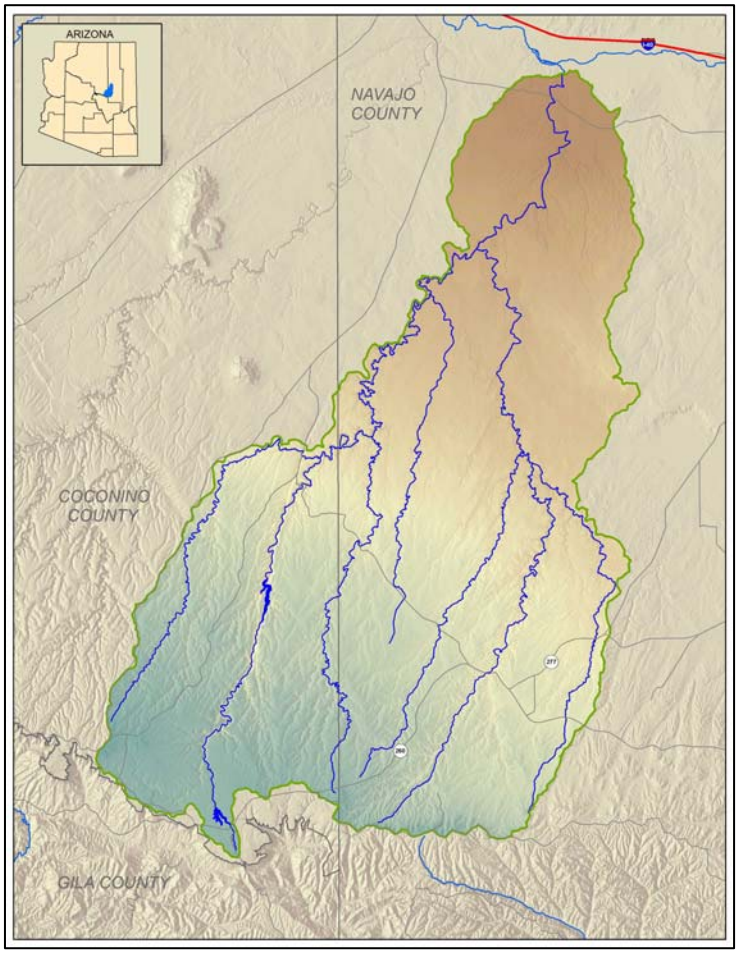
# Chevelon Canyon Watershed – Arizona
## Rapid Watershed Assessment
**April 2007**

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**Chevelon Canyon Watershed – 15020010**
**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 Chevelon Canyon Watershed

The Chevelon Canyon watershed is an eight-digit HUC subbasin located in the east-central portion of the state of Arizona, southeast of the town of Winslow and southwest of Holbrook (Figure 1-1). The basin comprises 529,935 acres (828 square miles) and is located in Navajo and Coconino Counties. Sixty-four percent of the land is managed by the Forest Service, 28% is private land, and 7% is state land. The remaining 2% of the land is managed by Bureau of Land Management (BLM) or Arizona Game & Fish.

Major towns in the watershed include Heber and Overgaard. The NRCS Field Offices for the area are located in Holbrook and Flagstaff.

Conservation assistance is provided through the Coconino and Navajo County Natural Resource Conservation Districts.

The area ranges in elevation from 5,400 to 7,200 feet. Rainfall amounts in this area range from 10 to 20 inches per year. The area in lower elevations is made up of undulating plains and low hills, with an occasionally deeply incised, steep sided drainage way. Some buttes and mesas rise abruptly above the level of the plains. At higher elevation the landscape is generally made up of level plains with hills and low mountains. This area supports a mixture of forest and grassland plant communities.

The majority of this watershed is used for cattle and sheep grazing. Rangeland and grazable forestland comprise over 90 percent of the area, while about 3 percent is used for cropland. The crops produced are corn, alfalfa, small grains and vegetable crops which are usually grown for local consumption. Scattered acreage of dry cropland occurs at the higher elevations.

Resource concerns in the watershed include soil erosion, rangeland site stability, rangeland hydrologic cycle, excessive runoff (causing flooding or ponding), 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, fish and domestic animals – inadequate quantities and quality of feed, forage, and stock water.

## Section 2: Physical Description

Watershed Size

The Chevelon Canyon Watershed covers approximately 828 square miles, representing less than 1% of the state of Arizona. The watershed has a maximum width of about 27 miles east-west, and a length of about 44 miles north-south.

The Chevelon Canyon 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 Chevelon Canyon Watershed has an 8-digit HUC of 15020010 and contains the following 10-digit HUCs:

- 1502001001 (Upper Chevelon Canyon);
- 1502001002 (Black Canyon); and,
- 1502001003 (Lower Chevelon Canyon) (Figure 1-2).

Geology

The Chevelon Canyon Watershed is on the down-dropped edge of the Mogollon Rim escarpment, the southern boundary of the Colorado Plateau Uplands physiographic province in the northeastern corner of the state. This province covers the northern 2/5 of the state of Arizona and is characterized by mostly level, horizontally stratified sedimentary rocks that have been eroded into canyons and plateaus, and by some high volcanic mountains.

The edge of the Mogollon Rim exposes a sequence, nearly 3,000 feet thick, of Paleozoic sedimentary rocks (Parker and Flynn, 2000). The overall vertical displacement of the Rim varies, but in some multiple fault zones near the Verde River it is estimated at approximately 6,000 feet (Feth, et al. 1954). Continued subsidence along several fault zones eventually formed the Chevelon Canyon Watershed, with the headwaters of Chevelon Canyon entrenched within one of the numerous northwest – southeast trending vertical faults forming the Rim escarpment.

Compared with the rest of Arizona geology, the Plateau Uplands seems easy to understand, the rocks are flat-lying sedimentary strata set in sequences of oldest (bottom) to youngest (top). The Chevelon Canyon (formed by both vertical faulting and creek down cutting) exposes the layered Paleozoic (245 million years old and older) sedimentary rocks (rocks formed by sediment, e.g., rock fragments or particles of various sizes), which include: sandstone, shale, and limestone. These rocks are visible as orange to reddish ledgy outcrops cliffs across the watershed.

Shaly siltstones, mudstone, conglomerates, and the Kaibab limestone overlay the Permian age Coconino Sandstone, and the older red siltstone and fine sandstone rocks of the Supai Formation are exposed in the deep canyon. Ancient marine and coastal deposits include a wide range of

rock types – limestone, claystone, mudstone, sandstone, and conglomerate.

The 240 million year-old Moenkopi formation can be traced from New Mexico, north to Nevada, and west to California. In northern Arizona, fossil vertebrate fauna have been described throughout the formation, including freshwater sharks, coelacanths, and lungfish. Fossil footprints and several fragmentary body fossils have been found throughout. Figure 2-1 shows the geology of the Chevelon Canyon Watershed.

## Soils

Soils within the Chevelon Canyon 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 covered by the NRCS "Soil Survey of Navajo County Area, 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 Chevelon Canyon Watershed is comprised of four Common Resource Areas (Figure 2-2 and Table 2-1).

The lower portion of the watershed is comprised of CRA 35.2 "Colorado Plateau Shrub – Grasslands" with elevations ranging from 3,500-5,500 feet and precipitation averaging 6 to 10 inches per year. Vegetation includes shadscale, fourwing saltbush, Mormon tea, blackbrush, Indian ricegrass, galleta, blue grama, and black grama. The soils in the area have a mesic soil temperature regime and a typic aridic soil moisture regime. The dominant soil orders are Aridisols and Entisols. Shallow and deep, moderately coarse to moderately fine-textured, soils occur on sandstone and shale plateaus. Deep, moderately fine and fine-textured, soils occur on floodplains.

Moving up the watershed, CRA 35.1 "Colorado Plateau Mixed Grass Plains" occurs at elevations ranging from 5,100 to 6,000 feet and precipitation averaging 10 to 14 inches per year. Vegetation includes Stipa species, Indian ricegrass, galleta, blue grama, fourwing saltbush, winterfat, and cliffrose. The soils in the area have mesic soil temperature regime and an ustic aridic soil moisture regime. The dominant soil orders are Aridisols and Entisols. Shallow, medium and fine-textured, soils and rock outcrop occur on plateaus and plains. Deep,

coarse to moderately fine-textured, soils occur on plains.

The middle portion of the watershed is comprised of CRA 35.7 “Colorado Plateau Woodland – Grassland” with elevations ranging from 5000 to 7000 feet and precipitation averaging 14 to 18 inches per year. Vegetation includes one-seed juniper, Colorado pinyon, Stansbury cliffrose, Apache plume, four-wing saltbush, Mormon tea, sideoats grama, blue grama, black grama, galleta, bottlebrush squirreltail, and muttongrass. The soils in the area have a mesic soil temperature regime and an aridic ustic soil moisture regime. The dominant soil orders are Alfisols and Mollisols. Shallow, medium and fine-textured, soils and rock outcrop occur on plateaus and plains. Shallow to deep, gravelly and cobbly, moderately coarse and fine-textured, soils occur on mountains and hills.

The upper portion of the watershed is comprised of CRA 39.1 “Mogollon Plateau Coniferous Forests” with elevations ranging from 7,000 to 12,500 feet and precipitation averaging 20 to 35 inches per year. Vegetation includes ponderosa pine, Gambel oak, Arizona walnut, sycamore, Douglas fir, blue spruce, Arizona fescue, mountain muhly, muttongrass, pine dropseed, and dryland sedges. The soils in the area have a mesic to frigid soil temperature regime and a typic ustic to udic ustic soil moisture regime. The dominant soil orders are Alfisols, Mollisols, and Entisols. Shallow to deep, gravelly and cobbly, moderately coarse and fine-textured, soils occur on mountains and hills. Moderately deep and deep, fine-textured, soils occur on mountains.

These four Common Resource Areas (CRA 35.2, 35.1, 35.7, 39.1) occur within the Colorado Plateau Physiographic Province which is characterized by a sequence of flat to gently dipping sedimentary rocks eroded into plateaus, valleys and deep canyons. Sedimentary rock classes dominate the plateau with volcanic fields occurring for the most part near its margin.

Slope Classifications

Slope, as well as soil characteristics and topography, are important when assessing the vulnerability of a watershed to erosion. Approximately 16% of the Chevelon Canyon Watershed has a slope greater than 15%, while about 57% of the watershed has a slope less than 5%. Lower Chevelon Canyon is comparatively flat, with only 5% of its area over 15% slope, and 79% less than 5% slope. The Upper Chevelon Canyon and Black Canyon Watersheds are relatively steeper, with 29% and 17% of the area greater than 15% slope, respectively (Table 2-2 and Figure 2-3).

*Table 2-1: Chevelon Canyon Watershed - Common Resource Areas*

| Common Resource Area Type | Area (sq. mi.) | Percent of Watershed |
|---|---|---|
| 35.2 Colorado Plateau Shrub - Grasslands | 73 | 8.9 |
| 35.1 Colorado Plateau Mixed Grass Plains | 171 | 20.8 |
| 35.7 Colorado Plateau Woodland -Grassland | 160 | 19.6 |
| 39.1 Mogollon Plateau Coniferous Forests | 415 | 50.7 |

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

*Table 2-2: Chevelon Canyon Watershed Slope Classifications*

| Watershed Name | Area (sq. miles) | Percent Slope | | |
|---|---|---|---|---|
| | | 0-5% | 5-15% | >15% |
| Upper Chevelon Canyon 1502001001 | 229 | 35% | 36% | 29% |
| Black Canyon 1502001002 | 319 | 53% | 30% | 17% |
| Lower Chevelon Canyon 1502001003 | 272 | 79% | 16% | 5% |
| Total | 820 | 57% | 27% | 16% |

*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 active and inactive US Geological Survey (USGS) gaging stations, and their respective annual mean stream flow, are found in Table 2-3.1. The two active gages in the Chevelon Canyon Watershed are located at Chevelon Fork below Wildcat Canyon, near Winslow, and at Chevelon Creek, near Winslow. The annual mean stream flows at he gages are 38 cfs and 51 cfs, respectively. Table 2-3.2 lists major lakes and reservoirs in the Watershed, as well as their watershed location, surface area, elevation and dam name. Chevelon Canyon Lake is the largest surface water body in the watershed with an area of about 249 acres. Table 2-3.3 lists the major streams and their lengths. Listed stream lengths range from about 57 miles for Black Canyon Stream to about 26 miles for Potatoe Wash.

*Table 2-3.1: Chevelon Canyon 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 | | | |
| 09397500 | Chevelon Fork Below Wildcat Canyon, Near Winslow | 1948 | 2006 | 38 |
| 09398000 | Chevelon Creek Near Winslow, AZ | 1906 | 2006 | 51 |

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

*Table 2-3.2: Chevelon Canyon Watershed Major Lakes and Reservoirs.*

| Lake Name (if known) | Watershed | Surface Area (acre) | Elevation (feet above mean sea level) | Dam Name (if known) |
|---|---|---|---|---|
| Chevelon Canyon Lake | Upper Chevelon Canyon | 249 | 6440 | Chevelon Canyon Dam |
| Willow Springs Lake | Upper Chevelon Canyon | 161 | 7523 | Willow Springs Dam |

*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: Chevelon Canyon Watershed Major Streams and Lengths*

| Stream Name | Watershed | Stream Length (miles) |
|---|---|---|
| Black Canyon | Black Canyon | 57 |
| Chevelon Canyon | Upper Chevelon Canyon | 49 |
| Chevelon Canyon | Lower Chevelon Canyon | 49 |
| Wildcat Canyon | Upper Chevelon Canyon | 34 |
| West Chevelon Canyon | Upper Chevelon Canyon | 30 |
| Pierce Wash | Black Canyon | 29 |
| Brookbank Canyon | Black Canyon | 28 |
| Potatoe Wash | Lower Chevelon Canyon | 26 |

*Data Sources: GIS data layer "chev_streams", Arizona State Land Department, Arizona Land Resource Information System (ALRIS 2004). http://www.land.state.az.us/alris/index.html*

## Riparian Vegetation

The Arizona Department of Game & Fish 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 Chevelon Canyon Watershed (Figure 2-5).

Five of the ten types of riparian areas occur within the Chevelon Canyon Watershed. Riparian areas encompass approximately 322 acres in the entire watershed. Tamarisk comprises about 160 acres of the riparian areas. Mountain Shrub and Wet Meadow comprise about 75 acres and 57 acres of the watershed, respectively (Table 2-4).

Lower Chevelon Canyon Watershed has the greatest amount of riparian vegetation with about 165 acres. Upper Chevelon Canyon is the only other watershed with riparian vegetation, and it has about 157 acres.

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 Chevelon Canyon Watershed, Table 2-5 identifies the Rocky Mountain Ponderosa Pine Woodland as the most common land cover type over the entire watershed, encompassing about 41% of the watershed. The next most common types are Colorado Plateau Pinyon-Juniper Woodland (27%), and Intermountain Basins Grassland, Savanna and Shrubland (26%).

Note: There are a total of 26 GAP vegetation categories present within the Chevelon Canyon 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 10 grouped GAP vegetation categories, as shown on Table 2-5.

*Table 2-4: Chevelon Canyon Watershed Riparian Vegetation (acres)*

| Riparian Vegetation Community | Upper Chevelon Canyon (1502001001) | Black Canyon (1502001002) | Lower Chevelon Canyon (1502001003) | Chevelon Canyon Watershed |
|---|---|---|---|---|
| Mesquite | | | 6 | 6 |
| Mixed Broadleaf | 25 | | | 25 |
| Mountain shrub | 74 | | | 75 |
| Tamarisk | | | 160 | 160 |
| Wet Meadow | 57 | | | 57 |
| Total Area (acres) | 157 | | 165 | 322 |

*Data Sources: GIS data layer "chev_riparian", Arizona State Land Department, Arizona Land Resource Information System (ALRIS, 2004) http://www.land.state.az.us/alris/index.html*

*Table 2-5: Chevelon Canyon Watershed Southwest Regional Gap Analysis Project Land Cover, Percent of 10-digit Watershed*

| Land Cover | Upper Chevelon Canyon 1502001001 | Black Canyon 1502001002 | Lower Chevelon Canyon 1502001003 | Percent of Total |
|---|---|---|---|---|
| Colorado Plateau Blackbrush-Mormon-tea Shrubland | | | 0.6% | 0.2% |
| Colorado Plateau Mixed Bedrock Canyon and Tableland | 0.3% | 0.4% | 3.5% | 1.2% |
| Colorado Plateau Mixed Low Sagebrush Shrubland | | 1.2% | 4.9% | 1.8% |
| Colorado Plateau Pinyon-Juniper Woodland | 18.2% | 41.4% | 18.6% | 27.4% |
| Developed, Medium - High Intensity | | 2.3% | | 0.9% |
| Inter-Mountains Basins Grassland, Savanna and Shrubland | 1.5% | 19.7% | 63.5% | 25.9% |
| Open Water | 0.2% | | | 0.1% |
| Rocky Mountain Montane Mixed Conifer Forest and Woodland | 1.5% | 0.6 | | 0.7% |
| Rocky Mountain Ponderosa Pine Woodland | 78.3% | 34.2% | 7.2% | 41.3% |
| Southern Colorado Plateau Sand Shrubland | | 0.1% | 1.7% | 0.5% |
| Area (Sq. mi.) | 229 | 319 | 272 | |

*Data Sources: GIS data layer "Arizona Gap Analysis Project Vegetation Map", University of Arizona, Southern Arizona Data Services Program, 2004 http://sdrsnet.srnr.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'*

## Meteorological Stations, Precipitation and Temperature

For the years 1961-1990, the average annual precipitation for the Chevelon Canyon Watershed was about 22 inches (Table 2-6). The Upper Chevelon Canyon Watershed at Chevelon Ranger Station received the most rainfall with 25 inches of rain in an average year, while the Upper Chevelon Canyon Watershed at Wallace Ranger Station and Black Canyon Watersheds typically received about 20 and 15 inches, respectively. Average Temperature for the Chevelon Canyon Watershed ranged from about 48.75 $^{o}$F at Chevelon Ranger station to about 47.95 $^{o}$F at the Wallace Ranger Station (Figure 2-7).

*Table 2-6: Chevelon Canyon Watershed Meteorological Stations, Temperature ($^{o}$F) and Precipitation (in/yr) with Recent Long-term Records.*

| 10-digit Watershed Name | Meteorological Stations and Map ID | Temperature ($^{o}$F) | | | Precipitation (in/yr) | | |
|---|---|---|---|---|---|---|---|
| | | Min. | Max. | Avg. | Min. | Max. | Weighted Average |
| Black Canyon HUC 1502001002 | Heber Ranger station | 32.1 | 65.4 | 48.75 | 9.0 | 25.0 | 15.30 |
| Upper Chevelon Canyon HUC 1502001001 | Wallace Ranger Station | 32.8 | 63.1 | 47.95 | 11.0 | 33.0 | 20.0 |
| Upper Chevelon Canyon HUC 1502001001 | Chevelon Ranger Station | 35.4 | 61.7 | 48.55 | 15.0 | 37.0 | 25.0 |
| Chevelon Canyon Watershed | - | - | - | - | 9.0 | 37 | 22.0 |

*Data Sources: Western Regional Climate Center (WRCC), Temperature data. July 15, 2004.* *http://www.wrcc.dri.edu/summary/climsmaz.html* Precipitation: GIS data layer "chev_precip" Arizona Land Information System (ALRIS 2004). http://www.land.state.az.us/alris/index.html.

## Land Ownership/Management

There are 5 different land ownership/management entities in the Chevelon Canyon Watershed (Figure 2-8 and Table 2-7). U.S. Forest Service land is the largest category, representing about 64% of the watershed, followed by the Private land with about 28%, and State Trust land with about 7%. The BLM and, U.S. Game and Fish manage the remaining 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 Chevelon Canyon Watershed is Range which makes up about 58% of the watershed. Forest is the next most common type with about 42% of the total area.

*Table 2-7: Chevelon Canyon Watershed Land Ownership/Management (Percent of each 10-digit Watershed)*

| Land Owner | Lower Chevelon Canyon 1502001003 | Black Canyon 1502001002 | Upper Chevelon Canyon 1502001001 | Chevelon Canyon Watershed |
|---|---|---|---|---|
| BLM | 2% | 2% | - | 1 % |
| U.S. Forest Service | 23% | 65% | 98% | 64% |
| Game and Fish | <1% | - | <1% | <1% |
| Private | 58% | 28% | 1% | 28% |
| State Trust | 16% | 6% | <1% | 7% |
| *Area (square miles)* | *229* | *319* | *272* | *820* |

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

*Table 2-8: Chevelon Canyon Watershed Land Use, (Percent of 10-digit Watershed)*

| Land Cover/Location | Upper Chevelon Canyon | Black Canyon | Lower Chevelon Canyon | Percent of Chevelon Watershed |
|---|---|---|---|---|
| Forest | 79% | 34% | 7% | 42% |
| Urban | -- | 2% | -- | 1% |
| Range | 20% | 64% | 93% | 58% |
| Water | <1% | -- | -- | <1% |
| Area (sq. mile) | 229 | 319 | 272 | 820 |

*Data Sources: GIS data layer "chev_gapveg", Arizona State Land Department, Arizona Land Resource Information System (ALRIS), February 7, 2002*
*http://www.land.state.az.us/alris/index.html*

Mines – Primary Ores

Table 2-9 and Figure 2-10 show the types of ores being mined in the Chevelon Canyon Watershed. After the 8 mines of "unknown" ore type, the other mines found in the watershed are four manganese mines, and three sand and gravel mines.

*Table 2-9: Chevelon Canyon Watershed Mines – Primary Ores.*

| Ore Type | Total Number of Mines |
|---|---|
| Unknown | 8 |
| Manganese | 4 |
| Sand and Gravel | 3 |

*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 Chevelon Canyon 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: Chevelon Canyon 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 |
| Water Quality | Nutrient loading | Nutrient Loading Excessive Suspended Sediment in Surface Water | Nutrient Loading Excessive Suspended Sediment in Surface Water | |
| Water Quantity | | Hydrologic Cycle & Reduced Water Storage from Sediment Accumulation | | |
| 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)

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. 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* indicates the following status of surface waters in the Chevelon Canyon Watershed.

- Black Canyon Lake. 15020010-0180. Lake surface area approximately 35 acres. Attaining some uses. Low dissolved oxygen occurred in three of eight samples, which may indicate nutrient problems. (02 – Black Canyon Sub-Basin)

- Chevelon Canyon Creek, from Black Canyon Creek to Little

Colorado River. 15020010-001. Stream reach approximately 19.3 miles. Attaining all uses. No exceedances (03 – Lower Chevelon Canyon Sub-Basin)

- Wood Canyon Lake. 15020010-1700. Lake surface area approximately 70 acres. Attaining some uses. Low dissolved oxygen in 5 of 13 sampling events. (EPA is likely to add this to the impaired waters list due to these exceedances, although ADEQ is listing it as attaining.) (01 – Upper Chevelon Canyon Sub-Basin)

Water Quantity

Water resources in the Chevelon Canyon Watershed are similar to those along the Mogollon Rim of the Little Colorado Watershed.

The Chevelon Canyon Watershed has two predominant stream types: perennial and ephemeral / intermittent. The main drainage within Chevelon Canyon, Chevelon Creek, is perennial for the first 40 miles, or for approximately 41% of the nearly 100 mile length. The remaining streams are intermittent and/or ephemeral. The definitions for the three different stream types 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.

• Ephemeral streams are at all times above the elevation of the ground water table, has no base flow, and flows only in direct response to precipitation.

Most streams in Arizona are intermittent or ephemeral. Some of the stream channels in the region are dry for years at a time, but are subject to flash flooding during high-intensity storms (Gordon et al., 1992).

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.

The encroachment of salt cedar (*Tamarix ramosissima*) has been reported to be an issue on the lower portion of Chevelon Creek. 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

Over the past several years, Arizona has experienced increased piñon and ponderosa pine mortality due to outbreaks of several species of bark beetles. Low tree vigor caused by several years of drought and excessively dense stands of trees have combined to allow beetle populations to reach outbreak levels.

To estimate the extent of bark beetle impacts in the Chevelon Canyon Watershed, the Forest Service uses aerial detection surveys on forested lands for visual tree mortality determinations. Based on an analysis of the Forest Service GIS data for bark beetle occurrence, approximately 301 acres of lands in this watershed have been affected by bark beetles, or about 0.06 percent of the total watershed area.

The Climate Assessment for the Southwest (CLIMAS) website (www.ispe.arizona.edu/climas http://www.ispe.arizona.edu/climas) provides information on Arizona's drought status. Recent precipitation events have placed the area of Arizona that encompasses the Chevelon Canyon Watershed in moderate drought status. However, the watershed remains abnormally dry, and the long term drought status remains moderate.

The Southwest Coordination Center (www.gacc.nifc.gov/swcc/predictive/outlooks/outlooks.htm) places the Chevelon Canyon Watershed in the Normal category for significant wildland fire activity potential due to favorably moist conditions, however, the upper portion of the Chevelon Canyon Watershed was moderately to severely burned during the massive Rodeo-Chediski wildfire of 2002. This event killed many of the pine trees along with most of the ground vegetation, thereby leaving the soils within much of the upper watershed unprotected and subject to runoff and erosion.

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 Chevelon Canyon Watershed contains 17 species that are either listed, or species of concern, under the U.S. Endangered Species Act (Table 3-2).

*Table 3-2: Chevelon Canyon Watershed Species of Concern Classifications and Observation*

| Common Name | Species Name | USESA (2) | USFS (3) | BLM (4) | STATE (5) | Range of Observation |
|---|---|---|---|---|---|---|
| Allen's Big-eared Bat | Idionycteris phyllotis | SC | | S | | 1993 |
| American Peregrine Falcon | Falco peregrinus anatum | SC | S | | WSC | 2005 |
| Arizona Myotis | Myotis occultus | SC | | S | | 2001 |
| Bald Eagle | Haliaeetus leucocephalus (wintering pop.) | LT,PDL | S | | WSC | 2004 |
| Blumer's Dock | Rumex orthoneurus | SC | S | | HS | 1998 |
| California Floater | Anodonta californiensis | SC | S | | | 1994 |
| Chiricahua Leopard Frog | Rana chiricahuensis | LT | S | | WSC | 1974 |
| Designated Critical Habitat for Little Colorado spinedace | CH for Lepidomeda vitatta | | | | | |

| Common Name | Species Name | USESA (2) | USFS (3) | BLM (4) | STATE (5) | Range of Observation |
|---|---|---|---|---|---|---|
| CH for Strix occidentalis lucida | Designated Critical Habitat for Mexican spotted owl | | | | | |
| Eared Quetzal | Euptilotis neoxenus | | S | | | 1994 |
| Eastwood Alum Root | Heuchera eastwoodiae | | S | | | 1985 |
| Fringed Myotis | Myotis thysanodes | SC | | S | | 2001 |
| Golden Eagle | Aquila chrysaetos | | | | | 2004 |
| Little Colorado Spinedace | Lepidomeda vittata | LT | S | | WSC | 1995 |
| Little Colorado Sucker | Catostomus sp. 3 | SC | S | | WSC | 1994 |
| Long-eared Myotis | Myotis evotis | SC | | S | | 2001 |
| Myotis volans | Long-legged Myotis | SC | | S | | 1993 |
| Triteleia lemmoniae | Mazatzal Triteleia | | | | SR | 1966 |
| Strix occidentalis lucida | Mexican Spotted Owl | LT | S | | WSC | 2002 |
| Accipiter gentilis | Northern Goshawk | SC | S | | WSC | 1998 |
| Rana pipiens | Northern Leopard Frog | | S | | WSC | 1998 |
| Pediocactus papyracanthus | Paper-spined Cactus | SC | | | SR | 1993 |
| Amsonia peeblesii | Peebles Blue Star | | | | | 1992 |
| Polemonium flavum | Pinaleno Jacobs Ladder | | S | | | 1989 |
| Gila robusta | Roundtail Chub | SC | S | | WSC | 2001 |
| Rhinichthys osculus | Speckled Dace | SC | | S | | 2003 |
| Fort Apache Reservation | White Mountain Apache Reservation | | | | | |

*Data Sources: Arizona Land Information System (ALRIS), Natural Resource Conservation Service (NRCS). 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: **(USESA) 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** NPL Arizona Native Plant Law (1993) Arizona Department of Agriculture

HS Highly Safeguarded: no collection allowed.

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 Chevelon Canyon Watershed is a mosaic of federal, state and private lands where logging, livestock grazing, and recreation are the primary land uses. The upper portion of the watershed is primarily managed by the U.S. Forest Service while the lower portion of the watershed is primarily private lands. Livestock grazing is the primary land use activity on the private land, while livestock grazing and logging occur on the U.S. Forest Service lands in the high elevations. The towns of Heber and Overgard are located in the southeastern portion of the watershed.

The Chevelon Canyon Watershed is recognized as an important wildlife area in the state. Hunting and fishing, with motor touring, are the primary recreational activities.

Chevelon Creek is considered to be one of the best sport fisheries in Arizona, especially near Chevelon Lake. The federally listed Little Colorado spinedace (*Lepidomeda vittata*) has been found within the watershed. The Chevelon Canyon Watershed contains two Arizona Game and Fish Wildlife Areas; Chevelon Canyon Wildlife Area and Raymond Ranch Wildlife Area. Water quality and instream flow are fishery concerns on Chevelon Creek and the wildlife areas.

The Chevelon Canyon Wildlife Area is located in the southern portion of the watershed along Chevelon Creek. Special status species observed on the Chevelon Canyon Wildlife Area include the American peregrine falcon (*Falco peregrinus anatum*), Mexican spotted owl (*Strix occidentalis lucida*), northern goshawk (*Accipiter gentiles*), narrow-headed gartersnake (*Thamnophis rufipunctatus*) and northern Mexican gartersnake (*Thamnophis eques megalops*). Other species of interest include turkeys, deer, elk and Albert's squirrel.

The Raymond Ranch Wildlife Area is located at the mouth of Chevelon Creek on the Little Colorado River. Special status species observed on the Raymond Ranch Wildlife Area include the northern leopard frog (*Rana pipiens*), bald eagle (*Haiaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*) and loggerhead shrike (*Lanius ludovicianus)*. Other species of interest include elk, pronghorn, deer and waterfowl.

Chevelon Creek is also noted for its large concentration of Late Archaic and Early Mogollon/Anasazi archaeology sites. Forest health and fire prevention are issues on the U.S. Forest Service lands especially near the communities of Heber and Overgard. The potential of increase development in the watershed exists near the communities of Heber and Overgarrd, and on the northern border of the U.S. Forest Service lands within the woodland vegetation community.

Conservation Progress/Status

Conservation progress for the previous five years in the Chevelon Canyon 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

While there have been conservation accomplishments in this watershed during fiscal years (FY) 2002 through 2006, there are no records found in the NRCS Progress Reporting System.

## 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 3 people per square mile. Black Canyon had the highest population mean with about 5 people per square mile, with a maximum of 323 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 6 people per square mile. Black Canyon had the highest mean population density with 9 people per square mile. Upper Chevelon Canyon had the highest maximum density of 676 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 2 people per square mile during this ten-year time period. Black Canyon had the highest mean increase in population density at 6 people per square mile. Lower Chevelon Canyon had the greatest decrease in mean population at -1 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, Chevelon Canyon Watershed Housing Density for 2000, identifies that about 198 sq. miles of housing is located in "undeveloped private" areas, while about 12 sq. miles is located in "exurban" areas. Figure 4-5 and Table 4-5, Housing Density for 2030, projects "undeveloped private" areas being reduced to about 193 sq. miles and "exurban" areas decreasing to 7 sq. miles.

*Table 4-1: Chevelon Canyon Watershed 1990 Population Density (people/square mile)*

| 10-digit Watershed Name | Area (sq. mile) | Population Density (people/sq.mi.) | | |
|---|---|---|---|---|
| | | Min | Max | Mean |
| Upper Chevelon Canyon - 1502001001 | 229 | 0 | 53 | 1 |
| Black Canyon - 1502001002 | 319 | 0 | 323 | 5 |
| Lower Chevelon Canyon - 1502001003 | 272 | 0 | 92 | 1 |
| Total Chevelon Canyon Watershed | 820 | 0 | 323 | 3 |

*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: Chevelon Canyon Watershed 2000 Population Density (people/square mile)*

| 10-digit Watershed Name | Area (sq. miles) | Population Density (people/sq.mi.) | | |
|---|---|---|---|---|
| | | Min | Max | Mean |
| Upper Chevelon Canyon – 1502001001 | 229 | 0 | 676 | 5 |
| Black Canyon – 1502001002 | 319 | 0 | 565 | 9 |
| Lower Chevelon Canyon – 1502001003 | 272 | 0 | 8 | =~ 0 |
| Total Chevelon Canyon Watershed | 820 | 0 | 676 | 6 |

*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 4-3: Chevelon Canyon Watershed Population Density Change 1990-2000 (people/square mile)*

| 10-digit Watershed Name | Area (sq. miles) | Population Density (people/sq.mi.) | | |
|---|---|---|---|---|
| | | Min | Max | Mean |
| Upper Chevelon Canyon – 1502001001 | 229 | 25 | 303 | 1 |
| Black Canyon - 1502001002 | 319 | -12 | 523 | 6 |
| Lower Chevelon Canyon - 1502001003 | 272 | -92 | 8 | -1 |
| Total Chevelon Canyon Watershed | 820 | -92 | 523 | 2 |

*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 4-4: Chevelon Canyon Watershed Housing Density 2000 (Percent of Watershed)*

| Housing Density | Upper Chevelon Canyon 1502001001 | Black Canyon 1502001002 | Lower Chevelon Canyon 1502001003 | Chevelon Canyon Watershed (sq. miles) |
|---|---|---|---|---|
| Undeveloped Private | 55% | 67 | 96% | 198 |
| Rural | 3% | 19% | 4% | 22 |
| Exurban | 22% | 12% | <1% | 12 |
| Suburban | 19% | <1% | - | 2 |
| Urban | <1% | <1% | - | 1 |

*Source: Arizona Land Information System (ALRIS 2004), Natural Resource Conservation Service (NRCS 2006) and Theobald (2005).*

*Table 4-5: Chevelon Canyon Watershed Housing Density Projections 2030 (Percent of Watershed)*

| Housing Density | Upper Chevelon Canyon 1502001001 | Black Canyon 1502001002 | Lower Chevelon Canyon 1502001003 | Chevelon Canyon Watershed (sq. miles) |
|---|---|---|---|---|
| Undeveloped Private | 55% | 67% | 96% | 193 |
| Rural | 3% | 19% | 4% | 26 |
| Exurban | 22% | 12% | <1% | 7 |
| Suburban | | 2% | | 8 |
| Urban | 20% | 1% | | 1 |

*Source: Arizona Land Information System (ALRIS 2004), Natural Resource Conservation Service (NRCS 2006) and Theobald (2005).*

## Chevelon Canyon 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 Chevelon Canyon Watershed is comprised of livestock grazing. Of the 27 farms that have pasture and rangeland, 48% have 100 or more acres. Seventy-seven percent of all farms in the watershed are less than 1,000 acres in size. Of the 12 farms that harvest crops, 83% are 49 acres or less in size.

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 that 100 percent.

Four zip codes in the Chevelon Canyon Watershed contained no information about agricultural practices in the NASS database. NASS assumes that no information for those areas means that there was no agricultural activity taking place within that zip code area.

*Figure 4-6: Chevlon Canyon Watershed Farms by Size (2002)*

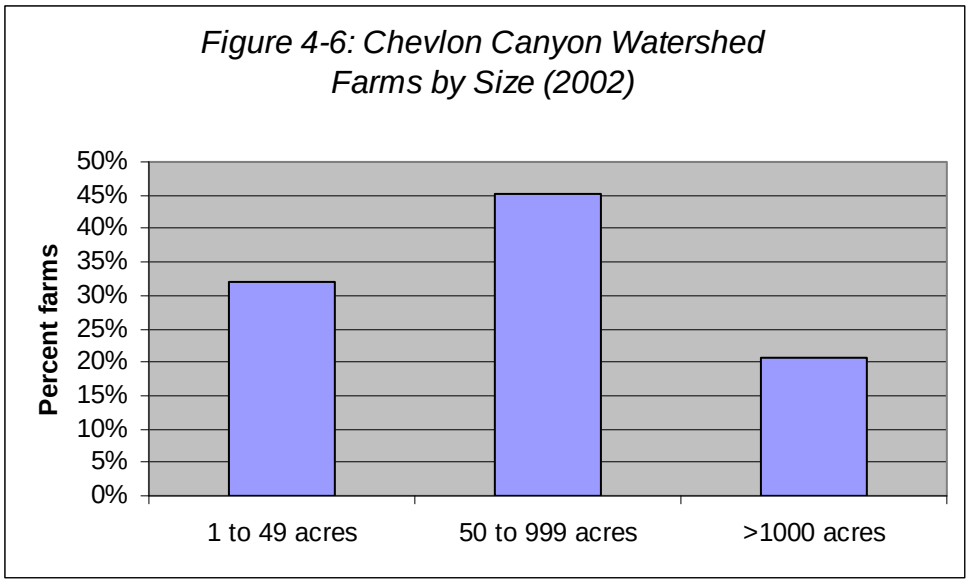



*Table 4-6: Chevelon Canyon Watershed Farms by Size (2002)*

| All farms | 1 to 49 acres | 50 to 999 acres | >1000 acres |
|---|---|---|---|
| 53 | 32% | 45% | 21% |

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

*Figure 4-7: Chevlon Canyon Watershed Permanent Pasture and Rangeland (2002)*

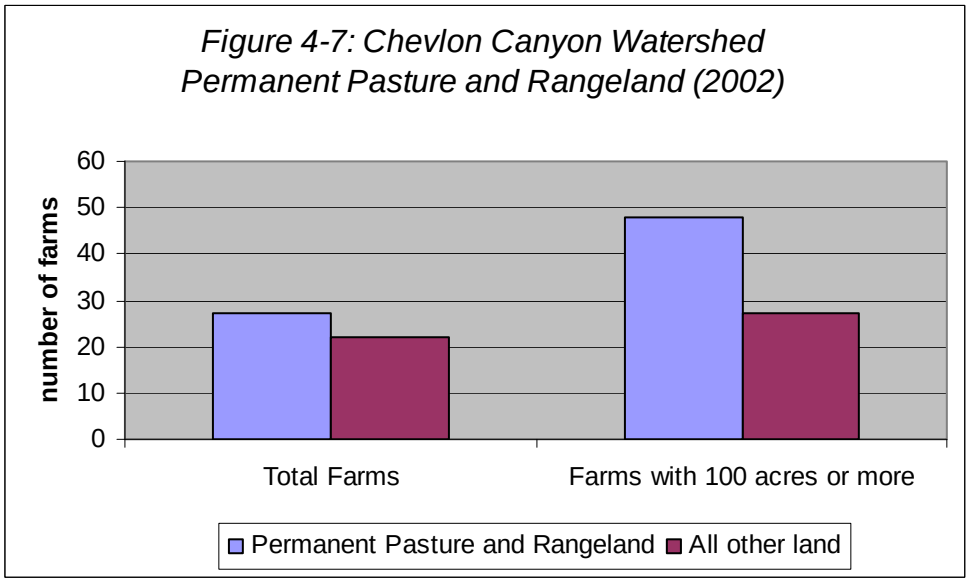



*Table 4-7: Chevelon Canyon Watershed Pasture and Rangeland (2002)*

| Category | Total farms | Farms 100 acres or more |
|---|---|---|
| Permanent pasture and rangeland | 27 | 48% |
| All other land | 22 | 27% |

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

*Figure 4-8: Chevlon Canyon Watershed Cropland Harvested (2002)*

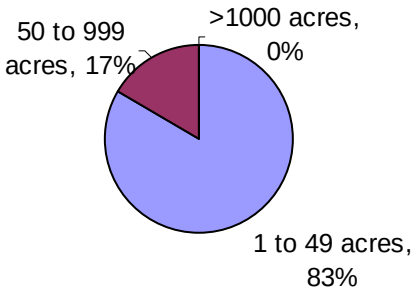



*Table 4-8: Chevelon Canyon Watershed Cropland Harvested (2002)*

| Total farms | 1 to 49 acres | 50 to 999 acres | >1000 acres |
|---|---|---|---|
| 12 | 83% | 17% | 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 Chevelon Canyon 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 and 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.

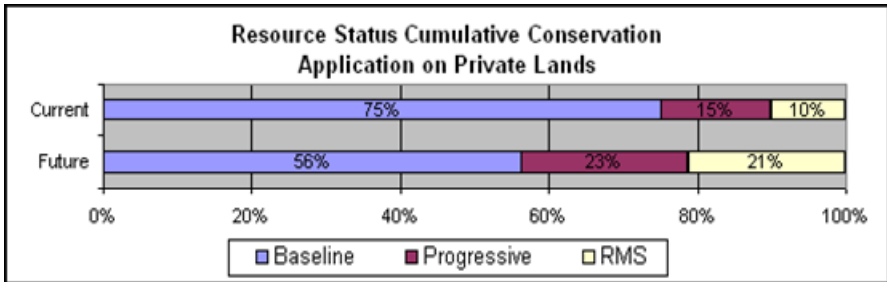
Credit goes to NRCS in Oregon for development of the template for these Resource Assessment Tables.

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

| WATERSHED NAME & CODE | CHEVELON CANYON - 15020010 | | | | LANDUSE ACRES | 301,371 | | |
|---|---|---|---|---|---|---|---|---|
| LANDUSE TYPE | RANGE | | | | TYPICAL UNIT SIZE ACRES | 50,000 | | |
| ASSESSMENT INFORMATION | | | | | CALCULATED PARTICIPATION | 25% | | |
| | Benchmark Conditions | Future Conditions | | | RESOURCE CONCERNS | | | |
| Conservation Systems by Treatment Level | 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 | Domestic Animals – Inadequate Quantities and Quality of Feed and Forage |
| **Baseline** | | | | **System Rating ->** | **1** | **3** | **0** | **0** |
| Fence (ft.) 382 | 22,603 | 16,952 | 0 | 16,952 | 0 | 1 | 1 | 1 |
| Pipeline (ft.) 516 | 22,603 | 16,952 | 0 | 16,952 | 3 | 3 | 0 | 0 |
| Watering Facility (no.) 614 | 45 | 34 | 0 | 34 | 0 | 4 | 1 | 0 |
| **Total Acreage at Baseline** | **226,028** | **169,521** | **0** | **169,521** | | | | |
| **Progressive** | | | | **System Rating ->** | **4** | **3** | **4** | **4** |
| Fence (ft.) 382 | 22,603 | 20,343 | 13,562 | 33,904 | 0 | 1 | 1 | 1 |
| Pipeline (ft.) 516 | 22,603 | 20,343 | 13,562 | 33,904 | 3 | 3 | 0 | 0 |
| Prescribed Burning (ac.) 338 | 4,521 | 3,390 | 3,390 | 6,781 | 1 | 1 | 4 | 4 |
| Prescribed Grazing (ac.) 528 | 45,206 | 33,904 | 33,904 | 67,808 | 5 | 3 | 5 | 5 |
| Watering Facility (no.) 614 | 18 | 20 | 7 | 27 | 0 | 4 | 1 | 0 |
| **Total Acreage at Progressive Level** | **45,206** | **33,904** | **33,904** | **67,808** | | | | |
| **RMS** | | | | **System Rating ->** | **4** | **4** | **5** | **5** |
| Brush Management (ac.) 314 | 3,014 | 3,014 | 3,390 | 6,404 | 4 | 4 | 5 | 3 |
| Fence (ft.) 382 | 30,137 | 38,048 | 25,993 | 64,041 | 0 | 1 | 1 | 1 |
| Pipeline (ft.) 516 | 30,137 | 38,048 | 25,993 | 64,041 | 3 | 3 | 0 | 0 |
| Prescribed Burning (ac.) 338 | 3,014 | 4,144 | 2,260 | 6,404 | 1 | 1 | 4 | 4 |
| Prescribed Grazing (ac.) 528 | 30,137 | 41,439 | 22,603 | 64,041 | 5 | 3 | 5 | 5 |
| Range Planting (ac.) 550 | 3,014 | 3,014 | 3,390 | 6,404 | 4 | 2 | 5 | 5 |
| Upland Wildlife Habitat Management (ac.) 645 | 30,137 | 30,137 | 33,904 | 64,041 | 0 | 0 | 4 | 1 |
| Watering Facility (no.) 614 | 30 | 39 | 25 | 64 | 0 | 4 | 1 | 0 |
| Wildlife Watering Facility (no.) 648 | 6 | 6 | 7 | 13 | 0 | 4 | 1 | 0 |
| **Total Acreage at RMS Level** | **30,137** | **30,137** | **33,904** | **64,041** | | | | |

| WATERSHED NAME & CODE | CHEVELON CANYON - 15020010 | LANDUSE ACRES | 301,371 |
|---|---|---|---|
| LANDUSE TYPE | RANGE | TYPICAL UNIT SIZE ACRES | 50,000 |
| CONSERVATION COST TABLE | | CALCULATED PARTICIPATION | 25% |

| | FUTURE | FEDERAL | | | | PRIVATE | | |
|---|---|---|---|---|---|---|---|---|
| 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 |
| **Progressive** | | | | | | | | |
| Fence (ft.) 382 | 13,562 | $20,343 | $0 | $4,069 | $24,411 | $20,343 | $814 | $23,770 |
| Pipeline (ft.) 516 | 13,562 | $54,247 | $0 | $10,849 | $65,096 | $54,247 | $2,170 | $63,387 |
| Prescribed Burning (ac.) 338 | 3,390 | $84,761 | $0 | $16,952 | $101,713 | $84,761 | $1,695 | $91,901 |
| Prescribed Grazing (ac.) 528 | 33,904 | $25,428 | $0 | $5,086 | $30,514 | $25,428 | $0 | $25,428 |
| Watering Facility (no.) 614 | 7 | $3,390 | $0 | $678 | $4,069 | $3,390 | $203 | $4,247 |
| **Subtotal** | **33,904** | **$188,169** | **$0** | **$37,634** | **$225,802** | **$188,169** | **$4,882** | **$208,734** |
| **RMS** | | | | | | | | |
| Brush Management (ac.) 314 | 3,390 | $203,425 | $0 | $40,685 | $244,111 | $203,425 | $4,069 | $220,563 |
| Fence (ft.) 382 | 25,993 | $38,990 | $0 | $7,798 | $46,788 | $38,990 | $1,560 | $45,559 |
| Pipeline (ft.) 516 | 25,993 | $103,973 | $0 | $20,795 | $124,768 | $103,973 | $4,159 | $121,492 |
| Prescribed Burning (ac.) 338 | 2,260 | $56,507 | $0 | $11,301 | $67,808 | $56,507 | $1,130 | $61,268 |
| Prescribed Grazing (ac.) 528 | 22,603 | $16,952 | $0 | $3,390 | $20,343 | $16,952 | $0 | $16,952 |
| Range Planting (ac.) 550 | 3,390 | $101,713 | $0 | $20,343 | $122,055 | $101,713 | $2,034 | $110,282 |
| Upland Wildlife Habitat Management (ac.) 645 | 33,904 | $0 | $132,227 | $26,445 | $144,260 | $0 | $44,076 | $67,848 |
| Watering Facility (no.) 614 | 25 | $12,432 | $0 | $2,486 | $14,918 | $12,432 | $746 | $15,574 |
| Wildlife Watering Facility (no.) 648 | 7 | $3,390 | $0 | $678 | $4,069 | $3,390 | $68 | $3,676 |
| **Subtotal** | **33,904** | **$537,382** | **$132,227** | **$133,922** | **$789,118** | **$537,382** | **$57,841** | **$663,214** |
| **Grand Total** | **67,808** | **$725,551** | **$132,227** | **$171,555** | **$1,014,920** | **$725,551** | **$62,723** | **$871,948** |



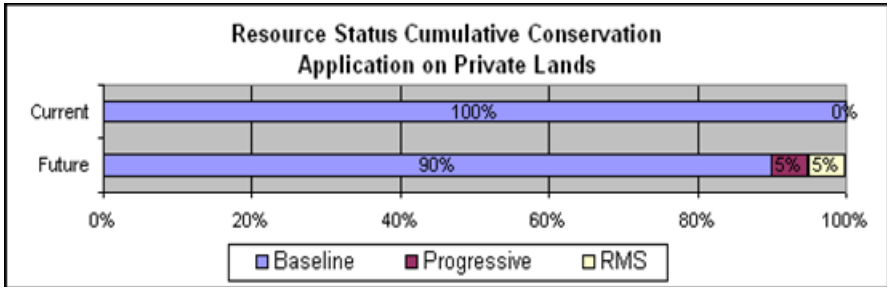

| Chart Refers To | |
|---|---|
| Landuse Type | RANGE |
| Calculated Participation Rate | 25% |

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

| WATERSHED NAME & CODE | CHEVELON CANYON - 15020010 | | | | LANDUSE ACRES | 217,876 | | |
|---|---|---|---|---|---|---|---|---|
| LANDUSE TYPE | FOREST | | | | TYPICAL UNIT SIZE ACRES | 50,000 | | |
| ASSESSMENT INFORMATION | | | | | CALCULATED PARTICIPATION | 10% | | |
| | Benchmark Conditions | Future Conditions | | | RESOURCE CONCERNS | | | |
| Conservation Systems by Treatment Level | 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 | Domestic Animals – Inadequate Quantities and Quality of Feed and Forage |
| **Baseline** | | | | **System Rating ->** | **1** | **3** | **0** | **0** |
| Fence (ft.) 382 | 21,788 | 19,609 | 0 | 19,609 | 0 | 1 | 1 | 1 |
| Pipeline (ft.) 516 | 21,788 | 19,609 | 0 | 19,609 | 3 | 3 | 0 | 0 |
| Watering Facility (no.) 614 | 44 | 39 | 0 | 39 | 0 | 4 | 1 | 0 |
| **Total Acreage at Baseline** | **217,876** | **196,088** | **0** | **196,088** | | | | |
| **Progressive** | | | | **System Rating ->** | **4** | **3** | **4** | **4** |
| Fence (ft.) 382 | 0 | 1,089 | 4,358 | 5,447 | 0 | 1 | 1 | 1 |
| Pipeline (ft.) 516 | 0 | 1,089 | 4,358 | 5,447 | 3 | 3 | 0 | 0 |
| Prescribed Burning (ac.) 338 | 0 | 0 | 1,089 | 1,089 | 1 | 1 | 4 | 4 |
| Prescribed Grazing (ac.) 528 | 0 | 0 | 10,894 | 10,894 | 5 | 3 | 5 | 5 |
| Watering Facility (no.) 614 | 0 | 2 | 2 | 4 | 0 | 4 | 1 | 0 |
| **Total Acreage at Progressive Level** | **0** | **0** | **10,894** | **10,894** | | | | |
| **RMS** | | | | **System Rating ->** | **5** | **4** | **5** | **3** |
| Brush Management (ac.) 314 | 0 | 0 | 1,089 | 1,089 | 4 | 4 | 5 | 3 |
| Fence (ft.) 382 | 0 | 1,089 | 9,804 | 10,894 | 0 | 1 | 1 | 1 |
| Pipeline (ft.) 516 | 0 | 1,089 | 9,804 | 10,894 | 3 | 3 | 0 | 0 |
| Prescribed Burning (ac.) 338 | 0 | 0 | 1,089 | 1,089 | 1 | 1 | 4 | 4 |
| Prescribed Grazing (ac.) 528 | 0 | 0 | 10,894 | 10,894 | 5 | 3 | 5 | 5 |
| Tree/Shrub Establishment (ac.) 612 | 0 | 0 | 1,089 | 1,089 | 5 | 1 | 4 | -3 |
| Upland Wildlife Habitat Management (ac.) 645 | 0 | 0 | 10,894 | 10,894 | 0 | 0 | 4 | 1 |
| Watering Facility (no.) 614 | 0 | 2 | 9 | 11 | 0 | 4 | 1 | 0 |
| Wildlife Watering Facility (no.) 648 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 |
| **Total Acreage at RMS Level** | **0** | **0** | **10,894** | **10,894** | | | | |

| WATERSHED NAME & CODE | CHEVELON CANYON - 15020010 | LANDUSE ACRES | 217,876 |
|---|---|---|---|
| LANDUSE TYPE | FOREST | TYPICAL UNIT SIZE ACRES | 50,000 |
| CONSERVATION COST TABLE | | CALCULATED PARTICIPATION | 10% |

| | FUTURE | FEDERAL | | | | PRIVATE | | |
|---|---|---|---|---|---|---|---|---|
| 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 |
| **Progressive** | | | | | | | | |
| Fence (ft.) 382 | 4,358 | $6,536 | $0 | $1,307 | $7,844 | $6,536 | $261 | $7,638 |
| Pipeline (ft.) 516 | 4,358 | $17,430 | $0 | $3,486 | $20,916 | $17,430 | $697 | $20,367 |
| Prescribed Burning (ac.) 338 | 1,089 | $27,235 | $0 | $5,447 | $32,681 | $27,235 | $545 | $29,529 |
| Prescribed Grazing (ac.) 528 | 10,894 | $8,170 | $0 | $1,634 | $9,804 | $8,170 | $0 | $8,170 |
| Watering Facility (no.) 614 | 2 | $1,089 | $0 | $218 | $1,307 | $1,089 | $65 | $1,365 |
| **Subtotal** | **10,894** | **$60,461** | **$0** | **$12,092** | **$72,553** | **$60,461** | **$1,569** | **$67,069** |
| **RMS** | | | | | | | | |
| Brush Management (ac.) 314 | 1,089 | $65,363 | $0 | $13,073 | $78,435 | $65,363 | $1,307 | $70,869 |
| Fence (ft.) 382 | 9,804 | $14,707 | $0 | $2,941 | $17,648 | $14,707 | $588 | $17,185 |
| Pipeline (ft.) 516 | 9,804 | $39,218 | $0 | $7,844 | $47,061 | $39,218 | $1,569 | $45,826 |
| Prescribed Burning (ac.) 338 | 1,089 | $27,235 | $0 | $5,447 | $32,681 | $27,235 | $545 | $29,529 |
| Prescribed Grazing (ac.) 528 | 10,894 | $8,170 | $0 | $1,634 | $9,804 | $8,170 | $0 | $8,170 |
| Tree/Shrub Establishment (ac.) 612 | 1,089 | $5,175 | $0 | $1,035 | $6,209 | $5,175 | $103 | $5,610 |
| Upland Wildlife Habitat Management (ac.) 645 | 10,894 | $0 | $42,486 | $8,497 | $46,352 | $0 | $14,162 | $21,800 |
| Watering Facility (no.) 614 | 9 | $4,358 | $0 | $872 | $5,229 | $4,358 | $261 | $5,459 |
| Wildlife Watering Facility (no.) 648 | 2 | $1,089 | $0 | $218 | $1,307 | $1,089 | $22 | $1,181 |
| **Subtotal** | **10,894** | **$165,313** | **$42,486** | **$41,560** | **$244,728** | **$165,313** | **$18,558** | **$205,630** |
| **Grand Total** | **21,788** | **$225,774** | **$42,486** | **$53,652** | **$317,281** | **$225,774** | **$20,126** | **$272,698** |




| 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. 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** | **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.).<br>**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.).<br>**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. |
| **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** | **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.<br>**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.<br>**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. The Hydrologic Unit Code (HUC) of a Drainage Basin is an 8-digit HUC. |

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