



Hat Creek



Tule River in Fall River Valley



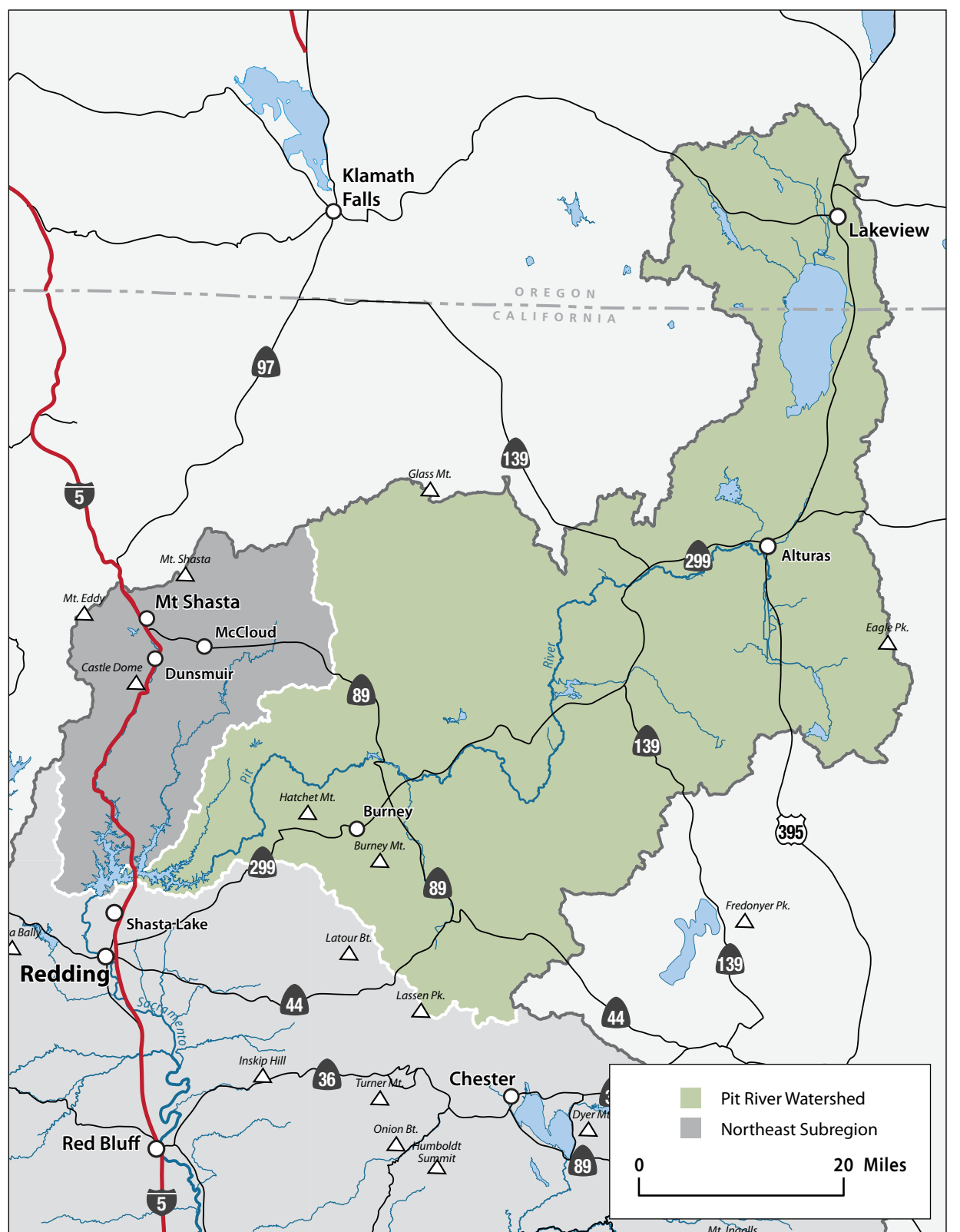
Pit River near Canby

The Watershed at a Glance

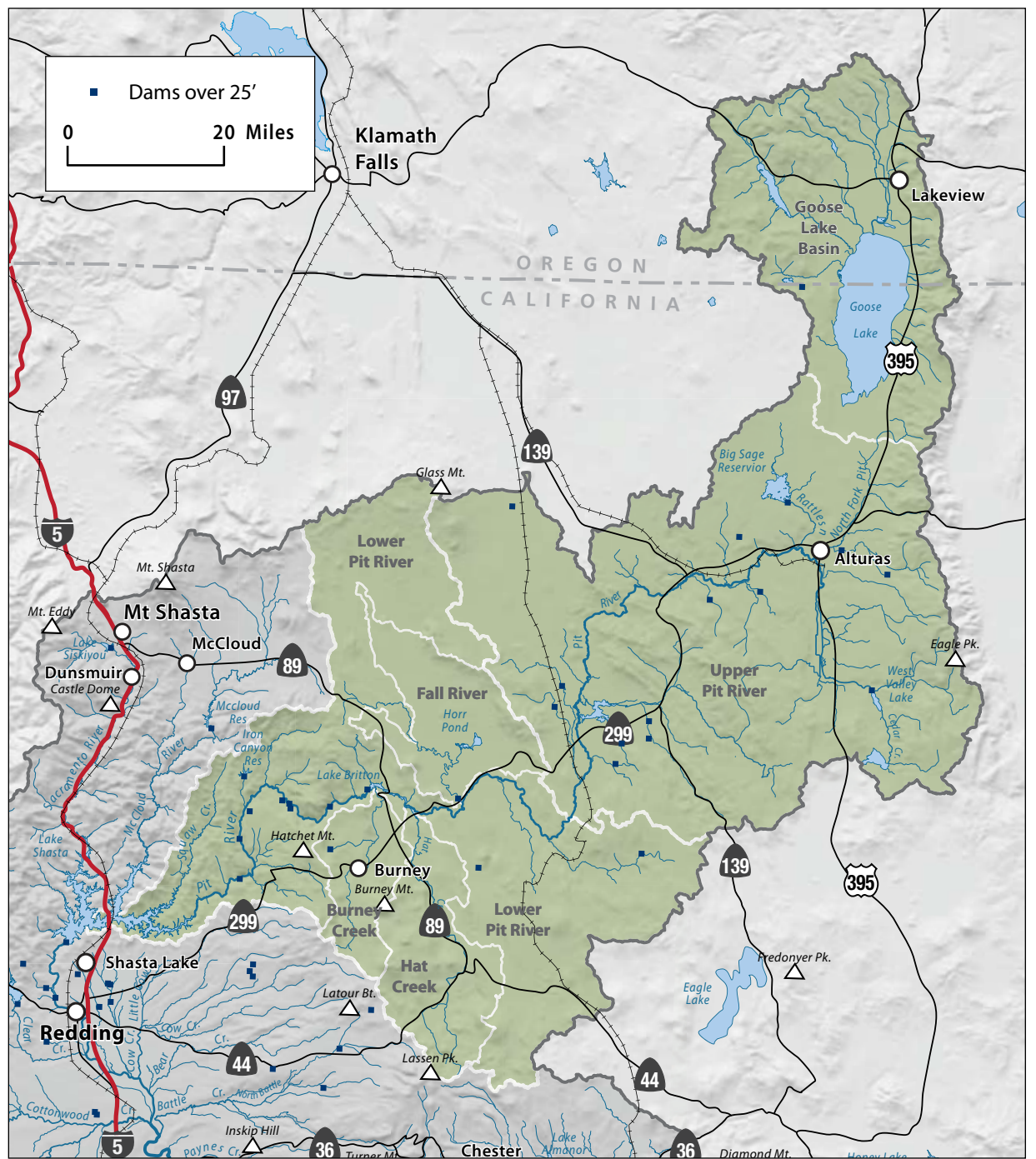
The Pit River Watershed includes all waters tributary to the Pit River from its headwaters in northeastern California near the Oregon and Nevada border to the confluence of Lake Shasta. Individual rivers and streams in this watershed vary greatly in their characteristics and the aquatic resources they support. Some are managed largely for agricultural irrigation supply, and others are among the state's most notable wild trout waters. Because of their differing attributes, management issues, and management programs, the following subwatersheds within the Pit River Watershed are described and discussed individually:

- » Goose Lake
- » Upper Pit River
- » Fall River
- » Hat Creek
- » Burney Creek
- » Lower Pit River

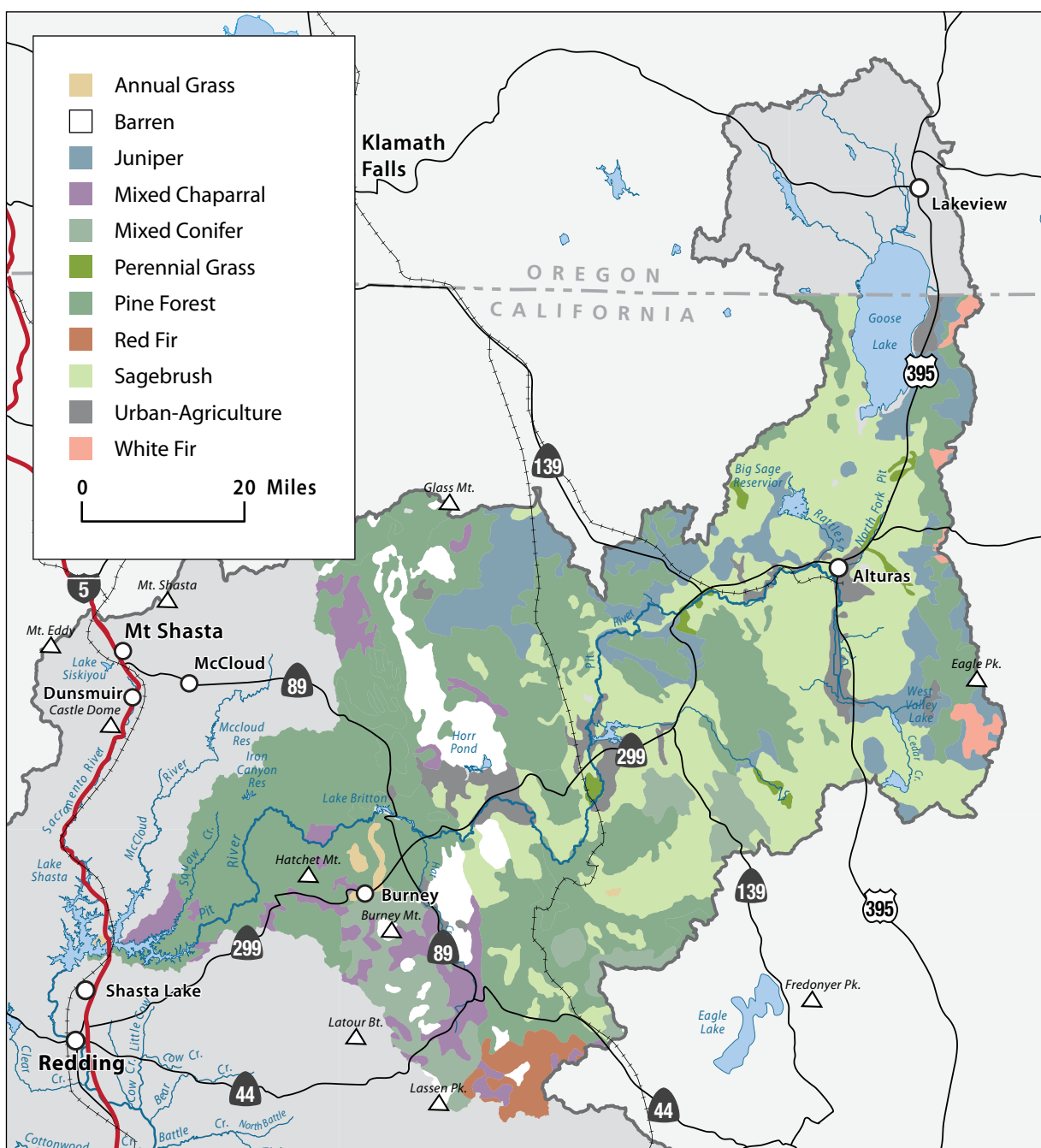
Management Issues: wild trout, forest health/fuels management, aquatic/riparian habitat, water quality, water supply, erosion/natural stream function, invasive species



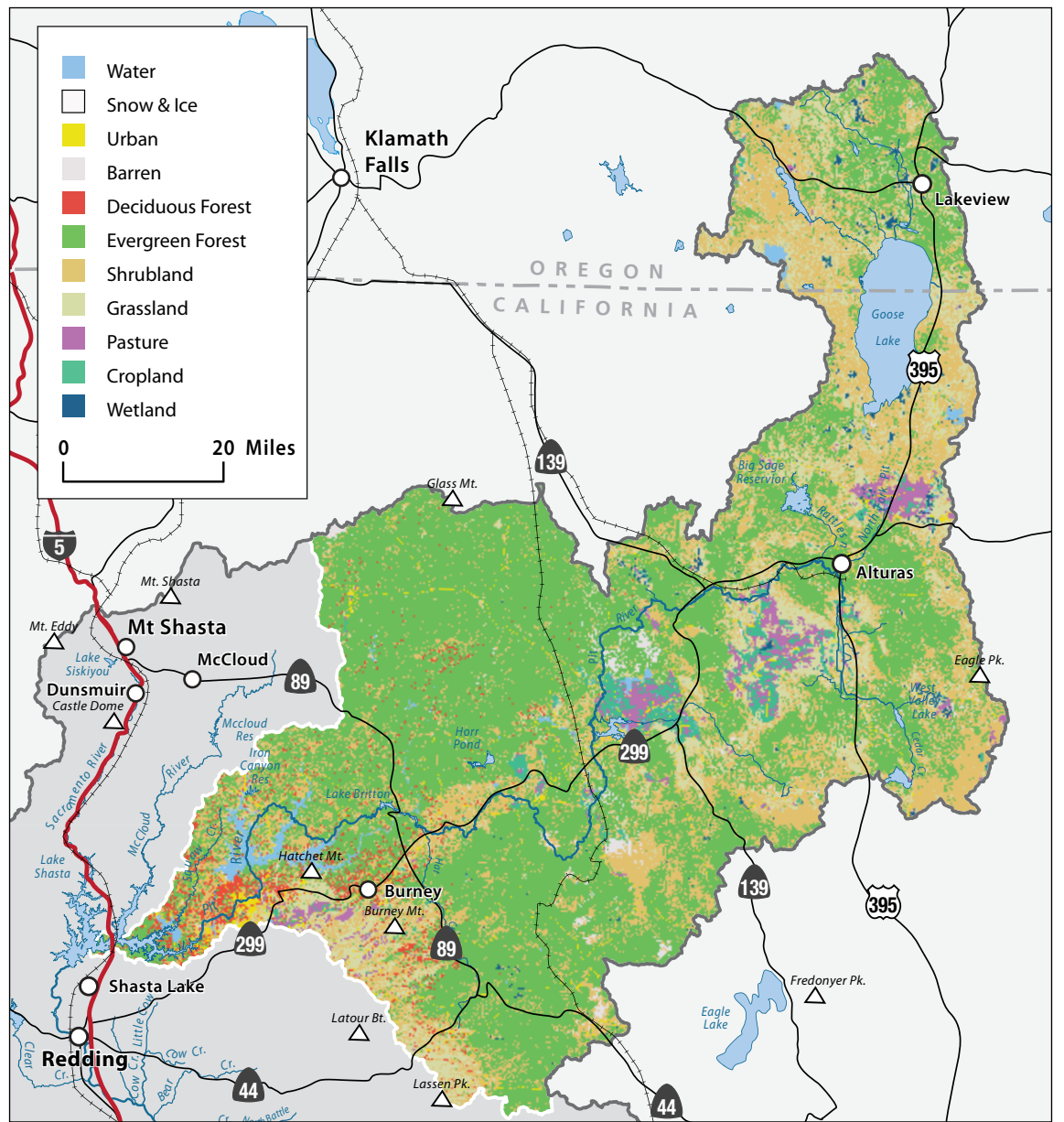
Pit River Watershed within the Northeast Subregion



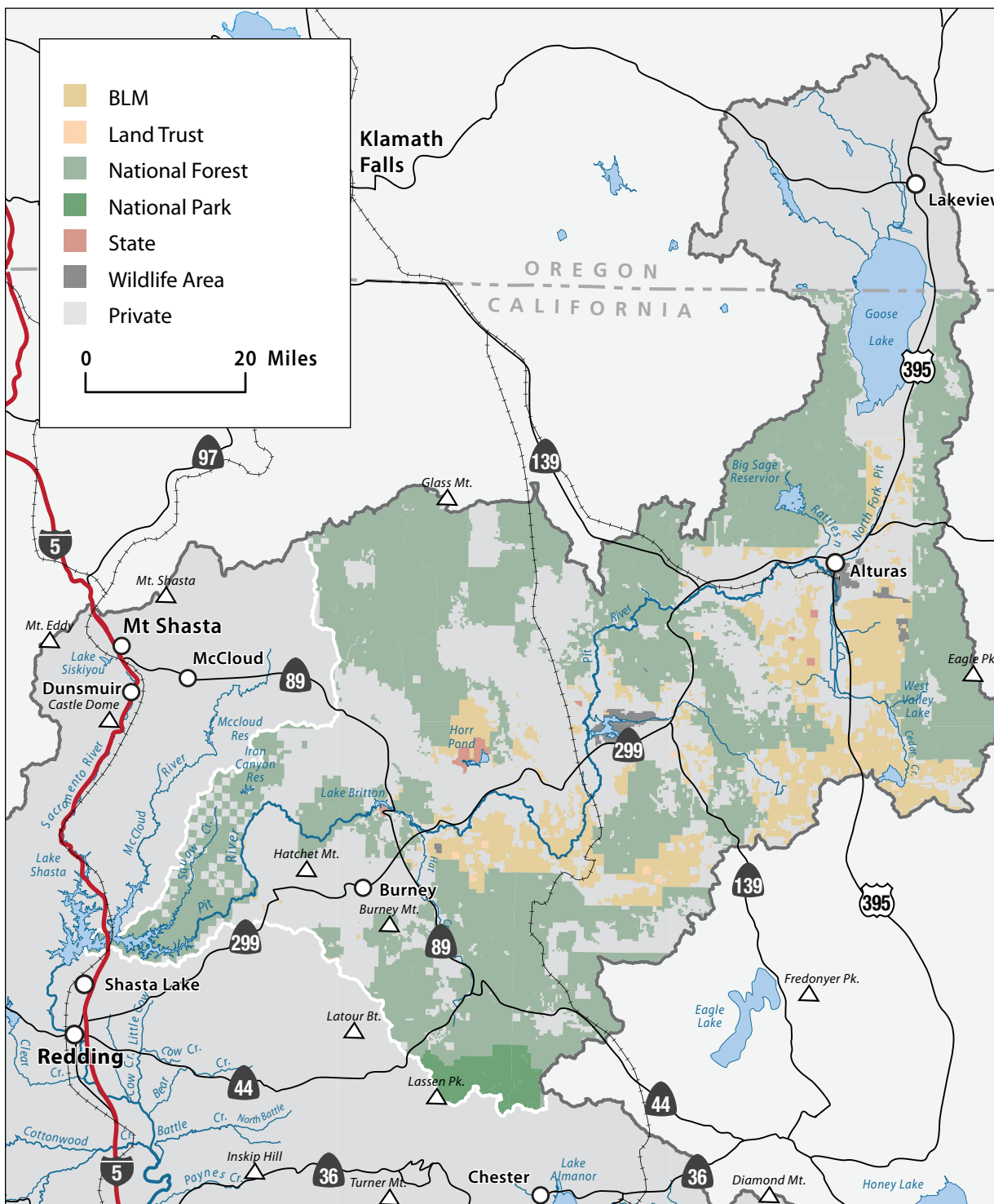
Hydrology In the Pit River Watershed



Vegetation types in the Pit River Watershed



Land use in the Pit River Watershed



Land ownership in the Pit River Watershed



Goose Lake, the state's largest closed basin lake



Goose Lake shoreline in winter



Lassen Creek meadow

Pit River: Goose Lake Watershed

The Watershed at a Glance

The Goose Lake Watershed is a closed basin located at the northeastern corner of California extending well into south-central Oregon. The Goose Lake Watershed occupies about 1,100 square miles, of which about two thirds are in Oregon and one third in California. The lake itself is about 144 square miles with the majority of the water on the California side. This is a semi-arid region, and historically Goose Lake has gone completely dry during periods of extended drought. The lake and its tributary streams support a unique assemblage of native fishes that are adapted to waters relatively high in alkalinity and dissolved salts. Of particular prominence is the Goose Lake redband trout. The upper watershed area is mostly publicly owned (USFS and the BLM), while lower elevation private lands are used for livestock grazing and hay and grain production.

WATERSHED STATISTICS

Watershed Size: 1,100 square miles

Watershed Length: ~500 linear miles of perennial streams

Average Annual Precipitation: 12 inches (Goose Lake) to 32 inches (Warner Mountains)

Elevation:

Highest—8,000 ft;

Lowest—5,000 ft

Population: ~3,000

Management Issues: native fish protection/enhancement, riparian and aquatic habitat improvements, forest and range conditions, local autonomy and responsibility in resource management

Counties: Modoc (CA), Lake (Oregon)



Goose Lake in the drought year of 1992

Hydrology

The major portion of inflow to Goose Lake comes from tributary streams on the eastside of the lake. On the California side of the basin are four major tributaries: Davis, Lassen, Willow, and New Pine Creeks. These streams are fed mostly by snowmelt, and the major runoff occurs during spring and early summer each year. In addition to surface runoff contributing to the volume of water that feeds Goose Lake, there is inflow from a series of distinct groundwater basins. Several small springs emerge from the lakebed itself. Historically, Goose Lake has both overflowed into the North Fork of the Pit River, and on several occasions gone completely dry. The lake reportedly last overflowed in 1881. The lake was dry in the summers of 1851–52, 1926, 1929–34, and most recently in 1992.



Willow Creek, tributary to Goose Lake

Water Quality

Water quality characteristics of Goose Lake are typical of closed basin lakes—high alkalinity and total dissolved solids. Water quality in tributary streams is generally good and supportive of the principal beneficial uses, i.e., coldwater habitat, recreation, and irrigation. Monitoring data for Goose Lake and tributary streams come from the 1966 Goose Lake Basin Study and the 1995 Goose Lake Water Quality Monitoring Report (both by the (RWQCB). For the past several years, the Goose Lake RCD has conducted water quality monitoring in compliance with requirements of the Central Valley RWQCB's Irrigated Lands Discharge Program, and both the Fremont and Modoc National Forests have collected extensive data on stream temperatures.



Lassen Creek



Water quality monitoring on Lassen Creek



Goose Lake native fish

Fish and Wildlife

There are eight native fishes of the Goose Lake Basin. Four of the species, Goose Lake redband trout, sucker, tui chub, and lamprey, are considered endemic to the area and known to spend at least part of their lives in the lake. During times of drought and low lake levels, tributary streams provide important refuge habitat for these species. The other four species are primarily stream-dwelling—the Pit-Klamath brook lamprey, speckled dace, Pit roach, and Pit sculpin. All of these fish are state and federally listed as species of special concern. Redband trout that spend part of their life cycle in Goose Lake are much larger than their stream-dwelling relatives and historically supported a commercial fishing operation at the mouth of Willow Creek. Populations have been highly variable from year to year, and no Goose Lake redband trout runs have been seen in Oregon since 1981 or in California streams since 1989.

The forest and sagebrush uplands are important habitat for mule deer and other wildlife species. During the fall and winter, Goose Lake provides resting habitat for large numbers of migrating waterfowl.



Avocets and white pelicans on Goose Lake

Vegetation

Upland areas are characterized by mixed conifer forest, open meadows, and sagebrush. The lower-elevation, privately owned lands are used for irrigated agriculture, mostly pasture and hay with some specialty crops (seeds, grains, potatoes, alfalfa, and orchard crops).



Willow Creek basin, sage, riparian



Meadow, willow riparian, and mixed conifer

Life in the Watershed

The Goose Lake Basin is an area of mixed ownership and multiple land use. Native Americans inhabited the basin for centuries, beginning with the Modocs and Achumawis. Today, the local economy is supported mostly by ranching, timber production, and recreation. Most residents live in Lakeview, Oregon, (population 2,800) or the small, rural communities of New Pine Creek and Davis Creek. Limited industrial uses in the basin include a mercury mine, gravel pits, small gold mines, and lumber mills.



Redband trout



Canada geese and cattle share irrigated pasture

Management Objectives

Cooperative management efforts in the Goose Lake Watershed began in the early 1990s with the formation of the bi-state Goose Lake Fishes Working Group (now the Goose Lake Watershed Council). Driven by apparent declines in native fish populations and the concern over federal and state endangered species listings, this group began formalizing tasks needed to protect habitat and fish species in the basin. The Goose Lake Fishes Conservation Strategy was prepared in 1996, and that document continues to guide management priorities for the basin. Management objectives are summarized as follows:

- » implement a locally directed management program to address all activities that potentially affect watershed resources through a cooperative effort by landowners, agencies, and resource users;
- » implement a management program that recognizes existing land uses, minimizes adverse economic impacts, and strives to maintain the rural agricultural nature of the watershed;
- » protect and restore aquatic and terrestrial habitat consistent with the local basin potential given climate, geology, and land-forming processes; and
- » protect and restore native fish species by providing adequate water quality and quantity, safe passage of migrants, and clean spawning, resting, and foraging habitat.



RCD field day at Thomas Creek, Oregon

Management Organizations Active in the Watershed

Goose Lake Watershed Council

This bi-state organization was formed in response to concerns with declining native fish populations and potential listings under the federal Endangered Species Act. The group operates by consensus and includes federal and state resource agencies, local city and county representatives, resource advocate groups, and private landowners. The group generally meets at least twice per year to review the status of conservation projects, lake and stream conditions, fish population trends, and to discuss future management strategy.

Goose Lake Resource Conservation District

Goose Lake RCD has been one of the leaders of the bi-state watershed council and has implemented several stream-improvement projects on Lassen and Willow Creeks. These projects include fish passage improvements, livestock fencing, off-stream livestock water facilities, erosion control, and general stream and meadow restoration work.



Pit River Falls



Wild rice fields near McArthur



South Fork Pit River near Likely

Pit River: Upper Pit River Watershed

The Watershed at a Glance

The Upper Pit River Watershed begins in the Warner Mountains of northeast California and flows in a southwesterly direction toward Shasta Lake. For planning and management purposes, the Upper Pit Watershed includes that area from the Pit River headwaters downstream to the confluence of Fall River. Below that confluence, the Pit River markedly changes character because of the inflow of large volumes of cold water from Fall River, Hat Creek, and Burney Creek. The watershed is characterized by sagebrush, juniper, and mixed conifer forests, rugged mountains, and broad alluvial valleys that contain significant riparian areas, meadows, and irrigated pasture. Most upper elevation lands are publicly owned (USFS and the BLM). Mid- and low-elevation private lands are used for timber production and irrigated agriculture (primarily cattle ranching). The watershed is unique with regard to its sparse population, vast open space, and habitat for a wide range of fish and wildlife species.

WATERSHED STATISTICS

Watershed Size: 3,400 square miles

Watershed Length: ~80 mi
(headwaters to Fall River)

Average Annual Precipitation: 10 inches
(low elevation) to 25 inches (high elevation)

Elevation:
Highest—9,800 ft (Warner Mts)
Lowest—3,200 ft (Fall River Valley)

Population: ~30,000

Management Issues: stream channel erosion, juniper and sagebrush management, irrigation water supply, aquatic/riparian habitat protection and improvement, water quality and the 303(d) listing

Counties: Modoc, Lassen, Siskiyou, and Shasta



Irrigation diversion dam on Pit River tributary (Willow Cr)

Hydrology

The North Fork and South Fork Pit River are fed by runoff from the westside of the Warner Mountains. They converge at the city of Alturas and flow southwesterly for approximately 60 miles to the confluence with Fall River. There are 21 principal tributaries totaling more than 1,000 linear miles of perennial stream. Flow gaging on the Pit River at Canby (mid-watershed location) has been maintained since 1904, and average daily flow at this location is approximately 250 cfs. Summer season flows typically range from 0 to 20 cfs with a peak flow of 9,100 cfs in 1986. There are 63 jurisdictional dams and reservoirs in the watershed that seasonally store rainfall and snowmelt and then release that water for irrigation use through the summer season. A series of dams on the mainstem of the Pit River is used to store

and divert water for agricultural use during the irrigation season. There are seven principal alluvial groundwater basins in the watershed, with Alturas and Big Valley Basins being the largest. In addition to the surface water diversions, groundwater is used extensively to meet irrigation water demands.



High spring runoff in Beaver Creek



Flow monitoring in the Pit River



USGS gaging station at Canby



Upper Ash Creek



Degraded channel and riparian habitat on Pit River near Bieber

Water Quality

The most recent comprehensive water quality monitoring study was done by the Pit River Alliance and the Central Valley RWQCB between 2000 and 2005. Data were collected at 12 river sites and approximately 30 sites on tributary streams. Beneficial uses designated for the Pit River include support for cold- and warmwater aquatic life, recreation, and municipal, industrial, and agricultural supply. The mainstem of the Pit River (headwaters to McArthur) is 303(d) listed as impaired for temperature, dissolved oxygen, and nutrients. In addition, several tributaries were recently listed as impaired for elevated levels of fecal coliform bacteria (*E. coli*). Water quality in the Pit River Watershed is influenced by a variety of current land and water use practices, past management practices, and natural geologic and climate conditions. The Pit River typically has relatively high levels of turbidity and suspended sediment, particularly during peak runoff events. Water quality improvement efforts in the watershed involve a combination of improved management practices and restoration projects to address legacy issues that have degraded channel and habitat conditions.



Channel erosion on upper Pit River



Green algae bloom in Pit River near McArthur

Fish and Wildlife

Given its large and relatively uninhabited landscape, the Upper Pit River Watershed is one of the state's most important regions for fish, wildlife, and associated aquatic resources. This diverse and unique natural aquatic fauna includes some federally and state-designated special-status species (e.g., Modoc sucker, rough sculpin, Pit roach, western pond turtle, and Shasta crayfish). Many of the tributary streams support good populations of rainbow trout in their upper elevations, while warmwater species such as bass and brown bullhead dominate lower-elevation reaches. Wetlands and irrigated agricultural habitats in the watershed provide habitat for both migratory and resident waterfowl. There are abundant populations of duck species, white and dark Canada geese, and sandhill cranes. Both Ducks Unlimited and California Waterfowl Association have been actively working with landowners on projects to improve waterfowl habitat. Upland areas contain some of the state's most important habitat for mule deer, elk, and antelope.



Antelope in irrigated hay field



USFWS fish survey in South Fork Pit River



Bald eagle

Vegetation

The upper elevations of the watershed are characterized by mixed conifer forest, juniper, and some stands of aspen. Sagebrush is common throughout the watershed. The lower-elevation, alluvial valley areas contain significant wetlands, riparian areas, and irrigated farmland (pasture, hay, and alfalfa). One of the principal management concerns has been the progressive increase in density and distribution of juniper stands resulting in impacts on range conditions, wildlife habitat, and water resources.



Pit watershed vegetation—sage, irrigated hay field, riparian vegetation, juniper, and conifer

Life in the Watershed

Rural lifestyles and a population density of fewer than 10 persons per square mile characterize the Upper Pit River Watershed. The largest city is Alturas, with a current population of 2,840. Other communities include Adin, Bieber, McArthur, and Fall River Mills. Irrigated agriculture (pasture, hay, and some specialty crops such as mint and wild rice), livestock production (cattle and sheep), timber production, and recreation (camping, hiking, hunting, and fishing) are the principal economic drivers in the watershed. The overall population of Modoc County has seen little change in the past 70 years (8,000 in 1930, compared to 9,500 in 2000). Efforts to improve and stabilize the local economy are focused primarily on strengthening natural resource-based industries.



Ranch and irrigated hayfield in Pit River Watershed



Ranch on Willow Creek near Bieber

Management Objectives

A watershed-scale management effort began in October 2000, with the establishment of the Pit River Alliance (a collaborative, nonprofit organization of agencies, private landowners, and resource advocates). This led to the completion of the *Upper Pit River Watershed Assessment* (October 2004) and the *Upper Pit River Watershed Management Strategy* (March 2010). The strategy discusses primary management issues and recommends projects and other actions to achieve the following objectives:

- » improve water quality in the Pit River and tributaries;
- » increase summer base flow to benefit habitat and irrigation needs;
- » reduce river and stream channel erosion;
- » sustain and improve aquatic, riparian, and wetland communities;
- » sustain and improve upland vegetation and wildlife communities;
- » control spread of invasive species and noxious weeds;
- » establish better coordination of data collection and information sharing;
- » support community sustainability through natural resource-based economies; and
- » strengthen community watershed stewardship through education and outreach.

The Upper Pit River Watershed (including Fall River, Hat Creek, and Burney Creek) has received “regional” designation from the IRWM program. The Pit River Alliance, together with the Northeastern California Water Association, has taken the lead in pursuit of an IRWM planning grant.

Management Organizations Active in the Watershed

Pit River Watershed Alliance

Formed in December 1999, the Pit River Watershed Alliance is a collaborative group of agencies and landowners working to achieve long-term economic and environmental health of the watershed. There are 27 signatory partners to the Pit River Watershed Alliance MOU, and administrative assistance is provided by the North Cal-Neva Resource Conservation and Development Council. Notable achievements include 5 years of watershed monitoring data, the 2004 Pit River Watershed Assessment, and the 2010 Upper Pit River Watershed Management Strategy. Given the large volume of public land in the watershed, both Modoc National Forest and BLM have been active participants in the Alliance and have implemented numerous environmental improvement projects on the lands they manage.



Central Modoc RCD demonstrates solar-powered stock water system



Annual field day with the Pit RCD

Resource Conservation Districts

The Upper Pit River Watershed is within the jurisdiction of the Central Modoc, Pit, and Fall River RCDs. These organizations have been actively involved in assisting private landowners and implementing on-the-ground watershed-improvement projects. These include projects to address channel erosion and habitat loss, improved livestock management, stream restoration projects to restore floodplain function and wet meadow conditions, and projects to improve upland vegetation (juniper removal and reducing fire and management of forest fuel-load conditions). Resource advocate groups such as California Waterfowl Association, Ducks Unlimited, and Cal Trout also have made significant contributions toward ecosystem-improvement projects on private lands.

Northeastern California Water Association

Northeastern California Water Association is a watershed-wide organization of agricultural water users formed principally to protect local water rights. The organization also has assumed responsibility as the coalition to represent agricultural dischargers and comply with the requirements of the Central Valley RWQCB’s Irrigated Lands Regulatory Program.

The River Center

Established in 1995, the River Center is a nonprofit community education center located in Alturas and supported by the Central Modoc RCD and Modoc County Office of Education. The River Center mission is to foster natural-resource stewardship and promote the sustainability of the local community. Programs include a visitor and interpretive center, watershed curriculum development for teachers and students, special events, field trips, and tours. The overall objective is to increase community appreciation and understanding of the attributes of the Pit River Watershed.



Project tour on south fork Pit River



River Center in Alturas



River Center in Alturas



Reviewing potential erosion control project on Witcher Creek



Fall River near the confluence with Spring Creek



Bear Creek, tributary to Fall River



Mount Shasta and the Tule River

Pit River: Fall River Watershed

The Watershed at a Glance

Fall River, located in eastern Shasta County, is one of the state's major "spring rivers." It is formed by a series of large springs that are believed to originate from snowmelt off Mount Shasta and surrounding volcanic regions. Much of this water traverses the region through a complex network of underground lava tubes and fracture systems. The river meanders for approximately 15 miles through Fall River Valley before entering the Pit River and eventually Lake Shasta. Because of its large volume of cold, clean water, Fall River is notable for its "blue ribbon" wild trout fishery. The Fall River Valley also supports significant agricultural operations (livestock forage crops, mint, strawberries, and wild rice) and is an important waterfowl habitat area. Flow in the lower river is diverted and used by PG&E for hydropower production.

WATERSHED STATISTICS

Watershed Size: 250 square miles

Watershed Length: ~15 miles

Average Annual Precipitation: 15 inches

Elevation:

Highest–6,300 ft.

Lowest–3,200 ft.

Population: ~2,000

Management Issues: protection and enhancement of the wild trout fishery, water quality (sediment and bacteria), invasive plant species (Eurasian milfoil), balancing public recreation and private land use

Counties: Shasta



Medicine Man Spring on Upper Fall River



Fall River Valley during high spring runoff

Hydrology

Surface waters in the Fall River Valley include mainstem Fall River, Big Lake, Tule River, and Little Tule River. The majority of flow in Fall River comes from Thousand Springs, Rainbow Springs, Spring Creek, and a number of other smaller springs and seeps. The only major tributary stream is Bear Creek near the headwaters of Fall River. Bear Creek contributes significant inflow during the winter and spring runoff season and then typically goes dry in its lower reaches by mid-summer. Fall River flows are joined by water from Big Lake and Tule River (also spring-fed) and enter the Pit River near the town of Fall River Mills. At this lower river location most of the flow is diverted by PG&E to generate electricity through the Pit 1 Powerhouse. Approximately 100 cfs is bypassed through Fall River Mills for fish, habitat, and recreation benefits in the lower reach of Fall River. Because the river is spring-fed, surface flow in Fall River is consistently high throughout the dry, summer season, even in low rainfall years. The average daily flow is around 1,000 cfs. Groundwater in this watershed is confined largely to the Fall River Valley Groundwater Basin. Storage is estimated to be 1,000,000 acre-feet to a depth of 400 feet and is an important supply source for irrigated agriculture.



PG&E Pit 1 diversion (from above)



PG&E Pit 1 diversion (from below)



Irrigation tailwater discharge to Fall River

Water Quality

Protecting the high quality waters of Fall River is a significant management issue. In addition to water quality and habitat needs for support of the wild trout fishery, many people living along Fall River divert water directly for their household supply. A comprehensive water quality study was conducted by the Pit River Alliance and the RWQCB during the period 2001 to 2005. Based on the findings of this study, general water quality conditions in Fall River are characterized as follows:

- » temperature range: 9C to 18C;
- » pH: 8 to 9;
- » turbidity: 2 to 4 NTU (with occasional higher spikes);
- » fecal coliform bacteria: 20 to 100 MPN (with occasional higher spikes); and
- » nitrate: 0.1 to 0.22 mg/l.

Findings from the 2001–2005 study did indicate that existing bacteria levels in the river have decreased from levels reported from data collected in the 1980s. Minimizing bacteria concentrations is a significant management objective given the ongoing domestic supply use of the river. The study found no apparent change in long-term trends for



Bank erosion from muskrat borrows



Fall River turbidity (at Spring Creek confluence) from erosion in Bear Creek drainage



Invasive milfoil in lower Fall River



Controlled watering access protects river bank habitat

temperature and nutrients. Current concerns over Fall River water quality are focused on sediment accumulation in the upper river and the spread of the invasive weed species Eurasian milfoil. Fall River is 303(d) listed as an impaired water body for sediment. Other water quality–related issues on Fall River are bank erosion from livestock trampling, irrigation tailwater discharge, and channel and riparian habitat impacts from muskrat burrowing.

Fish and Wildlife

The wild trout fishery of Fall River is important both ecologically and economically, and while DFG fish survey records are inconclusive, many river users and fishing guides believe this valuable resource is



Fall River rainbow trout



Fall River trout fishermen



Snow geese in the valley

in decline. Populations of the endangered Shasta crayfish have been found in most of the major headwater springs of the Fall River and Tule River. Protection of Shasta crayfish and rough sculpin (state-listed as threatened species) is a principal management issue. The Fall River Valley is a major habitat area for resident and migratory waterfowl, and both Ducks Unlimited and California Waterfowl Association are working with private landowners to protect and enhance waterfowl habitat.

Vegetation

Most of the upper watershed is dominated by mixed conifer forest that includes a well-represented hardwood component. Meadows and riparian habitat are common along the drainages and in low-lying areas. Valley lands along Fall River are mostly irrigated pasture and hay production, while recent years have seen an increase in wild rice acreage in the valley. Fuel loading and threat of catastrophic wildfire continue to be important issues as more than 70% of the watershed is composed of forest land. A large upper watershed wildfire in 1977 is believed to be a major contributor to the current problem of sediment accumulation in the Upper Fall River Watershed.



Wet meadow in Bear Creek drainage



Fall River



Downtown Fall River Mills

Life in the Watershed

Historically, the watershed was inhabited by the Achumawi (Pit River) tribe. Early European settlers recognized the hydropower opportunity on the Fall River and Pit River system and in 1920 embarked on establishing the largest hydropower system in northeast California at that time. In the following years, drainage and water management improvements were made to expand irrigated agriculture in the valley. Today, rural lifestyles and low population density characterize the Fall River Watershed, and a number of private homes have been built along the river. The largest town in the watershed is Fall River Mills (population 648). McArthur is another center of population. Ranching, farming, and timber production are the primary resource activities, and the principal agricultural crops are wild rice, strawberries, hay, and irrigated pasture. Tourism and recreation are very important to the local economy.

Management Objectives

Management issues in the watershed focus on protecting and enhancing the unique aquatic resources of Fall River, maintaining or improving water quality, managing upland forests for sustained timber production and fire control, and preserving



River bank vegetation prevents erosion



Homes on Lower Fall River

the rural, agricultural lifestyle of the watershed. The Fall River RCD recently completed the *Fall River Watershed Assessment and Management Strategy* (March 2010). This report includes seven management goals for addressing watershed concerns. While these are listed as independent objectives, it should be recognized that they are largely interrelated:

- » restore and maintain the blue ribbon trout fishery;
- » maintain or improve water quality;
- » reduce erosion and river sedimentation;
- » control invasive species and noxious weeds;
- » protect and restore source waters (meadows, springs, etc.) to meet water use demands and ecological needs;
- » support better data collection, data sharing, and reporting; and
- » support community sustainability by strengthening natural resource-based economies.



'The round barn' recently restored in Fall River Mills

Management Organizations Active in the Watershed

Fall River Resource Conservation District

In addition to the recently completed Fall River Watershed Assessment and Management Strategy, Fall River RCD has been actively involved in implementing watershed-improvement projects that include stream and meadow restoration, livestock enclosure fencing, muskrat control, stream-crossing improvements (on roads and railroads), and noxious weed eradication.

Fall River Conservancy

Fall River Conservancy was formed in May 2008 by a group of Fall River Valley landowners with the intent of improving water quality and aquatic habitat in Fall River. They have received their 501(c)3 nonprofit status, established a Board of Directors, and developed a 5-year strategic plan. The Conservancy hopes to attract support from private donors and work cooperatively with the RCD, state and federal agencies, and landowners to implement river improvement projects.

PG&E

PG&E is a major private landowner in the watershed with approximately 13,000 acres along Fall River and the McArthur Swamp area. As part of the 2003 bankruptcy settlement, PG&E and the Pacific Forest and Watershed Lands Stewardship Council have been working on a long-term plan to manage these lands to preserve and enhance habitat, open space, recreation, forestry, and grazing and to identify and manage cultural resources. This management plan will be one of the first to be approved by the Stewardship Council and will be one of many plans that ultimately will address all 140,000 acres of PG&E watershed lands in California.

Others

Other agencies and organizations have made important contributions to protection and improvement of Fall River Watershed conditions. This work includes livestock fencing, muskrat eradication, and habitat improvement projects. Those involved include NRCS, USFWS, DFG, Fall River Wild Trout Foundation, Cal Trout, and California Waterfowl Association.



Private residence on Fall River



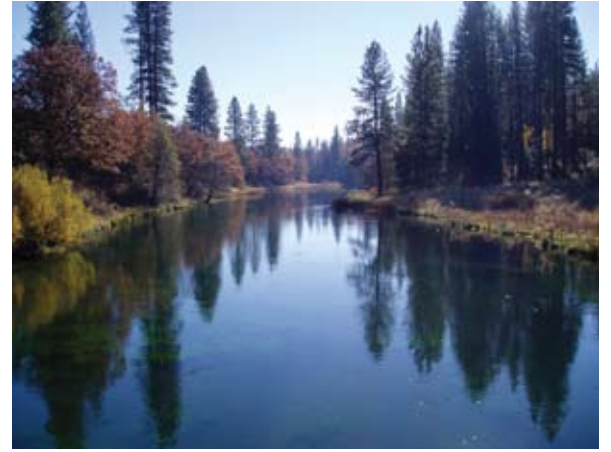
Homes on Eastman Lake (headwaters of the Little Tule River)



Hat Creek at PG&E public fishing access



Upper Hat Creek at Lassen National Park



Hat Creek above Highway 299

Pit River: Hat Creek Watershed

The Watershed at a Glance

Hat Creek is a major Pit River tributary entering Lake Britton several miles downstream of Fall River Mills. Source waters are snowmelt and groundwater flow from the volcanic geology of Lassen National Forest, Lassen Volcanic National Park, and the surrounding volcanic region. This large source of cold, clean water, and expansive public land make Hat Creek one of the state's important designated wild trout waters. Private ranch lands along Hat Creek are used for irrigated pasture and livestock production.

WATERSHED STATISTICS

Watershed Size: 300 square miles

Watershed Length: ~40 miles

Average Annual Precipitation: 18 to 60 inches

Elevation:
Highest—10,400 ft.
Lowest—2,800 ft.

Population: ~1,000

Management Issues: protecting and enhancing wild trout populations, aquatic habitat conditions (sediment and muskrat impacts), managing organized and dispersed recreation, forest health and wildfire

Counties: Shasta



Hat Creek at Old Station

Hydrology

Inflow to Hat Creek and its tributaries comes mostly from precipitation that is captured underground in the extensive lava flows off the north slope of Mount Lassen and the Modoc Plateau. This results in a year-round flow that remains relatively constant with a mean daily flow of about 500 cfs. Near the town of Cassel, Hat Creek flows are captured and diverted to the Hat 1 and Hat 2 PG&E hydropower project operations. Two spring-fed lakes, Rising River Lake and Crystal Lake, also provide significant inflow to Hat Creek.



PG&E Hat Creek Powerhouse

Water Quality

Water quality data come principally from studies by PG&E as stipulated in their FERC relicense requirements. High inflow from underground springs and seeps into Hat Creek results in very good water quality with cold temperatures (8 to 15° C), high dissolved oxygen (9 to 12 mg/l), low turbidity (0 to 2 NTU), and low dissolved solids (70 to 100 mg/l). Hat Creek water quality meets or exceeds requirements for the principal beneficial uses (coldwater species habitat, contact and non-contact recreation, hydropower production, and agricultural supply) and supports a robust wild trout population.



Mount Lassen, sourcewaters for Hat Creek



Large springs feed upper Hat Creek



Hat Creek near confluence with Lake Britton

Fish and Wildlife

Hat Creek was designated as one of the state’s first Wild Trout Streams by the Fish and Game Commission in 1972, following a restoration project that changed the stream from one overrun with suckers and other non-game fish to a highly productive wild trout fishery. In recent years, anglers and DFG have seen a decline in the trophy trout status of Hat Creek. The suspected causes include damage from livestock grazing (now controlled), and increased erosion/sedimentation from muskrat burrowing and other sources. Problems from sedimentation have led to a decline in aquatic plant growth and production of aquatic insects. Other notable aquatic species unique to this area are the endangered Shasta crayfish and rough sculpin. DFG operates a large fish hatchery on Hat Creek at Baum Lake, and both Crystal Lake and Baum Lake provide significant wetland habitat for waterfowl production. The heavily forested, sparsely inhabited uplands provide habitat for species such as spotted owls, northern goshawks, and pine martens, while more open areas (including irrigated pasture lands) are important habitat for mule deer and greater sandhill cranes.



Sandhill crane on Hat Creek meadow



DFG bank stabilization project (erosion from muskrats)



DFG bank stabilization project

Vegetation

Most of the Hat Creek Watershed is dominated by conifer forests mixed with brush and some hardwoods. Meadows and riparian areas are common along drainages and in low-lying areas. Drier areas tend to support juniper and sage species. Lower in the watershed and adjacent to Hat Creek, the topography is flatter with significant acreage of irrigated agricultural land.



Upland vegetation—timber and brush field

Life in the Watershed

Rural lifestyles with low population density characterize the Hat Creek Watershed. The small community of Hat Creek is the most populated area. More than 60% of the watershed is held by the USFS and 14% by the National Park Service. Large private timber companies also manage a significant portion of the watershed. Private ranch lands on the valley floor along Hat Creek support livestock production, pasture and hay, and recreation.



Uncle Runts in Old Station



Fishermen on Baum Lake



Hat Creek County Park



Hat Creek valley irrigated pasture



Rising River, tributary to Hat Creek

Management Objectives

Fall River RCD recently completed the *Hat Creek Watershed Assessment and Management Strategy* (March 2010). In summary, management objectives identified in this report are as follows:

- » improve habitat quality for wild rainbow trout;
- » improve recreational opportunities while reducing impacts of dispersed recreation;
- » improve forest health and manage wildfire risk;
- » maintain the excellent water quality of Hat Creek;
- » sustain water supply for irrigation demands, hydropower, and ecological needs;
- » support community sustainability by strengthening natural resource-based economies; and
- » improve data collection, data sharing, and information outreach.

Management Organizations Active in the Watershed

Fall River RCD

The Hat Creek Watershed lies within the jurisdiction of the Fall River RCD. The RCD recently completed the *Hat Creek Watershed Assessment and Management Strategy* and will be working with the Hat Creek Resource Action Committee, the Fall River Conservancy, and other stakeholders to identify and implement specific improvement projects.

Hat Creek Resource Action Committee

The Hat Creek Resource Action Committee is an informal advisory group of agencies, fishing organizations, PG&E, and tribal interests that meet periodically to discuss stream conditions and identify project opportunities for Hat Creek. The group was instrumental in implementing a project to treat a 750-ft reach of eroding streambank that was destabilized by muskrat burrowing, cattle trampling, and angler foot traffic.



Burney Falls State Park



Upper Burney Creek



Burney Creek in Long Valley near Burney

Pit River: Burney Creek Watershed

The Watershed at a Glance

Burney Creek originates in the forested uplands of eastern Shasta County, then flows through the town of Burney and into the Pit River. Its most notable feature is Burney Falls (located in McArthur–Burney Falls Memorial State Park), which has been called by some “the eighth wonder of the world.” The watershed supports valuable commercial timberland and high quality sport fishing for resident rainbow trout. Population in the watershed is mostly centered on the town of Burney.

WATERSHED STATISTICS

Watershed Size: 150 square miles

Watershed Length: ~25 miles

Average Annual Precipitation: 20 to 60 inches

Elevation:

Highest–8,630 ft.

Lowest–2,700 ft.

Population: ~4,000

Management Issues: forest health and fire management, water quality (temperature and sediment), aquatic habitat protection and improvement

Counties: Shasta



Burney Creek channel erosion

Hydrology

Mean daily flow in Burney Creek, as measured at the Burney Falls USGS gage, is about 250 cfs in the wet season and 150 cfs in the dry season. Streamflow is perennial from the headwaters downstream of the town of Burney. Below this point, reaches of Burney Creek typically go dry in late summer. Given the dominant volcanic geology, it is assumed that surface flow in the creek goes underground at these locations and resurfaces again in the vicinity of McArthur–Burney Falls State Park. There are several relatively small, isolated groundwater basins, the largest being the Goose Valley and Dry Burney Creek Basins (5 to 7 square miles).



Burney Creek near the town of Burney

Water Quality

Limited data from USGS and EPA indicate water quality in Burney Creek is generally good and supportive of all beneficial uses. Recent monitoring by the Pit River Alliance and the Central Valley RWQCB does show a decline in water quality as Burney Creek flows out of the forested uplands, through the town of Burney, and through irrigated pasture and wild rice operations downstream of Burney. Although Burney Creek is currently not 303(d) listed as impaired, there are persistent concerns among some local residents over elevated levels of turbidity, temperature, and bacteria.



Burney Creek near the town of Burney



Goose Valley wild rice field

Fish and Wildlife

Rainbow trout are common throughout the watershed and provide for an excellent sport fishery. The expansive, sparsely populated forest and meadow areas provide important habitat for a variety of mammals, raptors, and waterfowl.

Vegetation

Upper elevations in the watershed are composed of mixed conifer forest with a component of hardwoods (particularly in the mid- and lower-elevation areas). There are several large meadow systems in the upper watershed and on privately owned valley lands along Burney Creek. Irrigated agricultural land supports pasture and wild rice production.



Irrigated hay field on the Black Ranch



The Black Ranch, hay and wild rice



Burney area ranch and pasture

Life in the Watershed

The majority of the watershed is privately owned and managed for commercial timber production. There are several large ranches with irrigated land used for pasture, hay, and wild rice. The area in and around the town of Burney (population 3,200) includes retail stores and timber products industry and a diatomaceous earth mine. PG&E has a large regional office, and recently, a large wind power generation project was constructed on Hatchet Mountain above the town of Burney. The local economy has been hurt in recent years by the decline in the forest products industry, and in 2000 the median annual household income was listed as \$38,800. Nearby Lassen Volcanic National Park and McArthur–Burney Falls Memorial State Park receive approximately 200,000 visitors annually, providing some benefit to the local economy.

Management Objectives

Fall River RCD recently completed the *Burney Creek Watershed Assessment and Management Strategy* (March 2010). That report identifies principal management issues and recommended actions that include:

- » improve forest health and vigor;
- » improve water quality in Burney Creek;
- » support better data collection, data sharing, and public outreach; and
- » support community stability by strengthening natural resource-based economies.

Management Organizations Active in the Watershed

Fall River RCD

The Burney Creek Watershed lies within the jurisdiction of the Fall River RCD. To date, activity has involved mostly planning and assessment. With the completion of its management strategy, the RCD will be working with landowners to identify opportunities to implement watershed improvement projects.



Burney Sierra Pacific log mill



Wind power on Hatchet Ridge



Whitewater kayaker on the Lower Pit River



PG&E Pit 6 Dam



Pit 6 Reservoir shoreline

Pit River: Lower Pit River Watershed

The Watershed at a Glance

The Lower Pit River Watershed starts at Lake Britton and continues downstream for approximately 40 miles to the confluence with Lake Shasta. In this reach is a series of PG&E reservoirs that are operated for hydropower generation (Pit 4, 5, 6, and 7 Reservoirs). The watershed area is mostly steep, forested terrain that lies within the Shasta-Trinity National Forest or is privately owned by PG&E and commercial timber companies. The area is unpopulated except for the small community of Big Bend. River management in this part of the Pit River Watershed is controlled principally by PG&E and the FERC requirements that were stipulated in the recently completed Pit 3, 4, and 5 relicensing agreements. Management issues center on required instream flow in the river needed to protect aquatic life, recreational uses, and ecological functions within the river corridor.

WATERSHED STATISTICS

Watershed Size: 700 square miles

Watershed Length: ~40 miles

Average Precipitation: 70 inches

Elevation:

Highest—6,000 ft.

Lowest—1,000 ft.

Population: ~300

Management Issues: instream flow for maintaining river function, special status species (bald eagle and yellow-legged frog), recreation and cultural resources, wild trout protection and enhancement

Counties: Shasta



Iron Canyon Reservoir

Hydrology

The daily average Pit River flow through this reach is about 3,000 cfs, and summer flows rarely fall below 2,000 cfs. River flows are regulated through operation of Lake Britton, a 140,000-acre-foot reservoir, and the series of PG&E reservoirs downstream. Flows in this reach of the Pit River also are augmented by the PG&E McCloud-Pit Hydropower Project, where water is diverted from the McCloud River and transported to the Pit River through Iron Canyon Reservoir. Minimum bypass flows for the Pit 3, 4, and 5 reach of the river are stipulated in the FERC license (i.e., required instream release from hydropower operations in order to maintain the river ecosystem).



Hatchet Creek, tributary to the Pit River

Water Quality

Water quality through this reach of the Pit River is generally good, and the water quality concerns that do exist are influenced largely by the quality of the Pit River coming out of the upper watershed. These concerns include nutrient enrichment and algae blooms in Lake Britton, water temperature, and high levels of turbidity and suspended solids.

Fish and Wildlife

This reach of the Pit River supports warmwater species (e.g., bass, crappie, catfish, bullhead), primarily in Lake Britton, and an outstanding coldwater fishery for native rainbow trout in the lower river. Native and nonnative fish species are important prey items for the significant population of bald eagles. The Lower Pit River Watershed harbors one of the state's most important bald eagle populations, and it includes both resident and migratory birds.



Canada geese on the Lower Pit River



Lake Britton



Uplands vegetation in the Pit River canyon

Vegetation

Upland vegetation is predominantly mixed conifer and oak woodland. A narrow band of riparian vegetation grows along the Pit River, and the transition from riverine habitat to upland habitat is abrupt. Tree species common in the riparian area are alder, big-leaf maple, Oregon ash, and willow.



Pit River near Big Bend

Life in the Watershed

Native American peoples have historical and cultural ties with the Lower Pit River region (and throughout the entire Pit River Watershed). Native American inhabitants of the watershed, collectively known in past literature as the Achumawi, are today referred to as the federally recognized Pit River Tribe. In addition to the numerous tribal properties,

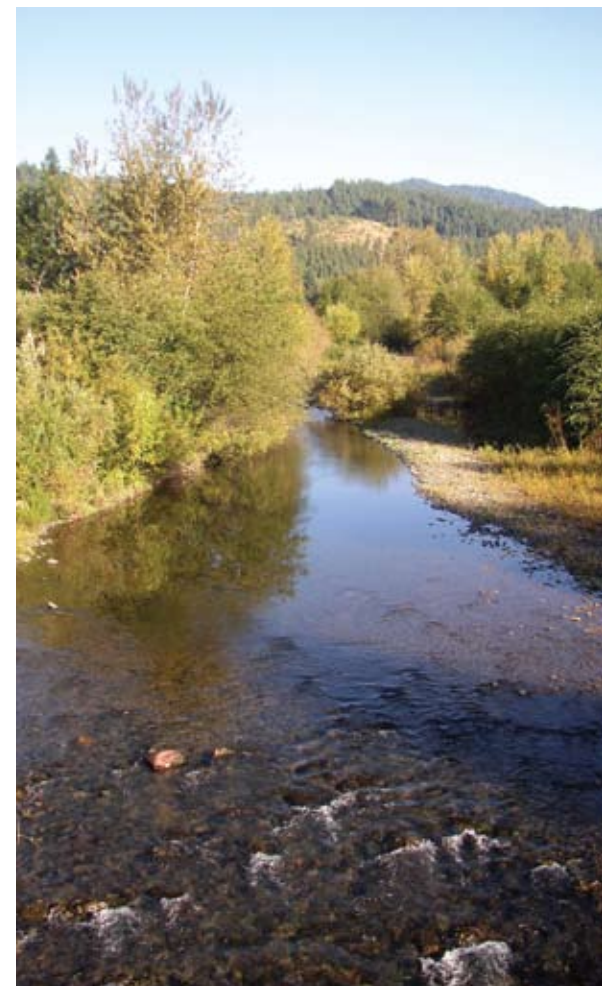
land in this watershed area is mostly within the Shasta-Trinity National Forest, or is private land owned by PG&E. There are also large tracts of privately owned commercial timberland designated by Shasta County as Timber Management Zone. The small community of Big Bend and its surrounding rural residents number about 300.



Big Bend general store



Lower Pit ranch and pasture land



Kosk Creek, Pit River tributary

Management Issues

Key issues associated with licensing the hydropower operations in the Lower Pit Watershed include establishing an appropriate flow regime in the bypassed reaches of the river to maintain sustainable ecosystem functions and to protect and enhance fish and wildlife resources, particularly native rainbow trout and bald eagle populations. Management in the Lower Pit Watershed is mostly the responsibility of PG&E and the USFS; however, state and federal resource agencies, the Tribe, and other watershed residents have provided substantial input to the agreed-upon operating conditions for this reach of the river.



Pit River in McArthur