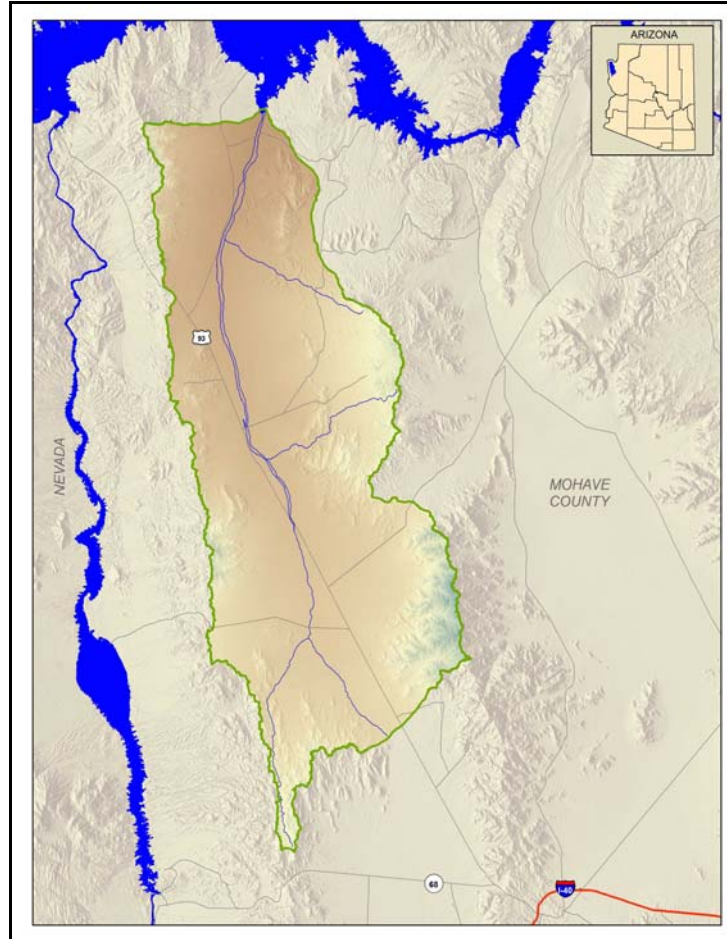


Detrital Wash Watershed – Arizona

Rapid Watershed Assessment

April 2007



Prepared by:

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The University of Arizona

In cooperation with:

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Arizona Department of Environmental Quality
Arizona Department of Water Resources
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**Detrital Wash Watershed – 15010014
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 cooperative watershed planning.

General Description of the Detrital Wash Watershed

The Detrital Wash watershed is an eight-digit HUC watershed located in northwest Arizona, northwest of Kingman (Figure 1-1). The watershed comprises 438,974 acres (686 square miles) and is located in Mohave County. Fifty-three percent of the land is managed by the Bureau of Land Management (BLM) 20% by National Park Service, 20% is private land, and 5% is State Trust land. The remaining 2% of the land is managed by the Bureau of Reclamation.

Major towns in the watershed include White Hills, Dolan Springs, and Grasshopper Junction. The NRCS Field Office for the area is located in Kingman. Conservation assistance is provided through the Big Sandy Natural Resource Conservation District.

The watershed ranges in elevation from 500 to 4,000 feet. Rainfall amounts in this area range from 4 to 12 inches per year. The Mohave Basin and Range is situated between the colder Great Basin

Desert on the north, and the Sonoran Desert on the south. Broad basins, valleys, and old lake beds make up most of the area. Numerous north to south trending mountain ranges dissect the valleys and basin creating the basin and range topographic feature.

Vegetation is characterized by widely spaced woody and succulent types of perennial plants that are well adapted to conserving water.

About 95% of the land use is rangeland. The remaining portion is comprised of forest land, urban, and other land uses. There is no cropland in the watershed. The area provides spring ephemeral grazing for livestock in good rainfall years. Livestock grazing on rangeland is limited by low rainfall. The 6 to 9 inch precipitation zone is primarily used only in the spring by stocker operations. In the 9 to 12 inch precipitation zone, cow, calf and stocker operations utilize the area.

Resource concerns in the watershed include soil erosion, rangeland site stability, rangeland hydrologic cycle, excessive runoff (causing flooding or ponding), aquifer overdraft, water quality concerns for ground water (pesticides, nutrients and organics) and surface water (pesticides, nutrients, organics, suspended sediment and turbidity), plant condition – productivity, health and vigor, noxious and invasive plants, wildfire hazard, domestic animals – inadequate quantities and quality of feed, forage, and stock water.

Section 2: Physical Description

Watershed Size

The Detrital Wash Watershed covers approximately 3.4 square miles, representing less than 1% of the state of Arizona. The watershed has a maximum width of about 18 miles east-west, and a length of about 54 miles north-south.

The Detrital Wash 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 Detrital Wash Watershed has an 8-digit HUC of 15010014 and contains the following 10-digit HUCs:

- 1501001401 (Upper Detrital Wash);
- 1501001402 (Middle Detrital Wash); and,
- 1501001403 (Lower Detrital Wash) (Figure 1-2).

Geology

The structural basin of Detrital Valley is within the Basin and Range Province, and consists of mountain ranges and basins formed on adjacent sides of high-angle normal faults (USGS, 2006). The bedrock of the mountains that separate the valleys consists of granitic,

metamorphic, sedimentary, and volcanic rocks. In most areas, the bedrock is relatively impermeable compared to the basin alluvial fill and forms barriers to ground water movement in the basin-fill aquifer.

The structural basin of the Detrital Valley contains basin alluvial fill that ranges in thickness from a veneer along the mountain fronts to more than 5,000 ft in parts of each valley (USGS, 2006). The basin fill is divided into older, intermediate, and younger hydrogeologic units. Older basin fill is the oldest and deepest deposit, and consists of moderately consolidated fragments of rocks eroded from the surrounding mountains in a silty-clay or sandy matrix. The grain size decreases from pebble- and boulder-size fragments in the fanglomerate (coarse material in an alluvial fan) near the mountains to coarse sand and interbedded clay and silt in the basin center.

Each valley has large areas of older basin fill where more than 55 percent of the sediments are fine grained. In the northern parts of Detrital Valley, massive evaporite deposits occur in the older basin fill. Evaporite deposits are the remains of ancient salt lakes that have evaporated, leaving layers of salt and gypsum. The composition of the intermediate basin fill is similar to that of the older basin fill, and the intermediate basin fill also becomes finer grained towards the basin center. However, the thickness of the intermediate basin fill is on the order of a few hundred feet rather than a few thousand feet. Thickness of the younger basin fill, which consists of Holocene piedmont, stream, and playa deposits, is also less than that of the

older basin fill. In the northern parts of Detrital Valley, the basin fill also includes limestone, and basalt flows of the Muddy Creek and Chemehueve Formations. Figure 2-1 shows the geology of the Detrital Wash Watershed.

Soils

Soils within the Detrital Wash 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). Lands within this watershed are covered by the "Soil Survey of Mohave County, AZ, Central Part." Soils data and maps from this Soil Survey 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 Detrital Wash 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 30.1 "Lower Mohave

Desert" with elevations ranging from 400 to 2500 feet and precipitation averaging 3 to 6 inches per year. Vegetation includes creosotebush, white bursage, Mormon tea, and brittlebush. The soils in the area have a hyperthermic soil temperature regime and a typical aridic soil moisture regime. The dominant soil orders are Aridisols and Entisols. Deep, medium to coarse-textured, soils occur on floodplains and low alluvial fans. Shallow, gravelly, and cobbly soils and rock outcrop occur on hills and mountains.

The middle portion of the watershed is comprised of CRA 30.2 "Middle Mohave Desert" with elevations ranging from 1500 to 3200 feet and precipitation averaging 6 to 9 inches per year. Vegetation includes creosotebush, white bursage, yucca, prickly pear and cholla species, Mormon tea, flattop buckwheat, ratany, winterfat, bush muhly, threeawns, and big galleta. The soils in the area have a thermic soil temperature regime and a typical aridic soil moisture regime. The dominant soil orders are Aridisols and Entisols. Deep, medium to coarse-textured, soils occur on floodplains and low alluvial fans. Shallow, gravelly, and cobbly soils and rock outcrop occur on hills and mountains.

The upper portion of the watershed is comprised of CRA 30.3 "Upper Mohave Desert" with elevations ranging from 2800 to 4500 feet and precipitation averaging 9 to 12 inches per year. Vegetation includes Joshua tree, blackbrush, creosotebush, ratany, bush muhly, big galleta, black grama, desert needlegrass, and Indian ricegrass. The soils in the area have a thermic soil temperature regime and a typical aridic

soil moisture regime. The dominant soil orders are Aridisols and Entisols. Shallow, gravelly and cobbly, moderately coarse to fine-textured, moderately sloping to very steep soils and rock outcrop occur on hills and mountains.

These three Common Resource Areas (CRA 30.1, CRA 30.2, CRA 30.3) 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: Detrital Wash Watershed Common Resource Areas

Common Resource Area Type	Area (sq. mi.)	Percent of Watershed
30.1 Lower Mohave Desert	175.8	25.6
30.2 Middle Mohave Desert	469.7	68.5
30.3 Upper Mohave Desert	40.5	5.9

Data Sources: GIS map layer "cra". Arizona Land Information System (ALRIS 2004). Natural Resource Conservation Service (NRCS 2006)

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 Detrital Wash Watershed has a slope greater than 15%, while about 55% of the watershed has a slope

less than 5%. Upper Detrital Wash is comparatively flat, with only 6% of its area over 15% slope, and 79% less than 5% slope. The Middle Detrital Wash is similar to the Upper, having 9% of its area over 15% slope, and 72% less than 5% slope. The Lower Detrital Wash Watershed is relatively steeper, with 30% of its area greater than 15% slope (Table 2-2 and Figure 2-3).

Table 2-2: Detrital Wash Watershed Slope Classifications.

Watershed Name	Area (sq. mile)	Percent Slope		
		0-5%	5-15%	>15%
Upper Detrital Wash 1501001401	152	79%	15%	6%
Middle Detrital Wash 1501001402	298	72%	19%	9%
Lower Detrital Wash 1501001403	237	50%	19%	30%
Detrital Wash Watershed	686	55%	20%	26%

Data Sources: Derived from DEM, obtained from U.S. Geological Survey, April 8, 2003 <http://edc.usgs.gov/geodata/>

Streams, Lakes and Gaging Stations

The Detrital Wash Watershed has no active or inactive US Geological Survey (USGS) gaging stations, as seen in Table 2-3.1. The watershed has no major lakes or reservoirs, as indicated by Table 2-3.2. Table 2-3.3 lists the major streams and their lengths. Listed stream lengths range from about 521 miles for Detrital Wash to about 11 miles for Stream (B) in Lower Detrital Wash.

Table 2-3.1: Detrital Wash 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			
	none			
	Inactive Gages			
	none			

* There are no stream gages within the Detrital Wash watershed.

Data Sources: USGS website, National Water Information System

<http://waterdata.usgs.gov/nwis/>

Table 2-3.2: Detrital Wash Watershed Major Lakes and Reservoirs.*

Lake Name (if known)	Watershed	Surface Area (acre)	Elevation (feet above mean sea level)	Dam Name (if known)
none				

* There are no major lakes or reservoirs within the Detrital Wash watershed.

Data Sources: GIS data layer "Lakes", Arizona State Land Department, Arizona Land Resource

Information System (ALRIS), February 7, 2003 <http://www.land.state.az.us/alris/index.html>

Table 2-3.3: Detrital Wash Watershed Major Streams and Lengths

Stream Name	Watershed	Stream Length (miles)
Detrital Wash	Upper Detrital Wash; Middle Detrital Wash; Lower Detrital Wash	87.24
Colorado River	Lower Detrital Wash	0.86
*A	Upper Detrital Wash	18.52
*B	Middle Detrital Wash	13.04
*C	Lower Detrital Wash	12.52

Data Sources: GIS data layer "Streams", Arizona State Land Department, Arizona Land Resources Information Ssystem (ALRIS), October, 10, 2002

<http://www.landstate.az.us/alris/index.html>

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 Detrital Wash Watershed (Figure 2-5).

North American Warm Desert Wash, North American Warm Desert Riparian Woodland and Shrubland, and North American Arid West Emergent Marsh are the three types of riparian vegetation that is found in the Detrital Wash Watershed. Riparian areas encompass approximately 2186 acres in the watershed (Table 2-4).

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 Detrital Wash Watershed, Table 2-5 identifies Sonora-Mojave Desert Scrub as the most common land cover type over the entire watershed, encompassing about 51% of the watershed. The next most common types are Mojave Mid-elevation Mixed Desert Scrub (23%), Sonoran Mid-Elevation Desert Scrub (16%), Great Basin Pinyon-Juniper Woodland (4%), and Mogollon Chaparral (3%).

Note: There are a total of 26 GAP vegetation categories present within the Detrital Wash 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 was able to create a total of 10 grouped GAP vegetation categories, as shown on Table 2-5.

Table 2-4: Detrital Wash Watershed Riparian Vegetation (acres) by 10 digit Watershed

Riparian Vegetation Community	Upper Detrital Wash 1501001401	Middle Detrital Wash 1501001402	Lower Detrital Wash 1501001403	Detrital Wash Watershed
North American Warm Desert Wash	-	-	2055	2055
North American Warm Desert Riparian Woodland and Shrubland	-	-	56	56
North American Arid West Emergent Marsh	-	-	76	76
Total Area (acres)	0.00	0.00	2186	2186

Data Sources: GIS data layer "det_gapveg", Southwest Regional Gap Analysis Landcover Dataset (SW ReGAP) October 13, 2005 <http://earth.gis.usu.edu/swgap/>

Table 2-5: Detrital Wash Watershed Southwest Regional GAP Analysis Project Land Cover, Percent of 10-digit Watershed

Watershed	Upper Detrital Wash 1501001401	Middle Detrital Wash 1501001402	Lower Detrital Wash 1501001403	Percent Of Total
Apacherian-Chihuahuan Upland Scrub	2%	1%	--	1%
Developed	--	2%	--	1%
Great Basin Pinyon-Juniper Woodland	8%	4%	--	4%
Mogollon Chaparral	7%	3%	--	3%
Mojave Mid-Elevation Mixed Desert Scrub	38%	27%	7%	23%
North American Warm Desert Bedrock Cliff and Outcrop	--	<1%	3%	1%
North American Warm Desert Volcanic Rockland	--	--	6%	2%
Open Water	--	--	--	0%
Sonora-Mojave Desert Scrub	19%	41%	85%	51%
Sonoran Mid-Elevation Desert Scrub	27%	22%	--	16%
Area (Sqm)	152	298	236	686

Data Sources: GIS data layer "det_gapveg", Southwest Regional Gap Analysis Landcover Dataset (SW ReGAP) October 13, 2005 <http://earth.gis.usu.edu/swgap/>

Meteorological Stations, Precipitation and Temperature

For the years 1960-1990, the average annual precipitation for the Detrital Wash Watershed was about 9 inches (Table 2-6 and Figure 2-7). The Upper Detrital Wash Watershed received the most rainfall with over 9 inches of rain in an average year, while the Middle and Lower Detrital Wash Watersheds

received about 9 and 7 inches, respectively.

Land Ownership/Management

There are 5 different land ownership/management entities in the Detrital Wash Watershed (Figure 2-8 and Table 2-7). BLM land is the largest category, representing about 53% of the watershed, followed by the Private land

and National Parks with about 20% each, State Trust land with about 5%, and Bureau of Reclamation with 2%.

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 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 Detrital Wash Watershed is Range which makes up about 99% of the watershed. Urban is the next most common type with about 1% of the total area. There is essentially no crop land, forest land, or surface water, other than the Colorado River which flows adjacent to the watershed boundary

Mines – Primary Ores

Table 2-9 and Figure 2-10 show the types of ores being mined in the Detrital Wash Watershed. The most common types of ores mined in the watershed are gold (11 mines), silver (8 mines), and uranium, sand & gravel, and lead (3 mines each).

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

10-digit Watershed Name	Meteorological Stations and Map ID	Temperature (°F)			Precipitation (in/yr)		
		Min.	Max.	Avg.	Min.	Max.	Average
Lower Detrital Wash 1501001403	None	-	-	-	5	9	7
Middle Detrital Wash 1501001402	White Hills 5 WSW*	-	-	-	5	11	8.67
Upper Detrital Wash 1501001401	None	-	-	-	7	11	9.33
Detrital Wash Watershed	-	-	-	-	5	11	8.78

*No temperature data could be found for this meteorological station, which was only active between 1962 and 1967.

Data Sources: Western Regional Climate Center (WRCC), Temperature data. July 15, 2004.

<http://www.wrcc.dri.edu/summary/climsmaz.html>

Table 2-7: Detrital Wash Watershed Land Ownership/Management (Percent of 10-digit Watershed)

Land Owner	Lower Detrital Wash 1501001403	Middle Detrital Wash 1501001402	Upper Detrital Wash 1501001401	Detrital Watershed
BLM	39%	64%	66%	53%
National Parks	45%	-	-	20%
Private	4%	33%	30%	20%
State Trust	8%	3%	3%	5%
Bureau of Reclamation	4%	-	-	2%
Area (square miles)	236	298	152	686

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

Table 2-8: Detrital Wash Watershed Land Use, Percent of 10-digit Watershed

Land Cover/Location	Forest	Urban	Range	Water	Area (sqm)
Lower Detrital Wash 1501001403	-	1%	99%	-	236
Middle Detrital Wash 1501001402	-	2%	98%	-	298
Upper Detrital Wash 1501001401	<1%	-	100%	-	152
Percent of Detrital Wash Watershed	-	1%	99%	-	686

Data Sources: GIS data layer "det_gapveg", Southwest Regional Gap Analysis Landcover Dataset (SW ReGAP) October 13, 2005 <http://earth.gis.usu.edu/swgap/>

Table 2-9: Detrital Wash Watershed Mines – Primary Ores.

Ore Type	Total Number of Mines
Gold	11
Silver	8
Uranium	3
Sand Gravel	3
Lead	3
Gemstone	2
Gypsum	2
Sodium	1
Copper	1

*Note: If a mine contains more than one ore, only the major ore is noted.
Data Source: Natural Resource Conservation Service (NRCS).*

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 Detrital Wash 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 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.

Water Quality

Water pollution from suspended sediment and turbidity is a resource concern whenever accelerated soil erosion contributes excessive sediment to perennial waters that support aquatic fauna. Grazing, farming, recreation and other activities in or near perennial waters can cause sediment and turbidity problems. Maintaining adequate vegetative cover on critically eroding sites and installing vegetative filter strips adjacent to these sites can help capture sediments before entering the stream or other body of water.

Conservation practices used to address this resource concern are generally those that improve vegetative cover and reduce upland and stream bank erosion. Practices may include critical area planting, filter strips, heavy use area protection, prescribed grazing, range planting, riparian forest buffers, sediment basins, stream bank protection, upland wildlife habitat management, and windbreak or shelterbelt establishment.

Table 3-1: Detrital Wash Watershed Priority Resource Concerns by Land Use

Resource Category	Cropland Concerns	Rangeland Concerns	Forest Concerns	Urban Concerns
		Sheet & Rill		Roads &

Soil Erosion		Erosion		Construction Sites
Water Quality		Excessive Suspended Sediment in Surface Water		
Water Quantity				
Air Quality				
Plant Condition		Plant Productivity, Health & Vigor		
Noxious & Invasive Plants		Noxious & Invasive Plants		
Domestic Animals		Inadequate Quantities & Quality of Feed & Forage & Water		
Species of Concern		T&E Species & Declining Species & Species of Concern		

No monitoring data was collected by ADEQ and no surface waters were assessed by ADEQ in this drainage area (Figure 3-1). This area contains no perennial or intermittent streams or lakes, other than the Colorado River which flows adjacent to the watershed boundary. However, maps indicate that a portion of Lake Mead extends into Detrital Wash when the lake is full. No monitoring data was collected in this portion of Lake Mead.

Water Quantity

It is estimated that ground water satisfies 100% of the water demand in this area (ADWR, 2006). Ground water occurs mostly in basin-fill material and at shallow depths in the alluvial deposits along the mountain washes (ADWR Webpage).

The Detrital Wash Watershed has no perennial streams. The definitions for the three different stream types in Arizona are below:

- Perennial surface water means surface water that flows continuously throughout the year, with baseflow maintained by ground water discharged into the channel;
- Intermittent surface water means a stream or reach of a stream that flows continuously only at certain times of the year; such as when it receives water from a seasonal rainfall, a spring, or from another source, such as melting spring snow; and,
- Ephemeral streams are at all times above the elevation of the

ground water table, have no base flow, and flows only in direct response to precipitation.

Only one river near the Detrital Wash Watershed is perennial, a 19-mile segment of the Colorado River that crosses the watershed boundary. There are no intermittent river segments in Detrital Wash Watershed.

Air Quality

There are no known air quality concerns in the watershed (Figure 3-2).

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 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

Detrital Wash Watershed has no area affected by Bark Beetles.

The Climate Assessment for the Southwest (CLIMAS) website (www.ispe.arizona.edu/climas) provides information on Arizona's drought status. Drought conditions are expected to persist or intensify in the area of Arizona that encompasses the Detrital Watershed until the summer monsoon rains arrive in July. The watershed remains abnormally dry, and the long term drought status remains moderate.

The Southwest Coordination Fire Center, of the National Interagency Fire Center,

(gacc.nifc.gov/swcc/predictive/outlooks/outlooks.htm) places the Detrital Watershed in the Above Normal category for significant wildland fire activity potential due to unusually warm windy and dry 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. 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 Detrital Wash Watershed contains 9 species that are either listed as threatened (LT), or species of concern (SC), under the U.S. Endangered Species Act (Table 3-2).

Table 3-2: Detrital Wash 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
Golden Eagle	Aquila chrysaetos					1994

Common Name	Species Name	USESA (2)	USFS (3)	BLM (4)	STATE (5)	Last Recorded Observation
Las Vegas Bearpoppy	Arctomecon californica	SC			SR	1999
Western Burrowing Owl	Athene cunicularia hypugaea	SC		S		1997
	Bat Colony					1986-PRE
Designated Critical Habitat for razorback sucker	CH for Xyrauchen texanus					
Pale Townsend's Big-eared Bat	Corynorhinus townsendii pallescens	SC				1986-PRE
Clustered Barrel Cactus	Echinocactus polycephalus var. polycephalus				SR	1990
Silverleaf Sunray	Enceliopsis argophylla			S		1999
American Peregrine Falcon	Falco peregrinus anatum	SC	S		WSC	2004
Sonoran Desert Tortoise	Gopherus agassizii (Sonoran Population)	SC			WSC	1993
Bald Eagle	Haliaeetus leucocephalus (wintering pop.)	LT,PDL	S		WSC	2005
Banded Gila Monster	Heloderma suspectum cinctum	SC		S		1987
Varied Fishhook Cactus	Mammillaria viridiflora				SR	1980
Straw-top Cholla	Opuntia echinocarpa				SR	1990
Cerbat Beardtongue	Penstemon bicolor ssp. roseus	SC		S	SR	2006
Kingman Springsnail	Pyrgulopsis conica	SC	S	S		1985

Data Sources: Arizona Land Information System (ALRIS), Natural Resource Conservation Service (NRCS).

Note: Status Definitions as Listed by Arizona Game and Fish Department, November 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:

LT Listed Threatened: imminent jeopardy of becoming Endangered.

PDL Proposed for Delisting

Candidate (Notice of Review: 1999):

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

The Detrital Wash Watershed is a mosaic of federal, state and private lands where recreation and livestock grazing are the primary land uses. The Detrital Wash drains into Lake Mead and the lower portion of the watershed is in the Lake Mead National Recreation Area. A majority of the land is managed by the Bureau of Land Management. Private land is primarily located along U.S. Route 93.

Lake Mead is an important national recreation area and a portion of Lake Mead extends into the Detrital Wash Watershed. Fishing and boating are important recreational activities. The Detrital Wash Watershed contains Designated Critical Habitat for the razorback sucker (*Xyrauchen texanus*). Other species of concern that have been found within the watershed include bald eagle (*Haliaeetus leucocephalus*), American peregrine falcon (*Falco peregrinus anatum*), western burrowing owl (*Athene cunicularia hypugaea*), Sonoran desert tortoise (*Gopherus agassizii*), banded gila monster

(*Heloderma suspectum cinctum*), Pale Townsend's big-eared bat (*Corynorhinus townsendii pallescens*), and Kingman springsnail (*Pyrgulopsis conica*).

Activities in the watershed can have a direct impact on Lake Mead and its resources. The main resource concern in the Detrital Wash Watershed is the potential for rapid development in the near future. With the completion of the Hoover Dam bypass in 2008, much of Mohave County will be within an hour's drive from Las Vegas. Plans for new housing developments that have already been approved or are in progress would add over 160,000 units to the Kingman area. The new developments have raised concerns regarding the availability of water supply to support the new and existing communities in the future. The new developments also have the potential to increase flooding and erosion, which would decrease water quality and have an adverse impact on The Lake Mead National Recreation Area. Low Impact Development (LID) practices should be

considered in the new developments to mitigate these potential impacts.

Conservation Progress/Status

Conservation progress for the previous five years in the Detrital Wash 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

- ✓ 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: Detrital Wash Watershed Conservation Treatment Applied

Detrital Wash Watershed (15010014) Conservation Treatment Applied	FY02-06 TOTAL
Pipeline (feet)	200
Prescribed Grazing (acres)	30,075

(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 2 people per square mile. Middle Detrital Wash had the highest population mean with 3 people per square mile. Middle Detrital Wash also had the highest maximum population density with 111 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 3 people per square mile. Middle Detrital Wash had the highest mean population density with 5 people per square mile. Middle Detrital Wash also had the highest maximum density of 233 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 mean increase of 1 people per square mile during this ten-year time period. Middle Detrital Wash had the highest mean increase in population density at 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, Detrital Wash Watershed Housing Density for 2000, identifies that about 453 sq. miles of housing is located in "undeveloped private" areas, while about 31 sq. miles is located in "exurban" areas. Figure 4-5 and Table 4-5, Housing Density for 2030, projects "undeveloped private" areas decreasing to about 398 sq. miles and "exurban" areas increasing to 80 sq. miles.

Table 4-1: Detrital Wash Watershed 1990 Population Density (people/square mile)

10-digit Watershed Name	Area (sq. mile)	Population Density (people/sq.mile)		
		Min	Max	Mean
Upper Detrital Wash 1501001401	151.7	0	17	1
Middle Detrital Wash 1501001402	297.6	0	111	3
Lower Detrital Wash 1501001403	236.3	0	31	<1
<i>Total Detrital Wash Watershed</i>	<i>685.6</i>	<i>0</i>	<i>111</i>	<i>2</i>

Note: Adjacent watersheds may share a grid square.

Data Sources: Census block statistics for 1990 were compiled from a CD prepared by Geo-Lytics (GeoLytics, Inc. 1998. Census 1990. Census CD + Maps. Release 3.0.)

Table 4-2: Detrital Wash Watershed 2000 Population Density (people/square mile)

10-digit Watershed Name	Area (sq. mile)	Population Density (people/sq.mile)		
		Min	Max	Mean
Upper Detrital Wash 1501001401	151.7	0	62	1
Middle Detrital Wash 1501001402	297.6	0	233	5
Lower Detrital Wash 1501001403	236.3	0	1	0
<i>Total Detrital Wash Watershed</i>	<i>685.6</i>	<i>0</i>	<i>233</i>	<i>3</i>

Note: Adjacent watersheds may share a grid square.

Data Sources: ESRI Data Products, Census 2000, October 17, 2003. <http://www.esri.com/data/>

Table 4-3: Detrital Wash Watershed Population Density Change 1990-2000 (people/square mile)

10-digit Watershed Name	Area (sq. mile)	Population Density (people/sq.mile)		
		Min	Max	Mean
Upper Detrital Wash 1501001401	151.7	-6	46	0.3
Middle Detrital Wash 1501001402	297.6	-22	231	2
Lower Detrital Wash 1501001403	236.3	-31	1	-0.3
Total Detrital Wash Watershed	685.6	-31	231	1.0

Note: Adjacent watersheds may share a grid square.

Data Sources: Derived from data from the GIS data used for tables 4-1 and 4-2.

Table 4-4: Detrital Wash Watershed Housing Density 2000 (Percent of Watershed)

Housing Density	Upper Detrital Wash 1501001401	Middle Detrital Wash 1501001402	Lower Detrital Wash 1501001403	Detrital Wash Watershed	Detrital Watershed (sq. miles)
Undeveloped Private	72.6%	59.4%	100.0%	66.11%	453.3
Rural	23.7%	31.4%	-	26.98%	185.0
Exurban	2.4%	5.7%	-	4.58%	31.4
Suburban	1.3%	3.4%	-	2.31%	15.8
Urban	-	0.1%	-	0.02%	0.1

Data Sources: Theobald, D. 2005. Landscape patterns of exurban growth in the USA from 1980 to 2020. *Ecology and Society* 10(1): 32. [online] URL: <http://www.ecologyandsociety.org/vol10/iss1/art32/>

Table 4-5: Detrital Wash Watershed Housing Density Projection 2030 (Percent of Watershed)

Housing Density	Upper Detrital Wash 1501001401	Middle Detrital Wash 1501001402	Lower Detrital Wash 1501001403	Detrital Wash Watershed	Detrital Watershed (Sq. miles)
Undeveloped Private	62.4%	59.4%	100%	58.08%	398.4
Rural	21.5%	31.4%	-	26.62%	182.6
Exurban	15.5%	5.7%	-	11.67%	80.1
Suburban	0.5%	3.4%	-	3.57%	24.5
Urban	-	0.1%	-	0.06%	0.4

Data Sources: Theobald, D. 2005. Landscape patterns of exurban growth in the USA from 1980 to 2020. *Ecology and Society* 10(1): 32. [online] URL: <http://www.ecologyandsociety.org/vol10/iss1/art32/>

Detrital Wash 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 Detrital Wash Watershed is comprised of livestock grazing and sheep operations and a few apiary (honey bee) locations.

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.

One zip code in Detrital Wash was listed as XX and one zip code was listed as HH, meaning that these are new zip code areas formerly covered by water or were uninhabited, respectively.

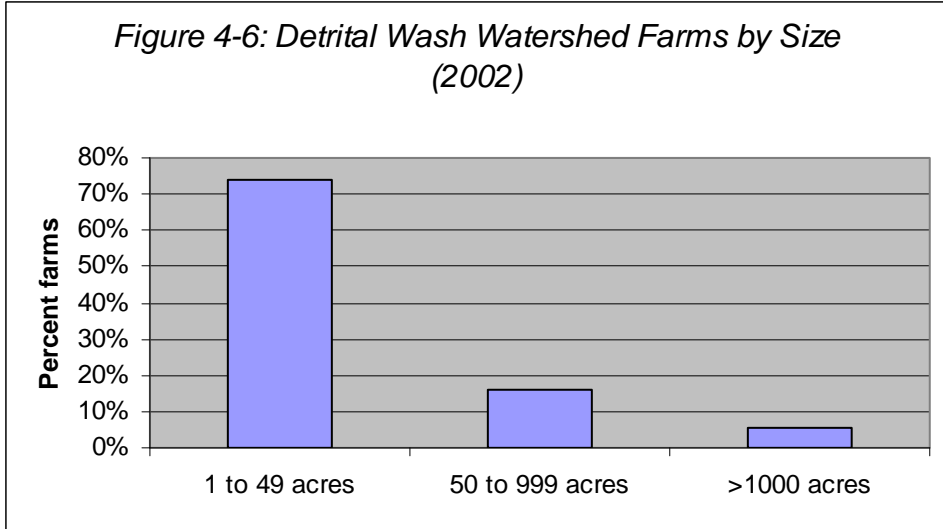


Figure 4-6: Detrital Wash Watershed Farms by Size (2002)

All farms	1 to 49 acres	50 to 999 acres	>1000 acres
19	74%	16%	5%

Percents rounded.

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

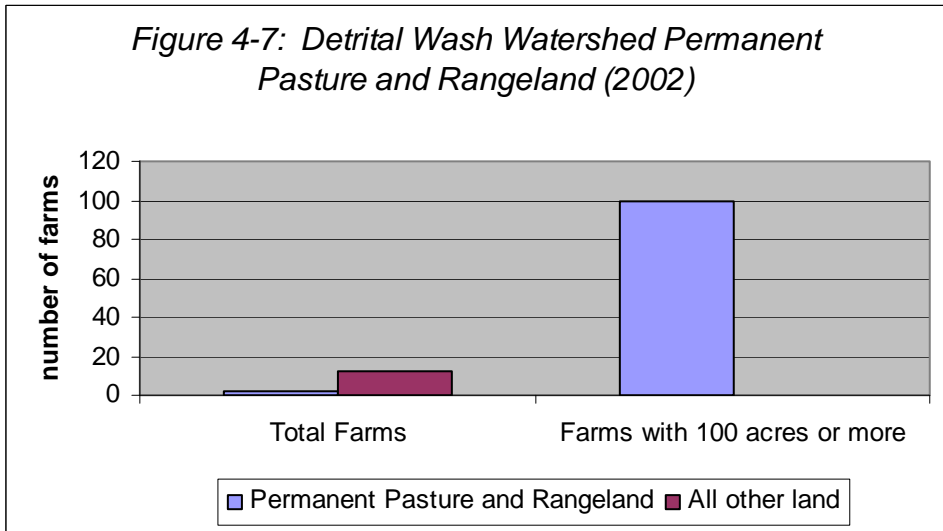


Table 4-7: Detrital Wash Watershed Pasture and Rangeland (2002)

Category	Total farms	Farms 100 acres or more
Permanent pasture and rangeland	2	100%
All other land	12	0%

Percents rounded.

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

Figure 4-8: Detrital Wash Watershed Cropland Harvested (2002)

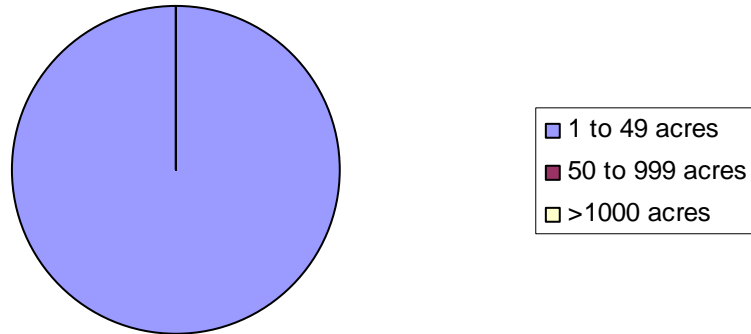


Table 4-8: Detrital Wash Watershed Cropland Harvested (2002)

Total farms	1 to 49 acres	50 to 999 acres	>1000 acres
1	100%	0%	0%

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 Detrital Wash 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 (range) 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		DETRITAL WASH - 15010014			LANDUSE ACRES		436,029	
LANDUSE TYPE		RANGE			TYPICAL UNIT SIZE ACRES		50,000	
ASSESSMENT INFORMATION		BENCHMARK CONDITIONS			CALCULATED PARTICIPATION		25%	
Conservation Systems by Treatment Level	Total Units	Existing Unchanged Units	Future Conditions		Soil Erosion – Sheet and Rill	Water Quality – Excessive Suspended Sediment and Turbidity in Surface Water	Plant Condition – Productivity, Health and Vigor	Domestic Animals – Inadequate Quantities and Quality of Feed and Forage
			New Treatment Units	Total Units				
Baseline								
Fence (ft.) 382	32,702	24,527	0	24,527	1	3	0	0
Pipeline (ft.) 516	32,702	24,527	0	24,527	0	1	1	1
Watering Facility (no.) 614	65	49	0	49	3	3	0	0
Total Acreage at Baseline	327,022	245,266	0	245,266	0	4	1	0
Progressive								
Fence (ft.) 382	32,702	29,432	19,621	49,053	4	3	4	4
Pipeline (ft.) 516	32,702	29,432	19,621	49,053	0	1	1	1
Prescribed Burning (ac.) 338	6,540	4,905	4,905	9,811	3	3	0	0
Prescribed Grazing (ac.) 528	65,404	49,053	49,053	98,107	1	1	4	4
Watering Facility (no.) 614	26	29	10	39	5	3	5	5
Total Acreage at Progressive Level	65,404	49,053	49,053	98,107	0	4	1	0
RMS								
Brush Management (ac.) 314	4,360	4,360	4,905	9,266	4	4	5	5
Fence (ft.) 382	43,603	55,049	37,608	92,656	4	4	5	3
Pipeline (ft.) 516	43,603	55,049	37,608	92,656	0	1	1	1
Prescribed Burning (ac.) 338	4,360	5,995	3,270	9,266	3	3	0	0
Prescribed Grazing (ac.) 528	43,603	59,954	32,702	92,656	1	1	4	4
Range Planting (ac.) 550	4,360	4,360	4,905	9,266	5	3	5	5
Upland Wildlife Habitat Management (ac.) 645	43,603	43,603	49,053	92,656	4	2	5	5
Watering Facility (no.) 614	44	57	36	93	0	0	4	1
Wildlife Watering Facility (no.) 648	9	9	10	19	0	4	1	0
Total Acreage at RMS Level	43,603	43,603	49,053	92,656	0	4	5	5

WATERSHED NAME & CODE		DETRITAL WASH - 15010014				LANDUSE ACRES		436,029
LANDUSE TYPE		RANGE				TYPICAL UNIT SIZE ACRES		50,000
CONSERVATION COST TABLE		RANGE				CALCULATED PARTICIPATION		25%
Conservation Systems by Treatment Level	FUTURE	FEDERAL			PRIVATE		Total Present Value Cost	Total Present Value Cost
		Installation Cost 50%	Management Cost - 3 yrs 100%	Technical Assistance 20%	Installation Cost 50%	Annual O & M + Mgt Costs 100%		
Progressive								
Fence (ft.) 382	19,621	\$29,432	\$0	\$5,886	\$35,318	\$29,432	\$1,177	\$34,391
Pipeline (ft.) 516	19,621	\$78,485	\$0	\$15,697	\$94,182	\$78,485	\$3,139	\$91,710
Prescribed Burning (ac.) 338	4,905	\$122,633	\$0	\$24,527	\$147,160	\$122,633	\$2,453	\$132,965
Prescribed Grazing (ac.) 528	49,053	\$36,790	\$0	\$7,358	\$44,148	\$36,790	\$0	\$36,790
Watering Facility (no.) 614	10	\$4,905	\$0	\$981	\$5,886	\$4,905	\$294	\$6,145
Subtotal	49,053	\$272,246	\$0	\$54,449	\$326,695	\$272,246	\$7,064	\$302,000
RMS								
Brush Management (ac.) 314	4,905	\$294,320	\$0	\$58,864	\$353,183	\$294,320	\$5,886	\$319,115
Fence (ft.) 382	37,608	\$56,411	\$0	\$11,282	\$67,694	\$56,411	\$2,256	\$65,916
Pipeline (ft.) 516	37,608	\$150,430	\$0	\$30,086	\$180,516	\$150,430	\$6,017	\$175,777
Prescribed Burning (ac.) 338	3,270	\$81,755	\$0	\$16,351	\$98,107	\$81,755	\$1,635	\$88,643
Prescribed Grazing (ac.) 528	32,702	\$24,527	\$0	\$4,905	\$29,432	\$24,527	\$0	\$24,527
Range Planting (ac.) 550	4,905	\$147,160	\$0	\$29,432	\$176,592	\$147,160	\$2,943	\$159,558
Upland Wildlife Habitat Management (ac.) 645	49,053	\$0	\$191,308	\$38,262	\$208,717	\$0	\$63,769	\$98,163
Watering Facility (no.) 614	36	\$17,986	\$0	\$3,597	\$21,583	\$17,986	\$1,079	\$22,532
Wildlife Watering Facility (no.) 648	10	\$4,905	\$0	\$981	\$5,886	\$4,905	\$98	\$5,319
Subtotal	49,053	\$777,494	\$191,308	\$193,760	\$1,141,711	\$777,494	\$83,685	\$959,549
Grand Total	98,107	\$1,049,740	\$191,308	\$248,210	\$1,468,405	\$1,049,740	\$90,749	\$1,261,550

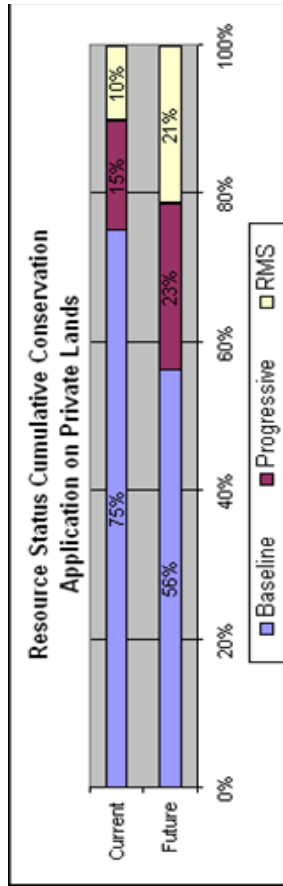


Chart Refers To	
Landuse Type	RANGE
Calculated Participation Rate	25%

Average PV Costs per Ac		
System	Federal	Private
Prog	\$6.66	\$6.16
RMS	\$23.27	\$19.56

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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. The Hydrologic Unit Code (HUC) of a Drainage Basin is a 6-digit HUC.
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</p>

	<p>temperatures at 50 cm (20 in.) below the surface.</p> <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.</p>
Surface Water	<p>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.</p>
Watershed	<p>The area of land that contributes surface run-off to a given point in a drainage system and delineated by topographic divides. The Hydrologic Unit Code (HUC) of a Drainage Basin is an 8-digit HUC.</p>

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