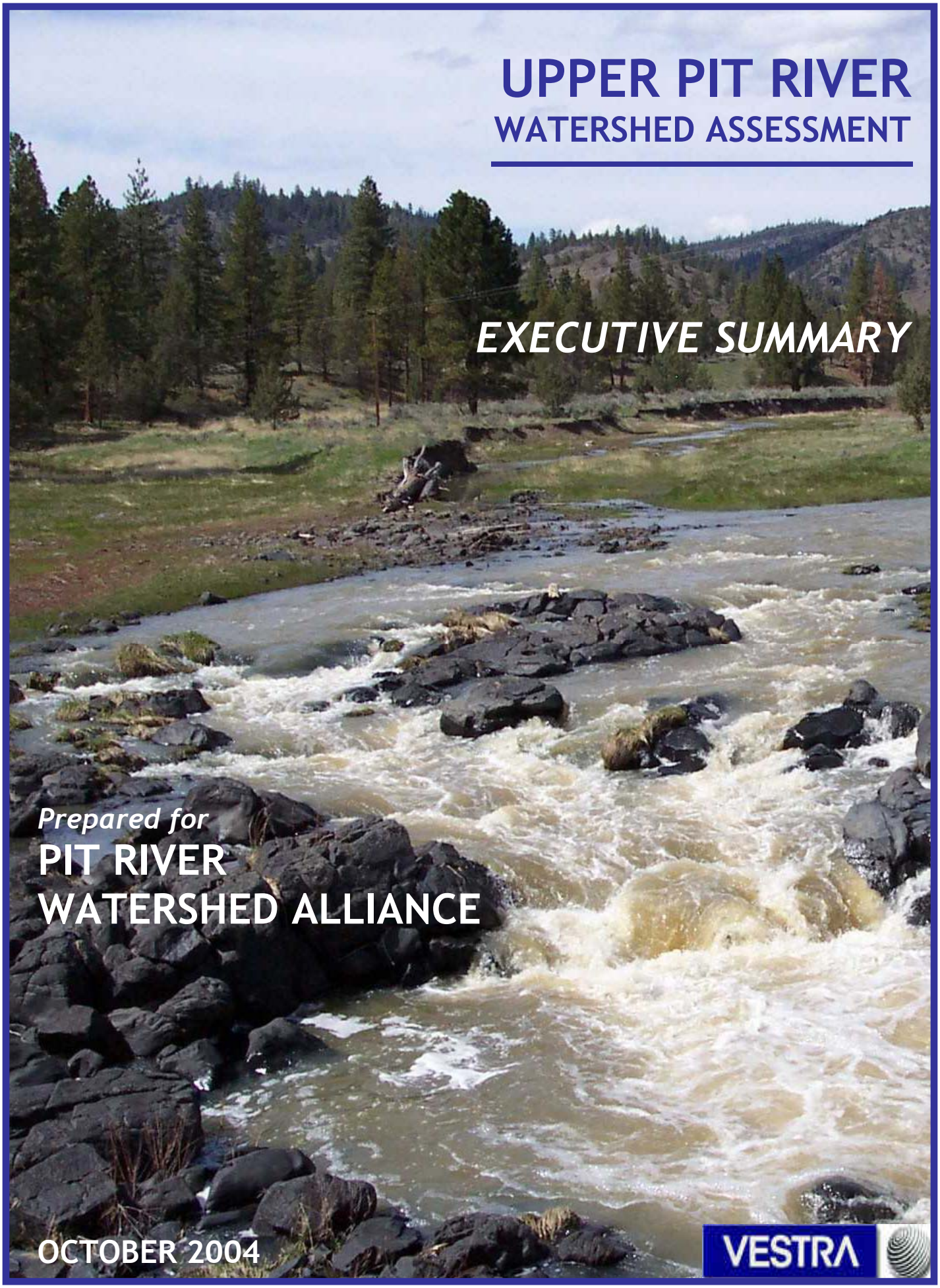

UPPER PIT RIVER
WATERSHED ASSESSMENT

EXECUTIVE SUMMARY

Prepared for
PIT RIVER WATERSHED ALLIANCE

OCTOBER 2004

VESTRA

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With major funding from the

CALFED Bay-Delta Program
Contract 4600001693

OCTOBER 2004

VESTRA

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EXECUTIVE SUMMARY OF THE UPPER PIT RIVER WATERSHED ASSESSMENT

LOCATION

The Upper Pit River Watershed is located in northeastern California at the eastern edge of the Great Basin Province. The north and south forks of the Pit River drain into the northern portion of the watershed. The North Fork of the Pit River originates at Goose Lake, an enclosed basin except during rare events when it spills over into the Pit River. The north fork headwaters include a number of tributaries in the Warner Mountains. The South Fork of the Pit River originates in the south Warner Mountains at Moon Lake in Lassen County. The north and south forks of the Pit River converge in the town of Alturas and flow in a southwesterly direction into Shasta Lake in Shasta County and eventually into the Sacramento River. The southern limit of the Upper Pit River Watershed is marked by the confluence of the Pit River and Fall River in eastern Shasta County. The Upper Pit River Watershed includes approximately 3,415 square miles, or 2,767,000 acres, 21 named tributaries totaling about 1,050 miles of perennial stream, and 4,054 river miles.

TOPOGRAPHY

Elevation within the watershed varies from 9,833 feet above mean sea level at the Eagle Peak summit, located in the southeast portion of the Warner Mountains, to the Fall River Valley floor, elevation 3,200 feet above mean sea level. The largely volcanic history of the region has done much to shape the topography and landforms present today. The low gradient of valley floors throughout the watershed is attributed to the deposition of large amounts of volcanics. Abundant volcanic flows were often channeled into the relatively narrow valleys, which confined the flows. This confinement, along with the inherent viscosity of the magma, combined to form nearly flat valley floors throughout the watershed. The overall flat topography of the Upper Pit River Valley plays a significant role in the ecological and physical characteristics of the river. Many of the numerous flat or gently sloping plateaus throughout the watershed were formed by more recent lava flows. Faulting subsequently broke up the plateaus, creating many uplifted sections that form the dominant ridges of the watershed. The uplifted sections are seen as mountain blocks, typically steep on one side and gently to steeply sloping on the other.

CLIMATE

The climate within the Upper Pit River Watershed is generally characterized by hot, dry summers and cold winters. Temperature ranges differ from the lower elevations to the high elevations in the mountains. Precipitation averages around 13 to 16 inches per year, with 35 percent of the annual total falls between the months of December and February. Snowfall occurs mainly in the mountains with an average of 72.75 inches. In the lower elevations, snowfall does occur but is unlikely to accumulate and stay throughout the winter.

Precipitation patterns are characterized by wide variability from year to year.

12.56	Average rainfall (inches)
47.05	Maximum rainfall (1952)
6.89	Minimum rainfall (2001)
2	Years 20 inches or more
17	Years 15 inches or more
21	Years 10 inches or less
5	Years 8 inches or less

Flood events as measured at Pit River near Canby:

Mar 1904	Dec 1934
Feb 1940	Jan 1942
Jan 1943	Apr 1952
Dec 1955	Oct 1962
Dec 1964	Jan 1967
Jan 1969	Jan 1970
Mar 1971	Feb 1972
Apr 1980	Feb 1982
Dec 1983	Feb 1986
Feb 1989	Mar 1993
May 1995	Feb 1996
Jan 1997	May 1998
Mar 1999	

Historic drought periods:

1912 – 1913	1918 – 1920
1929 – 1934	1947 – 1950
1959 – 1961	1976 – 1977
1987 – 1992	

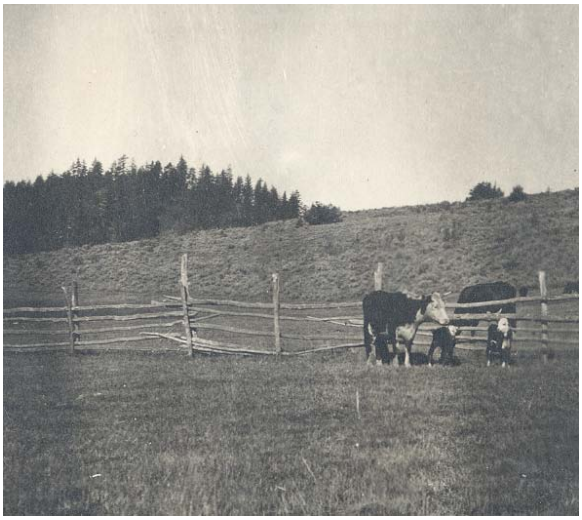
GENERAL HISTORY

The land within the watershed boundary has been home to humans for thousands of years. During the 1820s when the first Europeans were traveling through the valley, the primary inhabitants were the Ajumawi and Atsugewi peoples. These groups led a nomadic lifestyle during the summer months and inhabited permanent villages during the winter. In general, both groups were river or stream dependent cultures. As more Europeans moved through the area, disease and displacement resulted in the decline of native populations. By 1864 the first permanent white settlement was established in the Surprise Valley. In the years that followed, other towns sprang up and most of the watershed area was settled. Until the 1930s and 1940s, cattle ranching, sheepherding, and timber were the three largest uses of land followed by dry land farming in the form of grains and hay. As the federal government began regulating grazing access on public lands and economic demand shifted, cattle allotments began replacing sheep allotments. There were also improvements made in irrigation techniques and equipment that made the farming of water dependent crops possible within the watershed boundaries. Alfalfa has become the largest grossing crop in the area.

1820s
First contact between Native Americans and Europeans as Hudson Bay Company trappers traveled down the Pit River. In 1826 Peter Skend Ogden is the first European to enter the area. He is responsible for naming the Pit River after local Native American custom of constructing dead fall trap pits to hunt game.

1830s
Malaria outbreaks, brought on by contact with white trappers, rapidly reduce the native population by estimates upwards of 75 percent.

1840s
The 1840s saw a marked increase in traffic of settlers through the area. In 1843 Joseph Chiles led a party through, followed in 1846 by the Scott-Applegate party and 1848 by Peter Lassen and his group.



1850s
With the increased traffic through the area and the push to expand to new territories, Pacific Railroad conducts explorations of the area in 1854. By 1857, several wagon trails are established in East-West and North-South routes.

1860s
In 1864 the first permanent white settlement is started by James Townsend in Surprise Valley. By 1867, the town of Surprise Valley, later named Cedarville, is established.

1870s
Modoc County is officially named. In 1870, Dorris Bridge is founded by the Dorris family. It is later named Alturas. In 1871 Fall City is established and during the next decade grows to be the economic center of eastern Shasta County. Around 1888/89 the name is changed to Fall River Mills.

1880s and 1890s
Population of Modoc County reaches 4,000. The first in a series of small reservoirs is built by settlers in the watershed area, with the oldest recorded being a dam/reservoir constructed on the current Hagge Ranch in 1880.

1900s
The first bank, school, and library are built in the town of Alturas. In 1904 electricity arrives in the area and in 1908 the first railroad is established. During that same year Tule Lake reservoir is built. A year later Roberts Reservoir is constructed.

1910s
Population of Modoc County reaches 6,200.

1920s
Big Sage Reservoir is built in 1921. In 1929 the Pickering Lumber Company mill is built in western Alturas.

1930s
The 1930s saw quite a few water projects due to the Central Valley Project. In 1930 the Dorris Reservoir was built, followed by the West Valley Reservoir in 1936. Two major diversions were the 1934 diversion near Big Sage on Rattlesnake Creek and on the North Fork of the Pit River near Dorris in 1939.

1940s
The lumber industry reaches its peak. A diversion dam built along Ash Creek in 1947. Modoc County experiences growth due to homesteading of World War II veterans. This continues through the 1950s.

1950s-present
In 1954 the diversion dam near West Valley is constructed on the South Fork of the Pit River and in 1959 another diversion dam on the Pit River was completed near Roberts. In 1999 the Pit River Watershed Alliance was formed as a collaborative, non-regulatory group.

CURRENT LAND OWNERSHIP AND USES

Land use in the Upper Pit River Watershed is heavily influenced by ownership. While most of the low- and mid-elevation lands are held by private individuals who use these areas primarily for agriculture (ranching and farming) and residential uses, the upper elevations are held by commercial timber companies and the U.S. Forest Service (USFS) or the Bureau of Land Management (BLM).

NATURAL RESOURCES

Timber, farmland, and water have become the most valuable natural resources within the watershed. With the USFS as the largest land owner and private timber companies the third, timber was a resource that many within the watershed were historically dependent upon. Lack of harvests has resulted in numerous mill closures and a decline of timber dependent economies. While the population density remains well below the state average, the last two decades have seen growth and expansion in the urban areas. Traditionally urban expansion has the greatest impact on farmland, creating competition between developers and farmers. An increase in urban water demands, combined with a growing dependence on water for irrigation, as well as a call for an increase in river levels to maintain healthy fish populations, have caused available water resources to take on a new importance in the last few decades.

Land Ownership Acreage by Land Area in the Upper Pit River Watershed Study Area

Owner	Total Acres	Percent
Bureau of Land Management	338,819	16
U.S. Fish and Wildlife Service	7,582	0
U.S. Forest Service	983,983	45
Subtotal Federal Acres	*1,330,384*	*61*
Department of Fish and Game	17,111	1
Department of Parks and Recreation	4,309	0
State Lands Commission	6,020	0
Subtotal State Acres	*27,440*	*1*
Tribal Ownership	10,493	0
Subtotal Tribal Acres	*10,493*	*0*
Unclassified Private Ownership	580,269	27
Industrial Timber Companies	236.917	11
Subtotal Other Acres	*817,186*	*38*
Total	***2,185,503***	***100***

SOCIO-ECONOMIC PROFILE

Rural lifestyles and a population density of less than 10 persons per square mile generally characterize the Upper Pit River Watershed. The largest city in the watershed is Alturas with a current population of 2,840. Ranching, farming, and timber are the primary resource activities throughout the watershed area.

HYDROLOGY

The quantity, quality, and availability of water resources are vital to the natural and human activities within the watershed. Within the Upper Pit River Watershed, irrigation needs place high demands on water supplies. Historically, flows in the Upper Pit River decrease significantly during the summer season, when water needed for irrigation is at its highest point. There are 63 jurisdictional directional dams located within the watershed. These dams helped divert an estimated 230,000 acre-feet of surface water in the decade between 1985 and 1995. It is estimated that of this volume, approximately 170,000 acre-feet were lost to evapotranspiration. This loss, combined with drought conditions and an increased competition for surface water, has led to significant groundwater development to supplement irrigation needs. When early hydrographs of pre-irrigation monthly flows were compared to monthly post-irrigation flows, no significant differences were detected. In both cases, summer flows consistently fell to less that 10 cfs. Groundwater supplies are generally quite reliable in areas that have sufficient aquifer storage or where surface water replenishes supply throughout the year. In areas that depend on sustained runoff, water levels can be significantly depleted in drought years.

Several multi-year droughts have been recorded in the watershed, with the most severe occurring between 1929 and 1934.

Historical tree ring data from A.D. 869 to 1977 has also been analyzed in a study funded by the California Department of Water Resources. The results show that these more recent droughts are much less severe than historical droughts experienced around 1150 and 1350 that lasted more than 100 years.

Water rights in the watershed are either appropriated or riparian. Appropriated water rights include the intent to use the water, the diversion or control of the water, reasonable and beneficial use of the water, and priority of appropriation. Riparian rights include the right to use water based on the ownership of property that abuts a natural watercourse. Groups with water rights in the watershed include the South Fork Irrigation District, the State of California, Pacific Gas and Electric, and the Big Valley Irrigation District.

FIRE AND FUELS

Fire has long played an important role in watershed. There is evidence of native populations using fire as a tool to shape their surroundings to their needs. Fires set in the spring by natives reduced understory vegetation allowing for easier hunting and encouraged the growth of edible shoots and basket making materials. Some species of native trees, shrubs, and grasses depend upon fire for re-seeding purposes. With the influx of European settlers during the mid to late nineteenth century, wildfires were no longer viewed as a natural and needed part of the ecosystem, but as a dangerous and destructive force. With the implementation of the USFS policy of fire exclusion, there has been an accumulation of fuels for nearly 100 years.

Historically, decomposition rates are low in the Mediterranean climate of California. This is due to low temperatures in the winter and little to no moisture during the summer months. During the last century, however, the climate in California is slowly getting wetter. This, coupled with denser forest stands producing more biomass on the forest floor due to suppression of wildfires, is creating an environment that is favorable to decomposition. However, the possible increase in decomposition rates cannot handle the amount of material that has accumulated. Combine this fuel load with dry summer months, increased urbanization of wooded areas, and summer thunderstorms and the conditions lend themselves to increased fire risk.

WILDLIFE

The Upper Pit River Watershed is home to a diverse range of wildlife species. As human impact within the watershed, i.e. agriculture, logging, urban development, and fire suppression, have had negative impacts, there are five state and federally run refuges within the boundary. These areas primarily provide and protect habitat for various wildlife species. Wildlife within the watershed can be divided into three categories: native, exotic, and threatened and endangered.

Wildlife Populations (Native)

- Rocky Mountain mule deer
- Antelope
- Tule elk
- Bighorn sheep
- Mountain lion
- Tundra swan
- Green-winged teal
- Bufflehead
- Gadwall
- Columbian black-tailed deer
- Roosevelt elk
- Rocky Mountain elk
- Black bear
- Beaver
- Northern pintail
- Ross geese
- Mallard
- Mourning dove

Wildlife Populations (Exotic)

- Wild horses
- European Starling
- Feral cat
- Wild turkeys
- Rock dove (pigeon)
- Muskrat
- Ring-necked pheasant

Threatened and Endangered

- Greater sandhill crane
- Swainson's hawk
- Great grey owl
- Bank swallow
- California wolverine
- Bald eagle
- American peregrine falcon
- Northern spotted owl
- Willow flycatcher
- Sierra Nevada red fox

FISHERIES AND AQUATIC RESOURCES

Aquatic biology plays a major role in the biodiversity and health of a watershed. Periodically the California Department of Fish and Game and the United States Fish and Wildlife Service conduct fish surveys in the Pit River. The most recent of these surveys was conducted in 2002. During this survey, it was found that the fish composition in the Pit River is largely similar to historic surveys. To augment natural fish populations for sport fishing, agencies use fingerlings raised in hatcheries. Over the years various species of trout have been the most popular planting.

Records show that hatchery fish planting within the Upper Pit River Watershed appears to have started along the South Fork of the Pit River in 1908. In 1910 the North Fork received hatchery fish and in 1951 the mainstream of the Pit River was planted with catfish near Bieber. The three major hatcheries that supply fish for planting in the watershed were Burney Creek Hatchery (1927–1949), Crystal Lake Hatchery (1947–present), and Mount Shasta Hatchery (1888–present). These, along with many minor hatcheries, have provided millions of fingerlings in the Upper Pit River Watershed.

Four distinct fish assemblages appear in the Upper Pit River Watershed including the rainbow trout assemblage, the Pit scuplin-dace-sucker assemblage, the pikeminoow-hardhead-sucker assemblage, and the introduced warm water fish assemblage. The fishes in each assemblage are specifically adapted for definable sets of environmental conditions; however, the boundaries between these assemblages are not sharply defined and other fishes can dominate small stream sections. The warm water assemblages dominate the mainstem of the Pit River.

The health and vigor of fisheries and other aquatic resources is impacted by water quality parameters including temperature, dissolved oxygen, pH, turbidity and total solids, and nutrients. Other potential impacts on fish include altered temperature reigme,s low water levels, entrapment, physical barriers, channelization, loss of riparian zones, degradation of spawning habitat, fish eradication practices, and hatchery planting practices.

Native Fishes

- Pit Klamath brook lamprey
- Sacramento pikeminnow
- Sacramento sucker
- Chinook salmon
- Tule Perch
- Pit River tui chub
- Speckled dace
- Rainbow trout
- Pit sculpin

Threatened and Endangered

- Modoc sucker
- Bull trout
- Shasta crayfish
- Pit (=California) roach minnow
- Bigeye mashed sculpin
- Spotted frog
- Lahontan cutthroat trout
- Rough sculpin
- Redband trout
- Hardhead minnow
- Northwestern pond turtle
- Cascade frog

Non-Native Fish

- Golden shiner
- Black bullhead catfish
- Channel catfish
- Brook trout
- Western mosquitofish
- Sacramento perch
- Redear sunfish
- Largemouth bass
- Spotted bass
- Signal crayfish
- Carp
- Brown bullhead catfish
- Brown trout
- Arctic grayling
- Striped bass
- Bluegill
- Green sunfish
- Smallmouth bass
- Bullfrog
- Fantail (=virile) crayfish

BOTANICAL RESOURCES

The 2.2 million acres of the Upper Pit River Watershed lie on the Modoc Plateau of northeastern California. The vegetation that characterizes the watershed is highly varied, ranging from conifer forests, sagebrush and juniper, chaparral, agricultural and grass-covered areas, wet meadows, strips of riparian vegetation, and aspen stands.

At large scales, vegetation patterns are shaped by the ecological forces at work in a region. Climate, topography, soil, the frequency of natural disturbance such as fire, and human management are all driving factors that affect how vegetation is distributed on the landscape at a given point in time. Over the last 150 years the activities of settlers have significantly altered ecological conditions on the Modoc Plateau and Upper Pit River Watershed. The introductions of grazing and non-native cereal grains have had strong impacts on native grass lands. During the early part of the twentieth century, railroads gave timber companies easier access to forested lands, spurring a jump in logging that slow-growing large pine trees could not sustain. Another major impact to the watershed's ecosystem has been the suppression of wildfires. The lack of frequent, low-intensity fires has allowed the stocking of shade tolerant and fire intolerant species to increase. These conditions make it harder for pine regeneration to occur naturally.

Native Species

- Washoe pine
- Jeffery pine
- Big sagebrush
- Western juniper
- Black oak
- Cottonwood
- Idaho fescue
- Bluebunch wheatgrass
- Mountain mahogany
- Ponderosa pine
- Greanleaf manzanita
- Antelope bitterbrush
- Deerbrush
- Blue oak
- Mountain whitethorn
- Basin wildrye
- Snowbrush
- White fir

Toxic and Noxious Weeds

- Yellowspine thistle
- Spotted knapweed
- Halogeton
- Quackgrass
- Heart-podded hoarycress
- Bearded creeper
- Medusa head

Special Status

- Shore sedge
- Sagebrush bluebells
- Bearded lupine
- Nuttall's pondweed
- Western black currant
- Modoc bedstraw
- Great Basin nemophila
- Falcate saltbrush
- Marsh skullcap
- Northern daisy

WATER QUALITY

The main stem Pit River has been identified as an "impaired water body" under the Section 303(d) of the Federal Clean Water Act (CWA). The 303(d) listing means that the Regional Water Quality Control Board (RWQCB) has determined on a preliminary basis that the concentration or level of the listed parameters exceed the numeric or narrative standards that apply to existing or potential beneficial uses assigned to the Pit River. As a result of the 303(d) listing, the RWQCB is required to develop Total Maximum Daily Loading (TMDL) criteria and an implementation plan to attain the water quality objectives for the Pit River by 2011.

The RWQCB has designated beneficial uses for the Pit River and tributaries. These uses include Cold Freshwater Habitat (COLD) as an existing beneficial use on the North and South Forks of the Pit River and along the main stem between Alturas and Hat Creek. Optimum water temperatures for cold-water species, such as juvenile and adult trout, are less than 65ºF. The minimum dissolved oxygen standard identified to protect cold-water species is 7 mg/l.

Water quality parameters named in the 303(d) listing include temperature, dissolved oxygen, and nutrient loading. Although not listed, sediment and turbidity are also suspected of being at levels, which adversely impact aquatic life and recreational uses. The original listing was made based primarily on professional judgment, although observations of high temperature and low dissolved oxygen have been recorded from past studies. Causes of these conditions have not been conclusively demonstrated, although various natural and management related phenomena are suspected.

Temperature

Water temperature is a key parameter of water quality and an integral component of aquatic habitat. Geography, climate, stream channel characteristics, riparian vegetation, and water source are all major factors in water temperature. Elevated temperatures above natural variability are likely to impact aquatic biota, and influence other water quality parameters such as dissolved oxygen.

Physical conditions along the main stem Upper Pit River impacting water temperature include low flows, shallow slow moving water, and largely unvegetated stream banks. With an elevation drop of less than 10 feet per mile between Alturas and Canby, there is insufficient slope to keep the main stem flowing rapidly. As a result, the Upper Pit River meanders through several open valleys, often in shallow braided stream segments, and is subject to warming by high summer temperatures. Seasonal discharge from storage reservoirs, discharge from numerous hot springs located between Alturas and Canby, and discharge from irrigation activity may contribute to elevated temperatures along the main stem. Past water quality monitoring has found the following:

- Water temperatures in the Upper Pit River do not change significantly between Alturas and Pittville (i.e., on any give day, the water temperature in the Pit River at Alturas is similar to the water temperature in the Pit River at Canby and Pittville).

- Thirty percent of the water temperature readings collected between June and September exceeded 70ºF.

Dissolved Oxygen

Dissolved oxygen is gaseous oxygen dissolved in water. It is generated by diffusion from the surrounding air, as a byproduct of photosynthesis and from turbulence.

In general, green plants and certain microorganisms produce oxygen by photosynthesis. Animals and other microorganisms consume oxygen and produce carbon dioxide. Dissolved oxygen levels are usually reported in milligrams of oxygen per liter of water (mg/l). The unit mg/l is roughly equivalent to parts per million (ppm). Dissolved oxygen can also be expressed as percent saturation, or the actual mass of oxygen dissolved in water relative to the total amount possible based on temperature, pressure and salinity.

Photosynthesis, because it requires light, occurs during daylight hours. Respiration and decomposition, on the other hand, occur 24 hours per day. This difference alone can account for the large daily variations in dissolved oxygen concentrations. For example, during the night when the production of oxygen by photosynthesis does not counterbalance the loss of oxygen through respiration and decomposition, dissolved oxygen concentrations decline steadily. Dissolved oxygen concentrations are usually at their lowest point just before dawn, when photosynthesis resumes.

- Overall, average dissolved oxygen concentrations at key sampling stations along the Upper Pit River have not changed significantly, during the recent period of record. There is a common occurrence of readings that are less than 5 mg/l. Prior to 1983, 0.5 percent of the dissolved oxygen readings were less than 5 mg/l. Between 2001 and 2002, 5.9 percent of the readings were less than 5 mg/l.

- Historically, 10 percent of the dissolved oxygen readings at the Canby station were less than 7 mg/l.

Nutrients

The occurrence of algae blooms has been identified as a potential problem along the main stem Pit River. Nutrients are listed as impairment to the Upper Pit River because of eutrophication.

- Prior to 1983, the average dissolved orthophosphate concentration was 0.10 mg/l between Alturas and Bieber. Between 2001 and 2002, the average dissolved orthophosphate concentration was estimated to be 0.20 mg/l. In general, to prevent eutrophication in phosphorus-limited systems, the average annual total phosphate concentration should not exceed 0.10 mg/l in streams.

- Overall, the nitrate levels recoded between 2001 and 2002 are similar to the levels recorded prior to 1983. Nitrate was not detected (<0.02 mg/l) in 58 percent of the samples collected in conjunction with the 2003 RWQCB study.

Turbidity

Turbidity is a measure of the degree suspended particles, including organic matter such as algae and inorganic particles, such as silt and clay, scatter light passing through a water column. Light scattering increases with increasing sediment load. Turbidity is commonly measured in Nephelometic Turbidity Units (NTU). Simply stated, turbidity is the measure of relative clarity of a liquid. The drinking water standard is 0.5 NTU. The most frequent causes of turbidity in lakes and rivers are plankton and soil erosion.

Turbidity levels in the Pit River are high relative to most other north state rivers and streams. The predominant contributing factor to seasonal turbidity in the Upper Pit River appears to be the erosion of volcanic soils that are carried downstream as suspended load or total suspended solids (TSS). Elevated temperatures and high nutrient content also contribute to algae growth which impacts turbidity.

According to 2003 RWQCB study, there was no upstream or downstream trend in turbidity or sediment. Elevated turbidity in the South Fork of the Pit River near Likely was attributed to releases from West Valley Reservoir.

CULTURAL RESOURCES

This section focuses on current cultural issues and relationships between Native American tribal interests and modern resources use decisions. Federal law mandates the active participation of tribal governments in resource and land use planning. There are eleven recognized bands of the Pit River Tribe. Eight of these tribes, the Atsugewi, Aporige, Ajumawi, Atwamsini, Astarawi, Hewise, Kosealekte, and Hammawi, have aboriginal territories located within the Upper Pit River Watershed. Today, there are about 1,500 Ajumawi living within the watershed on tribal lands. Traditionally, the Ajumawi occupied the Pit River drainage. The far northeastern corner of the watershed lies in traditional Modoc territory.

Federal agencies are required to establish a government-to-government relationship with federally recognized tribes. Over the years many laws and regulations governing the manner in which historical, archaeological, and sites of cultural significance on both public and private lands have been developed. These laws and regulations are administered at the county, state, and federal levels.

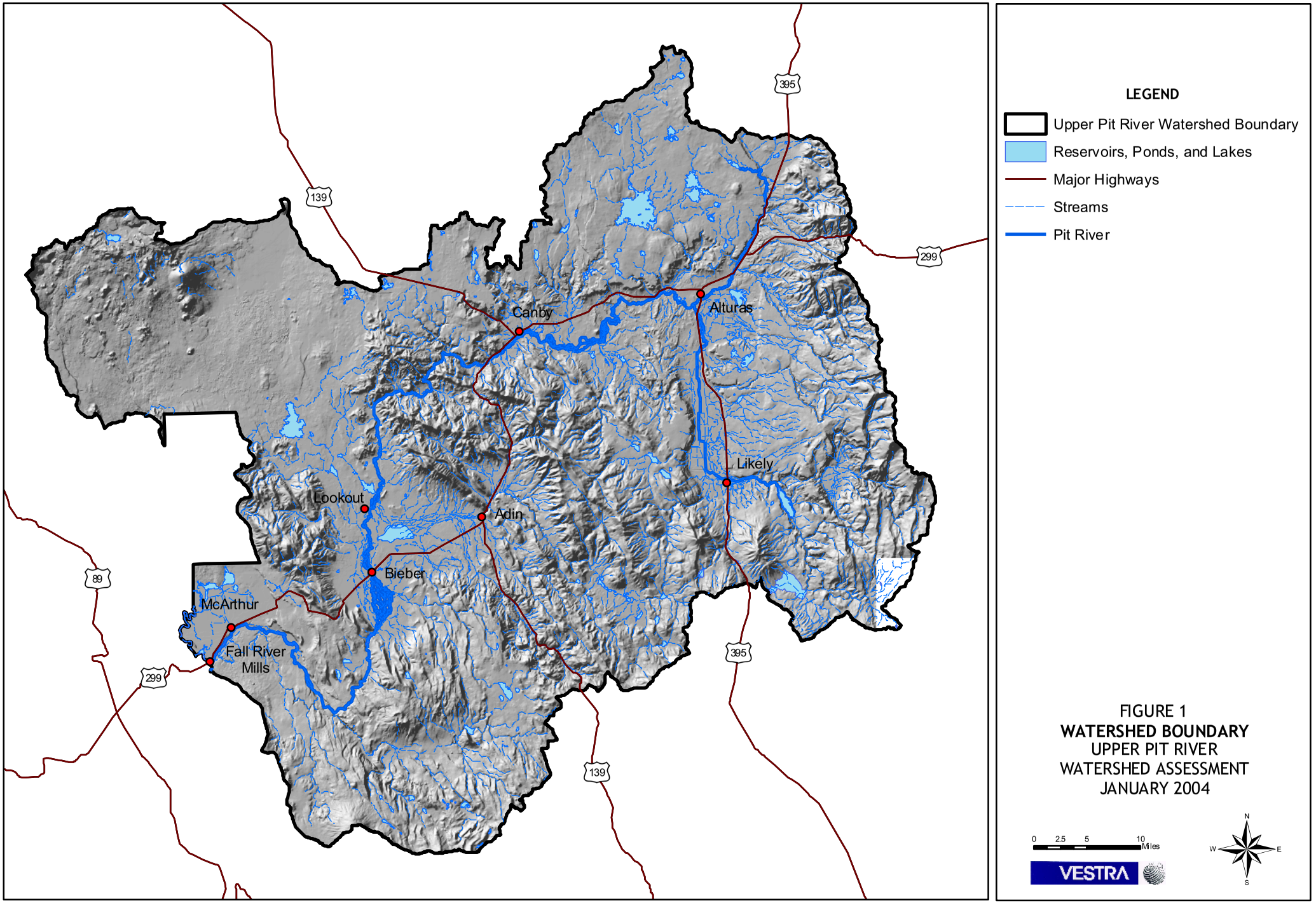
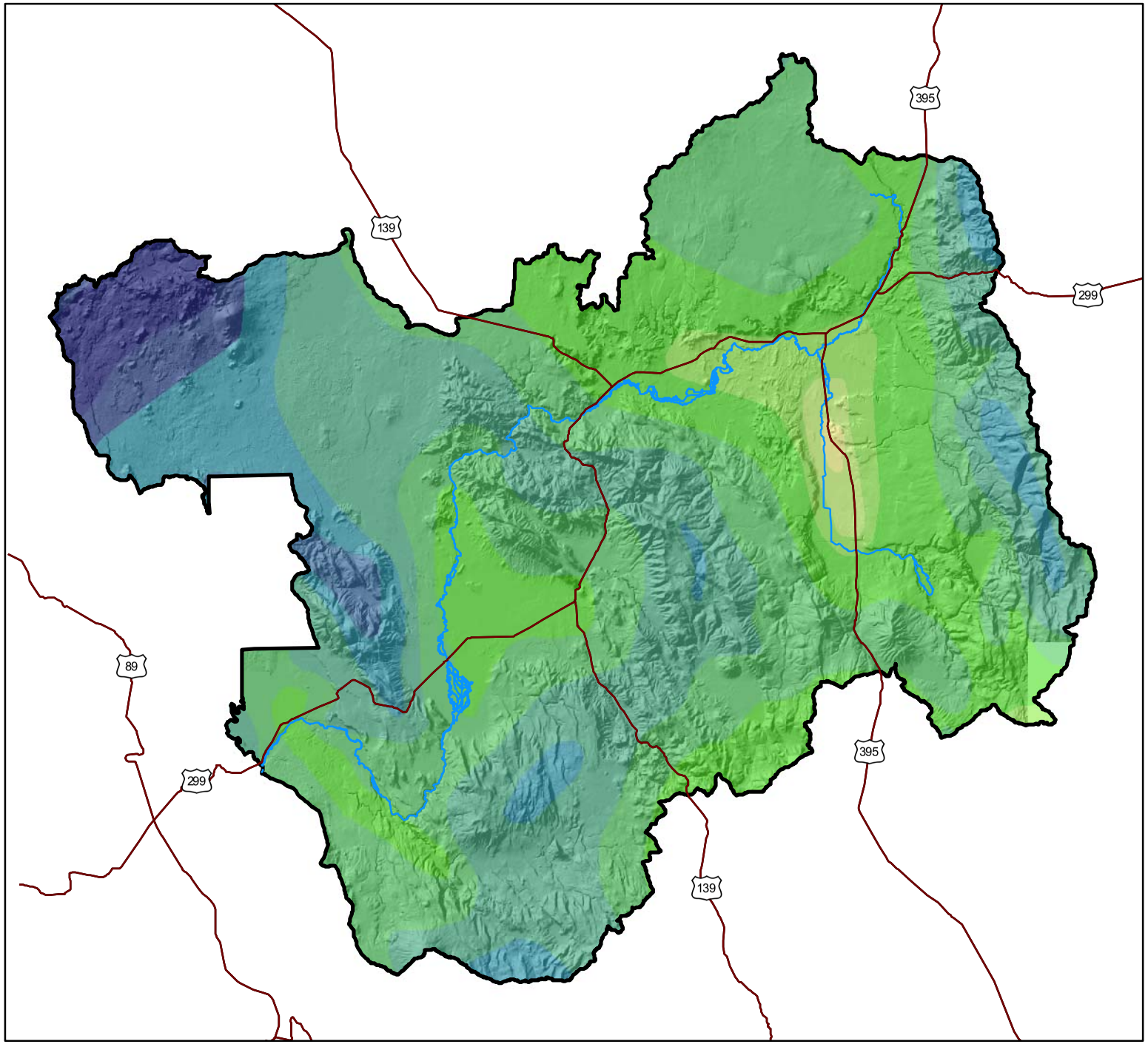


FIGURE 1
WATERSHED BOUNDARY
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004



LEGEND

- Upper Pit River Watershed Boundary
- Pit River
- Major Highways
- < 7.0 inches
- 7.0 to 9.0 inches
- 9.1 to 11.0 inches
- 11.1 to 14.0 inches
- 14.1 to 18.0 inches
- 18.1 to 22.5 inches
- 22.6 to 27.5 inches
- 27.6 to 32.5 inches
- 32.6 to 35 inches
- 35.1 to 45 inches

FIGURE 2
ISOHYETAL CONTOURS
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004

0 2.5 5 10 Miles

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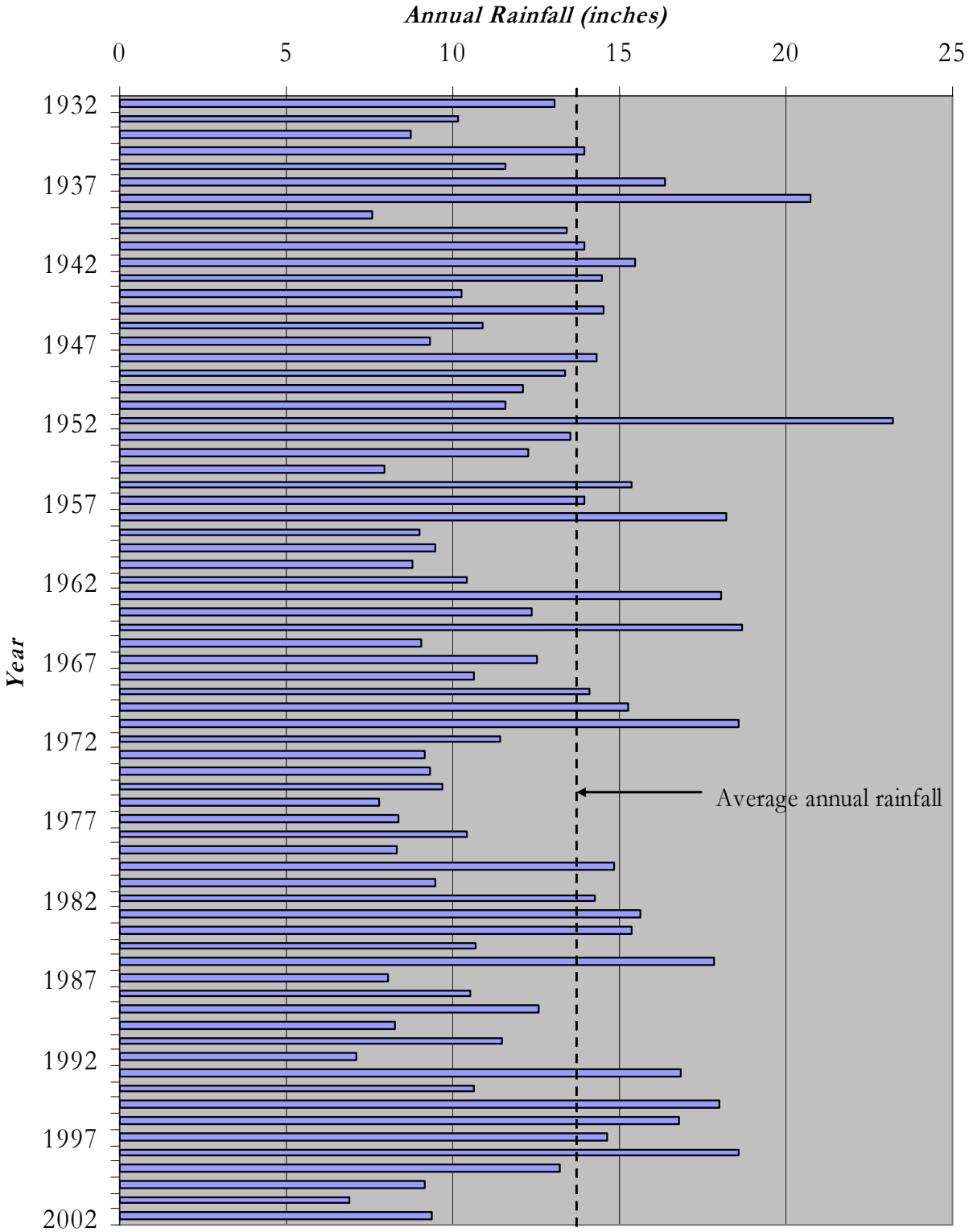
Figure 3

Historical Precipitation and Climate Records

Alturas - Upper Pit River Watershed



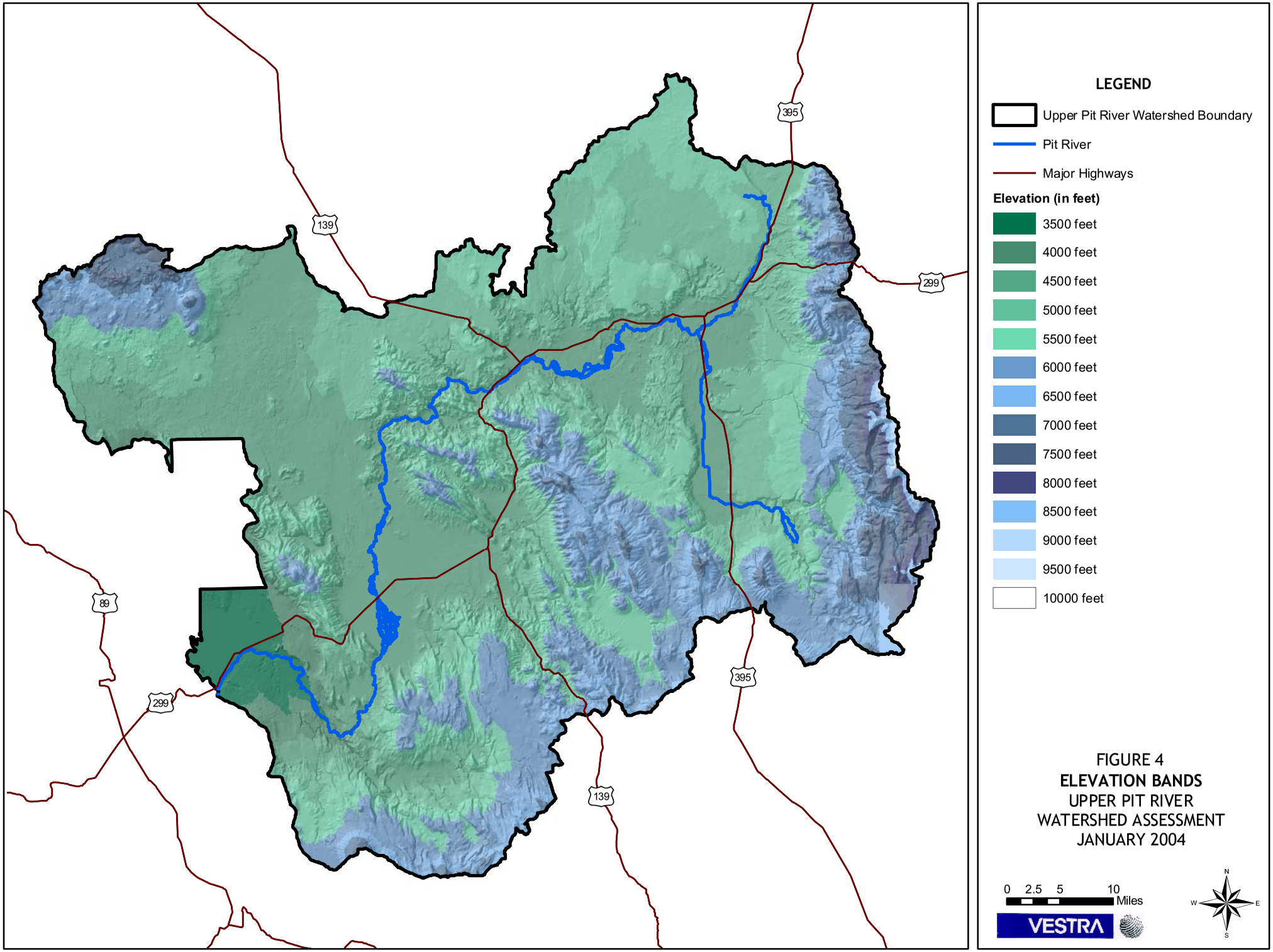


FIGURE 4
ELEVATION BANDS
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004

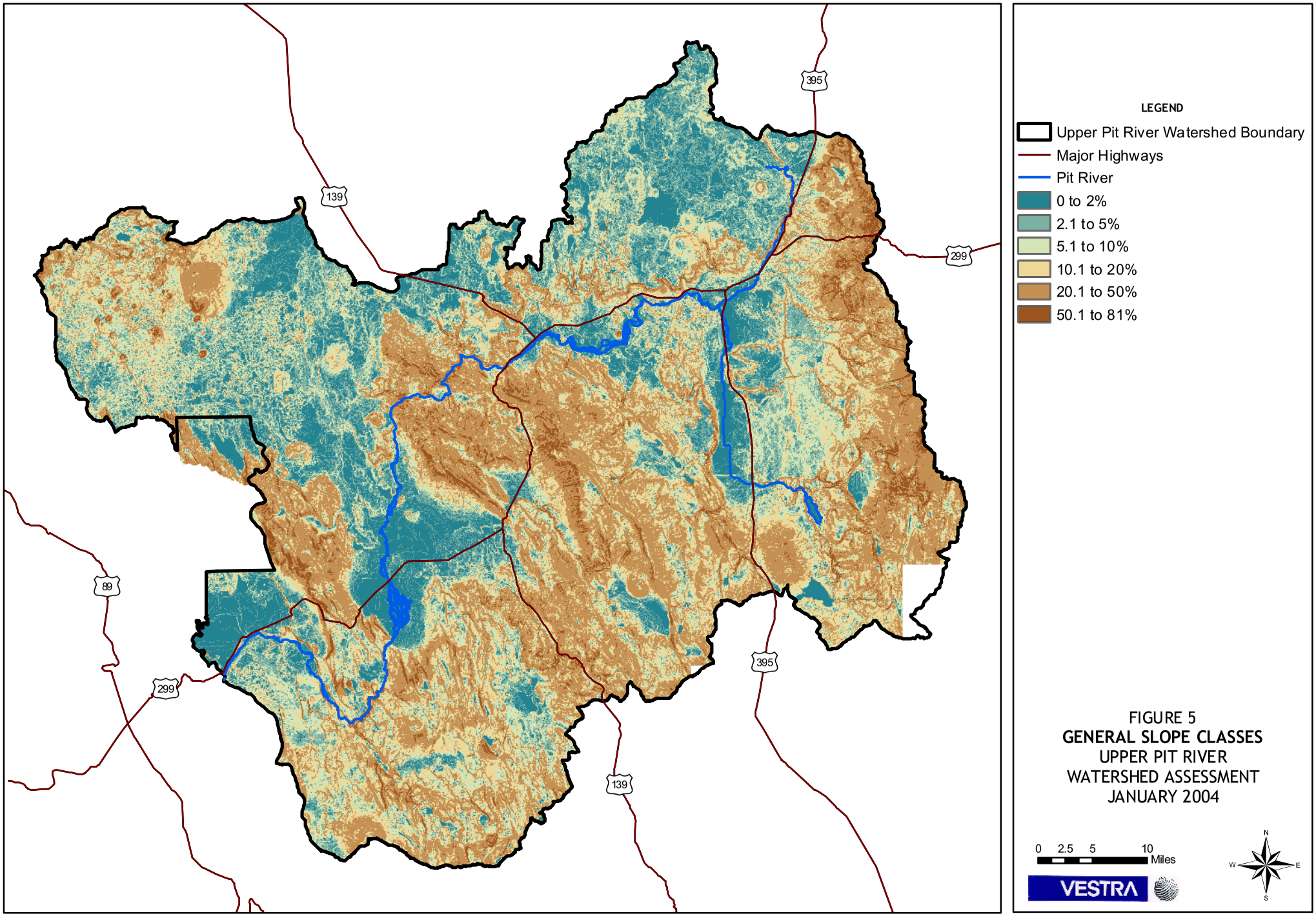
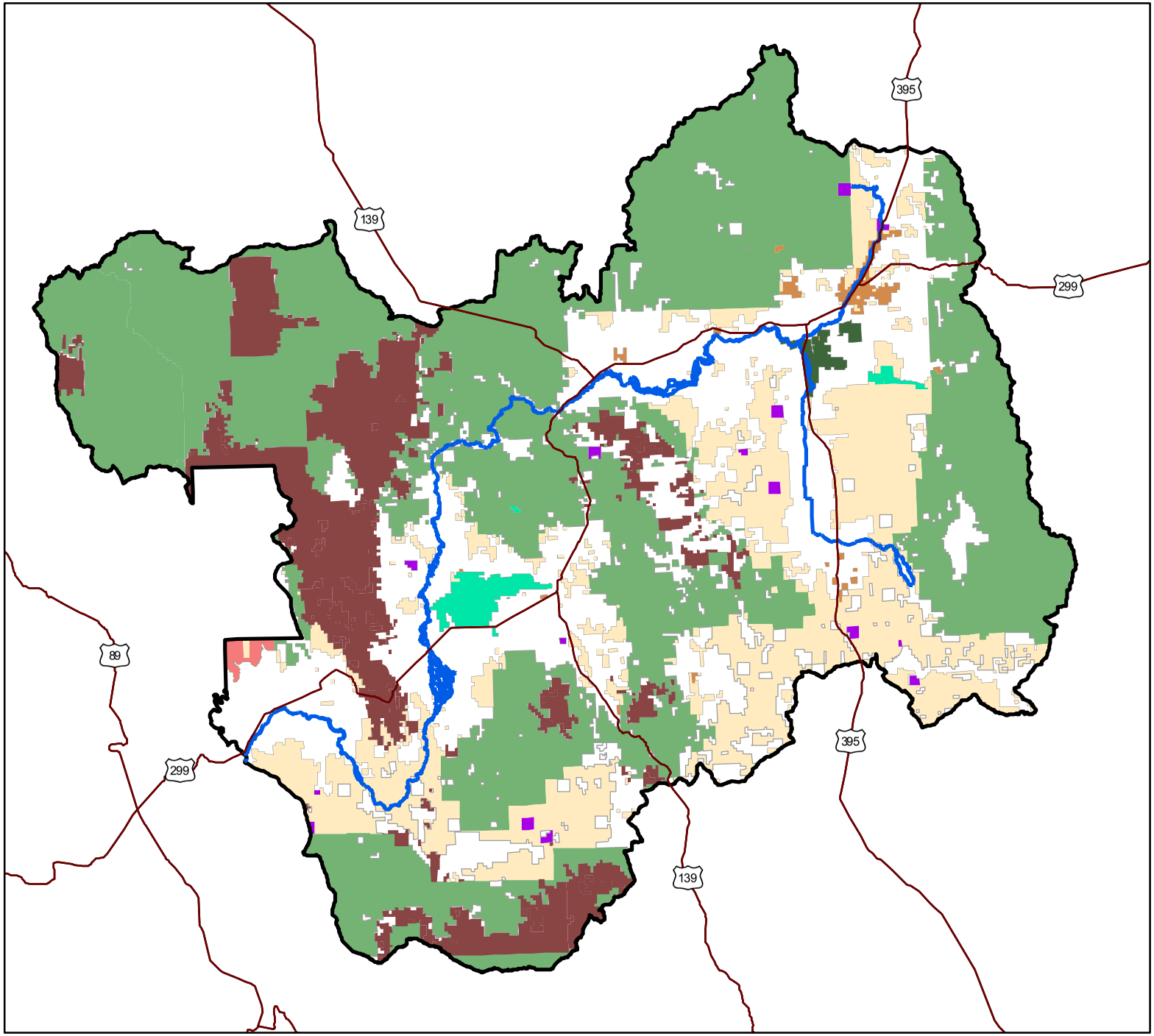


FIGURE 5
GENERAL SLOPE CLASSES
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004



LEGEND

- Upper Pit River Watershed Boundary
- Pit River
- Major Highways
- Bureau of Land Management
- California Department of Fish and Game
- California Department of Parks and Recreation
- State Lands Commission
- Tribal Lands
- Private Lands
- U.S. Fish and Wildlife Service
- USDA Forest Service
- Industrial Forest Lands

FIGURE 6
OWNERSHIP
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004

0 2.5 5 10 Miles

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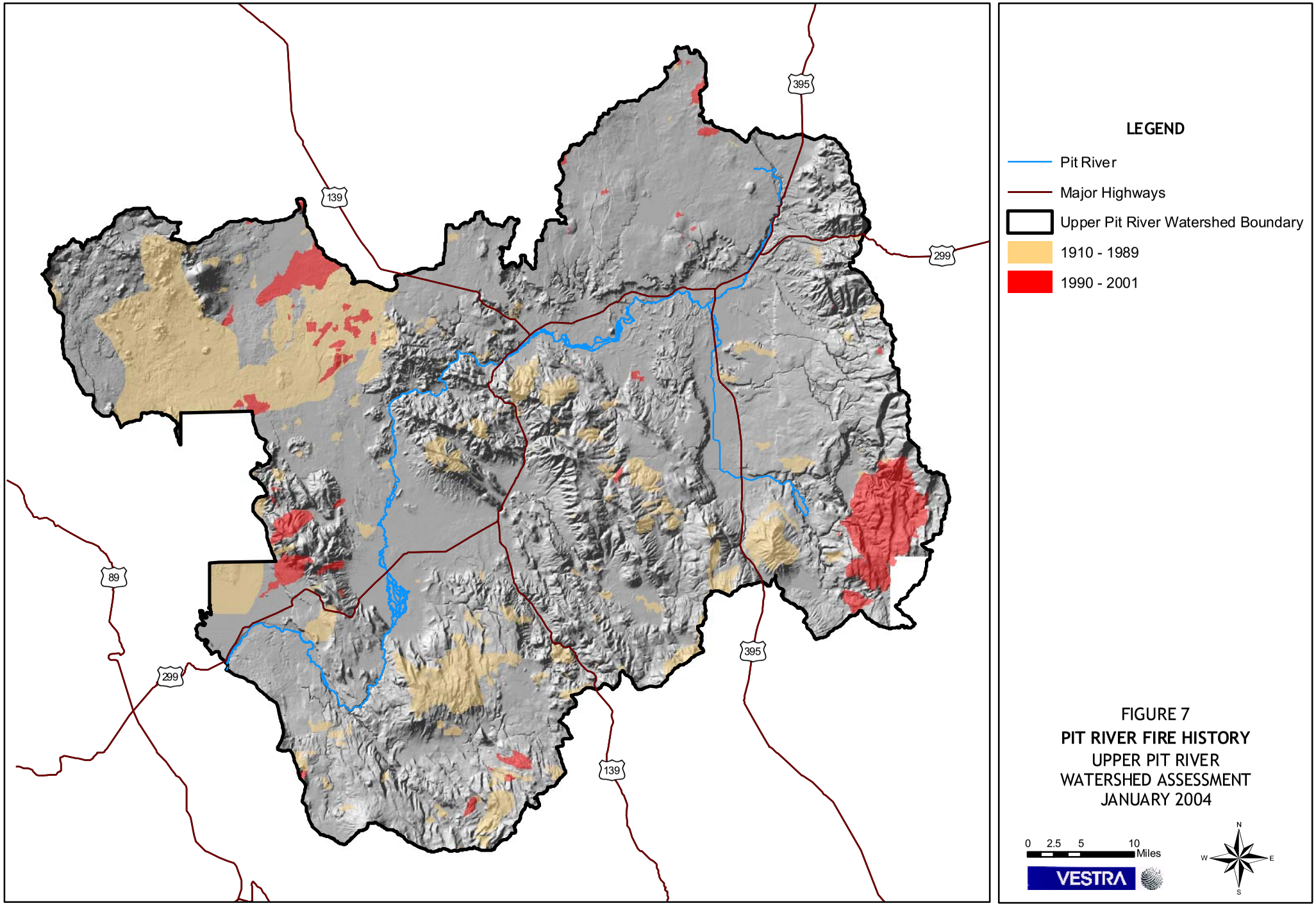
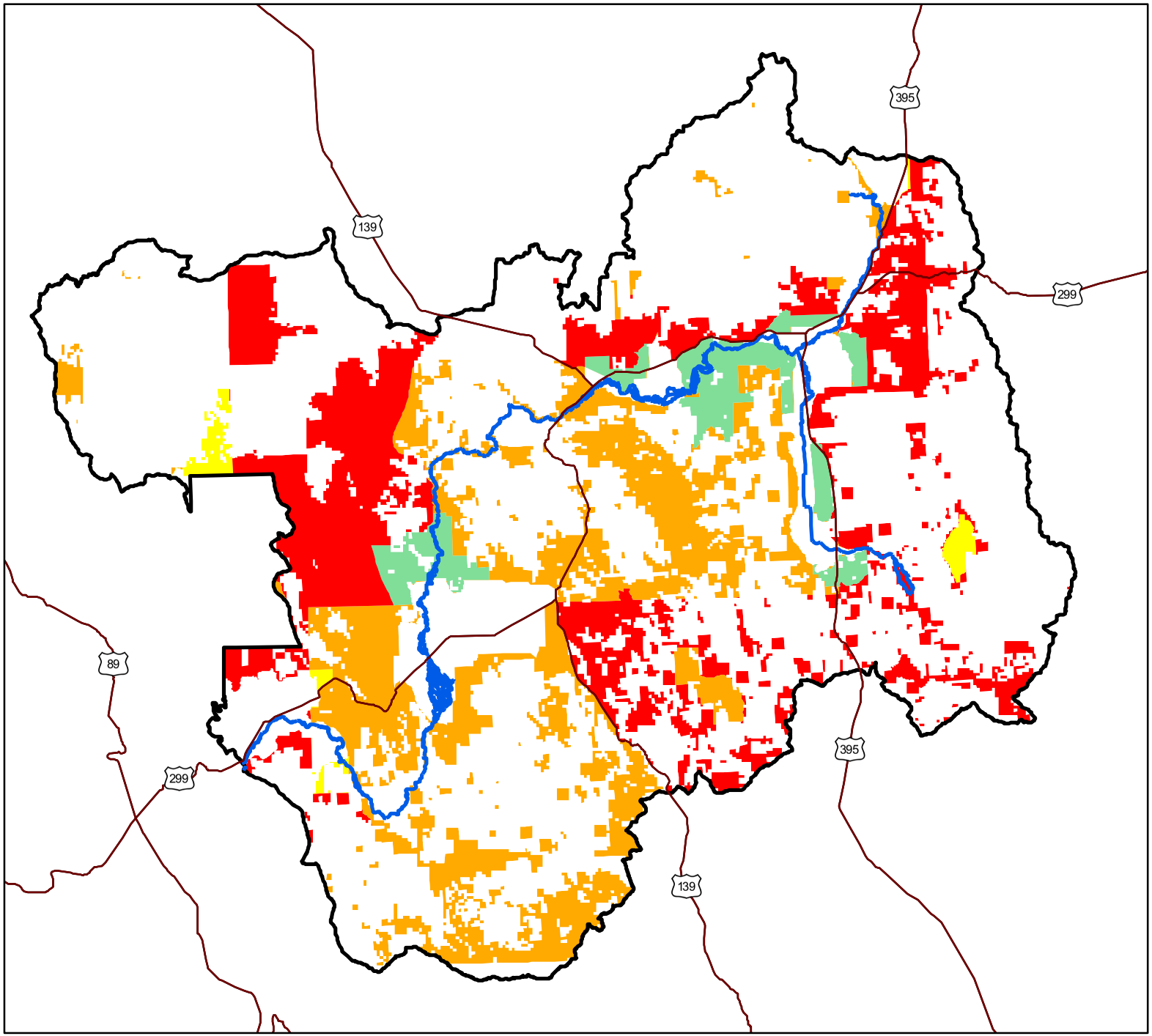


FIGURE 7
PIT RIVER FIRE HISTORY
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004



LEGEND

- Upper Pit River Watershed Boundary
- Pit River
- Major Highways
- Very High (1,501,939.5 acres)
- High (152,916.2 acres)
- Moderate (287,158.3 acres)
- No Severity Rank Assigned (13,256.3 acres)
- Not State Responsibility Area (230,281.0 acres)

FIGURE 8
FUEL LOADING AND RISK
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004

0 2.5 5 10 Miles

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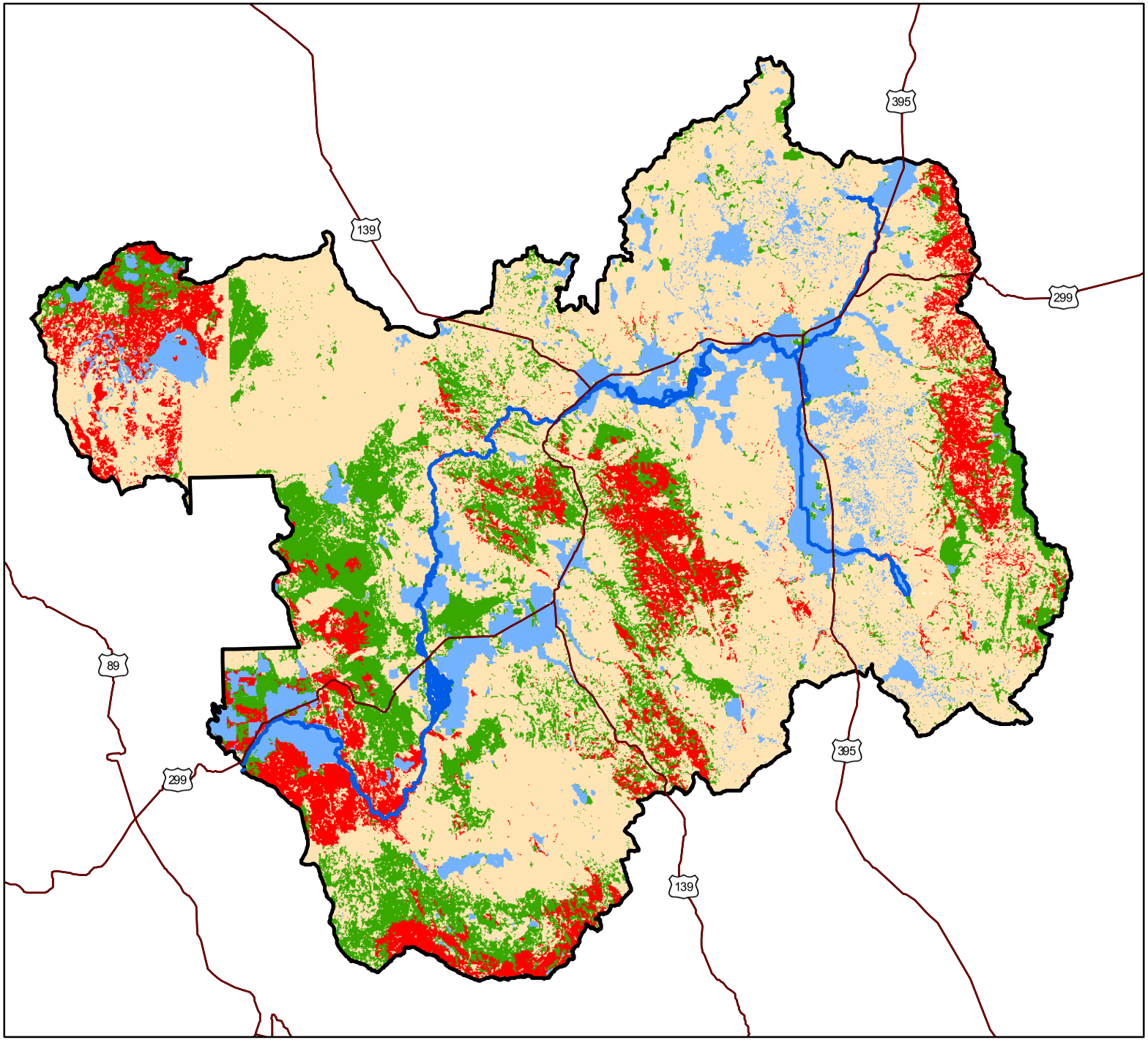

LEGEND

- Upper Pit River Watershed Boundary
- Pit River
- Major Highways
- Non-Fuel (240,311 acres)
- Moderate (360,092 acres)
- High (1,336,187 acres)
- Very High (248,961 acres)

FIGURE 9
FUEL RANKS
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004

0 2.5 5 10 Miles

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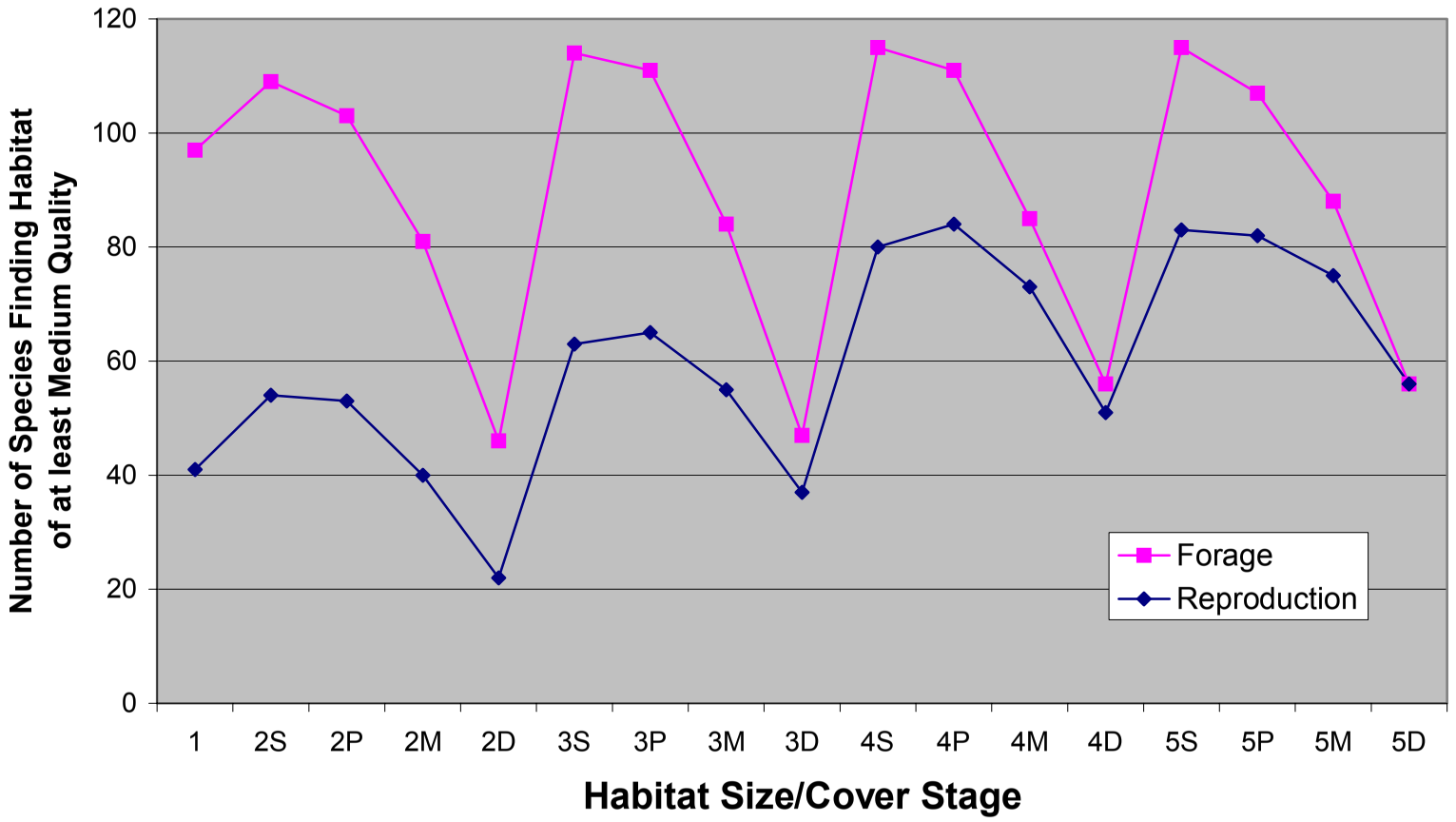


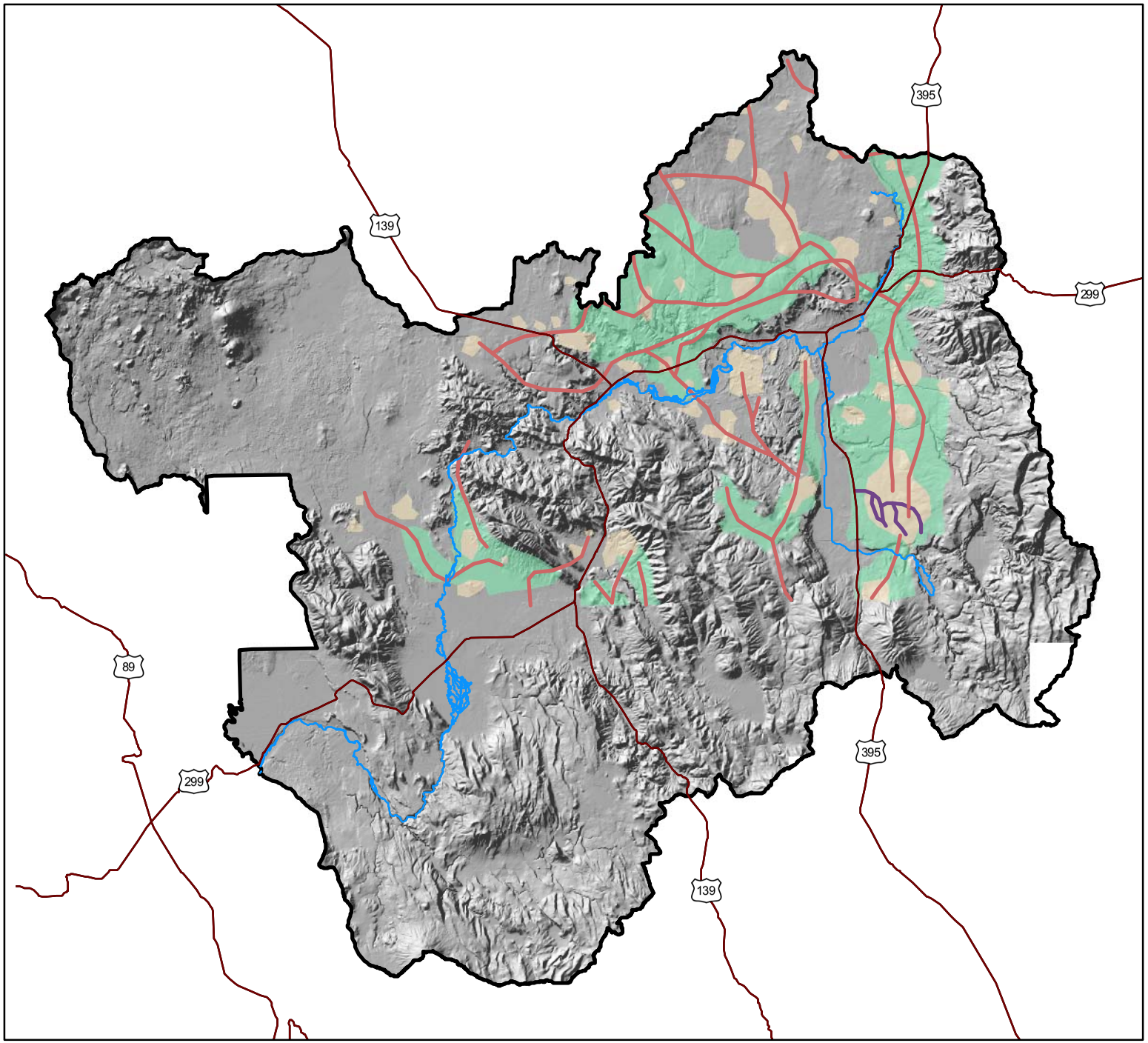
Notes: Data is from a species detail query of the CWHR 8.0 habitat suitability model. The query is for all animals that find habitat of at least medium quality in at least one size/cover stage of Eastside Pine in Modoc county. Reproductive and foraging habitats are considered independently of each other. The patterns shown above are for overall wildlife biodiversity. In actuality, there are important groups of species linked to size and cover condition combinations that may have low overall biodiversity. The definitions of the CWHR size and cover classes are as follows: **1**: quadratic mean tree diameter (QMD) at breast height < 1", **2**: QMD = 1-6", **3**: QMD = 6-11", **4**: QMD = 11-24", **5**: QMD >24", **S**: forest canopy cover = 10-25%, **P**: cover = 25-40%, **M**: cover = 40-60%, **D**: cover >60%.

FIGURE 10
THE RELATIONSHIP BETWEEN WILDLIFE BIODIVERSITY AND MODOC COUNTY EASTSIDE PINE FOREST SUCCESSIONAL STAGES – DENSITY AND TREE SIZE
UPPER PIT RIVER WATERSHED ASSESSMENT

VESTRA

JOB NO. 702017

JANUARY 2004



LEGEND

- Pit River
- Major Highways
- Kidding Grounds
- Winter Range
- Upper Pit River Watershed Boundary
- Migration Route
- Weather Stress Migration Route

FIGURE 11
ANTELOPE
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004

0 2.5 5 10 Miles

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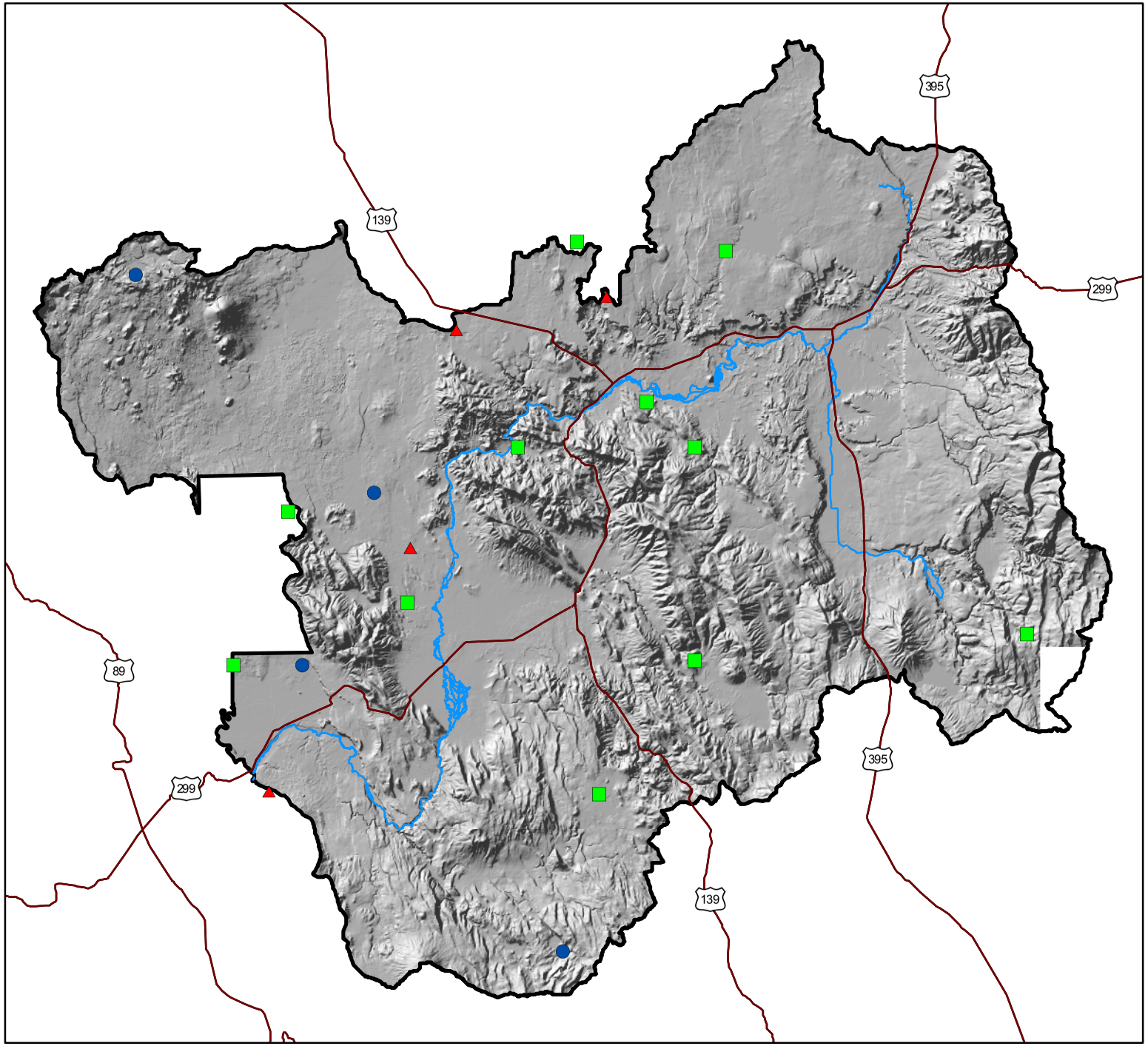

LEGEND

- Upper Pit River Watershed Boundary
- Pit River
- Major Highways
- First Occupied 1959 - 1977
- First Occupied 1978 - 1987
- First Occupied 1988 - 1997

FIGURE 12
BALD EAGLES: 1959 - 1997
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004

0 2.5 5 10 Miles

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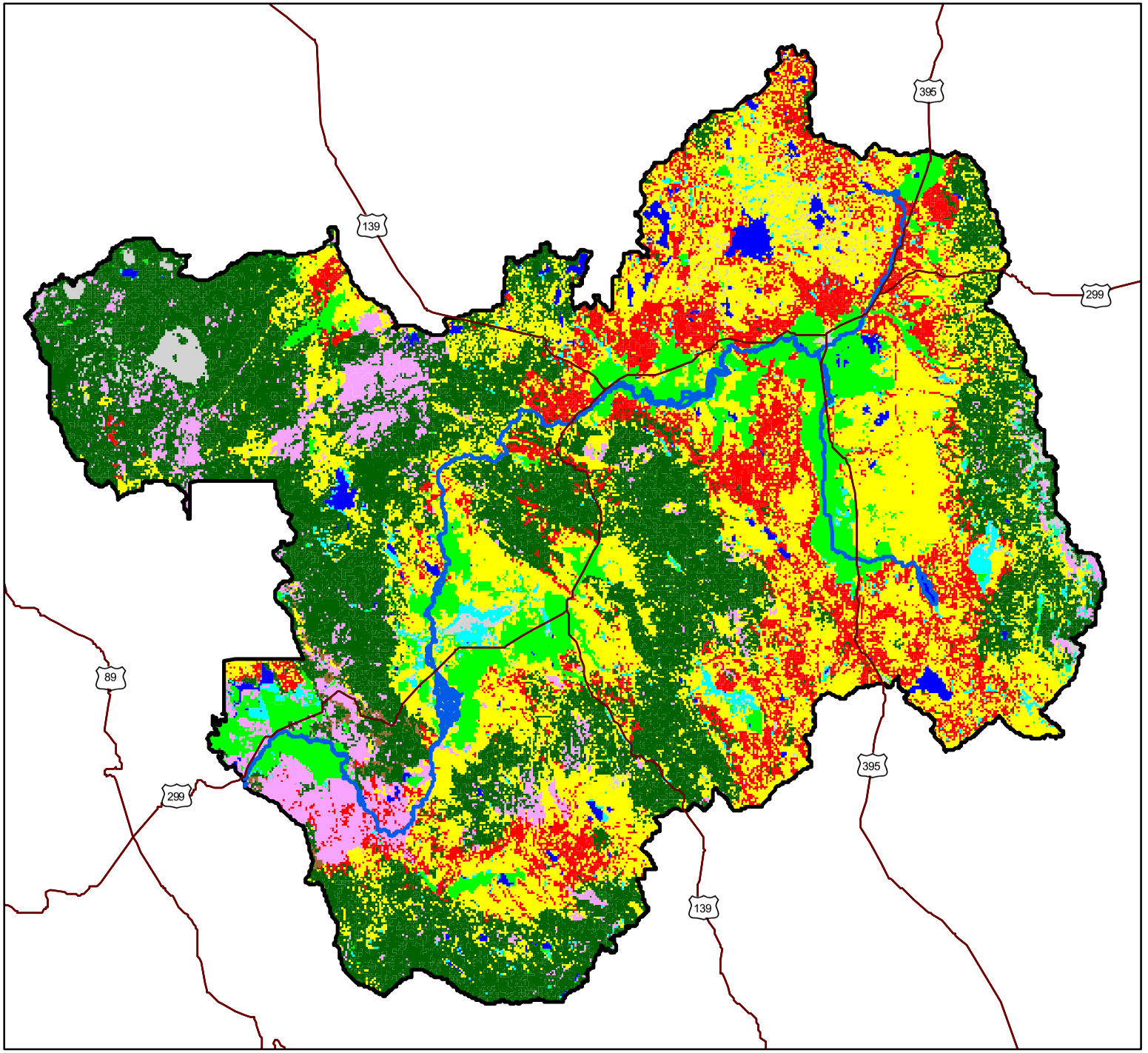

LEGEND

- Upper Pit River Watershed Boundary
- Pit River
- Major Highways
- Agric./Grassland
- Aspen
- Chaparral
- Conifer
- Hardwood
- Juniper
- Other
- Sagebrush Scrub
- Water
- Wetland

FIGURE 13
LCMMP VEGETATION MAPPING
UPPER PIT RIVER
WATERSHED ASSESSMENT
JANUARY 2004

0 2.5 5 10 Miles

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