Mountain Meadow Watershed Restoration Action Plan

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Condensed to fit Web Page format

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Introduction

Plan Description

The *Mountain Meadows Watershed Restoration Plan* (MM WRAP) is based on input from members of the Mountain Meadows Watershed Group (MMWG), and is designed to be flexible, and includes accommodation for periodic review and revision as new information becomes available. Although the MMWG was formed to provide information to create this plan, it also has become a forum for the discussion of watershed issues beyond the plan. The plan is designed to achieve two goals:

1. **Provide a comprehensive assessment of the ecological condition of the Mountain Meadows Watershed.**

   This plan provides a community-based framework for maintaining and improving the watershed health of the private and public lands that drain into the Mountain Meadows Reservoir. The framework created by this Plan can be used to guide the development of individual and collaborative action plans for stakeholders in the drainage basin.

2. **Provide action alternatives to landowners based on site requirements and personal preference.**

This plan provides a large selection of effective and voluntary action alternatives that are intended for use as a technical and educational resource for landowners and managers in the region with a vested interest in the long term protection of the soil, water, and other natural resources of the watershed. In some cases, the recommended actions include further research in order to inform the development of additional recommended actions.

Plan Development

The Mountain Meadows Conservancy (MMC) initiated this project with support from a several funding sources. Founded in 2001, the MMC is a non-profit land trust focused

on the long term stewardship of the Mountain Meadows Basin of Northern California (**Figure 1**). The goal of the MMC is to improve the overall ecological conditions of the region through the implementation of best management practices, environmental restoration, voluntary land acquisitions, sustainable use of water resources and the development of economic and recreational resources consistent with the Lassen County General Plan.

The most important piece in the development of this plan has been the creation of the MMWG. This watershed group believes that the collaborative process facilitates consensus by engaging landowners and stakeholders into a dialogue that highlights the need for improved management of lands within the watershed. Creating the MMWG was guided by the intent to assemble a diverse collective of individuals that have similar concerns about their land. The MMC wanted this group to be comprised of landowners, lessees, land managers and other folks who know the land and have a stake in the management of its resources.

In November 2011 the MMC hosted the first meeting of the MMWG. The meeting was attended by two representatives of the MMC and two forestland managers. One represented Sierra Pacific Industries (SPI), which is a major private landowner in the watershed and the largest private landowner in the state of California; the other represented W.M. Beaty & Associates, a private forest land management firm that controls thousands of acres of the private lands in the watershed. The group had a productive meeting and quickly realized that there were more similarities than differences regarding concerns about the basin and its water resources.

Since that initial meeting many hours of outreach have been conducted to incorporate stakeholders into the group. These efforts have included hundreds of emails and phone calls that have resulted in larger, more inclusive stakeholder group that has met

numerous times. The second meeting of the MMWG took place on March 21st and had 13 attendees that represented many of the stakeholder groups of our region. Attendees included representatives of the United States Forest Service (USFS) with representatives of both of the ranger districts that manage lands in the Mountain Meadows Watershed- the Almanor and the Eagle Lake Districts of the Lassen National Forest, Sierra Pacific Industries, W.M. Beaty & Associates, Pacific Gas and Electric (PG&E), the Point Reyes Bird Observatory (PRBO), the Feather River Coordinated Resource Management (FR CRM), private ranchland owners, environmental consultants, and the public.

During our March meeting the group identified goals, objectives, and recommended actions that formed the basis for the **Stewardship Goals** section of this plan. Since the March meeting, the group has met three times; twice on private properties within the Mountain Meadows watershed and again on November 24th at the Mountain Meadows Conservancy office in Westwood. The field meetings allowed stakeholders involved with the MMWG to gives its members a chance to observe first-hand what types of issues need to be address as we develop a watershed restoration plan. The most recent meeting in Westwood, on November 24th, focused on this restoration action plan document, it also served as a platform for the stakeholders to voice their input on how to prioritize work in the watershed and how to move projects forward.

It has become clear that the stakeholders in the basin are concerned about the health of mountain meadows in the basin and these meadows are where the most urgent projects exist.

The Watershed

The Mountain Meadows Watershed forms the limit of this plan because this provides a clear boundary and a common denominator for stakeholders. Using the watershed as an organization tool helps provide context to the problems that landowners may encounter in their area; it can help when those landowners are searching for solutions

that address those problems. Landowners within a watershed often share similar challenges; an understanding of the watershed helps stakeholders understand their water supply, the fate of their runoff, soil erosion and deposition, wildlife habitat and many other important conservation issues.

For purposes of clarity, a watershed is sometimes referred to as a drainage basin, and is comprised of an area of land where all surface water converges to a single point. Therefore within a watershed, all lands are related to each other because they contribute water to a shared resource. A watershed acts as a funnel by collecting all the water within the area and channeling that water to a single point, usually the exit of the basin, also known as the outlet, is where the waters join another water body. In this example, the Indian Ole Dam on the outlet of the Mountain Meadows Reservoir is herein designated the exit of all waters of the basin. This point is designated the mouth (lowest extent) of the watershed; therefore defining its boundary and size. Within the Mountain Meadows basin there are numerous drainage basins, although the entire watershed can be seen as one drainage basin as well (**Map 1**).
Watersheds occur on many scales from small to large; the smaller drainages are often referred to as sub-watersheds. Several sub-watersheds combine to form a larger watershed. For example, the Mountain Meadows Watershed is one of many watersheds that constitute the Upper Feather River **(Map 2)**; the Feather River is one of the watersheds that make up the Sacramento River Watershed. Watershed boundaries are drawn along the ridgelines or high points, such as mountains or subtle rises in flat lands that surround the basin of interest.

An Overview of the Mountain Meadows Watershed

The Mountain Meadows basin is located at just over 5,000 ft. elevation at the headwaters of the Hamilton Branch of the North Fork of the Feather River, near Westwood, California. Westwood is a historic mill town that is surrounded by thousands of acres of public and private lands, many of which are owned by the heirs of the Walker Family that established the town and mill in the early 1900s; all of the Walker lands are managed by Beaty and Associates. These meadows are cradled between the Sierra Nevada and the Cascade mountain ranges.

There are numerous seasonal streams and six permanent creeks in the watershed that flow into the Mountain Meadows Reservoir (5,800 acre/feet at maximum storage): Deerheart, Duffy, Goodrich, Homer, Mountains Meadows, and Robbers. The reservoir is impounded by Indian Ole Dam (constructed in 1924 and then raised in 1962). The reservoir collects water from 158 square mile drainage basin and is a part of PG&E's Hamilton Branch Unit; this reservoir serves as a fore bay for the Hamilton Branch Powerhouse. According to the Federal Energy Regulatory Commission, this powerhouse was completed in 1921 and it generates approximately 26.1 gigawatt[1] hours per year; the normal operating capacity of the powerhouse is 4.8 megawatts[2]. It has a total of elevation drop of 410 feet and its maximum water flow is 200 cubic feet per second (cfs).

The Mountain Meadows Reservoir supports a multi-species fishery and is surrounded by thousands of acres of wetlands and meadows. Watershed lands are owned by the Lassen National Forest, members of the Walker Family, SPI and other private landowners. These lands are currently managed for timber production, hydropower, grazing and crushed rock production. Public access has been allowed on a majority of

[1] *(GWh--a gigawatt is equal to one billion watts or 1 gigawatt = 1000 megawatts)*
2 (MW-- a megawatt is equal to one million watts).

these lands. Current public uses include recreation such as hunting, fishing, wildlife viewing, canoeing, hiking, biking, horseback riding, skiing, ice skating, off-highway vehicle use and snowmobiling. Residents of Lassen and Plumas Counties rely on forested lands in the watershed to gather firewood in order to heat their homes.

The Mountain Meadows contain a diverse variety of wildlife habitat. According to the California Department of Fish and Game, this watershed contains 24 of the 52 wildlife habitat types described in "A Guide to Wildlife Habitat types of California" (see Appendix 3). These habitats include: Subalpine Conifer, Red Fir, Lodgepole Pine, Sierran Mixed Conifer, White Fir, Jeffery Pine, Ponderosa Pine, Eastside Pine, Juniper, Aspen, Montane Hardwood-Conifer, Montane Riparian, Alpine Dwarf Shrub, Bitterbrush, Montane Chaparral, Mixed Chaparral, Chamise-Redshank Chaparral, Annual Grasslands, Perennial Grasslands, Wet Meadow, Fresh Emergent Wetland, Pasture, Riverine, and Lacustrine.

The watershed area is also of enduring importance to the Honey Lake Maidu people of northeastern California with whom the MMC has a Memorandum of Understanding (MOU). Additionally, one of our board members is the Chairman of the Honey Lake Maidu. Including the Honey Lake Madiu in long term watershed restoration planning will help to ensure that their sacred places will be considered before projects are implemented. There are numerous significant sites in the watershed including landmarks that were left by the Mountain Maidu World Maker as well as historic ceremonial, village and burial sites dating back over six thousand years.

Natural History of the Mountain Meadows region

Location and Topography

The Mountain Meadows Watershed is located at the transition between the Sierra Nevada and Cascade Mountain Ranges and the Great Basin Province in northeastern

California. Each of these geologic regions has their own unique geologic histories. The watershed is situated east of the crest of the Sierra Nevada Range and west of the Pacific Drainage Divide. Waters that drain from the Caribou Wilderness form the headwaters of four major streams; two of which flow into the Pacific (Robbers and Bailey) and two which flow into the Great Basin (Pine Creek and the Susan River), which encompasses most of Nevada, and parts of California, southeastern Oregon, western Utah, southwestern Wyoming, and southern Idaho (**see map 3 below provided by the United States Forest Service**).

The watershed varies in elevation from nearly 7,500 feet mean sea level (msl) on Keddie Peak to 5,041 feet msl at Mountain Meadows Reservoir. The watershed drains volcanic peaks, densely forested mountains, and low gradient wet meadows.

Geology

The Mountain Meadows watershed is located along the divide between the Sierra Nevada Mountain Range, which is generally characterized by uplifting and volcanism; the Cascade Mountain Range, which is generally characterized by volcanism; the Modoc Plateau to the north, which is generally characterized by basalt flows; and the Basin and Range Province to the east, which is generally characterized by fault blocking and crustal extension. This confluence of geologic influence can be observed throughout the region.

At Mountain Meadows Reservoir it is possible to observe younger deposits of recently eroded material that has been deposited by moving water. These sedimentary materials have been deposited over lava flows that accumulated on older metasedimentary rocks of the Keddie Ridge. Many Geologists consider the lava flows of the Modoc Plateau and of Lassen Peak to be associated with the Cascadian Province. Sierra Nevada

geology consists of igneous and metasedimentary rock formations. The Great Basin Province is known for arid landscapes of upthrusted ridges and down dropped valleys, also known as the Basin and Range Province (**see map 4 below**).

Soils

There are many soil types in the Mountain Meadows basin. Much of the basin is underlain by volcanic flows that have strong resistance to erosion. The meadows are composed of fine grained soils that were deposited by moving water (alluvial); this makes streams within these areas highly susceptible to down cutting.

The following soils are commonly found in the watershed and are representative of common soils found at the various locations from the valleys to the peaks.

- Mountmed peat, 0 to 1 percent slopes—found on floodplains, very poorly draining
- Keddie loam, 0 to 2 percent slopes—found on floodplains, consisting of alluvium from mixed rocks
- Dotta gravelly loam, high water table, 0 to 5 percent slopes—found on alluvial fans at the transition between meadows and hills
- Lasco gravelly loam, 15 to 30 percent slopes—found on the mountain slopes, consisting of coarse rocks, well draining and stable
- Lasco gravelly sandy loam, 30 to 50 percent slopes—found in the hills, coarse rocks, good drainage

Mountain Meadows

Of all of the habitat types that are found in the watershed, the meadows are the most unique and the most sensitive to human disturbance. The meadows found in this watershed are among the most unique habitat types in the Sierra Nevada region. Access to perennial water and characteristic soil types in riparian areas has led to the

development of distinct plant communities from the adjacent upland (Kondolf et al., 1996). Meadows generally form where streams and rivers flow into to low-gradient, alluvial valleys and the shallow water table promotes a unique riparian vegetation community.

Meadows are disproportionately valuable compared to the area they cover in the Sierra Nevada for the ecological services they provide (Kattlemann and Embury, 1996; Kondolf et al., 1996). Ecologically functional montane meadows are hotspots for biodiversity in the Sierra Nevada (Kattlemann and Embury, 1996), and provide vital services such as flood attenuation, sediment filtration, water storage, and water quality improvement (DeLaney, 1995; Woltemade, 2000; Hammersmark et al., 2008), carbon sequestration (Povirk et al., 2001), and livestock forage (Torrell et al., 1996).

Though less than 1% of the area of the Sierra Nevada is comprised of riparian habitat (Kattlemann and Embury, 1996), approximately one-fifth of the 400 species of terrestrial vertebrates that inhabit the Sierra Nevada are strongly dependent on riparian areas (Graber, 1996). Montane meadows are among the most important habitats for birds in the Sierra Nevada (Siegel and DeSante, 1999; Burnett and Humple, 2003; Burnett et al., 2005). In the Sierra Nevada, meadows support several rare and declining bird species and are utilized at some point during the year by almost every bird species that breeds in or migrates through the region (Siegel and DeSante, 1999).

The majority of the meadows in the Sierra Nevada have undergone a long history of degradation that has led to a decrease in forage production, ecological diversity and they provide fewer ecological services (Ratliff, 1985; Knapp and Matthews, 1996; Castelli et al., 2000; Sarr, 2002; Krueper et al., 2003). Grazing, timber harvest, roads, culverts, dams, diversions, and alien species invasions have all contributed to meadow degradation (Ratliff, 1985). While many meadows have been resilient to these impacts, once a threshold has been passed many of these systems cannot readily recover on their own (Allen-Diaz, 1991; Micheli and Kirchner, 2002; Chambers et al., 2004; Briske et al.,

2008). Once significant channel incision and down-cutting has occurred and floodplain connectivity has been lost, actions may be necessary to restore form and function (Micheli and Kirchner, 2002).

Management and restoration of the lands in the Mountain Meadows watershed should consider the importance of theses meadow habitats to birds and other wildlife. A disproportionate number of the special status wildlife species in the Sierra Nevada are tied to meadows, including four bird species – Greater Sandhill Crane, Great Gray Owl, Willow Flycatcher, and Yellow Warbler. Moving forward, the MMC and the MMWG should use meadow-dependent bird species as indicators of meadow form and function; doing this will be a powerful adaptive management tool for informing management and restoration decisions in these meadows. Through such a focal species approach, it is possible to identify conservation priorities, help guide meadow restoration design and management prescriptions, and establish and evaluate management and conservation targets (Burnett et al., 2005; Chase and Geupel, 2005).

Flora

The flora of the Mountain Meadows watershed reflects its geographical position at the junction of the Cascade, Sierra Nevada and the Great Basin. Some elements of its flora are associated with the Cascades, and are near the southern extent of their distribution. Others are species of the Sierra Nevada, and at the northern extent of their range. Each forest type (red fir at the higher elevations, lodgepole pine in cool drainages, and pine and mixed conifer forest throughout the watershed) has its particular plant associates, but the greatest plant diversity is associated with montane meadow complexes, aspen stands, sagebrush flats, water bodies, springs, and riparian corridors.

Notable plant communities in the Mountain Meadows Watershed range from wet meadow within the vast Goodrich and McKenzie Meadow complexes, to rock-dwelling species that inhabit granitic outcroppings near Keddie Peak. Mountain Meadows Reservoir itself is host to a diverse suite of aquatic plant species in its shallow bays.

Vernal pools, seasonally inundated depressions, found east of Swain Mountain contain a flora dominated by colorful annual plant species whose flowering is dependent upon winter snowpack. Aspen stands along stream corridors and meadow edges contain floral diversity that exceeds that of adjacent forests. Some meadow complexes are characterized by an ecotone[3] of sagebrush plant communities at their margins, with big sagebrush and low sagebrush components in narrow bands between forest and meadow.

Eighteen plant species within the Mountain Meadows watershed have been accorded a Rare Plant Ranking by the California Native Plant Society's Rare Plant Program. One is a federally listed species, others are Region 5 Forest Service Sensitive species, and still others are Special Interest species for the Lassen or Plumas National Forests. See **Appendix 1** for additional information.

Wildlife

An exceptional diversity of species, including some that are listed as threatened, endangered and of special concern can be found within the Mountain Meadows watershed see **Appendix 2** for more information on listed species found in the watershed. These species include: the state-endangered Bald Eagle, Peregrine Falcon, Little Willow Flycatcher, and Great Gray Owl; the state-threatened Yellow Warbler, Vaux's Swift, Olive-sided Flycatcher, Yellow-headed Blackbird, Swainson's hawk, and Greater Sandhill crane, California Spotted Owl, Barrow's Goldeneye, Northern Goshawk, Black Tern, White-faced Ibis, Sierra Nevada Red Fox, Pine Marten, Sierra Nevada Snowshoe Hare. In total, seven threatened and endangered species, 33 bird and mammal species of special concern, and six rare plant species have been recorded in the basin. The current status of selected species is summarized in **Appendix 3.**

[3] *An ecotone is a transition between two biological communities, in this case the transition between meadows and sagebrush.*

In addition to special status species, many other important wildlife species occur within the watershed. These species include a diversity of nesting and migratory waterfowl species, often numbering in the thousands; upland game birds, including blue grouse and mountain quail; several raptor species, including rough-legged hawk and golden eagle; 20 species of shorebirds and colonial waterbirds; 13 mesocarnivore species, including American badger and long-tailed weasel; and a variety of big game species, including black bear, mountain lion, blacktailed and Rocky Mountain mule deer, and pronghorn antelope.

The Mountain Meadows Basin has been the focus of wildlife conservation interest for at least 50 years. In the late-1950's, the Department of Fish and Game conducted extensive waterfowl nesting studies in the wetlands and meadows adjacent to the reservoir and found outstanding waterfowl production (Personal Communciation with Mike Young fall 2012). Historic nesting waterfowl numbers and future potential numbers are high with restoration. Nesting species include Great Basin Canada geese and a variety of ducks. The Mountain Meadows Reservoir is probably the single most important wood duck nesting site in northeastern California due to the presence of snags that resulted from the flooding of the reservoir during its initial construction. Migratory waterfowl are abundant in all seasons.

In addition, some of the first California State Duck Stamp projects involving nesting islands and structures were constructed here in the mid-1970's. PG&E contributed sites and materials for nesting islands to benefit nesting ducks and geese. The California Waterfowl Association (CWA) and Wildlife Conservation Board (WCB) funded additional waterfowl nesting improvements in the mid-1990's. These projects included adjustments in livestock grazing and structures for nesting waterfowl. The total cost of these investments was in excess of $100,000 (Personal communication with Steve Robinson, fall 2012).

Climate, Precipitation and Runoff

The climate of the watershed is characterized as Mediterranean with dry summers and cool, moist winters. Approximately 80 percent of the precipitation at Westwood occurs from November to April and nearly 85 percent of the snow accumulates between December and March. Precipitation totals range from an average of nearly 80 inches per year around the Caribou Wilderness to 22.5 inches per year at Mountain Meadows Reservoir. The streams in the Mountain Meadows watershed follow seasonal patterns that are dominated by rainfall and snowmelt. The highest flows are observed during the snowmelt period during late spring and early summer.

The basin includes large areas that are near the average snowline, rainfall and rain-snow mixtures are common during winter storms. Warm rain events that follow snow events cause the greatest runoff, which can result in widespread flooding and erosion problems. Consequently, the overall timing and rates of runoff from the basin are highly sensitive to winter temperature fluctuations (Koczot et. al 2005). Precipitation in the watershed occurs primarily as rain at elevations under 5,000 feet above sea level. The Mountain Meadows watershed contains streams that ultimately flow through the Hamilton Branch into Lake Almanor. The Hamilton Branch and the North Fork Feather River join in Lake Almanor and the outlet of that reservoir is known as the North Fork Feather River, the Hydrologic Unit Code (HUC) code of the North Fork Feather River is 18020121).

The North, Middle, West Branch and South Forks of the Feather River are impounded by the Oroville dam at Lake Oroville, which represents 8 percent of California's reservoir capacity (California Department of Water Resources 1998, 2000). Below this impoundment the Feather River enters the California Water Project where it is delivered to over 20 million Californians and used to irrigate 750,000 acres of agricultural land in the Central Valley.

The Feather River is one of the primary tributaries to the Sacramento River, joining the Sacramento River north of the City of Sacramento.

Precipitation-runoff processes in the Feather River Basin determine short- and long-term streamflow variations that are of considerable local, State, and Federal concern. During the precipitation season water resources managers are responsible for forecasting streamflow, planning and managing reservoirs for winter floods, and measuring snowpack accumulation in basins such as the Feather. DWR managers, in particular, must plan for, and forecast, warm-season water availability. The primary source of warm-season streamflow is melting snow. DWR defines this snowmelt season as April 1–July 31, and assumes April 1 snowpack accumulations represent annual accumulations (California Department of Water Resources 2000).

During the snowmelt season, when flood-generating storms are rare, Lake Oroville receives about 40 percent of the annual total inflow (California Department of Water Resources 2000).

Lake Oroville plays an important role in flood management, water quality, and the health of fisheries, affecting areas downstream at least as far south as the Sacramento/San Joaquin River Delta. Two of the basin's major tributaries have been developed for hydropower with the capacity of generating 3.7 percent of California's peak daily electrical power demands (Freeman 2000).

Climate Change

Changes in climate have influenced, and are predicted to continue influencing, temperature, the timing and amount of precipitation, and the type of precipitation that the watershed experiences. Due to increasing temperatures within California more precipitation is expected to fall as rain and the timing of snowmelt is expected to be earlier in the year. Snowpack storage is predicted to decrease 25% by 2050 (Bales et al.

2011). According to Huang et al. (2012) the minimum temperature of the region between 1971 and 2001 demonstrated an upward trend of approximately 0.44 ^{o}C/decade.

Accompanying this change is also a 21% loss of runoff from April through June, over the period of 1964 to 2009, to the Lake Almanor basin as a whole. In regards to groundwater, since the 1960's approximately 30% of the inflow to Lake Almanor has ceased, this is likely due to the decrease in groundwater recharge resulting from less input of water from gradually melting snowpack (Freeman 2010). These changes have the potential to negatively impact mountain meadow habitat.

Humans in the Mountain Meadows Basin

Indigenous People

The Maidu have occupied the high elevation valleys between Lassen Peak and the Nevada border for thousands of years. Mountain Meadows and Big Meadows are both places that once supported many Maidu families; they both are no longer occupied due to the creation of Mountain Meadows Reservoir and Lake Almanor, and due to the elimination and privatization of available land. Beginning in 1902 the area began to be registered by homesteading ranchers and timbermen. As Great Western Power secured land in the Big Meadows for their hydropower projects many Maidu were displaced; some families moved the relatively short distance to the Hamilton Branch area and made their homes and livelihoods in Mountain Meadows. Many Maidu received allotment lands in the Mountain Meadows.

In the prehistoric period many anthropologists estimate that the Mountain Maidu population was roughly 3,000 (Kroeber 1925), by the turn of the century (1900) that figure was closer to 300 (Kelsey 1906). There are now approximately 500 Mountain Maidu people who make their homes in northeastern California. The Maidu believe

that the Creator placed them in these Mountain Meadows at the dawn of the world. The Maidu people have continuously practiced their unique cultural traditions ever since. The MMC has a Memorandum of Understanding with the Honey Lake Maidu their interests are protected. Future restoration activities in the watershed will incorporate the concerns of the Honey Lake Maidu.

European Settlers

Much of the early exploration of California was done by traders and trappers in their search for new areas in which to trap a variety of mammals including beavers. The intensive and continued trapping by these men soon led to a decrease in the beaver population in Northern California (Tappe 1941). Following the trappers, another wave of early white settlers came through this part of the state in search of a better way to get across the Sierra Nevada Mountains and into the rich goldfields of the Sierra Nevada foothills. After the Donner Party failed to find a safe way over the mighty mountains near Tahoe, a number of other explorers headed northwest and their travels brought them through the Long Valley into the Honey Lake Valley. The Lassen and Nobel Immigrant trails led travelers across northeastern California into the northern Sacramento Valley. Early settlers in the watershed raised livestock and cut hay in the alpine meadows of the region.

Historic Land Uses

Logging

The timber baron T.B. Walker learned about the virgin forests of the region and beginning in 1894, Walker acquired timberlands in this region. By 1905, he owned an estimated 900,000 acres in Lassen, Plumas, Siskiyou, Shasta and Tehama Counties.

Walker faced major challenges in the development of these lands due to the lack adequate infrastructure to move the timber to markets. Walker's original concept was

to establish several sawmills through the region, ultimately he bought land in the Mountain Meadows and made a deal with the Southern Pacific Railroad. This led to the development of Westwood; in 1912 plans were developed to establish a company town and sawmill in Mountain Meadows. The creation of a mill town in the region facilitated a major influx of inhabitants into the region. From 1912 to 1944 the Red River Lumber Company controlled the town of Westwood and the forestlands that surrounded the community (Purdy 2011). The Red River Lumber Company harvested timber from the region until the late 1930s when they sold the town of Westwood and their mill operations to the Fruit Growers Supply Company.

Livestock Grazing

Livestock producers have been using the Mountain Meadow basin since the 1850s. Most producers winter their herds in the Sacramento Valley due to the lack of feed and the harsh winter conditions that exist in the region. Most managers bring their livestock to the meadows in May and remain until the winter storms come in late October. In the past the livestock were driven into the mountains on foot (Haase 2005).

Because of their productivity, meadows have been exploited for livestock grazing, often leading to extensive degradation (Kauffman and Krueger 1984; Clary and Webster 1989). Overstocked meadows can experience trampling by grazing livestock, this has the potential to decreases soil macropore spaces, resulting in soil compaction. Soil compaction decreases infiltration, increases runoff during winter storms, increases rates of erosion and leads to reduced root growth and lower plant production (Orr 1960; Bohn and Buckhouse 1985).

Biomass Power Generation

A biomass burning power plant was constructed and operated on the northwest shore of Mountain Meadows Reservoir for approximately 25 years. This facility received forest waste generated by timber production operations in the region and burned those

materials to generate electricity that was then sold to PG&E. The power plant has recently closed down and this has made it difficult for local forest managers to dispose of the byproducts from their timber sales.

PG&E Company Hydroelectric Projects

As described above, the Mountain Meadows watershed is the headwaters of the North Fork Feather River Hydroelectric Project operated by PG&E. Water from the Mountain Meadows watershed is collected in Mountain Meadows and then is delivered to the Hamilton Branch Powerhouse through a flume. The powerhouse is located at the confluence of the Hamilton Branch with Lake Almanor.

Current Land Use

The following current impacts are likely to have an influence on the conditions of hydrologic function, stream conditions, fish and wildlife habitat in the Mountain Meadows watershed:

Operation of Mountain Meadows Reservoir for power production

The management of the Mountain Meadows Reservoir and the Hamilton Branch hydropower generation facility impact the stream conditions by fluctuating water levels in the Mountain Meadows watershed by varying the base level for tributary creeks. As a result, creeks either incise (cut into) or agrade (deposit material) as the base level fluctuates. Goodrich Creek is the main stream of concern within the watershed because it is the only perennial stream that flows into the reservoir; all others have intermittent surface flows and groundwater.

The Mountain Meadows Reservoir traps sediment, resulting in a gradual filling of the reservoir with sediment and a long term loss of storage capacity. The water diversions from the main channel of Hamilton Branch have altered the natural streamflow regime of that stream. With the diversions there is now a steady water flow and this has eliminated periodic flushing flows, this has led to vegetation encroachment and a disconnection between the active channel and the floodplain. Without access to a floodplain, heavy storm flows are unable to have their energy dissipate and thus the potential for intense erosion events increases.

Timberland management and associated road building

The USFS, Sierra Pacific Industries, W.M. Beaty & Associates and a variety of other landowners manage their lands for timber production. The primary impact is road construction and maintenance. Forest roads disrupt the natural hydrologic balance and contribute fine sediments to creeks; this sediment can degrade the habitat for native aquatic organisms and also is deposited into the Mountain Meadows Reservoir and potentially into lower water bodies.

Additionally, stream crossings can washout and constrict streamflows. Forests in the Mountain Meadows watershed are being managed for commercial timber and fuels reduction. Potential impacts resulting from timber harvest include soil disturbance, wildfires, a reduction of long term land productivity and the degradation of water quality. Timber is harvested on both private and public lands using different timber harvest practices and stewardship protocols.

Residential development

As the population in California continues to grow, more pressure is being placed on rural areas for the creation of new residential areas. Our region has been marketed as a four season recreational area and major new residential developments are planned in the area. Conversion of forest land to residential development will increase the area of

paved surfaces and therefore, runoff, and degraded water quality for downstream water users. This change facilitates an increase in the peak discharge to creeks by reducing the time between storm events and peak runoff. Increased peak runoff can result in incision and bank failure as the channel adjusts to a more powerful flow regime.

Mining

Hardrock mining has occurred on Round Mountain near the Mountain Meadows Reservoir.

The quarry is extracting rock from a deposit of Tertiary volcanic pyroclastic rock from a butte that is a prominent landmark in the meadows and that is also a sacred location for the Honey Lake Maidu who have lived in the meadows for thousands of years.

Wastewater treatment

The Westwood Community Services District (WCSD) operates a domestic wastewater treatment plant (WWTP) consisting of five ponds adjacent to Mountain Meadows Reservoir. The WCSD is regulated under Waste Discharge Requirements Order No. 5-01-253 by the California State Water Board. The average dry weather design capacity of the WWTP is 0.3 million gallons per day. The original wastewater collection system was built in the early 1900's as the town of Westwood was being developed.

During the last 40 years, several collection system upgrades have been performed. In 1998, the WCSD received a Community Development Block Grant and Farmers Home Administration loan to upgrade the remainder of the collection system, including the refurbishing of several pump stations. However, in the last decade, the WWTP has experienced repeated violations of their minimum freeboard specification. During the large storms of early 2006, the WWTP discharged thousands of gallons of partially treated wastewater to the Mountain Meadows Reservoir, in violation of their waste discharge requirements (CVRWQCB 2007).

Hydrologic monitoring

Although there are numerous gages collecting hydrologic data in the vicinity of the Lake Almanor watershed, there are no operating gages that measure streamflows in the Mountain Meadows watershed. The existing gages measure precipitation and the stream gage.

Existing streamflow records do not measure natural runoff conditions; the primary purpose of the operating flow gages is to measure the discharge through powerhouses and document the minimum flows released to bypass stream reaches. PG&E currently operates two gages on Hamilton Branch. Gage NF-83 records daily average discharge at the Hamilton Branch Powerhouse. Average flow at the powerhouse averaged 109 cubic feet per second (cfs) for water years 1976 to 1999. The discharge downstream of the Hamilton Branch Powerhouse diversion structure has been measured by PG&E since water year 1970; for the period of record from 1970 to 1999, the average annual discharge was 85 cfs. The monitoring of water flow and water quality will be an important element of future restoration activities in the watershed.

Seeking Solutions

The watershed has a number of problems and before a restoration plan can be developed by the MMWG, an inventory of existing conditions needs to be performed. It is expected that such an inventory is the logical next step once this plan is approved. With the data from a watershed inventory and with direction from the MMWG, a list of priority projects will be developed based on need. The following are examples of primary issues that exist in the watershed:

- Historic railroad grades
- Roads
- Stream Crossings
- Grazing management
- Irrigation diversions
- Meadow destruction by locals
- The lack of a water monitoring program

Stewardship Goals

The following goals have been developed by the MMWG. The group agreed that voluntary implementation of these actions by the watershed stakeholders will not only help address the problems related to the identified resource concerns, but will help prevent other problems from occurring. Thus, this type of watershed planning is intended to be as much a guide for preventive maintenance as it is a guide for addressing current concerns. This plan provides a first step toward the mutual understanding within the community which can lay the foundation for broad cooperative action into the future. The MMC believes that landowner participation in the development of a long term management plan will ensure that the positive attributes of the region will persist for the benefit of its residents, its producers, the consumers of the basin's products, the downstream water users and the native flora and

fauna of the basin. Most of the following goals and objectives will require additional funding to carry out.

The goals identified in this plan have been developed by stakeholders involved with the MMWG; they are elaborated with several objectives. These objectives are measureable milestones that will enable the MMC to track progress toward maintaining a natural balance in watershed resources. Most of the objectives involve promoting and encouraging practices and behaviors that will support development of a healthy watershed. Most objectives offer several recommended actions that can be undertaken to meet the objective. The listed actions are dependent on specific site conditions and personal preferences; they are intended to be used as a technical and educational resource for landowners and land managers in the region who have a vested interest in the long term protection of the soil, water, and other natural resources of the watershed. In some cases, the recommended actions include further research in order to inform the development of additional recommended actions.

Mutual understanding is a major characteristic of this planning and management program, this understanding is desirable regarding not only the technological issues related to watershed management, but also the social interaction that promotes a more complete understanding of the respective needs of the landowners and land managers of the Mountain Meadows Basin.

GOAL 1: To manage watershed lands to minimize unnatural rates of erosion and sedimentation

Objective 1.1-Reduce streambank instability and erosion in the basin
Recommended actions:
The MMC and the MMWG will conduct a detailed erosion assessment to identify issues and priority locations. Following this assessment an implementation plan will be developed with landowners and land managers.

Individual landowners can perform the following actions**:**
-Establish riparian buffers between creeks and adjacent land uses

-Exclude livestock from sensitive stream and lakeside areas
-Plant deep-rooted native or non-invasive perennial vegetation to maintain bank stability
-Develop off site water supplies to reduce livestock impact on the riparian areas and the shoreline of Mountain Meadows Reservoir
-Develop a grazing plan that restricts access to streams and riparian areas; additionally they can promote adequate soil cover to prevent erosion
-Remove and/or control non-native invasive vegetation in riparian areas
-Increase rainfall infiltration and reduce peak runoff in the meadows by establishing deep rooted native or non-invasive perennial grasses on rangeland and open spaces
-Use recommended stream bank stabilization practices to reduce erosion rates and keep the topsoil in place

Objective 1.2-Reduce erosion resulting from agricultural activities
Recommended actions:
-The MMC and members of the MMWG will conduct a detailed watershed-wide assessment to identify erosion issues and priority project locations
-The MMC and the MMWG will develop an erosion management plan in coordination with the Lassen County Farm Bureau, University of California Cooperative Extension, Natural Resouce Conservation Service and the California Department of Fish and Game
-The MMC and the MMWG will seek funding to assist landowners implement projects that reduce erosion

Individual landowners can perform the following actions**:**
-Work to ensure that bare soil is avoided, seeding cover crops where possible
-Establish vegetated filter strips adjacent to stream channels in order to reduce sediment deposition into the streams during overland flow events
-Install tail-water return systems with vegetation sediment traps
-Establish riparian buffer strips using native and non-invasive perennial vegetation between agricultural land and ditches, sloughs, and canals
-Vegetate irrigation ditches and canals with appropriate native perennial grasses
-Follow recommended agricultural erosion reduction practices
-Exclude livestock from sensitive stream side habitats and provide alternative off site watering systems for their livestock

Objective 1.3-Increase the use of erosion control techniques and practices for existing land uses
Recommended actions:
-The MMC and the MMWG will develop resources for landowners in order to inform them of the latest erosion prevention techniques.

Individual landowners can perform the following actions**:**
-Include erosion control and sediment control plans as priorities when planning soil

disturbing activities and projects
-Re-vegetate disturbed soil and cover with straw mulch or erosion control fabric as appropriate
-Use recommended general erosion reduction practices
-Monitor the condition of existing culverts, bridges and ditches and make necessary repairs before large volumes of soil enter streams and surface waters

Objective 1.4-Inform residents of the Mountain Meadows Watershed of the causes of erosion
Recommended actions:
-The MMC will conduct periodic tours of problem sites and successful erosion control projects
-The MMC will provide periodic trainings to demonstrate the practices used to reduce erosion
-The MMC will discuss the impacts of off road travel on the meadow and riparian ecosystem

Objective 1.5-Reduce the threat of catastrophic wildfire in the watershed
Recommended actions:
-The MMC and the MMWG will develop a plan that addresses areas of high risk of wildfire
-The MMWG will lobby for strategic fuels treatments throughout the watershed

GOAL 2: To use and manage surface water wisely to meet current and future needs

Objective 2.1-Support creative and collaborative solutions to surface water conveyance needs
Recommended actions:
-The MMC and the MMWG will analyze existing diversion structures and irrigation techniques used in the meadows
-The MMC and the MMWG will identify diversion structures that are in need of improvement
-Structures that can be retrofitted for fish protection will be identified and prioritized
-The MMC and the MMWG will facilitate improvements to water delivery systems in the watershed
-The MMWG will collaborate with the Natural Resources Conservation Service, Honey Lake Valley RCD, University of California Cooperative Extension, United States Forest Service and the Department of Water Resources to develop a long term diversion and irrigation plan for the Mountain Meadows Watershed
-The MMWG will encourage participation by landowners and lessees'

Objective 2.2-Perform outreach in order to improve community awareness of surface water needs

Recommended Actions:

-The MMC will provide residents and land managers with ongoing information about water management techniques through community workshops and the MMC website.
-The MMC will create a land management library which is accessible to Mountain Meadows Watershed landowners
-The MMC will encourage participation in the MMWG by local landowners/land managers
-The MMC will make the Mountain Meadows Watershed Restoration Action Plan available to residents, land owners, land managers, and leaseholders

Objective 2.3-Increase water use efficiency

Recommended Actions:

-The MMC and the MMWG will analyze current uses of irrigation water management practices on the rangelands within the Mountain Meadows basin in an attempt to improve the infrastructure for water conveyance

Individual landowners can perform the following actions:
-Follow Best Management Practices for water conservation
-Increase irrigation system efficiency on irrigated rangelands
-Install tailwater return systems on irrigated lands in order to reduce nutrient loading for downstream users

GOAL 3: To maintain and improve water quality for all water users

Objective 3.1-Prevent surface and ground water contamination from nutrients, chemicals and sediment

Recommended actions:

-Determine water quality issues
-Quantify water quality using consistent analytical methods
-Identify sources of water quality degradation
-The MMC and the MMWG will develop a water quality monitoring plan and begin to collect water quality samples at selected locations throughout the watershed
-The MMC and members of the MMWG will inventory water crossings that are failing and allowing additional sediment to enter the watershed

Individual landowners can perform the following actions:
-Manage livestock to minimize access to streams and riparian areas
-Implement erosion control practices (See Goal 1)

-Incorporate Integrated Pest Management techniques
-Install and maintain filtration strips adjacent to streams
-Vegetate irrigation ditches, sloughs, and canals with appropriate permanent plantings such as grasses, sedges, rushes, and forbs

Objective 3.2-Determine sources of water quality impairment
Recommended actions:
-The MMC and the MMWG will collaborate with local landowners and land managers to assess point sources and non point sources of water pollution in the basin
-The MMC and MMWG will remain current on local water quality issues by communicating with the Lassen County Farm Bureau, Natural Resource Conservation Service, University of California Cooperative Extension, Department of Water Resources, Pacific Gas & Electric and the United Sates Forest Service
-The MMWG will provide citizen monitoring of lands within the basin in order to observe direct causes of water quality degradation

Objective 3.3-Increase community awareness of the local causes of water quality impairment
Recommended actions:
-The MMC will provide residents of the Mountain Meadows Watershed with current information about water quality improvement techniques through community workshops, and their website.
-The MMC will encourage participation in the Mountain Meadows Watershed Group
-The MMC will make the Mountain Meadows Watershed Restoration Action Plan available to all residents of the region
--The MMWG will provide landowner education for self-directed, simple and confidential water quality monitoring techniques; additionally the MMC will develop a monitoring program with the local schools that provides an opportunity for youth of our region to learn about water quality testing and the value of clean water
-The MMC will secure funds to purchase water quality testing equipment

GOAL 4: To maintain and improve watershed habitats to support a diversity of native plants and animals

Objective 4.1-Protect existing native plant and animal communities, habitats, and wildlife corridors
Recommended actions:
-The MMC will identify critical wildlife habitat areas in the Mountain Meadows Watershed, taking into account existing high quality habitat, gaps in high quality habitat, and other areas that have the potential to host sensitive species

-The MMC and the MMWG will prioritize projects in areas that have a high potential to improve a diversity of habitats
-The MMC and the MMWG will perform outreach activities that educate local stakeholders about sensitive habitat areas

Objective 4.2-Reestablish native plant communities in appropriate areas
Recommended actions:
-If deemed necessary, the MMC may coordinate the development of Safe Harbor Agreements between landowners and the USFWS
-The MMC may facilitate a Safe Harbor agreement and coordinate permits for restoration work in the watershed

Individual landowners can perform the following actions:
-Promote habitat diversity by planting native vegetation on areas that are not being managed for production
-Expand existing riparian areas using native vegetation
-Exclude livestock from sensitive areas
-Install native vegetation around ponds
-Install native vegetation along irrigation canals and ditches as appropriate
-Use recommended restoration practices
-Fence stock ponds and riparian areas, while also installing off-site watering systems to control livestock access to sensitive vegetation communities

Objective 4.3-Establish and maintain wildlife corridors between open spaces
Recommended actions:
-Members of the MMC and MMWG will identify and prioritize existing and potential wildlife corridors in the watershed
-The MMC will provide coordination and planning support for coordinated wildlife corridor enhancement throughout the Mountain Meadows Watershed; this will include intermittent creeks, wetlands, and other identified wildlife corridor areas

Individual landowners can perform the following actions:
-Enhance and connect riparian areas that are contiguous across property lines to increase available wildlife habitat
-Install native vegetation alongside and within irrigation canals and ditches as appropriate

Objective 4.4-Manage non-native invasive species
Recommended actions:

-The MMWG will develop invasive species management strategies in cooperation with the Honey Lake Valley RCD, University of California Cooperative Extension, Lassen County Farm Bureau, and the Natural Resources Conservation Service
-The MMWG will coordinate invasive species management in the Mountain Meadows watershed

Individual landowners can perform the following actions:
-Remove invasive non-native riparian vegetation from stream channels and riparian areas
-Replace invasive non-native riparian vegetation with vegetation appropriate to the site
-Plant native perennial grasses on roadsides, ditch banks, and on rangelands to compete with non-native species
-Minimize bare soil on their land
-Utilize a diverse set of practices (e.g. prescribed burning, herbicides, grazing, mowing, mulching) in developing invasive vegetation management strategies
-Inform the MMC about invasive plants that are observed on their lands

Objective 4.5-Improve the condition of existing Aspen stands in the watershed
Recommended actions
-The MMC and the MMWG will identify critical Aspen groves and develop plans to improve the health
-The MMC will develop a monitoring program in coordination with local schools and conservation groups in order to analyze management effectiveness

Objective 4.6-Address conifer encroachment into meadow ecosystems in the watershed
Recommended actions
-The MMC and the MMWG will work with local landowners to identify and treat areas of significant encroachment
-The MMC will identify potential funding sources to facilitate the implementation of these projects

GOAL 5: To promote land management practices that supports a sustainable and productive economy

Objective 5.1-Use a watershed approach when making natural resource decisions
Recommended Actions:
-The MMC and MMWG will continue to encourage participation in their watershed group
-The MMC and MMWG will encourage the development of stakeholder teams that focus on particular actions within the watershed

-The MMC and MMWG will encourage landowners to develop long term plans for their lands that are appropriate for our region
-The MMC and MMWG will make the Mountain Meadows Watershed Restoration Action Plan available to all residents of the region
-The MMC will provide residents of the basin with accessible local watershed information and ongoing information about watershed management through community workshops, the MMC website and the MMC office

Objective 5.2-Increase the awareness and use of sustainable agricultural practices
Recommended Actions:
-The MMC and MMWG will promote agricultural education for children and young people
-The MMC and MMWG will facilitate funding for new conservation practices on local ranches
-The MMC and MMWG will provide residents of the basin with ongoing information about sustainable agricultural practices through community workshops, the MMC website, and periodic tours
-The MMC and the MMWG will schedule tours that showcase sustainable management practices in operation throughout the watershed

Objective 5.3-Encourage appropriate land protection measures to allow willing landowners to keep their land in agricultural production
Recommended Actions:
-The MMC will encourage and support agricultural land preservation
-The MMC will make available current information on land protections measures
- Landowners can support conservation easements and agricultural easements as a means to improve the profitability of marginal agricultural lands; this can help to maintain current agricultural land in agricultural production and affordable to future land stewards

Objective 5.4-Promote sustainable economic development projects in the basin
Recommended Actions:
-The MMC and the MMWG will work to identify projects that have the potential to improve economic conditions in the region
-The MMC will analyze the region and identify locations for recreational trails
-The MMC and the MMWG will collaborate with local groups in order to facilitate the development of a regional trail network (Pacific Crest Trail, Bizz Johnston Trail, Collins Pine Trail, Noble Trail, Lassen Trail)
-The MMC and the MMWG will analyze the potential of biomass projects that utilize waste woody material from forest management operations

-The MMC and the MMWG will identify priority locations for the installation of interpretive signs and other infrastructure that educates the public and attracts tourists to the area

GOAL 6: To promote a watershed approach for decisions involving the Mountain Meadows basin by supporting communication and collaboration among all stakeholders.

Objective 6.1-Support an open forum for meaningful discussion of issues concerning the watershed.
Recommended Actions:
-The MMWG will hold regular stakeholder meetings
-The MMC will use the MMWG as a forum for discussing important watershed issues
-The MMC will encourage public and private stakeholder participation in the MMWG
-The MMWG will coordinate management solutions with Lassen County, the NRCS, the Honey Lake Valley RCD, the UCCE, USFS, USFWS, and other groups
-The MMWG will coordinate watershed assessment and planning with the Integrated Regional Water Management Plan (IRWMP)

Objective 6.2-Increase awareness of watershed issues in the community of Westwood
Recommended Actions:
- The MMC will maintain an up-to-date webpage of the MMWG
- The MMC will host speakers and workshops on important watershed topics including illegal dumping on private lands and activities that damage private property
-The MMC will develop a multi-year, multi-disciplinary place based youth education program that involves the community and local schools in resource conservation and restoration projects

Objective 6.3-Develop a Geographic Information System (GIS) database for the Mountain Meadows watershed

Recommended actions:
-The MMC will compile data into a GIS database that will be used for watershed related projects

GOAL 7: Preserve historic and culturally significant resources in collaboration with the Honey Lake Maidu

Objective 7.1-The MMC will continue to represent the Honey Lake Maidu and their interests as they have done for the past 10 years

APPENDICIES

Appendix 1: Rare plant species with reported occurrences within the Mountain Meadows Watershed boundary (sources: CNDDB 2012, CNPS 2012, USDA Forest Service 2012, Sierra-Pacific Industries 2012).

Species	Common Name	Federal Status	R5 Forest Service Sensitive Status	Lassen NF or Plumas NF Special Interest Plant Status	Rare Plant Ranking (CNPS 2012)
Botrychium minganense	Mingan moonwort	--	Sensitive	--	2.2
Botrychium montanum	western goblin	--	Sensitive	--	2.1
Botrychium simplex	little grapefern	--	--	LNF – SI, PNF -- SI	--
Brasenia schreberi	watershield	--	--	LNF - SI	2.3
Carex lasiocarpa	woolly-fruited sedge	--	--	LNF – SI, PNF -- SI	2.3
Carex petasata	Liddon's sedge		--	LNF – SI, PNF - SI	2.3
Carex sheldonii	Sheldon's sedge	--	--	LNF – SI, PNF - SI	2.2
Cypripedium fasciculatum	clustered lady's slipper	--	Sensitive	--	4.2
Drosera anglica	English sundew	--	--	LNF – SI	2.3
Erigeron inornatus var.	hot rock daisy	--	--	LNF -- SI	4.3

calidipetris					
Juncus hemiendytus var. *americanus*		--	--	LNF -- SI	4.3
Muhlenbergia jonesii		--	--	LNF -- SI	4.3
Orcuttia tenuis	slender Orcutt grass	Federally Threatened	Sensitive	--	1B.1
Penstemon cinicola	ash beardtongue	--	--	LNF -- SI	4.3
Penstemon sudans	Susanville milkvetch	--	Sensitive	--	1B.3
Pyrrocoma lucida	sticky Pyrrocoma	--	Sensitive	--	1B.2
Rhamnus alnifolia	alder buckthorn	--	--	--	2.2
Stellaria obtusa	obtuse starwort	--	--	LNF -- SI	4.3

Sources:

California Native Plant Society (CNPS). 2012. Inventory of Rare, Threatened, and Endangered Plants of California, (8th edition). Rare Plant Scientific Advisory Committee. California Native Plant Society, Sacramento, CA. http://cnps.web.aplus.net/cgi-bin/inv/inventory.cgi, [accessed online 11 November 2012].

California Natural Diversity Database (CNDDB). 2012. Biogeographic Data Branch, California Department of Fish and Game. Version 3.1.1, August 3, 2012.

Sierra Pacific Industries 2012. MeadowView THP (#2-11-062-LAS), Section IV: Cumulative Impacts Assessment. Accessed online at

ftp://thp.fire.ca.gov/THPLibrary/Cascade_Region/THPs2011/2-11-062LAS/20120404_2-11-062LAS_Sec4_App.pdf on 11 November 2012.

USDA Forest Service 2012. TESP-Invasives Species geodatabase, accessed 10 November 2012.

Appendix 2: List of status of wildlife and plant species occurring in the Mountain Meadows Watershed.

Note-Season=Time of year the species occupies the watershed: B=breeding; W=winter; SM=spring migration; FM=fall migration; s=summer (non-breeding)

ENDANGERED SPECIES
Mountain Meadows

List and status of wildlife and plant species occurring in the Mountain Meadows Conceptual Area, that are categorized as threatened, endangered, special concern, rare, or significant. The status "significant" is an informal categorization based on the professional opinion of the California Department of Fish and Game (see CDFG "List of Special Animals," January 2002). The other categories are formal determinations made under or by the federal Endangered Species Act (ESA); the California Endangered Species Act (CESA); the California Department of Fish and Game (CDFG); the Natural Diversity Data Base (NDDB); and the California Native Plant Society (CNPS). See Appendix II for WHR habitat descriptions in the Mountain Meadows Conceptual Area.

		ESA/CESA/CDFG*	NDDB	CNPS	SEASON^
Listed Birds					
Buteo swainsoni	Swainson's hawk	ST	G4S2		FM, SM
Empidonax traillii	willow flycatcher	SE	G5S1		B, FM
Falco peregrinus anatum	American peregrine falcon	SE/FSC	G4T3S2		B, FM, W
Grus canadensis tabida	greater sandhill crane	ST	G5T2S2		B, FM, SM
Haliaeetus leucocephalus	bald eagle	FPD/SE	G4S2		B, W
Strix nebulosa	great gray owl	SE	G5S1		S (1 record)
Special Concern Birds					
Accipiter cooperi	Cooper's hawk	CSC	G4S3		B, FM, SM
Accipiter gentilis	northern goshawk	FSC/CSC	G4S3		B, W
Accipiter striatus	sharp-shinned hawk	CSC	G5S3		FM, SM
Aquila chrysaetos	golden eagle	CSC	G4S3		B, W

Ardea herodias	great blue heron		G5S4		B, W
Asio flammeus	short-eared owl	CSC	G5S3		S, W
Asio otus	long-eared owl	CSC	G5S3		B
Bucephala islandica	Barrow's goldeneye	CSC	G5S1		FM, W
Buteo regalis	ferruginous hawk	FSC/CSC	G4S3S4		W
Chaetura vauxi	Vaux's swift	FSC/CSC	G5S3		B, FM, SM
Chlidonias niger	black tern	FSC/CSC	G4S2		B, SM
Circus cyaneus	northern harrier	CSC	G5S3		B, FM, SM
Contopus borealis	olive-sided flycatcher	FSC	G4S4		B, SM
Dendroica occidentalis	hermit warbler	FSC	G4G5S3?		B, FM, SM
Dendroica petechia brewsteri	yellow warbler	CSC	G5T2S2		B, FM, SM
Egretta thula	snowy egret	FSC	G5S4		S, FM
Empidonax wrightii	gray flycatcher	FSC	G5S?		B, FM, SM
Falco columbarius	merlin	CSC	G5S3		FM, SM
Falco mexicanus	prairie falcon	CSC	G5S3		FM, SM, W
Gavia immer	common loon	FSC/CSC	G5S1		W, SM, FM
Larus californicus	California gull	CSC	G5S2		S (B?), FM, SM, W
Melanerpes lewis	Lewis' woodpecker	FSC	G4S?		B, W
Numenius americanus	long-billed curlew	FSC/CSC	G5S2		S (B?), SM
Pandion haliaetus	osprey	CSC	G5S3		B, FM, SM
Pelecanus erythrorhynchos	American white pelican	CSC	G3S1		S, FM
Phalacrocorax auritus	double-crested cormorant	CSC	G5S3		B, SM, FM
Plegadis chihi	white-faced ibis	FSC/CSC	G5S1		B

Sphyrapicus ruber	red-breasted sapsucker	FSC	G5S?		B, W
Strix occidentalis occidentalis	California spotted owl	FSC/CSC	G3T3S3		B, W
Significant Birds					
Ardea alba	great egret		G5S4		S, FM, W, SM
Aythya valisineria	canvasback		G5S2?		FM, W, SM
Nycticorax nycticorax	black-crowned night heron		G5S3		S (B?)
Spizella breweri	Brewer's sparrow		G5S3		B, FM, SM
Spizella passerina	chipping sparrow		G5S3S4		B, FM, SM
Sterna caspia	Caspian tern		G5S4		S (B?), SM
Sterna forsteri	Forster's tern		G5S4		B, FM, SM
Xanthocephalus xanthocephalus	yellow-headed blackbird		G5S3S4		B, FM, SM
Listed Mammals					
Vulpes vulpes necator	Sierra Nevada red fox	ST/FSC	G5T3S1		B, W
Special Concern Mammals					

Aplodontia rufa	Sierra Nevada mountain beaver	FSC/CSC	G5T3T4S3?		B, W
Lepus americanus tahoensis	Sierra Nevada snowshoe hare	FSC/CSC	G5T3T4S2?		B, W
Lepus townsendii	white-tailed hare	CSC	G5S3		B, W
Martes americana	pine marten	FSC	G5S3S4		B, W
Significant Mammals					
Antilocapra americana	pronghorn				S, FM
Felis concolor	mountain lion				B, W
Odocoileus hemionus subspp.	mule deer and black-tailed deer				B, W, FM, SM
Taxidea taxus	American badger		G5S4		B, W
Ursus americanus	black bear				B, W
Rare Plants					
Erigeron inornatus var. calidipetris	volcanic rayless daisy		G5T3S3.3	4	
Penstemon cinicola	ash beardstongue		G4S3.3	4	
Ranunculus macounii	marsh buttercup		G5S2.2	2	
Scutellaria galericulata	marsh skullcap		G5S2.2	2	
Senecio hydrophiloides	sweet marsh ragwort		G5S2S3	4	
Botrychium crenulatum	scalloped moonwort		G3S2.2	2	

*FPD = Federal Petition to Delist; FSC = Federal Species of Special Concern; SE = CA State Endangered; ST = CA State Threatened; CSC = California Species of Special Concern.

Appendix 3: Current status of selected wildlife species within Mountain Meadows Watershed.

Category (State of CA)	Species	Status
Endangered	bald eagle	up to 3 active nest sites during past 10 years
Endangered	great gray owl	1 record
Endangered	peregrine falcon	formerly nested on Keddie Ridge on edge of Conceptual Area; current breeding status uncertain
Endangered	willow flycatcher	6 to 12 nests during past 8 years
Threatened	greater sandhill crane	recorded as nesting (10 pairs present Spring, 2002); up to 400 individuals present in migration
Threatened	Sierra Nevada red fox	several records
Threatened	Swainson's hawk	uncommon in migration
Important	black bear	Common
Important	pronghorn antelope	6 to 30 present in summer; may currently be limited by existing fences
Important	Great Basin Canada geese	80-120 breeding pairs
Important	blacktailed and Rocky Mtn. mule deer	important fawning area for Bass Hill subherd of Doyle Herd; zone X-6A
Important	mountain lion	Uncommon
Important	wood duck northern spotted owl northern Goshawk American Marten Pallid bat Western Red bat	20-30 nesting pairs; probably the single most important nesting site in NE California.

endix 5-Flow Diagram of the PG&E Hydroelectric System

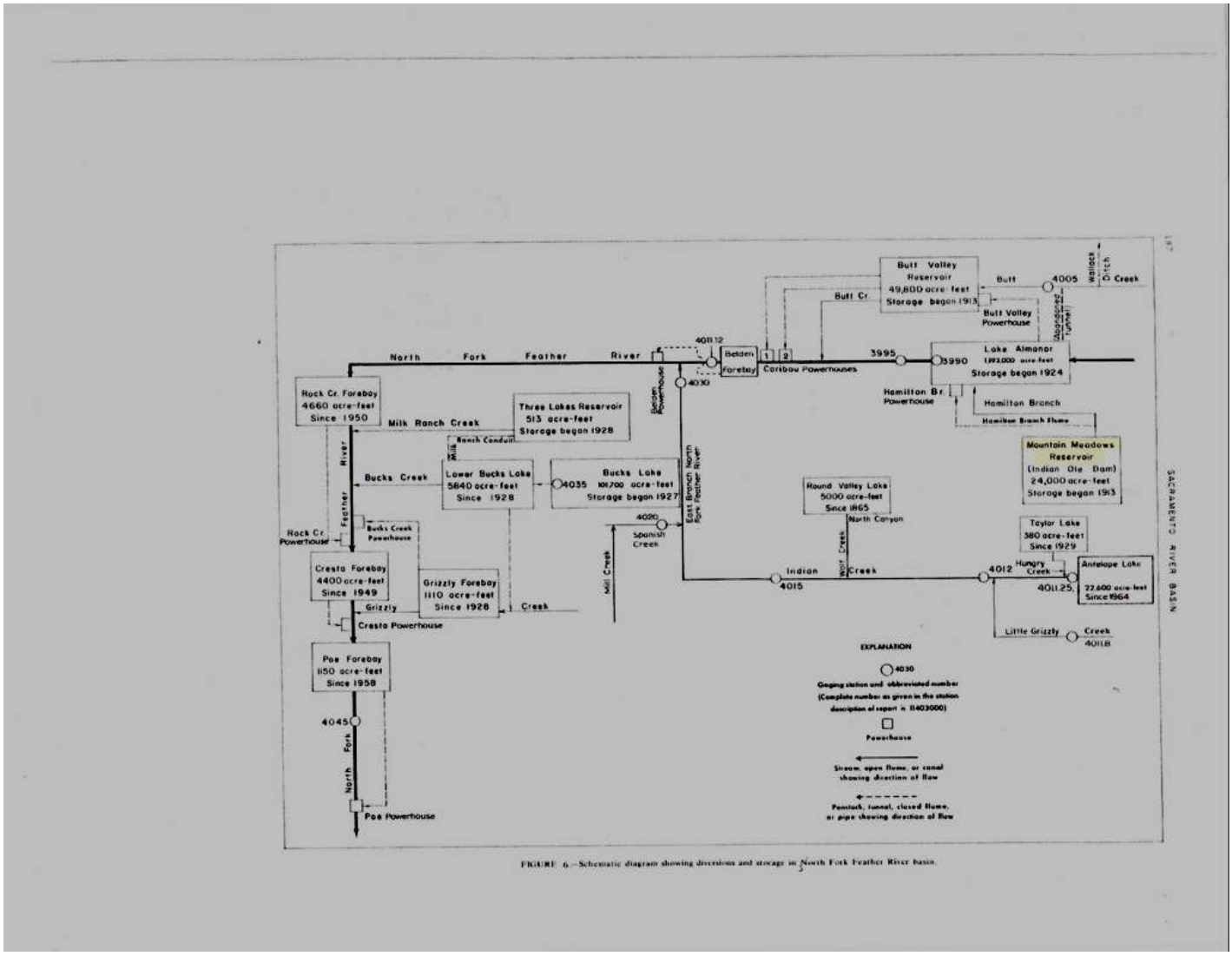

FIGURE 6.—Schematic diagram showing diversions and storage in North Fork Feather River basin.

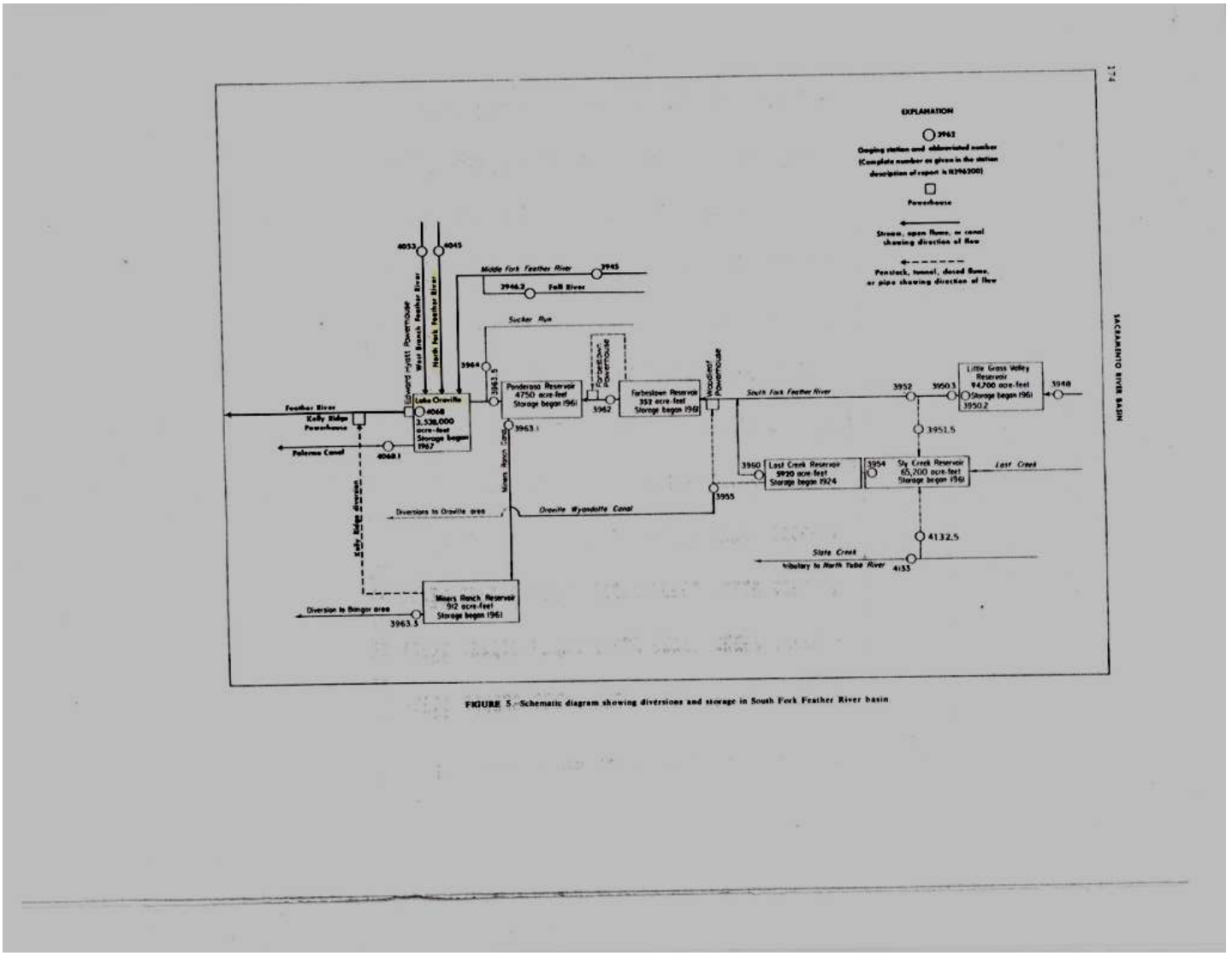

FIGURE 5.—Schematic diagram showing diversions and storage in South Fork Feather River basin

Additional information:

Regional geologic map of the region:

http://ngmdb.usgs.gov/ngm-bin/ILView.pl?sid=371_1.sid&vtype=b

List of mammals and reptiles found in Lassen County:

http://users.psln.com/pete/lassen_county_mammals.htm

http://users.psln.com/pete/lassen_county_reptiles.htm

List of Information on status and range, causes of decline, potential threats and management needs is presented for 61 bird species of special concern in California: http://www.dfg.ca.gov/wildlife/nongame/publications/bird_ssc.html

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