing the vulnerability of a watershed to erosion. Approximately 26% of the San Simon Watershed has a slope greater than 15%, while 62% of the watershed has a slope less than 5%.

The Tule Wells Draw-San Simon River Watershed is relatively flat, with only 15% of its area over 15% slope, and 80% less than 5% slope. The San Simon River Headwater Slick Rock

Watershed is relatively steeper, with 44% of the area greater than 15% slope, and 43% of the area with less than 5% slope (Table 2-2 and Figure 2-3).

Table 2-2: San Simon River Watershed Slope Classifications

Watershed Name	Area (sq. miles)	Percent		
		0-5%	5-15%	>15%
San Simon River Headwaters Slick Rock 1504000601	342	43	13	44
Cave Creek-San Simon River 1504000602	353	57	12	31
Happy Camp Wash 1504000603	175	68	5	27
East Whitetail Creek-San Simon River 1504000604	393	66	9	25
Whitlock Wash-Hospital Flat 1504000605	189	53	18	29
Tule Wells Draw-San Simon River 1504000606	209	80	5	15
Gold Gulch-San Simon River 1504000607	286	66	17	17
Slick Rock Wash-San Simon River 1504000608	303	64	18	18
San Simon River Watershed	2,250	62	12	26

Data Sources: Arizona Land Information System (ALRIS 2004), Natural Resource Conservation Service (NRCS 2006), U.S. Census Bureau TIGER 2000, USGS DLG 1988. USGS National Elevation Dataset 2004 10-meter.

Streams, Lakes and Gaging Stations

The locations of USGS stream gaging stations, and their respective annual mean stream flow, are found in Table 2-3.1.

There are no active gages in the San Simon River Watershed. However, the largest active stream flow for inactive gages was recorded at San Simon River below Fandrop Det. Dam near Bowie, Arizona with about 18 cfs.

Table 2-3.2 lists major lakes and reservoirs in the San Simon River Watershed, as well as their watershed position, surface area, elevation and dam name. Hot Well Draw Lake is the largest surface water in the watershed with an area of about 434 acres. Table 2-3.3 lists the major streams and their lengths. Listed stream lengths range from about 33 miles for Gold Gulch Stream to about 11 miles for the San Simon River in Tule Wells Draw.

Table 2-3.1: San Simon River Watershed USGS Stream Gages and Annual Mean Stream Flow.

USGS Gage ID	Site Name	Begin Date	End Date	Annual Mean Stream Flow (cfs)
	Active Gages			
	No active gages listed for this watershed			
	Inactive Gages			
09455000	Cave Creek Near Paradise, AZ	10/1/1921	9/30/1925	1.01
09454500	Cave Creek Near Paradise, AZ	10/1/1920	9/30/1925	7.80
09455500	East Turkey Creek at Paradise, AZ	10/1/1920	9/30/1925	1.14
09456000	San Simon River near San Simon, AZ	10/1/1920	9/30/1940	5.45
09456600	Gold Gulch below Creighton Det. Dam near Bowie, AZ	10/1/1957	9/30/1958	4.20
09456700	Gold Gulch below HX Det. Dam near Bowie, AZ	10/1/1957	9/30/1958	1.97
09456200	San Simon river below Fandrop Det. Dam near Bowie, AZ	10/1/1957	9/30/1958	18.50
09456800	San Simon river near Tanque, AZ	10/1/1958	9/30/1958	20.4
09456900	Goat Wash Well below Drop Structure near Solomon, AZ	10/1/1957	9/30/1958	0.97
09457000	San Simon River near Solomon, AZ	10/1/1932	9/30/1982	11.67

Data Sources: USGS website, National Water Information System <http://waterdata.usgs.gov/nwis/>

Table 2-3.2: San Simon River Watershed Major Lakes and Reservoirs.

Lake Name (if known)	Watershed	Surface Area (acre)	Elevation (feet above mean sea level)	Dam Name (if known)
Hot Well Draw	Whitlock Wash-Hospital Flat 1504000605	434	1070	Unknown
Gold Gulch #1	Gold Gulch-San Simon River 1504000607	157	180	Creighton Dam
Gold Gulch #2	Gold Gulch-San Simon River 1504000607	78	180	H X Dam
Gold Gulch #3	Gold Gulch-San Simon River 1504000607	30	180	Unknown

Data Sources: GIS data layer "Lakes", Arizona State Land Department, Arizona Land Resource Information System (ALRIS, 2004) <http://www.land.state.az.us/alris/index.html>. New Mexico Resource Geographic Information (RGIS 2007)

Table 2-3.3: San Simon River Watershed Major Streams and Lengths

Stream Name	Watershed	Stream Length (miles)
Gold Gulch	Gold Gulch-San Simon River	32.6
Hot Well Draw	Whitlock Wash-Hospital Flat	27.9
San Simon River	Slick Rock Wash-San Simon River	25.7
	East Whitetail Creek-San Simon River	22.3
Oak Draw	Slick Rock Wash-San Simon River	18.0
San Simon River	Cave Creek-San Simon River	17.2
	Gold Gulch-San Simon River	13.3
	Tule Wells Draw-San Simon River (1504000606)	10.5
Total		150.3

Data Sources: GIS data layer "Streams", Arizona State Land Department, Arizona Land Resource Information System (ALRIS 2004). <http://www.land.state.az.us/alris/index.html> New Mexico Resource Geographic Information (RGIS 2007).

Riparian Vegetation

The Arizona Game & Fish Department has identified and mapped riparian vegetation associated with perennial waters in response to the requirements of the state Riparian Protection Program (July 1994). This map was used to identify riparian areas in the San Simon River Watershed (Figure 2-5).

Five of the ten types of riparian areas classified by Game & Fish occur within the San Simon River Watershed. Riparian areas encompass approximately 1,965 acres (3.1 sq. mi.) or less than 0.1% of the entire watershed. Conifer Oak comprises about 1,626 acres, or 83% of the riparian areas. Mixed Broadleaf and Agriculture comprise about 9% and 4% of the watershed, respectively (Table 2-4).

Cave Creek-San Simon River Watershed has the greatest amount of riparian vegetation with about 1,894 acres (3.0 square miles). The San Simon River Headwaters at Slick Rock

is the only other watershed with riparian vegetation, and it has about 70 acres (0.1 sq. mi.).

Land Cover

The Riparian Vegetation map (Figure 2-5) and Land Cover map (Figure 2-6) were created from the Southwest Regional Gap Analysis Project land cover map (Lowry et. al, 2005). Within the San Simon Watershed, Table 2-5 identifies the Apacherian-Chihuahuan Grassland and Mesquite Scrub as the most common land cover type over the entire watershed, encompassing about 43% of the watershed. The next most common types are Chihuahuan Desert, Thorn, and Sand Flat Scrub (32%) and Madrean Pine Oak Woodland (8%).

Note: There are a total of 26 GAP vegetation categories present within the San Simon Watershed boundary. Some of these categories occur only in small concentrations, and are not visible at the small scale in which the maps are displayed. Some of the vegetation categories were re-grouped in order to

increase the legibility of the map. In collaboration with NRCS, staff were able to create a total of 14 grouped GAP

vegetation categories, as shown on Table 2-5.

Table 2-4: San Simon River Watershed Riparian Vegetation (acres) by 10-digit Watershed (Part 1 of 2)

Riparian Vegetation Community	San Simon River Headwaters Slick Rock 1504000601	Cave Creek-San Simon River 1504000602	Happy Camp Wash 1504000603	East Whitetail Creek-San Simon River 1504000604
Agriculture	-	77	-	-
Conifer Oak	-	1,626	-	-
Mixed Broadleaf	-	186	-	-
North American Warm Desert Lower Montane Riparian Woodland and Shrub	39	-	-	-
North American Warm Desert Riparian Mesquite Bosque	32	6	-	-
San Simon Watershed total area (acres)	70	1,894	-	-

Table 2-4: San Simon River Watershed Riparian Vegetation (acres) by 10-digit Watershed (Part 2 of 2)

Riparian Vegetation Community	Whitlock Wash-Hospital Flat 1504000605	Tule Wells Draw-San Simon River 1504000606	Gold Gulch-San Simon River 1504000607	Slick Rock Wash-San Simon River 1504000608	Total acres
Agriculture	-	-	-	-	77
Conifer Oak	-	-	-	-	1,626
Mixed Broadleaf	-	-	-	-	186
North American Warm Desert Lower Montane Riparian Woodland and Shrub	-	-	-	-	38
North American Warm Desert Riparian Mesquite Bosque	-	-	-	-	38
San Simon Watershed total area (acres)	-	-	-	-	1,965

Data Sources: GIS data layer "pan_riparian_att", Arizona State Land Department, Arizona Land Resource Information System (ALRIS, 2004) <http://www.land.state.az.us/alris/index.html>. Southwest ReGAP (GAP 2007).

Table 2-5: San Simon River Watershed Southwest Regional GAP Analysis Project Land Cover, Percent of 10-digit Watershed (Part 1 of 2)

Landcover	Slick Rock Wash-San Simon River 1504000505	Whitlock Wash-Hospital Flat 1504000607	Tule Wells Draw-San Simon River 1504000607	East Whitetail Creek-San Simon River 1504000606
Agriculture	0.98%	-	2.14%	4.10%
Apacherian-Chihuahuan Grassland and Mesquite Scrub	26.27%	43.12%	59.48%	43.61%
Chihuahuan Desert, Thorn, and Sand Flat Scrub	64.20%	45.09%	26.85%	33.22%
Developed, Medium - High Intensity	0.04%	-	0.44%	0.36%
Developed, Open Space - Low Intensity	0.02%	-	0.14%	-
Madrean Pine Oak Woodland	2.44%	3.12%	6.71%	8.34%
Madrean Pinyon-Juniper Woodland	2.13%	4.53%	2.09%	4.96%
Mogollon Chaparral	0.26%	1.34%	0.58%	1.29%
No Value, this occurs along state lines	-	-	-	1.68%
North American Warm Desert Barren Lands	1.00%	0.90%	0.45%	1.80%
North American Warm Desert Woody and Emergent Wetlands	0.26%	0.34%	1.11%	0.54%
Open Water	-	<0.01%	-	-
Rocky Mountain Ponderosa Pine and Aspen Forest Woodland	-	0.01%	<0.01%	0.41%
Sonoran Desert Scrub	2.38%	1.03%	0.01%	-
Area (sq. mile)	303	189	209	393

Data Sources: GIS data layer "Arizona Gap Analysis Project Vegetation Map", University of Arizona, Southern Arizona Data Services Program, 2004

<http://sdrsnet.snr.arizona.edu/index.php> Originated by Arizona Game & Fish Department, Habitat Branch, 1993, this dataset was digitized from the August 1980 David E. Brown & Charles H. Lowe 1:1,000,000 scale, 'Biotic Communities of the Southwest'. New Mexico Resource Geographic Information (RGIS 2007)

Table 2-5: San Simon River Watershed Southwest Regional GAP Analysis Project Land Cover, Percent of 10-digit Watershed (Part 2 of 2)

Landcover	Cave Creek-San Simon River 1504000604	San Simon River Headwaters 1504000602	Gold Gulch-San Simon River 1504000608	Happy Camp Wash 1504000604	San Simon River Watershed
Agriculture	0.84%			1.64%	1.25%
Apacherian-Chihuahuan Grassland and Mesquite Scrub	35.60%	46.62%	44.73%	54.89%	42.66%
Chihuahuan Desert, Thorn, and Sand Flat Scrub	25.18%	10.59%	43.40%	19.48%	32.10%
Developed, Medium - High Intensity	-	-	0.19%	0.32%	0.14%
Developed, Open Space - Low Intensity	-	-	-	-	0.01%
Madrean Pine Oak Woodland	6.69%	14.18%	7.34%	13.48%	8.02%
Madrean Pinyon-Juniper Woodland	7.35%	10.09%	2.12%	5.77%	5.42%
Mogollon Chaparral	1.43%	2.94%	0.74%	1.88%	1.40%
No Value, this occurs along state lines	20.72%	13.03%	-	-	6.57%
North American Warm Desert Barren Lands	1.72%	2.44%	0.45%	1.32%	1.43%
North American Warm Desert Woody and Emergent Wetlands	0.05%	0.54%	0.57%	1.22%	0.42%
Open Water	-	<0.01%	-	-	<0.01%
Rocky Mountain Ponderosa Pine and Aspen Forest Woodland	0.41%	0.02%	0.10%	-	0.10%
Sonoran Desert Scrub	-	-	0.34%	-	0.42%
<i>Area (sq. mile)</i>	354	342	286	175	2,250

Data Sources: GIS data layer "Arizona Gap Analysis Project Vegetation Map", University of Arizona, Southern Arizona Data Services Program, 2004 <http://sdrsnet.srn.arizona.edu/index.php> Originated by Arizona Game & Fish Department, Habitat Branch, 1993, this dataset was digitized from the August 1980 David E. Brown & Charles H. Lowe 1:1,000,000 scale, 'Biotic Communities of the Southwest'. New Mexico Resource Geographic Information (RGIS 2007)

Meteorological Stations, Precipitation and Temperature

For the years 1961-1990, the average annual precipitation for the San Simon River Watershed was about 21 inches (Table 2-6 and Figure 2-7). The Cave Creek-San Simon River Watershed received the most rainfall with 23 inches

of rain in an average year, while the San Simon Headwaters and Happy Camp Wash Watersheds typically received about 22 and 20 inches, respectively. Average Temperature for the San Simon Watershed ranged from 64 °F at the Bowie meteorological station to about 54 °F at Portal 4 SW.

Table 2-6: San Simon River Watershed Meteorological Stations, Temperature (°F) and Precipitation (in/yr) with Recent Long-term Records.

Watershed Name	Meteorological Stations	Average Temperature (°F)			Precipitation (in/yr)		
		Min.	Max.	Weighted Average	Min.	Max.	Weighted Average
Slick Rock Wash-San Simon River 1504000505	Tanque R9 on W4*	-	-	-	9	17	13.44
Whitlock Wash-Hospital Flat 1504000607	-	-	-	-	9	19	14.25
Tule Wells Draw-San Simon River 1504000607	Bowie	47.6	80.3	63.95	9	23	15.89
East Whitetail Creek-San Simon River 1504000606	San Simon	44.3	79.9	62.10			
	San Simon 5 NW*	-	-				
Cave Creek-San Simon River 1504000604	San Simon 9 NE*	-	-		9	31	19.21
	Painted Canyon*	-	-	-			
	Portal 4 SW	37.4	70.9	54.15			
	Portal	42.6	73.7	58.15			
San Simon River Headwaters 1504000602	Paradise	40.0	70.2	55.10			
	San Simon 9 ESE	47.2	78.1	62.65	9	43	23.00
	Apache 6 WNW*	-	-	-	11	39	22.11

Watershed Name	Meteorological Stations	Average Temperature (°F)			Precipitation (in/yr)		
		Min.	Max.	Weighted Average	Min.	Max.	Weighted Average
Gold Gulch-San Simon River 1504000608	Bowie Junction R15 ON W*	-	-	-	9	21	15.40
Happy Camp Wash 1504000604	Bowie 3 ESE*	-	-	-	9	25	19.53
San Simon River Watershed	-	-	-	-	9	43	20.85

Source: Temperature: Western Regional Climate Center (WRCC), Temperature data: <http://www.wrcc.dri.edu/summary/climsmaz.html>. Precipitation: GIS data layer "car_wash_precip" Arizona Land Information System (ALRIS 2004). <http://www.land.state.az.us/alris/index.html>. New Mexico Resource Geographic Information (RGIS 2007).

*Note: WRCC lists these stations as inactive, or insufficient data reported.

Land Ownership/Management

There are five different land ownership/management entities in the San Simon River Watershed (Figure 2-8 and Table 2-7). BLM held land is the largest category, representing about 41% of the watershed, followed by State Trust land with about 26%, and Private land with about 19%. The National Park Service, the U.S. Forest Service, and the Military hold smaller amounts of land in the watershed.

Land Use

The land cover condition during the early 1990's was determined using the National Land Cover Dataset (NLCD). The NLCD classification contains 21 different land cover categories (USGS, NLCD Land Cover Class Definitions); however, these categories have been consolidated into five land cover types (Figure 2-9 and Table 2-8). The five groupings for the land cover categories are:

- Crop, which includes confined feeding operations; cropland and pasture; orchards, groves, vineyards, nurseries and ornamental horticulture; other agricultural land.
- Forest, includes areas characterized by tree cover (natural or semi-natural woody vegetation, generally greater than 6 meters tall); tree canopy accounts for 25-100 percent of the cover
- Water, identifies all areas of surface water, generally with less than 25% cover of vegetation/land cover
- Range, which includes herbaceous rangeland; mixed range; shrub and brush rangeland.
- Urban, which includes residential areas; commercial and services; industrial and commercial

complexes; mixed urban or built-up land; other urban or built-up land; strip mines quarries and gravel pits; transportation, communication and utilities.

The most common land cover type in the San Simon River Watershed is Range which makes up about 98% of the watershed. Crop is the next most common type with about 1% of the total area.

Table 2-7: San Simon River Watershed Land Ownership/Management. (Percent of each 10-digit Watershed) (Part 1 of 2)

Land Owner	Slick Rock Wash-San Simon River 1504000505	Whitlock Wash-Hospital Flat 1504000607	Tule Wells Draw-San Simon River 1504000607	East Whitetail Creek-San Simon River 1504000606*	Cave Creek-San Simon River 1504000604*
BLM	88.04%	30.69%	55.59%	46.97%	31.74%
Military	-	-	-	-	-
National Parks	-	-	-	0.37%	-
Private	2.87%	2.18%	21.94%	18.64%	26.94%
State Trust	5.94%	67.13%	22.47%	22.14%	21.18%
USFS	3.15%	-	-	11.67%	19.89%
Area (square miles)	303	189	209	393	354

Data Sources: GIS data layer "ownership", (Arizona Land Information System (ALRIS 2004), Natural Resource Conservation Service (NRCS 2006). New Mexico Resource Geographic Information (RGIS 2007) <http://www.land.state.az.us/alris/index.html>

Table 2-7: San Simon River Watershed Land Ownership/Management. (Percent of each 10-digit Watershed) (Part 2 of 2)

Land Owner	San Simon River Headwaters 1504000602*	Gold Gulch-San Simon River 1504000608	Happy Camp Wash 1504000604	San Simon River Watershed
BLM	5.52%	41.07%	33.72%	41.32%
Military	-	-	-	-
National Parks	-	-	1.39%	0.25%
Private	38.14%	8.67%	29.87%	19.15%
State Trust	16.92%	46.33%	29.82%	25.80%
USFS	39.42%	3.94%	5.19%	13.42%
Total Area (square miles)	342	286	175	2,251

Data Sources: GIS data layer "ownership (Arizona Land Information System (ALRIS 2004), Natural Resource Conservation Service (NRCS 2006). New Mexico Resource Geographic Information (RGIS 2007), <http://www.land.state.az.us/alris/index.html>.

Table 2-8: San Simon River Watershed Land Use, Percent of 10-digit Watershed

Land Cover/Location	Crop	Forest	Urban	Range	Water	Area (sq. mi.)
Slick Rock Wash-San Simon River 1504000505	0.98%	0.04%	0.06%	98.92%	-	303
Whitlock Wash-Hospital Flat 1504000607	-	0.30%	-	99.70%	<0.01%	188
Tule Wells Draw-San Simon River 1504000607	2.14%	0.21%	0.59%	97.06%	-	209
East Whitetail Creek-San Simon River 1504000606	4.18%	1.35%	0.36%	94.32%	-	393
Cave Creek-San Simon River 1504000604	1.07%	1.88%	-	97.06%	-	353
San Simon River Headwaters 1504000602	-	0.81%	-	99.16%	<0.01%	342
Gold Gulch-San Simon River 1504000608	-	0.15%	0.19%	99.66%	-	286
Happy Camp Wash 1504000604	1.64%	1.37%	0.32%	96.67%	-	175
San Simon River Watershed	1.34%	0.85%	0.17%	97.64%	<0.01%	2,250

Data Sources: GIS data layer "san_gapveg", Arizona State Land Department, Arizona Land Resource Information System (ALRIS 2004) <http://www.land.state.az.us/alris/index.html>. New Mexico Geographic Information (RGIS 2007).

Mines – Primary Ores

Table 2-9 and Figure 2-10 show the types of ores being mined in the San Simon River Watershed. The most common mine type found in the watershed are geothermal, with 64 geothermal wells, followed by copper with 20 mines, lead with 19 mines, and gold and manganese, each with 13 mines.

Table 2-9: San Simon River Watershed Mines – Primary Ores.

Ore Type	Total Number of Mines	Ore Type	Total Number of Mines
Geothermal*	64	Gypsum	4
Copper	20	Uranium	4
Lead	19	Silver	2
Gold	13	Stone	2
Manganese	13	Tin	2
Sand & Gravel	6	Silicon	1
Zeolites	6	Clay	1
Tungsten	5	Beryllium	1
Diatomite	4	Zinc	1
Fluorine	4		

GIS data layer “mines”, Arizona State Land Department, Arizona Land Resource Information System (ALRIS, 2004). <http://www.land.state.az.us/alris/index.html>. New Mexico Resource Geographic Information (RGIS 2007).

**All Geothermal mine names are listed as “name unknown.” All other listings have mine names associated with them.*

Section 3: Resource Concerns

Introduction

Conservation Districts and other local leaders, along with NRCS and other resource management agencies, have identified priority natural resource concerns for this watershed. These concerns can be grouped under the broad resource categories of Soil, Water, Air, Plants, or Animals (SWAPA). Refer to Table 3-1 for a listing of priority resource concerns by land use within the San Simon River Watershed.

Soil Erosion

Soil erosion is defined as the movement of soil from water (sheet and rill or gully) or wind forces requiring treatment when soil loss tolerance levels are exceeded. Sheet and rill erosion is a concern particularly on rangeland and forest land in areas of shallow soils and poor vegetative cover. Soil loss results in reduced water holding capacity and plant productivity. Gully erosion can be a significant problem in areas of steep slopes and deep soils. Loss of vegetative cover and down-cutting of streams contribute to gully formation. Wind erosion is locally significant where adequate vegetative cover is not maintained.

Conservation practices applied to address this resource concern are generally those that help improve vegetative cover, stabilize sites, and control water flows. Practices may include critical area planting, deferred grazing, grade stabilization structures, herbaceous wind barriers, prescribed grazing, range planting, stream channel stabilization, tree and shrub

establishment, water and sediment control basins, water spreading, windbreak establishment, and wildlife upland habitat management.

Soil Condition

Soil condition is a resource concern on cropland whenever soil tilth is poor or soil compaction is excessive. Poor soil tilth results whenever unsuitable combinations of minerals, air, water, and organic matter occur, resulting in low microbial activity and chemical reactions. Soil compaction results from excessive compressing of soil particles and aggregates by machines or livestock, thus affecting plant-soil-moisture-air relationships. Soil condition can become a problem whenever a field is excessively tilled or tilled when the soil is wet, lack of crop rotation, and lack of addition of organic matter. Poor soil condition reduces root growth and plant productivity.

Conservation practices applied to address this resource concern are generally those that improve plant cover, improve soil organic matter, improve soil microbial activity, reduce tillage operations, or mechanically break up compacted soils. Practices may include deep tillage, conservation cover, conservation crop rotation, cover & green manure crop, irrigation water management, mulching, nutrient management, pest management, residue management, tree and shrub establishment, and waste utilization. Reduced tillage passes and addition of organic matter from cover crops or residue will improve soil condition.

Table 3-1: San Simon River Watershed Priority Resource Concerns by Land Use

Resource Category	Cropland Concerns	Rangeland Concerns	Forest Concerns	Urban Concerns
Soil Erosion		Sheet & Rill Erosion	Sheet & Rill Erosion	Roads & Construction Sites
Soil Condition	Soil Compaction & Organic Matter Depletion			
Water Quality	Excessive Nutrients & Organics & Pesticides in Ground Water	Excessive Suspended Sediment in Surface Water	Excessive Suspended Sediment in Surface Water	Excessive Nutrients & Organics & Pesticides in Ground Water
Water Quantity	Inefficient Use on Irrigated Land & Aquifer Overdraft			Inefficient Use on Irrigated Land & Aquifer Overdraft
Air Quality				
Plant Condition		Plant Productivity, Health & Vigor	Plant Productivity, Health & Vigor	
Noxious & Invasive Plants		Noxious & Invasive Plants	Noxious & Invasive Plants	
Domestic Animals		Inadequate Quantities & Quality of Feed & Forage & Water	Inadequate Quantities & Quality of Feed & Forage & Water	
Species of Concern		T&E Species & Declining Species & Species of Concern	T&E Species & Declining Species & Species of Concern	

(NRCS, 2007)

Water Quality

The Arizona Department of Environmental Quality (ADEQ) assesses surface water quality to identify which surface waters are impaired or attaining designed uses and to prioritize future monitoring. Impaired waters, as defined by Section 303(d) of the federal Clean Water Act, are those waters that are not meeting the state's water quality standards for designated uses. Attaining waters meet state water quality standards for designated uses. Strategies are implemented on impaired waters to reduce pollutant loadings so that surface water quality standards will

be met, unless impairment is *solely* due to natural conditions.

Once a surface water has been identified as impaired, activities in the watershed that might contribute further loadings of the pollutant are not allowed. Agencies and individuals planning future projects in the watershed must be sure that activities will not further degrade these impaired waters and are encouraged through grants to implement strategies to reduce loading. One of the first steps is the development of a Total Maximum Daily Load (TMDL) analysis to empirically determine the

load reduction needed to meet standards.

The *Draft 2006 Status of Ambient Surface Water Quality in Arizona* (ADEQ 2007) indicates that generally surface water quality is excellent where monitored and assessed (Figure 3.1). The status of water bodies in the San Simon River Watershed is:

- Cave Creek, from headwaters to South Fork of Cave Creek. 15040006-852A. 7.5 miles. This reach is given “unique water” protection. Impaired due to selenium. (Note that preliminary TMDL monitoring does *not* show further exceedances.) (02 Cave Creek-San Simon River Sub-Basin)
- Cave Creek, from South Fork Cave Creek to Coronado National Forest boundary. 15040006-852B. 1.5 miles. This reach is given “unique water” protection. Attaining all uses. No exceedances.
- Dankworth Ponds. 15040006-0440. 8 acres. Attaining some uses. Selenium exceedance in 1 (out of 1) sample. However, this lake system is also considered naturally impaired by low dissolved oxygen due to ground water upwelling. (06 Stockton Wash Sub-Basin)
- Roper Lake. 15040006-1250. 25 acres. Attaining some uses. Missing core parameters needed to assess designated uses. No exceedances. However, this lake system is also considered

naturally impaired by low dissolved oxygen due to ground water upwelling. (06 Stockton Wash Sub-Basin)

- South Fork Cave Creek, from headwaters to Cave Creek. 15040006-849. 8.1 miles. Attaining all uses.

(Data collected on other stream reaches or lakes in this watershed was insufficient to determine if impaired or attaining any designated use.)

Water Quantity

According to the Arizona Department of Water Resources (ADWR), ground water, in general, is found under water-table conditions in the upper aquifer and under artesian conditions in the lower aquifer. Prior to development, ground water movement generally followed surface-water patterns. Since the early 1950's, when pumpage increased dramatically, ground water movement has been toward areas of intense pumpage near farming centers. Declines in water levels are greatest in these areas. Maximum declines are found in the lower aquifer of up to 211 feet near Bowie from 1962-1987, and declines of up to 100 feet common around much of the watershed. In the southern part of the sub-basin, ground water level changes ranged from a rise of 15 feet to a decline of 15 feet over the same period.

Water levels in the upper aquifer for 1987 ranged from 30 to 150 feet below land surface, and discharge from wells varied from 75 to 300 gallons per minute. In the lower aquifer, water levels

range from less than 100 to 500 feet below land surface and large irrigation wells yield 500 to 2,000 gallons per minute.

Air Quality

Air quality is not a significant concern for this watershed (Figure 3-2). According to the ADEQ Air Quality Division (ADEQ, Air Quality Division), the San Simon River Watershed contains no areas that are listed as “non-attainment” areas, or “attainment areas with air quality maintenance plans.”

Plant Condition

Plant condition is a resource concern whenever plants do not manufacture sufficient food to continue the growth cycle or to reproduce. Plant condition is frequently a concern on rangeland where proper grazing management is not being applied.

Conservation practices applied to address this resource concern are generally those that maintain or improve the health, photosynthetic capability, rooting and reproductive capability of vegetation. Practices may include brush management, critical area planting, deferred grazing, fencing, forest stand improvement, herbaceous wind barriers, nutrient management, pest management, prescribed grazing, prescribed burning, range planting, recreation area improvement, riparian forest buffers, tree and shrub establishment, wetland development or restoration, wildlife upland habitat management, wildlife watering facility, wildlife wetland habitat management, and windbreak establishment.

Noxious and Invasive Plants

Noxious and invasive plants are a resource concern whenever these species cause unsuitable grazing conditions for livestock or wildlife and due to their potential to out-compete native species which are generally preferred for wildlife habitat value. Increases in noxious and invasive plants can result from poor grazing management, drought, control of wildfires in the higher elevations, and other causes.

Conservation practices applied to address this resource concern are generally those that control the establishment or reduce the population of noxious and invasive plant species. Practices may include brush management, deferred grazing, fencing, forest stand improvement, pest management, prescribed burning, prescribed grazing, and wildlife upland habitat management.

Bark Beetle, Drought, and Wildfire

Bark beetles are rarely found in the San Simon River Watershed and are not a significant concern (USFS 2007).

The Climate Assessment for the Southwest (CLIMAS) website (www.ispe.arizona.edu/climas) provides information on Arizona and New Mexico's drought status. Recent precipitation events have placed the areas of Arizona and New Mexico that encompass the San Simon Watershed in the mild and moderate drought status. However, the watershed remains abnormally dry, and continued drought development is likely.

The Southwest Coordination Center (www.gacc.nifc.gov/swcc/predictive/outlooks/outlooks.htm) places the San Simon Watershed in the “Above Normal” category for significant wildland fire activity potential due to the abnormally dry and warm conditions.

Domestic Animal Concerns

Domestic animal concerns occur whenever the quantity and quality of food are not adequate to meet the nutritional requirements of animals, or adequate quantity and quality of water is not provided. This is frequently a concern on rangeland when changes in species composition resulting from poor grazing management and drought can reduce the availability of suitable forage.

Conservation practices applied to address this resource concern are generally those that maintain or improve the quantity, quality, and diversity of forage available for animals, reduce the concentration of animals at existing water sources, and insure adequate quantity and reliability of water for the management of domestic animals. Practices may include brush

management, deferred grazing, fencing, pest management, prescribed burning, prescribed grazing, pipelines, ponds, range planting, water spreading, wells, spring development, watering facility, and wildlife upland habitat management.

Species of Concern

There are 55 threatened and endangered species listed for Arizona (U. S. Fish and Wildlife Service website). In 1990 Arizona voters created the Heritage Fund, designating up to \$10 million per year from lottery ticket sales for the conservation and protection of the state’s wildlife and natural areas. The Heritage Fund allowed for the creation of the Heritage Data Management System (HDMS) which identifies elements of concern in Arizona and consolidates information about their status and distribution throughout the state. (Arizona Game & Fish website, 2006)

The San Simon River Watershed contains 18 species that are either listed, species of concern, or candidate species, under the U.S. Endangered Species Act (Table 3-2).

Table 3-2: San Simon River Watershed Species of Concern and Endangered Species Classifications and Observations⁽¹⁾

Common Name	Species Name	USESA (2)	USFS (3)	BLM (4)	STATE (5)	Last Recorded Observation
Accipiter gentilis	Northern Goshawk	SC	S		WSC	1994
Allium bigelovii	Bigelow Onion				SR	1968
Allium plummerae	Plummer Onion				SR	1963
Allium rhizomatum	Redflower Onion		S		SR	1980-PRE
Amazilia violiceps	Violet-crowned Hummingbird				WSC	1995
Ammodramus bairdii	Baird's Sparrow	SC			WSC	1996-WI
Anthocharis cethura	Felder's Orange Tip		S			1964
Apacheria chiricahuensis	Chiricahua Rock Flower				SR	1977

Common Name	Species Name	USESA (2)	USFS (3)	BLM (4)	STATE (5)	Last Recorded Observation
<i>Aquila chrysaetos</i>	Golden Eagle					1979
<i>Arabis tricornuta</i>	Chiricahua Rock Cress		S			2001
<i>Asclepias lemmonii</i>	Lemmon Milkweed		S			1989
<i>Astragalus cobrensis</i> var. <i>maguirei</i>	Coppermine Milk-vetch	SC	S		SR	1991
<i>Astragalus cobrensis</i> var. <i>maguirei</i>	Coppermine Milk-vetch	SC	S		SR	1993
<i>Athene cunicularia</i> <i>hypugaea</i>	Western Burrowing Owl	SC		S		1979
Bat Colony						2001
<i>Carex chihuahuensis</i>	A Sedge		S			1994
CH for <i>Empidonax</i> <i>traillii extimus</i>	Designated Critical Habitat for southwestern willow flycatcher					
CH for <i>Strix</i> <i>occidentalis lucida</i>	Designated Critical Habitat for Mexican spotted owl					
CH for <i>Xyrauchen</i> <i>texanus</i>	Designated Critical Habitat for razorback sucker					
<i>Choeronycteris</i> <i>mexicana</i>	Mexican Long-tongued Bat	SC			WSC	2005
<i>Coccyzus americanus</i> <i>occidentalis</i>	Western Yellow-billed Cuckoo	C	S		WSC	1984
<i>Corynorhinus</i> <i>townsendii pallescens</i>	Pale Townsend's Big- eared Bat	SC				2005
<i>Crotalus willardi</i> <i>obscurus</i>	New Mexico Ridge-nosed Rattlesnake	LT	S			1998
<i>Cyprinodon macularius</i>	Desert Pupfish	LE			WSC	1991
<i>Draba standleyi</i>	Standley Whitlow-grass	SC				1996
<i>Echinocereus ledingii</i>	Pinaleno Hedgehog Cactus				SR	1979
<i>Empidonax fulvifrons</i> <i>pygmaeus</i>	Northern Buff-breasted Flycatcher	SC			WSC	2000
<i>Empidonax traillii</i> <i>extimus</i>	Southwestern Willow Flycatcher	LE	S		WSC	1998
<i>Erigeron kuschei</i>	Chiricahua Fleabane	SC	S		SR	1982
<i>Escobaria tuberculosa</i>	Incense Corycactus				SR	1995
<i>Eumops perotis</i> <i>californicus</i>	Greater Western Bonneted Bat	SC				1969
<i>Euptilotis neoxenus</i>	Eared Quetzal		S			1979
<i>Falco peregrinus</i> <i>anatum</i>	American Peregrine Falcon	SC	S		WSC	2005

Common Name	Species Name	USESA (2)	USFS (3)	BLM (4)	STATE (5)	Last Recorded Observation
Gentianella wislizeni	Wislizeni Gentian	SC	S		SR	1999
Gopherus agassizii (Sonoran Population)	Sonoran Desert Tortoise	SC			WSC	2001

Data Sources: Arizona Land Information System (ALRIS), Natural Resource Conservation Service (NRCS). Status Definitions as Listed by Arizona Game and Fish Department, Nov. 26, 2006
http://www.gf.state.az.us/w_c/edits/hdms_status_definitions.shtml

(1) Proposed for Listing: (USEA) Federal U.S. Status ESA Endangered Species Act (1973 as amended)
 US Department of Interior, Fish and Wildlife Service

(2) Listed:

- LE Listed Endangered: imminent jeopardy of extinction.
- LT Listed Threatened: imminent jeopardy of becoming Endangered.

Candidate (Notice of Review: 1999):

C Candidate. Species for which USFWS has sufficient information on biological vulnerability and threats to support proposals to list as Endangered or Threatened under ESA. However, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.

SC Species of Concern. The terms "Species of Concern" or "Species at Risk" should be considered as terms-of-art that describe the entire realm of taxa whose conservation status may be of concern to the US Fish and Wildlife Service, but neither term has official status (currently all former C2 species).

(3) USFS US Forest Service (1999 Animals, 1999 Plants)
 US Department of Agriculture, Forest Service, Region 3

S Sensitive: those taxa occurring on National Forests in Arizona which are considered sensitive by the Regional Forester.

(4) BLM US Bureau of Land Management (2000 Animals, 2000 Plants)
 US Department of Interior, BLM, Arizona State Office

S Sensitive: those taxa occurring on BLM Field Office Lands in Arizona which are considered sensitive by the Arizona State Office.

(5) State Status

SR Salvage Restricted: collection only with permit.

WSC Wildlife of Special Concern in Arizona. Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by the Arizona Game and Fish Department's listing of Wildlife of Special Concern in Arizona (WSCA, in prep).

Resource Concern Summary

Local leaders have identified watershed health as a priority concern for the San Simon Watershed (Brandau, Wittler, and Orr, 2003). This includes both the upland areas of the watershed and the

riparian or stream course areas. The condition of the upland areas is integral to the hydrologic function, such that when precipitation falls on the land its disposition is affected by the soil and vegetation, which in turn are affected by land uses, both historical and current.

The amount of the precipitation which immediately runs off the land surface, and that which infiltrates into the soil to either be used for plant growth or to recharge ground water, is dependent on this critical interface.

The San Simon watershed is a mosaic of federal, state and private lands where livestock grazing, agriculture and recreation are the primary land uses. Recreational use includes a designated OHV use area. The San Simon River started to incise early in the 20th century. Starting in the 1930's the Bureau of Land Management has installed erosion control structures to halt the channel incision. There are currently 19 major detention dams, dikes and earth structures installed in the San Simon Watershed. Erosion and erosion control remain important concerns in the San Simon Watershed.

With access to U.S. Interstate 10 the private and state lands near the communities of Bowie and San Simon have the potential to experience rapid growth in the future. The southern portion of the San Simon Watershed, with high elevations and moderate temperatures, also has the potential to experience growth in the form of small acreage ranches.

Conservation Progress/Status

Conservation progress for the previous five years in the San Simon River Watershed has focused on addressing the following primary resource concerns:

- ✓ Soil Erosion – Sheet and Rill Erosion
- ✓ Water Quality – Excessive Suspended Sediment and Turbidity in Surface Water
- ✓ Water Quantity – Inefficient Water Use on Irrigated Land
- ✓ Plant Condition – Productivity, Health and Vigor
- ✓ Domestic Animals – Inadequate Quantities and Quality of Feed and Forage

The following table presents conservation accomplishments in this watershed during fiscal years (FY) 2002 through 2006, according to the NRCS Progress Reporting System (Table 3-3).

Table 3-3: San Simon River Watershed Conservation Treatment Applied

San Simon River Watershed (15040006) Conservation Treatment Applied	FY02-06 TOTAL
Brush Management (acres)	480
Conservation Crop Rotation (acres)	1,495
Fence (feet)	8,394
Irrigation System, Sprinkler (acres)	1,203
Irrigation Water Conveyance, Pipeline, Underground, Plastic (feet)	26,872
Irrigation Water Management (acres)	5,177
Nutrient Management (acres)	3,414
Pest Management (acres)	3,414
Pipeline (feet)	37,132
Prescribed Grazing (acres)	141,535
Residue Management, Seasonal (acres)	949
Structure for Water Control (number)	16
Upland Wildlife Habitat Management (acres)	39,430
Watering facility (number)	13

(NRCS, 2007)

Section 4: Census, Social and Agricultural Data

This section discusses the human component of the watershed and the pressure on natural resources caused by humans and by population change.

Population Density, 1990

Census block statistics for 1990 were compiled from information prepared by Geo-Lytics (Geo-Lytics, 1998). These data were linked with census block data and used to create a density map (Figure 4-1) through a normalization process using a grid of 7 km squares. This process involves calculating density per census block and intersecting it with the grid, which is then used to calculate the number of people and thus density per grid square.

Table 4-1 shows the tabulated minimum, maximum and mean number of people per square mile in 1990 for each watershed. In 1990, the mean population density for the entire watershed was about 1 person per square mile. Cave Creek-San Simon River had the highest population mean with about 3 people per square mile, and a maximum of 126 people per square mile.

Population Density, 2000

The Census Block 2000 statistics data were downloaded from the Environmental Systems Research Institute (ESRI) website (ESRI Data Products, 2003) and are shown in Table 4-2.

A population density map (Figure 4-2) was created from these data. The mean

population density in 2000 was about 1.4 people per square mile. Slick Rock Wash-San Simon River had the highest mean population density with 7 people per square mile, respectively. East Whitetail Creek-San Simon River had the highest maximum density of 54 people per square mile.

Population Density Change, 1990-2000

The 1990 and 2000 population density maps were used to create a population density change map. The resulting map and table (Figure 4-3 and Table 4-3) show population increase or decrease over the ten year time frame. Overall, mean population density showed a zero increase in people per square mile during this ten-year time period. Happy Canyon Wash and Tule Wells Draw at San Simon River both had the highest mean increase in population density at 0.2 people per square mile. Sam Simon Headwater and Cave Creek at San Simon River both had the greatest decrease in population at -0.2 people per square mile.

Housing Density, 2000 and 2030

The Watershed Housing Density Map for the years 2000 and 2030 were created with data developed by David M. Theobald (Theobald, 2005). Theobald developed a nationwide housing density model that incorporates a thorough way to account for land-use change beyond the “urban fringe.”

Exurban regions are the “urban fringe”, or areas outside suburban areas, having population densities greater than 0.68 – 16.18 ha (1.68 – 40 acres) per unit. Theobald stresses that exurban areas are increasing at a much faster rate than

urban sprawl, are consuming much more land, and are having a greater impact on ecological health, habitat fragmentation and other resource concerns.

Theobald estimates that the exurban density class has increased at a much faster rate than the urban/suburban density classes. Theobald’s model forecasts that this trend will continue and may even accelerate by 2030. This indicates that development patterns are shifting more towards exurban, lower density, housing units, and are thereby consuming more land. He suggests that exurban development has more overall effect on natural resources because of

the larger footprint and disturbance zone, a higher percent of impervious surfaces, and higher pollution because of more vehicle miles traveled to work and shopping.

Figure 4-4 and Table 4-4, San Simon River Watershed Housing Density for 2000, identifies that about 47% of housing is located in “undeveloped private” areas, while about 4.7% is located in “exurban” areas. Figure 4-5 and Table 4-5, Housing Density for 2030, projects “undeveloped private” areas being reduced to about 39% and “exurban” areas increasing to 12.5%.

Table 4-1: San Simon River Watershed 1990 Population Density (people/square mile)

Watershed Name	Area (sq. mi.)	Population Density (people/sq.mi.)		
		Min	Max	Mean
San Simon River Headwaters (1504000601)	342	0	80	2
Cave Creek-San Simon River (1504000602)	353	0	126	3
Happy Camp Wash (1504000603)	175	0	39	1
East Whitetail Creek-San Simon River (1504000604)	393	0	2	0.4
Whitlock Wash-Hospital Flat (1504000605)	189	0	26	0.4
Tule Wells Draw-San Simon River (1504000606)	209	0	0	0
Gold Gulch-San Simon River (1504000607)	286	0	2	0.2
Slick Rock Wash-San Simon River (1504000608)	303	0	12	0.15
Total San Simon Watershed	2250	0	126	1

Data Sources: ESRI Data Products, Census 2000, October 17, 2003. <http://www.esri.com/data/> New Mexico Resource Geographic Information (RGIS 2007).

Table 4-2: San Simon River Watershed 2000 Population Density (people/square mile)

Watershed Name	Area (sq. mi.)	Population Density (people/sq.mi.)		
		Min	Max	Mean
San Simon River Headwaters (1504000601)	342	0	24	1
Cave Creek-San Simon River (1504000602)	353	0	16	1
East Whitetail Creek-San Simon River (1504000604)	393	0	54	1
Happy Camp Wash (1504000603)	175	0	5	1
Tule Wells Draw-San Simon River (1504000606)	209	0	3	0.4
Gold Gulch-San Simon River (1504000607)	286	0	5	0.1
Whitlock Wash-Hospital Flat (1504000605)	189	0	0	0
Slick Rock Wash-San Simon River (1504000608)	303	0	252	7
Total San Simon Watershed	2250	0	252	1.4

Data Sources: ESRI Data Products, Census 2000, October 17, 2003. <http://www.esri.com/data/> New Mexico Resource Geographic Information (RGIS 2007).

Table 4-3: San Simon River Watershed 1990 to 2000 Population Density Change (people/square mile)

Watershed Name	Area (sq. mile)	Population Density (people/sq. mile)		
		Min	Max	Mean
San Simon River Headwaters (1504000601)	342	-80	23	-2
Cave Creek-San Simon River (1504000602)	353	-110	6	-2
East Whitetail Creek-San Simon River (1504000604)	393	-21	15	0
Happy Camp Wash (1504000603)	175	-2	3	0.2
Tule Wells Draw-San Simon River (1504000606)	209	-1	2	0.2
Gold Gulch-San Simon River (1504000607)	286	-2	9	0
Whitlock Wash-Hospital Flat (1504000605)	189	0	0	0
Slick Rock Wash-San Simon River (1504000608)	303	-53	107	3
Total San Simon Watershed	2250	-110	107	0

Data Sources: ESRI Data Products, Census 2000, October 17, 2003. <http://www.esri.com/data/> New Mexico Resource Geographic Information (RGIS 2007).

*Table 4-4: San Simon River Watershed Housing Density 2000 (Percent of Watershed)
(Part 1 of 2)**

Housing Density	San Simon River Headwaters Slick Rock 1504000601	Cave Creek-San Simon River 1504000602	Happy Camp Wash 1504000603	East Whitetail Creek-San Simon River 1504000604
Undeveloped Private	57.8%	50.9%	86.1%	30.3%
Rural	42.0%	48.5%	13.8%	67.3%
Exurban	0.2%	0.6%	0.1%	2.2%
Suburban	0.0	0.0	0.0	0.1%
Urban	0.0	0.0	0.0	0.0
San Simon Watershed (sq. miles)	342	353	175	393

*Table 4-4: San Simon River Watershed Housing Density 2000 (Percent of Watershed)
(Part 2 of 2)**

Housing Density	Whitlock Wash-Hospital Flat (1504000605)	Tule Wells Draw-San Simon River (1504000606)	Gold Gulch-San Simon River (1504000607)	Slick Rock Wash-San Simon River (1504000608)
Undeveloped Private	92.2%	57.7%	95.4%	47.3%
Rural	7.7%	40.5%	3.9%	46.1%
Exurban	0.1%	1.6%	0.6%	4.7%
Suburban		0.2%		1.1%
Urban		0.1%		0.9%
San Simon Watershed (sq. miles)	189	209	286	303

Source: Arizona Land Information System (ALRIS 2004), Natural Resource Conservation Service (NRCS 2006) and Theobald (2005). *All calculations are based on GIS data layer "housing density (Theobald, 2005)."

*Table 4-5: San Simon River Watershed Housing Density 2030 (Percent of Watershed)
(Part 1 of 2)**

Housing Density	San Simon River Headwaters Slick Rock (1504000601)	Cave Creek-San Simon River (1504000602)	Happy Camp Wash (1504000603)	East Whitetail Creek-San Simon River (1504000604)
Undeveloped Private	17.5%	32.0%	9.6%	6.4%
Rural	69.5%	46.8%	84.9%	59.9%
Exurban	13.0%	20.9%	5.5%	32.6%
Suburban		0.3%		1.0%
Urban				0.1
San Simon Watershed (sq. miles)	342	353	175	393

*Table 4-5: San Simon River Watershed Housing Density 2030 (Percent of Watershed)
(Part 2 of 2)**

Housing Density	Whitlock Wash-Hospital Flat (1504000605)	Tule Wells Draw-San Simon River (1504000606)	Gold Gulch-San Simon River (1504000607)	Slick Rock Wash-San Simon River (1504000608)
Undeveloped Private	88.4%	8.2%	23.9%	39.0%
Rural	11.3%	64.6%	74.3%	42.5%
Exurban	0.2%	24.8%	1.8%	12.5%
Suburban	0.1%	1.7%		4.5%
Urban		0.7%		1.5%
San Simon Watershed (sq. miles)	189	209	286	303

Source: Arizona Land Information System (ALRIS 2004), Natural Resource Conservation Service (NRCS 2006) and Theobald (2005). *All calculations are based on GIS data layer "housing density (Theobald, 2005)."

San Simon River Watershed Agricultural Statistics

Arizona is known as one of the most productive and efficient agricultural regions in the world, with beauty that also provides the food and fiber to sustain life in the desert. Arizona is also one of the most diverse agricultural producing states in the nation, producing more than 160 varieties of vegetables, livestock, field crops and

nursery stock. The climate, natural resources, agribusiness infrastructure and farm heritage help make agriculture a \$9.2 billion dollar industry employing more than 72,000 individuals.

According to the United States Department of Agriculture's, 2002 Census, there are more than 7,000 farms and ranches, seventy-eight percent of which are owned by individuals or families. The total

farmland in Arizona is comprised of more than 26,000,000 acres with irrigated crops on 1,280,000 acres and pasture for animals on 23,680,000.

Agriculture in general on the San Simon Watershed is comprised of:

- Considerable grazing land for many livestock operations
- Multiple recreational equestrian facilities
- A number of apiary (honey bee) operations
- Large plantings of pecans and a few pistachios and walnuts
- A significant amount of chili production
- A few mixed crops including:
 - Alfalfa
 - Small grains
- Vineyards and grapes
- Miscellaneous plantings of fruit trees, including apples, peaches, nectarines and plums

Of the 323 farms that have pasture and rangeland, 75% have 100 or more acres. Seventy-three percent of all farms in the watershed are less than 1,000 acres in size. Of the 211 farms that harvest crops, 47% are 49 acres or less in size.

To derive the data, the NASS (National Agricultural Statistics Service, United States Department of Agriculture) has farm data by zip code. We used the U.S. Census Bureau ZIP Census Tabulation Areas (ZCTA) to generate maps. A typical 5-digit ZCTA (there are 3-digit ZCTAs as well) is typically nearly identical to a 5-digit U.S. Postal Service ZIP code, but there are some distinctions. Unlike ZIP codes, ZCTA areas are spatially complete and they

are easier to map. The Bureau created special `XX ZCTAs (ZCTAs with a valid 3-digit ZIP but with "XX" as last two characters of the code) which represent large unpopulated areas where it made no sense to assign a census block to an actual ZIP code. Similarly, HH ZCTAs represent large bodies of water within a 3-digit zip area. There is typically no population in either an XX or HH ZCTA.

Data is withheld by NASS for categories with one to four farms. This is to protect the identity of individual farmers. Farm counts for these zip codes are included in the "State Total" category. Some categories only contained stars instead of numbers. Each star was counted as one farm. But because each star could represent as many as 4 farms, each number on the tables are actually greater than or equal to the number listed. In some cases this results in percentages that add up to more or less than 100 percent.

Tables for the San Simon Watershed include data from zip codes both contained within the watershed and zip codes crossing watershed boundaries.

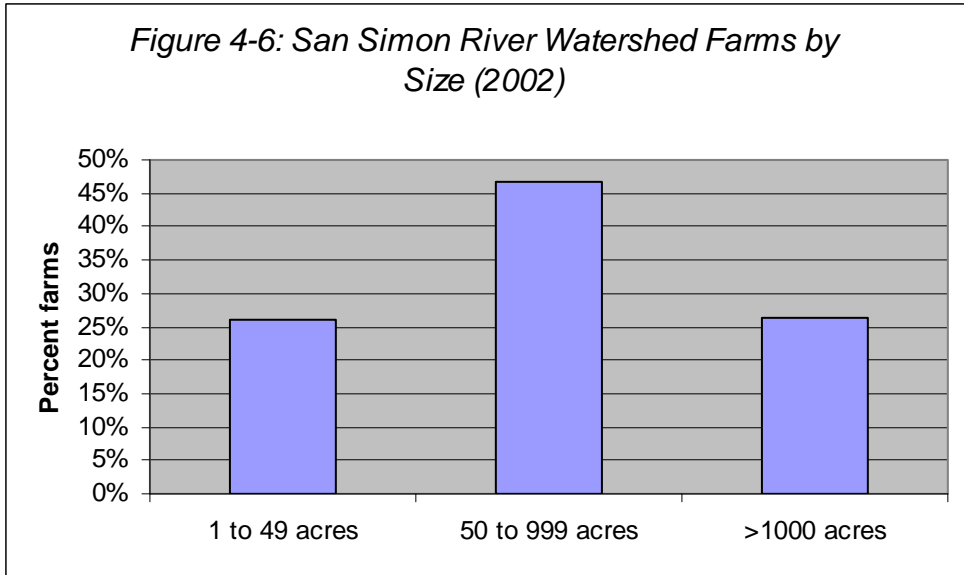


Table 4-6: San Simon River Wash Watershed Farms by Size

All farms	1 to 49 acres	50 to 999 acres	>1000 acres
610	26%	47%	26%

Percents rounded. Data source: NASS (National Agricultural Statistics Service, United States Department of Agriculture)

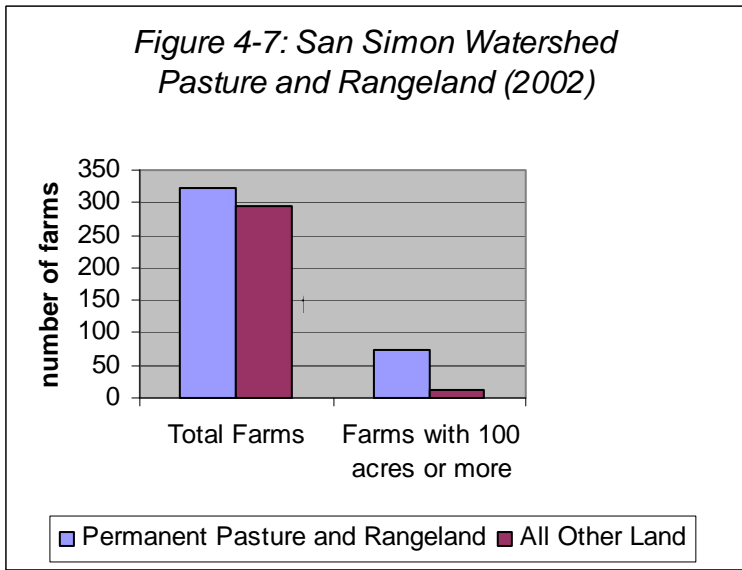


Table 4-7: San Simon River Watershed Pasture and Rangeland

Category	Total farms	Farms 100 acres or more
Permanent pasture and rangeland	323	75
All other land	295	11

Percents rounded. Data source: NASS (National Agricultural Statistics Service, United States Department of Agriculture)

Figure 4-8: San Simon Watershed Cropland Harvested (2002)

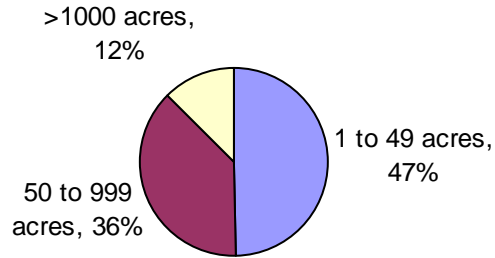


Table 4-8: San Simon River Watershed Cropland Harvested

Total farms	1 to 49 acres	50 to 999 acres	>1000 acres
211	47%	36%	12%

Percents rounded.

Data source: NASS (National Agricultural Statistics Service, United States Department of Agriculture)

Section 5: Resource Assessment Tables

The following Resource Assessment Tables summarize current and desired future natural resource conditions for the San Simon River Watershed. The tables present information on benchmark and future conservation systems and practices, qualitative effects on primary resource concerns, and estimated costs for conservation implementation. Conservation District board members, NRCS conservationists, and other people familiar with conservation work in the watershed were consulted for estimating current and future natural resource conditions.

The tables show three levels of conservation treatment (Baseline, Progressive, Resource Management System) for each of the major land uses (crop, range, forest) within the watershed. **Baseline** is defined as a low level of conservation adoption with landowners who are typically not participating in conservation programs. There are, however, a few practices that have been commonly adopted by all landowners in this watershed. **Progressive** is defined as an intermediate level of conservation adoption with landowners who are actively participating in conservation programs and have adopted several practices but not satisfied all of the Quality Criteria in the NRCS Field Office Technical Guide. **Resource Management System (RMS)** is defined as a complete system of conservation practices that addresses all of the Soil, Water, Air, Plant, and Animal (SWAPA) resource concerns typically seen for this land use in this watershed.

For each land use, the results of the assessment are presented in two parts. Part 1 (Assessment Information) summarizes the conservation practices at each treatment level and the quantities of practices for current benchmark conditions and projected future conditions. Part 1 also displays the four primary resource concerns, along with individual practice effects and an overall Systems Rating (ranging from a low of 1 to a high of 5) indicating the effectiveness of the conservation system used at each treatment level. Part 2 (Conservation Cost Table) summarizes the installation, management, and related costs by conservation practice and treatment level for the projected future conditions by federal and private share of the costs. Part 2 also displays the benchmark and future conservation conditions status bars.

Credit goes to NRCS in Oregon for development of the template for these Resource Assessment Tables.

NOTE: the numbers in the first column of each table represent NRCS conservation practice codes.

WATERSHED NAME & CODE		SAN SIMON RIVER - 15040006		LANDUSE ACRES		19,255
LANDUSE TYPE		CROP		TYPICAL UNIT SIZE ACRES		1,000
ASSESSMENT INFORMATION		Future Conditions		CALCULATED PARTICIPATION		81%
Conservation Systems by Treatment Level	Benchmark Conditions	Future Conditions		RESOURCE CONCERNS		
		Existing Unchanged Units	New Treatment Units	Soil Condition - Organic Matter Depletion	Water Quality - Excessive Nutrients and Organics in Groundwater	Air Quality - Particulate matter less than 10 micrometers in diameter (PM 10)
	Total Units		Total Units			
Baseline			System Rating ->	1	5	2
Irrigation Land Levelling (ac.) 464	722	108	0	0	4	0
Irrigation System, Surface and Subsurface (ac.) 443	2,888	433	0	433	4	0
Irrigation Water Conveyance, Ditch and Canal Lining (ft.) 428	2,888	433	0	433	4	0
Irrigation Water Conveyance, Pipeline (ft.) 430	1,444	217	0	217	5	3
Structure for Water Control (no.) 587	3	0	0	0	3	0
Total Acreage at Baseline	2,888	433	0	433		
Progressive			System Rating ->	4	5	4
Conservation Crop Rotation (ac.) 328	1,926	481	289	4	3	1
Irrigation Land Levelling (ac.) 464	963	313	72	0	4	0
Irrigation System, Surface and Subsurface (ac.) 443	963	385	0	385	4	0
Irrigation Water Conveyance, Ditch and Canal Lining (ft.) 428	9,628	2,696	1,155	3,851	4	2
Irrigation Water Conveyance, Pipeline (ft.) 430	1,926	626	144	770	5	3
Irrigation Water Management (ac.) 449	1,926	481	289	4	5	5
Residue Management, Seasonal (ac.) 344	963	241	144	3	1	-1
Structure for Water Control (no.) 587	10	3	1	4	3	0
Total Acreage at Progressive Level	1,926	481	289	770		
RMS			System Rating ->	4	5	4
Conservation Crop Rotation (ac.) 328	14,441	15,885	2,166	18,052	3	1
Irrigation Land Levelling (ac.) 464	14,441	15,705	2,347	18,052	4	0
Irrigation System, Microirrigation (ac.) 441	1,444	1,444	361	1,805	4	0
Irrigation System, Sprinkler (ac.) 442	1,444	1,444	361	1,805	4	0
Irrigation System, Surface and Subsurface (ac.) 443	14,441	17,330	722	18,052	4	0
Irrigation Water Conveyance, Ditch and Canal Lining (ft.) 428	144,413	153,799	26,716	180,516	4	2
Irrigation Water Conveyance, Pipeline (ft.) 430	28,883	31,410	4,693	36,103	5	3
Irrigation Water Management (ac.) 449	14,441	15,885	2,166	18,052	4	5
Nutrient Management (ac.) 590	14,441	14,441	3,610	18,052	3	5
Pest Management (ac.) 595	14,441	14,441	3,610	18,052	1	0
Residue and Tillage Management, Mulch Till (ac.) 345	7,221	7,221	1,805	9,026	1	-1
Residue Management, Seasonal (ac.) 344	7,221	7,943	1,083	9,026	1	-1
Structure for Water Control (no.) 587	144	154	27	181	3	0
Total Acreage at RMS Level	14,441	14,441	3,610	18,052		

WATERSHED NAME & CODE		SAN SIMON RIVER - 15040006			LANDUSE ACRES			19,255		
LANDUSE TYPE		CROP			TYPICAL UNIT SIZE ACRES			1,000		
CONSERVATION COST TABLE		FUTURE			FEDERAL			CALCULATED PARTICIPATION		
Conservation Systems by Treatment Level		New Treatment Units	Installation Cost 50%	Management Cost - 3 yrs 100%	Technical Assistance 20%	Total Present Value Cost	Installation Cost 50%	Annual O & M + Mgt Costs 100%	Total Present Value Cost	81%
Progressive										
Conservation Crop Rotation (ac.) 328		289	\$0	\$8,665	\$1,733	\$9,453	\$0	\$2,888	\$4,446	
Irrigation Land Leveling (ac.) 464		72	\$36,103	\$0	\$7,221	\$43,324	\$36,103	\$2,166	\$45,228	
Irrigation System, Surface and Subsurface (ac.) 443		0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Irrigation Water Conveyance, Ditch and Canal Lining (ft.) 428		1,155	\$4,621	\$0	\$924	\$5,545	\$4,621	\$185	\$5,400	
Irrigation Water Conveyance, Pipeline (ft.) 430		144	\$722	\$0	\$144	\$866	\$722	\$29	\$844	
Irrigation Water Management (ac.) 449		289	\$0	\$8,665	\$1,733	\$9,453	\$0	\$2,888	\$4,446	
Residue Management, Seasonal (ac.) 344		144	\$0	\$2,599	\$0	\$2,836	\$0	\$866	\$1,334	
Structure for Water Control (no.) 587		1	\$173	\$0	\$0	\$208	\$173	\$7	\$202	
Subtotal		289	\$41,620	\$19,929	\$12,310	\$71,686	\$41,620	\$9,030	\$61,900	
RMS										
Conservation Crop Rotation (ac.) 328		2,166	\$0	\$64,986	\$12,997	\$70,900	\$0	\$21,662	\$33,345	
Irrigation Land Leveling (ac.) 464		2,347	\$1,173,352	\$0	\$234,670	\$1,408,022	\$1,173,352	\$70,401	\$1,469,907	
Irrigation System, Microirrigation (ac.) 441		361	\$270,773	\$0	\$54,155	\$324,928	\$270,773	\$27,077	\$384,833	
Irrigation System, Sprinkler (ac.) 442		361	\$306,877	\$0	\$61,375	\$368,252	\$306,877	\$12,275	\$358,584	
Irrigation System, Surface and Subsurface (ac.) 443		722	\$0	\$0	\$0	\$0	\$0	\$0	\$0	
Irrigation Water Conveyance, Ditch and Canal Lining (ft.) 428		26,716	\$106,865	\$0	\$21,373	\$128,238	\$106,865	\$4,275	\$124,871	
Irrigation Water Conveyance, Pipeline (ft.) 430		4,693	\$23,467	\$0	\$4,693	\$28,160	\$23,467	\$839	\$27,421	
Irrigation Water Management (ac.) 449		2,166	\$0	\$64,986	\$12,997	\$70,900	\$0	\$21,662	\$33,345	
Nutrient Management (ac.) 590		3,610	\$0	\$108,309	\$21,662	\$118,166	\$0	\$36,103	\$55,575	
Pest Management (ac.) 595		3,610	\$0	\$108,309	\$21,662	\$118,166	\$0	\$36,103	\$55,575	
Residue and Tillage Management, Mulch Till (ac.) 345		1,805	\$0	\$46,031	\$0	\$50,221	\$0	\$15,344	\$23,620	
Residue Management, Seasonal (ac.) 344		1,083	\$0	\$19,496	\$0	\$21,270	\$0	\$6,499	\$10,004	
Structure for Water Control (no.) 587		27	\$4,007	\$0	\$0	\$4,809	\$4,007	\$160	\$4,683	
Subtotal		3,610	\$1,885,341	\$412,117	\$459,492	\$2,712,031	\$1,885,341	\$252,499	\$2,581,763	
Grand Total		3,899	\$1,926,961	\$432,046	\$471,801	\$2,783,717	\$1,926,961	\$261,529	\$2,643,663	

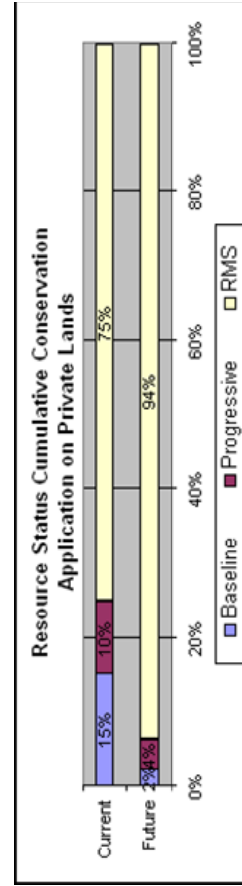


Chart Refers To	
Landuse Type	CROP
Calculated Participation Rate	81%

Average PY Costs per Ac		
System	Federal	Private
Prog	\$248.20	\$214.32
RMS	\$751.19	\$715.11

WATERSHED NAME & CODE		SAN SIMON RIVER - 15040006			LANDUSE ACRES		1,393,764
LANDUSE TYPE		RANGE			TYPICAL UNIT SIZE ACRES		50,000
ASSESSMENT INFORMATION							
Conservation Systems by Treatment Level	Benchmark Conditions	Future Conditions			RESOURCE CONCERNS		
		Existing Unchanged Units	New Treatment Units	Total Units	Soil Erosion - Sheet and Rill	Water Quality - Excessive Sediment and Turbidity in Surface Water	Plant Condition - Productivity, Health and Vigor
Baseline							
Fence (ft.) 382	104,532	52,266	0	52,266	1	3	0
Pipeline (ft.) 516	104,532	52,266	0	52,266	0	1	1
Watering Facility (no.) 614	209	105	0	105	3	3	0
Total Acreage at Baseline	1,045,323	522,662	0	522,662	4	3	4
System Rating ->							
Progressive							
Fence (ft.) 382	69,688	60,977	104,532	165,509	0	1	1
Pipeline (ft.) 516	69,688	60,977	104,532	165,509	3	3	0
Prescribed Burning (ac.) 338	13,938	6,969	26,133	33,102	1	1	4
Prescribed Grazing (ac.) 528	139,376	69,688	261,331	331,019	5	3	5
Watering Facility (no.) 614	56	80	52	132	0	4	1
Total Acreage at Progressive Level	139,376	69,688	261,331	331,019	4	4	5
System Rating ->							
RMS							
Brush Management (ac.) 314	20,906	20,906	33,102	54,008	4	4	5
Fence (ft.) 382	209,065	270,042	270,042	540,084	4	4	5
Pipeline (ft.) 516	209,065	270,042	270,042	540,084	0	1	1
Prescribed Burning (ac.) 338	20,906	27,875	26,133	54,008	3	3	0
Prescribed Grazing (ac.) 528	209,065	278,753	261,331	540,084	1	1	4
Range Planting (ac.) 550	20,906	20,906	33,102	54,008	5	3	5
Upland Wildlife Habitat Management (ac.) 645	209,065	209,065	331,019	540,084	4	2	5
Watering Facility (no.) 614	209	289	251	540	0	0	4
Wildlife Watering Facility (no.) 648	42	42	66	108	0	4	1
Total Acreage at RMS Level	209,065	209,065	331,019	540,084	4	4	5

WATERSHED NAME & CODE		SAN SIMON RIVER - 15040006				LANDUSE ACRES				1,393,764
LANDUSE TYPE		RANGE				TYPICAL UNIT SIZE ACRES				50,000
CONSERVATION COST TABLE										
		FUTURE				FEDERAL				PRIVATE
		New Treatment Units	Installation Cost - 50%	Management Cost - 3 yrs - 100%	Technical Assistance - 20%	Total Present Value Cost	Installation Cost - 50%	Annual O & M + Mgt Costs - 100%	Total Present Value Cost	50%
Conservation Systems by Treatment Level										
Progressive										
Fence (ft.) 382		104,532	\$156,798	\$0	\$31,360	\$188,158	\$156,798	\$6,272	\$183,218	
Pipeline (ft.) 516		104,532	\$418,129	\$0	\$83,626	\$501,755	\$418,129	\$16,725	\$488,582	
Prescribed Burning (ac.) 338		26,133	\$653,327	\$0	\$130,665	\$783,992	\$653,327	\$13,067	\$708,368	
Prescribed Grazing (ac.) 528		261,331	\$195,998	\$0	\$39,200	\$235,198	\$195,998	\$0	\$195,998	
Watering Facility (no.) 614		52	\$26,133	\$0	\$5,227	\$31,360	\$26,133	\$1,568	\$32,738	
Subtotal		261,331	\$1,450,386	\$0	\$290,077	\$1,740,463	\$1,450,386	\$37,632	\$1,608,904	
RMS										
Brush Management (ac.) 314		33,102	\$1,986,114	\$0	\$397,223	\$2,383,336	\$1,986,114	\$39,722	\$2,153,438	
Fence (ft.) 382		270,042	\$405,063	\$0	\$81,013	\$486,075	\$405,063	\$16,203	\$473,314	
Pipeline (ft.) 516		270,042	\$1,080,167	\$0	\$216,033	\$1,296,201	\$1,080,167	\$43,207	\$1,262,169	
Prescribed Burning (ac.) 338		26,133	\$653,327	\$0	\$130,665	\$783,992	\$653,327	\$13,067	\$708,368	
Prescribed Grazing (ac.) 528		261,331	\$195,998	\$0	\$39,200	\$235,198	\$195,998	\$0	\$195,998	
Range Planting (ac.) 550		33,102	\$993,057	\$0	\$198,611	\$1,191,668	\$993,057	\$19,861	\$1,076,719	
Upland Wildlife Habitat Management (ac.) 645		331,019	\$0	\$1,290,974	\$258,195	\$1,408,458	\$0	\$430,325	\$662,421	
Watering Facility (no.) 614		251	\$125,439	\$0	\$25,088	\$150,527	\$125,439	\$7,526	\$157,142	
Wildlife Watering Facility (no.) 648		66	\$33,102	\$0	\$6,620	\$39,722	\$33,102	\$662	\$35,891	
Subtotal		331,019	\$5,472,266	\$1,290,974	\$1,352,648	\$7,975,177	\$5,472,266	\$570,572	\$6,725,460	
Grand Total		592,350	\$6,922,652	\$1,290,974	\$1,642,725	\$9,715,640	\$6,922,652	\$608,204	\$8,334,364	

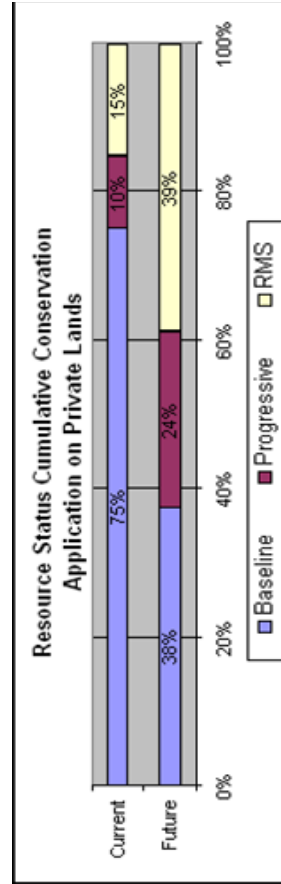


Chart Refers To	
Landuse Type	RANGE
Calculated Participation Rate	50%

Average PV Costs per Ac		
System	Federal	Private
Prog	\$6.66	\$6.16
RMS	\$24.09	\$20.32

WATERSHED NAME & CODE		SAN SIMON RIVER - 15040006				LANDUSE ACRES		24,728
LANDUSE TYPE		FOREST				TYPICAL UNIT SIZE ACRES		50,000
ASSESSMENT INFORMATION						CALCULATED PARTICIPATION		10%
Conservation Systems by Treatment Level	Benchmark Conditions	Future Conditions			RESOURCE CONCERNS			
		Total Units	Existing Unchanged Units	New Treatment Units	Total Units	Soil Erosion – Sheet and Rill	Water Quality – Excessive Suspended Sediment and Turbidity in Surface Water	Plant Condition – Productivity, Health and Vigor
Baseline								
Fence (ft.) 382	2,473	2,226	0	2,226	0	1	3	0
Pipeline (ft.) 516	2,473	2,226	0	2,226	3	3	0	0
Watering Facility (no.) 614	5	4	0	4	0	4	1	0
Total Acreage at Baseline	24,728	22,255	0	22,255				
Progressive								
Fence (ft.) 382	0	124	495	618	4	3	4	4
Pipeline (ft.) 516	0	124	495	618	0	1	1	1
Prescribed Burning (ac.) 338	0	0	124	124	3	3	0	0
Prescribed Grazing (ac.) 528	0	0	1,236	1,236	1	1	4	4
Watering Facility (no.) 614	0	0	0	0	5	3	5	5
Total Acreage at Progressive Level	0	0	1,236	1,236				
RMS								
Brush Management (ac.) 314	0	0	124	124	5	4	5	3
Fence (ft.) 382	0	124	1,113	1,236	4	4	5	3
Pipeline (ft.) 516	0	124	1,113	1,236	0	1	1	1
Prescribed Burning (ac.) 338	0	0	124	124	3	3	0	0
Prescribed Grazing (ac.) 528	0	0	1,236	1,236	1	1	4	4
Tree/Shrub Establishment (ac.) 612	0	0	124	124	5	3	5	5
Upland Wildlife Habitat Management (ac.) 645	0	0	1,236	1,236	5	1	4	-3
Watering Facility (no.) 614	0	0	1	1	0	0	4	1
Wildlife Watering Facility (no.) 648	0	0	0	0	0	4	1	0
Total Acreage at RMS Level	0	0	1,236	1,236				

WATERSHED NAME & CODE		SAN SIMON RIVER - 15040006				LANDUSE ACRES		24,728	
LANDUSE TYPE		FOREST				TYPICAL UNIT SIZE ACRES		50,000	
CONSERVATION COST TABLE		FUTURE				CALCULATED PARTICIPATION		10%	
Conservation Systems by Treatment Level		FEDERAL		PRIVATE					
		New Treatment Units	Installation Cost 50%	Management Cost - 3 yrs 100%	Technical Assistance 20%	Total Present Value Cost	Installation Cost 50%	Annual O & M + Mgt Costs 100%	Total Present Value Cost
Progressive									
Fence (ft.) 382		495	\$742	\$0	\$148	\$890	\$742	\$30	\$867
Pipeline (ft.) 516		495	\$1,978	\$0	\$396	\$2,374	\$1,978	\$79	\$2,312
Prescribed Burning (ac.) 338		124	\$3,091	\$0	\$618	\$3,709	\$3,091	\$62	\$3,351
Prescribed Grazing (ac.) 528		1,236	\$927	\$0	\$185	\$1,113	\$927	\$0	\$927
Watering Facility (no.) 614		0	\$124	\$0	\$25	\$148	\$124	\$7	\$155
Subtotal		1,236	\$6,862	\$0	\$1,372	\$8,234	\$6,862	\$178	\$7,612
RMS									
Brush Management (ac.) 314		124	\$7,418	\$0	\$1,484	\$8,902	\$7,418	\$148	\$8,043
Fence (ft.) 382		1,113	\$1,669	\$0	\$334	\$2,003	\$1,669	\$67	\$1,950
Pipeline (ft.) 516		1,113	\$4,451	\$0	\$890	\$5,341	\$4,451	\$178	\$5,201
Prescribed Burning (ac.) 338		124	\$3,091	\$0	\$618	\$3,709	\$3,091	\$62	\$3,351
Prescribed Grazing (ac.) 528		1,236	\$927	\$0	\$185	\$1,113	\$927	\$0	\$927
Tree/Shrub Establishment (ac.) 612		124	\$587	\$0	\$117	\$705	\$587	\$12	\$637
Upland Wildlife Habitat Management (ac.) 645		1,236	\$0	\$4,822	\$964	\$5,261	\$0	\$1,607	\$2,474
Watering Facility (no.) 614		1	\$495	\$0	\$99	\$593	\$495	\$30	\$620
Wildlife Watering Facility (no.) 648		0	\$124	\$0	\$25	\$148	\$124	\$2	\$134
Subtotal		1,236	\$18,762	\$4,822	\$4,717	\$27,776	\$18,762	\$2,106	\$23,338
Grand Total		2,473	\$25,624	\$4,822	\$6,089	\$36,010	\$25,624	\$2,284	\$30,950

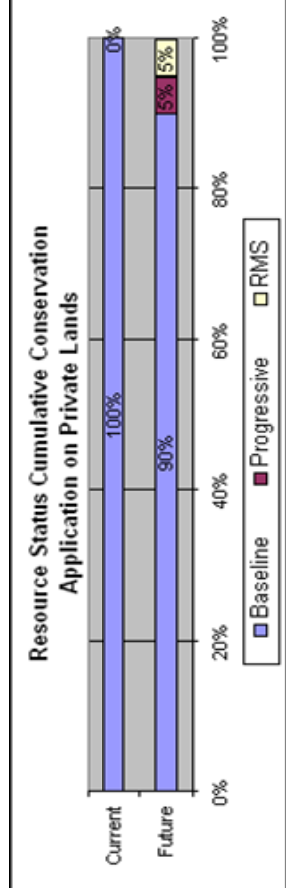


Chart Refers To	
Landuse Type	FOREST
Calculated Participation Rate	10%

Average PV Costs per Ac		
System	Federal	Private
Prog	\$6.66	\$6.16
RMS	\$22.46	\$18.88

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GLOSSARY

Drainage Basin	A region or area bounded by a topographic divide and occupied by a drainage system, also known as a watershed.
Drought	There is no universally accepted quantitative definition of drought. Generally, the term is applied to periods of less than average precipitation over a certain period of time; nature's failure to fulfill the water wants and needs of man.
Flood	A flood is an overflow or inundation that comes from a river or other body of water and causes or threatens damage. It can be any relatively high streamflow overtopping the natural or artificial banks in any reach of a stream. It is also a relatively high flow as measured by either gage height or discharge quantity.
Ground Water	The supply of fresh and saline water found beneath the Earth's surface which is often used for supplying wells and springs. Because ground water is a major source of drinking water, there is a growing concern over areas where leaching agricultural or industrial pollutants are contaminating ground water.
Soil Moisture Regimes	<p>Aridic is a soil moisture regime that has no water available for plants for more than half the cumulative time that the soil temperature at 50 cm (20 in.) below the surface is >5°C (41° F.), and has no period as long as 90 consecutive days when there is water for plants while the soil temperature at 50 cm (20 in.) is continuously >8°C (46°F.).</p> <p>Udic is a soil moisture regime that is neither dry for as long as 90 cumulative days nor for as long as 60 consecutive days in the 90 days following the summer solstice at periods when the soil temperature at 50 cm (20 in.) below the surface is above 5°C (41° F.).</p> <p>Ustic is a soil moisture regime that is intermediate between the aridic and udic regimes and common in temperate subhumid or semiarid regions, or in tropical and subtropical regions with a monsoon climate. A limited amount of water is available for plants but occurs at times when the soil temperature is optimum for plant growth.</p>
Soil Orders	A soil order is a group of soils in the broadest category. In the current USDA classification scheme there are 12 orders, differentiated by the presence or absence of diagnostic horizons.
Soil Temperature Regimes	<p>Hyperthermic is a soil temperature regime that has mean annual soil temperatures of 22°C (72°F.) or more and >5°C (41° F.) difference between mean summer and mean winter soil temperatures at 50 cm (20 in.) below the surface.</p> <p>Thermic is a soil temperature regime that has mean annual soil temperatures of 15°C (59°F.) or more but <22°C (72°F.), and >5°C (41° F.) difference between mean summer and mean winter soil temperatures at 50 cm (20 in.) below the surface.</p>

	Mesic A soil temperature regime that has mean annual soil temperatures of 8°C (46°F.) or more but <15°C (59°F.), and >5°C (41° F.) difference between mean summer and mean winter soil temperatures at 50 cm (20 in.) below the surface.
Surface Water	Water on the earth's surface. Lakes, bays, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, wetlands, marshes, inlets, canals, and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, navigable or non-navigable, and including the beds and banks of all watercourses and bodies of surface water, that are wholly or partially inside or bordering the state or subject to the jurisdiction of the state; except that waters in treatment systems which are authorized by state or federal law, regulation, or permit, and which are created for the purpose of waste treatment.
Watershed	The area of land that contributes surface run-off to a given point in a drainage system and delineated by topographic divides.

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