

## STEP 1. CHARACTERIZATION OF THE WATERSHED

The purpose of characterization is to identify the dominant physical, biological, and human processes and features of the watershed that affect ecosystem functions and conditions. The core team also considered the status of land allocations, plan objectives and regulatory constraints that influence resource management for the watershed. This section identifies the primary ecosystem elements needing more detailed analysis in subsequent sections.

### **Erosion Processes**

The primary sources of sediment due to management activities are road, logging and stream bank erosion. Roads have the greatest erosion rate and are the largest source of sediment in the high elevation areas of the watershed. Erosion from timber harvest is approximately 1/2 that from roads. There are four major geologic parent materials which result in different erosion rates (Table 1).

Table 1. Geologic Erosion Rates

<u>Geologic Parent Material</u>	<u>Geologic Period</u>	<u>% of Watershed</u>	<u>Geologic Erosion Factor</u>
Alluvial	Quaternary	9	1.05
Olivine basalt	Quaternary	59	0.42
Rhyolite	Tertiary	6	1.00
Tuffaceous sedimentary rocks/pumicites	Tertiary	23	0.66

The forested basalt and tuff derived soils have low to moderate surface erosion rates and a low risk of mass movement. These soils are resistant to erosion and weather into clays which hold the soil together. However, they are highly susceptible to compaction from management activities which reduces infiltration and increases overland flow and erosion. Shallower soils have high erosion risks due to restricted infiltration and percolation rates. Overland flow is common on these soil types.

Soils derived from rhyolite are moderately deep to deep. Rhyolitic soils have a moderate to high risk of rill and gully erosion because of their loose coarse texture and the steep landforms on which they occur. The risk of compaction is low. The risk of mass movement (debris avalanche) is low, but it does occur on the steeper slopes. Rotational slumps do not occur on these soil/bedrock materials.

## **Hydrology**

### A. Climate

The watershed is located in the semiarid rain shadow region east of the Cascade Mountains. This area has both maritime and continental climate patterns, with most of the weather patterns moving inland on cyclonic low pressure fronts off the Pacific coast. Maritime air masses are blocked by the Cascade Mountain Range and the Warner Mountains. This results in the east side of the Warner Mountains receiving slightly less snow than the west side. The majority of precipitation falls as snow, with higher elevations receiving greater depths of snow.

Temperatures also vary widely, both seasonally and by elevation. Summer highs exceed 100°F in the lower elevations and winter lows well below 0°F at any elevation. Freezing temperatures can occur any time of the year, especially at high elevations. Higher elevation areas have a progressively shorter growing season, especially above 6,000 feet.

### B. Water Quantity

Rain on snow events periodically occur in December or January and result in the highest flow events. Normal spring runoff occurs from March through June with May usually producing the highest flows in Deep Creek. March produces the highest flows in Twentymile and Drake Creeks. The higher elevations are a significant source of flow for both base flow and spring runoff. The low elevation areas contribute more towards spring runoff with less influence on base flow.

Current peak flows with a return frequency of five to 50 years appear to be 10 to 30% higher than historic flows. The gauging records show less change in the 1.5 and 100 year return periods. Deep Creek experienced peak flows exceeding a 100 year event in 1964. Possible causes of increased peak flows are linked to the effects of high road densities and high levels of compacted soil from logging.

The understory forest canopy has generally increased and forested stands now have higher canopy than the mean of historic conditions. However, the forested canopy is within the natural range of variability for the watershed and closer to the mean than the outside range. Also clearcuts or burn areas are less than 12% of any subshed. Research shows that this level of impact has little effect on increased runoff.

Base flows are estimated to have decreased a small amount as compared to historic conditions. Encroachment of conifers/junipers in meadows and stringers, downcutting of streams, loss of beaver dams and interception by roads create conditions for less base flow.

Mean monthly flows have changed little since historic times, however duration of flows at bankfull have increased. This increase in high flows results in additional scour potential to the channel that can add to bank erosion.

## **Vegetation**

### A. Upland (Forest) Vegetation

The forested portion of the watershed lies on the east slopes of Crane Mountain and the upper slopes of the Camas Creek drainage in the Warner Range. The eastern slopes of Crane Mountain

are influenced by the rain shadow effects of the mountain's elevation; 8,456 feet at its highest point. The mountain is actually a series of north to south running ridges separating the Goose Lake Valley from the eastern Oregon high desert.

The upper eastern slope of Crane Mountain above 8,000 feet is generally above tree line. Slopes just below 8,000 feet are generally subalpine consisting of open meadows and white barked pine.

Camas Creek flows west to east through the northern part of the watershed along Oregon State Highway 140. The vegetation pattern of this area is more typical of west/east flowing drainages with the drier southern slopes containing more ponderosa pine. The slightly wetter northern slopes have a greater component of white fir with some stands of pure white fir at higher elevations.

Most of the timber stands on public land have been entered in the last fifty years to remove large valuable ponderosa pine. Many stands have been entered a second or third time to remove remaining large overstory pine and white fir, while culturing the second growth understory. Many of these stands had an understory of 60 to 80 year old white fir. Several were thinned to capture growing space and increase growth. Clearcutting of many stands occurred in the 1980s where the residual growing stock was badly damaged from previous entries, suppressed or undergoing mortality from insects and disease. Stand regeneration generally has been successful. Most clearcut sites have been restocked to ponderosa pine.

The Warner Range was not as heavily attacked by fir engraver bark beetles (*Scolytus ventralis*) as the rest of the Lakeview Ranger District during the drought of the 1980s and early 1990s. It has been attacked by epidemic outbreaks of the green phase of the spruce budworm (*Choristoneura occidentalis*), known as the Modoc budworm (*Choristoneura viridis*, Freeman). This budworm phase seems to be native to the Warner Mountain Range of southern Oregon and northern California. Attacks seem to occur on a 10 to 15 year cycle. The Modoc budworm population seems to ebb and flow with a naturally occurring virus that causes outbreaks to crash quickly. Defoliation of the new shoots and first year needles usually results in some top kill but rarely in tree mortality.

The watershed is not prone to large scale fire disturbances. Storm tracks which produce lightning usually skirt the Warners proceeding northeast across the open desert or flowing up over the western part of the forest.

## B. Rangeland

Vegetation off the Fremont National Forest is predominantly nonforested. There are about 84,000 acres of BLM-administered (67%) and privately (33%) owned lands. The dominant vegetation is low sagebrush-grass and mountain big sagebrush-grass with western juniper as an overstory. Low sagebrush-grass occupies about 53% of the total area (62% of BLM acres) and 25% of that is in the late seral stage with Idaho fescue being the most common understory grass. Mountain big sagebrush-grass occupies about 12% of both the BLM acreage and the total area. Western juniper-low sagebrush-grass comprises about 3% of the total area and 5% of BLM-administered lands. Many of the large old growth (125 years or older) junipers are found in this plant community. Western juniper-mountain big sagebrush-grass type comprises about 9% of BLM and total area. Only about 3% of the total area contains vegetation associated with riparian areas or wetlands.

Other shrub communities that occupy small percentages but may be very important include silver sagebrush, mountain mahogany, antelope bitterbrush and some small areas of mixed pine and fir trees. There are also inclusions of important plant populations such as snowberry and aspen.

Antelope bitterbrush or mountain mahogany is the dominant vegetation in only about 3% of the total acres in the BLM portion of the watershed. About 5% of these acres are in the climax seral stage and 42% in the late seral stage. These unique and relatively rare types are very important habitat for deer and other wildlife species.

The most common grasses found in the understory include Sandberg's bluegrass, bottlebrush squirreltail, Idaho fescue, bluebunch wheatgrass and Thurber's needlegrass. These grass species are often growing together, but one or two are usually the dominant species at a given site depending on soils, topography and previous disturbance. In low sagebrush, the dominant grasses are Sandberg's bluegrass (42%), bottlebrush squirreltail (29%) and Idaho fescue (23%). In mountain big sagebrush, the dominant grasses are bluebunch wheatgrass (27%), Idaho fescue (25%), bottlebrush squirreltail (23%) and Sandberg's bluegrass (12%). Within western juniper-low sagebrush-grass, the dominant grasses are Idaho fescue (63%) and bottlebrush squirreltail (34%). Within western juniper-mountain big sagebrush-grass, the dominant grasses are Thurber's needlegrass (56%), bottlebrush squirreltail (20%) and bluebunch wheatgrass (14%).

Plant communities without dominant shrubs or trees are grasslike sites and make up about 3% of the total area. Many of these communities are found in association with water and make up about 57% of the grasslike dominated sites. These are dominated by tufted hairgrass, Kentucky bluegrass, sedges and rushes. About 23% of the grasslike communities are dominated by crested wheatgrass and 17% by Nevada bluegrass.

Disturbances that have and are still influencing vegetation include livestock grazing, roads and suppression of wildfires. The biggest impact from livestock grazing was between about 1900 and 1935 before there was any control or management on the numbers or the season of use. There were areas of intense use from cattle and sheep during this period. The impact from wildfire suppression is also apparent as much of the present juniper is less than 100 years old and has been expanding in the absence of fire. Roads have contributed to the spread of noxious weeds and other undesirable plants.

#### C. Noxious Weeds

Noxious weeds such as Hoary cress (*Cardaria draba*), Canada thistle (*Cirsium arvense*), Bull thistle (*Cirsium vulgare*), Diffuse knapweed (*Centaurea diffusa*), Spotted knapweed (*Centaurea maculosa*), Field bindweed (*Convolvulus arvensis*), Klamath weed (*Hypericum perforatum*), Mediterranean sage (*Salvia aethiopsis*) and Yellow toadflax (*Linaria vulgaris*) have been identified in several areas.

#### D. Riparian Vegetation

Riparian vegetation buffers the fluvial system from potential impacts and disturbances caused by land management activities and natural events. A well vegetated zone of grasses, sedges, herbs, shrubs and trees characterize riparian areas. The above ground biomass provides coarseness to the surface and dissipates the energy of flowing water acting as a filter to catch and hold sediment before it reaches the stream. Below ground biomass (roots and woody structures) holds the soil mantle together and minimizes stream bank erosion into the channel.

Few examples of pristine riparian areas remain due mainly to past grazing practices. More than 75 years of intense grazing from domestic livestock have modified the riparian species composition. Cattle browse and trample shrubs and tree seedlings and reduce soil productivity through compaction and nutrient export. They can also contribute to bank sloughing and erosion. These

can lead to channel downcutting and lowering of the water table. Lower water tables in riparian zones have changed the vegetative character and impaired floodplain functions. Willows and cottonwood diminish as the water table lowers. Soil that is no longer held in place by the vegetative system is subject to rapid erosion. The eroded material quickly contributes to the sediment load in the stream.

The forested lower elevations along the eastern flank of Crane Mountain have "stringers" of conifers in draws and swales where soil has collected or on some northern aspects where moisture can be retained for a slightly longer period during the growing season. These stringers can be very productive as riparian zones but only marginally productive for growing conifers.

Fire suppression has affected the vegetative component of the riparian zones by allowing encroachment of shade tolerant conifers into aspen and cottonwood. This combined with livestock use has reduced the ability of these deciduous communities to compete for site resources and to regenerate in the low light conditions caused by conifer encroachment.

#### E. Sensitive Plants

Eight sensitive plant species are known to occur in the watershed. The Dismal Swamp area has been recommended for designation as a botanical special interest area.

### Stream Channel

#### A. Fluvial System

Streams in the watershed include perennial, intermittent and ephemeral channels. Major streams and tributaries are listed below.

Table 2. Major Streams/Tributaries by Subshed

<u>Subshed</u>	<u>Major Stream/ Tributary</u>	<u>Subshed</u>	<u>Major Stream/ Tributary</u>
Mud Creek (01)	Mud Creek Porcupine Creek	Willow Creek (08)	Willow Creek Polander Creek
Lower Camas Cr. (02)	Camas Creek Squaw Butte Creek Rosa Creek	Cressler Creek (09)	Cressler Creek
Horse Creek (03)	Horse Creek	Big Valley (10)	Deep Creek
Burnt Creek (04)	Burnt Creek	Lower Deep Cr. (11)	Deep Creek
Crane Lake (05)	No perennial stream	Blue Creek (12)	Camas Creek Blue Creek

<u>Subshed</u>	<u>Major Stream/ Tributary</u>	<u>Subshed</u>	<u>Major Stream/ Tributary</u>
Upper Deep Cr. (06)	Deep Creek North Fork Deep Cr . Middle Fork Deep Cr. South Fork Deep Cr . Mosquito Creek	Peddlers Creek (13)  Drake Creek (14)	Parsnip Creek  Drake Creek Roaring Spring Fork
Dismal Cr. (07)	Dismal Creek	Gibson Canyon (15)  Twentymile	Deep Creek  Barley Camp Twelvemile N.F. Twelvemile Fifteenmile

Risk ratings for each subshed were developed based on roads, canopy and channel conditions. The ratings range from low to high risk. High road densities and high stream temperatures are the primary reasons for high risk ratings. Canopy removal from timber harvest did not result in a high risk rating.

### **Water Quality**

The watershed provides water that supports many beneficial uses, including potable water for the Town of Lakeview, irrigation, livestock and wildlife watering, and road watering for dust abatement. Another beneficial use is fisheries habitat. The lower portions of the watershed are currently habitat for the threatened Warner sucker. The entire watershed provides habitat for redband trout (a Pacific Northwest Region sensitive species), brook trout and dace. Demand for these beneficial uses are expected to increase in the future. Private water rights exist within the watershed and specific information can be obtained from the Watermaster, District 12, Oregon Water Resources Department.

Stream temperature is the primary limiting factor that is out of compliance with State standards (17.8°C, 7-day average). Thirteen streams are on the EPA 303(d) list for not meeting temperature standards. Only Dismal, Rosa and Twelvemile Creeks meet standards. Increased width to depth ratios in stream channels and reduced shading from loss of riparian vegetation are the primary causes of elevated temperatures. It is not known if State stream temperature standards can be achieved even under natural or reference conditions. In addition to stream temperature, Burnt Creek has biological criteria (macroinvertebrates) identified as a listing criteria.

Sieve analysis shows that fine sediment in spawning substrate ranges from four to 40%. Levels above 25 to 30% are considered detrimental to fisheries. Most stream segments monitored fall into the acceptable range. Eroding stream banks and sediment from roads and timber harvest are the primary sources of detrimental fine sediment in the stream substrate.

Heavy livestock grazing near the turn of the century resulted in riparian and stream channel degradation. Current livestock numbers are much reduced from historic levels and most stream channels are steadily improving under present management. Most stream channels have not returned to pregrazing conditions.

## **Species and Habitats**

### A. Terrestrial

#### 1. Threatened, Endangered, and Sensitive Species

##### a) Northern Bald Eagle (Threatened)

Northern bald eagles occur in the winter, mainly in lower Deep Creek canyon near Adel. There is also significant use in Warner Valley along Crump Lake and private lands to the south. Eagles are also seen passing through the area between Goose Lake and Warner Basins. There are no known bald eagle nests or roost sites.

##### b) American Peregrine Falcon (Endangered)

Peregrine falcons have been observed within the watershed, probably from the hack/release site on Crump Lake to the northeast. Sightings have been recorded near Warner Canyon (1971), Walker Creek (1976), Peddlers Creek (1977) and Mud Creek (1978). There are no known active or historic nest sites. Potential habitat has been characterized at eight cliff sites.

Although the watershed contains potential habitat for peregrine falcons, a study conducted in 1982 by the Wilderness Research Institute (Boyce and White) concluded the habitat is marginal. The northern portion of Fish Creek Rim rated higher than the southern portion due to proximity to prey and nest aspect.

The study also concluded prey base for peregrines is inadequate above the rim (low numbers of small mammals and nongame birds). Therefore, they are completely dependent on sporadic migrations of neotropical birds, shorebirds and waterfowl found in the Warner Valley near the chain of lakes. It was concluded this would make it energetically too expensive to use the upper rim rock for a nest site. The lower rocks/cliffs on Fish Creek Rim would have the highest potential for occupancy.

##### c) Western Sage Grouse (BLM and FS Sensitive)

Western sage grouse occur year-round. Four strutting grounds have been located and six more have been observed within five miles. Sage grouse numbers appear to be stable or expanding slightly. There is no designated crucial sage grouse nesting or wintering habitat.

##### d) California Bighorn Sheep (BLM and FS Sensitive)

Forty to fifty California bighorn sheep occur along Fish Creek Rim. The Oregon Department of Fish and Wildlife (ODFW) has set a management goal of 100 bighorns. The bighorn sheep population is expanding and should approach ODFW's management goal sometime in the near future. There is no designated crucial California bighorn sheep habitat.

There are no other known threatened, endangered or sensitive terrestrial wildlife species that occur as residents or breeders.

## 2. Keystone Species

### a) Big Game

The watershed lies within the 600,000-acre Warner Management Unit and is managed for mule deer, Rocky Mountain elk and pronghorn antelope. The area also contains huntable populations of cougar and black bear. All are permit or quota system hunts with the exception of the general eastern Oregon black bear season and the first season Rocky Mountain elk general hunt.

There are 25,000 acres of BLM-administered crucial deer winter range. Forested hiding cover ranges from a low of 0% in Big Valley and Gibson Canyon subsheds (nonforest habitat types) to a high of 65% in the Willow Creek subshed, with an overall average of 26%. Road densities within subsheds vary from a low of 0.4 mi/mi<sup>2</sup> in Upper Twelvemile to a high of 5.1 mi/mi<sup>2</sup> in Mud Creek. Average road density for the watershed is 2.4 mi/mi<sup>2</sup>.

The current mule deer population is estimated at 2,475 animals which is 45% of the management objective of 5,500 animals. The population is managed for 15 bucks/100 does and 35 fawns/100 does. Mule deer numbers are expanding slightly and could reach the management objective in the future. Mule deer are present year-round, but no crucial fawning areas have been identified.

The expanding Warner Rocky Mountain elk herd is currently at 150 animals which is 30% of the management objective of 500 animals. The herd is managed for 20 bulls/100 cows and 40-50 calves/100 cows. There is no designated crucial calving or wintering habitat, however, elk are known to winter in the Sagehen Butte and Peddlers Creek areas extending south into California.

The pronghorn population is currently at 2,300 animals and provides hunting opportunities. Pronghorn numbers are static or decreasing slightly within the management unit due to weather and predation. Pronghorn can be seen year-round, but tend to migrate from the area during severe winters. There is no designated crucial pronghorn wintering or kidding areas.

Cougar numbers appear to be on the increase while black bear numbers are fairly stable.

### b) Beaver

Beaver are present and expanding in numbers in all perennial drainages during good water years and attempt to colonize the lower reaches of intermittent drainages during high flow years. Beavers consistently colonize sections of Parsnip and Camas Creeks where habitat is sufficient to support them. The extent and actual locations of beaver occupation in the forested portion of the watershed is unknown. Historic records (1930s and 1940s) show native beaver populations along Camas, Deep and Dismal Creeks. Beavers were transplanted into eight different sites between 1937 and 1940.

### c) Nongame Species

Other terrestrial animals common to the high desert are found in the area. Bobcats, coyotes, rabbits, porcupines, red-tailed hawks, golden eagles, prairie falcons, ravens, American kestrels, great-horned owls, amphibians, reptiles and other birds and small mammals are common. A large variety of nongame, neotropical birds and some cavity nesters are also found within the watershed.

### 3. Management Indicator Species Associated with Late and Old (LOS) Forest Cover

#### a) General

Old-growth forest stands (Management Areas 14 and "Other" late/old forest cover) occur on 3,211 acres (5% of Forest Service acres). Old-growth forest cover has declined since the turn of the century, and species composition in pure ponderosa pine stands has changed to a mixed conifer dominated forest in some lower elevation areas. Late and old structure stands (LOS) occur on 30,084 acres, or 39% of the forested portion of the watershed. Interior habitat (areas buffered in 300 feet from a unit edge or a maintained road) occurs on 8,637 acres. Interior LOS patch size averages 22.5 acres.

There is no designated LOS forest cover on BLM-administered lands.

#### b) Goshawk

There is one known active goshawk nest site. Three historic nest sites have been recorded in the Cressler Creek subshed (1987). The extent or number of goshawk sightings is unknown. Suitable goshawk habitat exists in 11 of the 18 subsheds.

#### c) Pileated Woodpecker

There are no known active pileated woodpecker nests, however, a few pileated sightings have occurred throughout the area in the early 1980s. Suitable habitat exists in the mixed conifer LOS stands.

#### d) American Marten

There have been no marten sightings recorded or surveys conducted. Suitable habitat exists in some upper elevation mixed conifer and lodgepole pine LOS stands.

#### e) Black-backed/Three-toed Woodpecker

There have been no woodpecker sightings reported or surveys conducted. Suitable habitat exists in the mixed conifer and lodgepole LOS stands with adequate snag densities. Some potential habitat may exist on the forest fringe.

### 4. Dead Wood Habitat Management Indicator Species (MIS)

#### a) Primary Excavators

Snag and down log habitat is variable with some areas exceeding wildlife habitat needs and other areas devoid of dead wood. Actual numbers or densities for snags and down logs by subshed are not known. Similar potential habitat is located on the forest fringe.

### 5. Aspen/Deciduous Riparian Habitat MIS

#### a) Red-naped Sapsucker

There have been no sapsucker or neotropical bird surveys. Preferred habitat for this species (LOS aspen stands) has a limited distribution and encompasses about 4,000 acres within the

watershed. Overall condition of aspen stands is unknown. Some potential sapsucker habitat may exist on the forest fringe and neotropical bird habitat in riparian areas and aspen stands.

## B. Aquatic Habitat

Native redband trout and dace are found throughout the watershed. Nonnative brook trout are found in the upper reaches of some streams. The earliest records of brook trout stocking are from 1932. ODFW files indicate stocking of this species in Camas, Drake, Deep and Mud Creeks. Other nonnative fish include hatchery raised rainbow trout that had been stocked in the watershed. This activity last occurred in 1990 in Deep and Camas Creeks. Recent stocking occurred at 4 locations on Dismal Creek, 8 locations on Deep Creek and 4 locations on Willow Creek. Rainbow trout were stocked as early as 1925 in Camas Creek, and early stocking was done in all the major streams. It is not known if or how extensively planted stock have interbred with the native redband.

Brook trout were also observed in Willow Creek above 7,100 feet elevation by Fremont Forest biologists.

Redband trout up to 12 inches in length require access to spawning gravels of up to 2.5 cm in diameter with less than 25 to 30% fine sediment. Throughout the watershed, sediments are found that exceed the recommended threshold of 25 to 30% fines in spawning substrates.

Generally, water temperatures in excess of 21°C (70°F) are unfavorable and may cause stress to all age classes (Sigler and Sigler 1987). Temperatures in excess of 25°C and 29.4°C have been shown to be lethal (Bjornn and Reiser 1991). Temperatures of about 15°C, or 58-60°F, are ideal for optimal growth of rainbow trout (Leitritz and Lewis 1980). In many cases, stream temperatures exceed the recommended biological thresholds that are shown above.

Spring spawning trout will use intermittent streams for reproduction. Road culverts in intermittent streams are barriers to migration and a limiting factor for spawning on many intermittent streams.

Many streams have lost pool habitat through loss of large woody material and pools filling with sediment.

Downcutting of stream channels has occurred in some areas. Excessive herbivory by livestock and other ungulates in the late 1800s and early 1900s resulted in conditions that allowed downcutting of stream channels. Other factors leading to downcutting include road and ditch construction. Downcutting has contributed to lower water tables and decreased base flows. This is most evident in Camas Creek along Oregon State Highway 140 and in Deep Creek around Sagehen Butte. Downcutting has resulted in altered streamside riparian vegetation which provides less shade.

Overall, temperature, low flows and sediment appear to be the dominant limiting factors for fisheries.

## **Human Uses**

Deep Creek and other subsheds have provided a multifaceted natural environment that is attractive to and utilized by human beings for all manner of activities. These activities range from utilitarian functions to spiritual pursuits and mental renewal. All the natural features that support a full array of human needs are contained within the watershed.

Occupation first occurred in the open areas contiguous and away from the dense forests. American Indian people took advantage of the dominant natural features, i.e. rock outcrops, wet and dry meadows, pooled and running water, for their resource needs and religious practices.

Occupation of the region is known to span a time period covering the last 10,000 years.

Historically, the area was utilized and occupied by members of the Fort Bidwell Band of the Northern Paiute Indians. Oral history of the Northern Paiute indicates that they drove the Klamath Indians out of the area. Given this, there is some possibility that formerly, the area was within the range of the Klamath.

Early settlers and explorers focused their activities and settlement in the open areas near the many springs, streams and other water sources. The trappers and mountain men moved through the Deep Creek watershed taking furbearing animals. The abundant water and grasses were very attractive to early pioneers and they brought livestock to these rich resource areas. Permanent Euroamerican settlement was located downstream away from the forest areas in the large open meadow/valley features (Big Valley) and further downstream in the nonforested grasslands.

A military post, Camp Warner, was established to protect settlers who began to occupy what had formerly been lands open to the American Indian people. There are actually two Camp Warner locations. The first camp was located on Hart Mountain to the east of the watershed. After one year, it was moved to a location west of Warner Valley. This new location is located on private property.

One historic road, the Oregon Central Military Road, crosses the area. This road was used sporadically for the movement of supplies for the army.

Historically, the area was used for ranching and livestock grazing. Numerous small water developments or range improvements dot the landscape. Reservoirs and spring developments provide livestock water.

There are 20 grazing allotments within the watershed: Blue Creek, Vinyard Individual, Hickey Individual, Lane Plan II and Sagehen on BLM-administered public land and Barley Camp, Crane/Kelly, Crane Mountain, Horse Prairie, Little Cove, McDowell, Porcupine, Rogger Peak and Squaw Butte on National Forest System lands. Portions of six other BLM grazing allotments are in the watershed: Flynn, Fitzgerald, Lynch-Flynn, Crump Individual, Lane Plan I and Schadler. All the allotments encompass both private and public land.

All 11 BLM allotments had biological assessments completed in 1994 to determine the effect of livestock grazing management on the threatened Warner sucker. Livestock grazing management in most of the allotments has been determined to have "No Effect" on the sucker. Other allotments have had management adjusted so the determination is "May affect, not likely to adversely affect".

Timber harvesting and supportive infrastructure (i.e. roads) construction began slowly, then accelerated rapidly after 1945.

Adjacent to the watershed boundary, the Crane Mountain roadless area provides a unique recreation experience for the forest user.