

Mountain Home Demonstration State Forest Management Plan

May 28, 2020



California Department of Forestry and Fire Protection
The California Natural Resources Agency

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CERTIFICATION by REGISTERED PROFESSIONAL FORESTER

pursuant to
California Code of Regulations
Title 14, §1602.1

I, James J. Kral, am responsible for the preparation of this Forest Management Plan for
Mountain Home Demonstration State Forest.



James J. Kral, RPF #2588

June 10, 2020
Date

**APPROVAL of FOREST MANAGEMENT PLAN
for
Mountain Home Demonstration State Forest**

Approved by vote of the Board of Forestry and Fire Protection



Matt Dias, Executive Officer

June 10, 2020
Date

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I. Introduction

The forests of the Sierra Nevada provide important values to Californians. They supply many of the public trust resources that we use and enjoy, including clean water, fish, wildlife, oxygen, carbon sequestration and forest products such as firewood, poles, lumber, mushrooms, herbs and landscape materials. California's forests also provide an important destination for recreational activity.

The majority of public wildlands in California are set aside as reserves and parks to preserve rare ecosystems. Demonstration State Forests, by contrast, are public lands that have a legislative mandate distinct from parks and wilderness areas. Demonstration State Forests are mandated by law to provide opportunities to conduct research, demonstration, and education on sustainable forestry practices. Demonstration State Forests are required to balance periodic timber harvest with public trust resource values such as recreation, watershed protection, wildlife, forage, fisheries, and aesthetic enjoyment.

The Demonstration State Forest system meets an important need to advance research and demonstration into sustainable forestry practices. Our state's large population places many competing demands on forested lands, including a need for recreation and environmental protection that conflicts with pressure for conversion to residential use. Given the often contentious perception of timber production in California, the State Forests play an important role in helping maintain California's leadership in creating innovative solutions to difficult and controversial forest management problems.

The California Department of Forestry and Fire Protection (CAL FIRE) manages approximately 72,000 acres of Demonstration State Forests on behalf of the public. Mountain Home Demonstration State Forest (MHDSF), a 4,807-acre mixed conifer forest located in the southern Sierra Nevada in Tulare County, is 22 air miles northeast of Porterville, and is the third largest State Forest in California.

This document contains a general forest management plan for MHDSF. The management plan lays out the proposed on-the-ground management on the Forest for the next ten years and will guide the development of the Forest through the next century. It serves as a guide to Forest Managers as well as a public disclosure of the management at Mountain Home.

Authority and Statutes

CAL FIRE is responsible for the management of MHDSF on behalf of the public. The legislative authority for the State Forest System is outlined in statutes (Public Resources Code [PRC] §4631-4658 and §4701-4703). The California Code of Regulations (CCR, Title 14, Division 1.5, Chapter 9) contains more detailed rules and regulations governing recreational use and the sale of timber and other forest products.

The Public Resources Code (§§4651 and 4658) provides that State Forests shall be in conformity with forest management practices designed to achieve maximum sustained production of high-quality forest products while considering values relating to recreation, watershed, wildlife, range and forage, fisheries, and aesthetic enjoyment. Specifically, this statute also specifies that MHDSF shall be maintained as a multiple use forest, primarily for public hunting, fishing, and recreation.

Guided by these statutes, the Board of Forestry and Fire Protection establishes policy which

governs Mountain Home and other Demonstration State Forests in more detail. The following are some highlights of Board Policy Section 350, et.seq.: Recreation is the primary land use on MHDSF, while timber production is subordinate to recreation. The primary purpose of the State Forest Program is to conduct innovative demonstrations, experiments, and education in forest management. All State Forests' land uses should serve this purpose in some way.

Per Board Policy (Section 351.1) Jackson, Latour, Mountain Home, Soquel and Boggs Mountain Demonstration State Forests are commercial timberland areas managed by professional foresters who conduct programs in timber management, recreation, demonstration, and investigation in conformance with detailed management plans. The Department conducts periodic timber sales on Jackson, Latour, Boggs Mountain, Soquel and Mountain Home State Forests.

The Department conducts a balanced program of demonstrations and investigations in silviculture, mensuration, logging methods, economics, hydrology, protection, prescribed fire use, ecological restoration and recreation. These demonstrations and investigations are directed to the needs of the general public, small forest landowners, timber operators, and the timber industry.

State Forest timberlands are to be managed based on the sustained yield principle, defined as management which will achieve and maintain continuous timber production consistent with environmental constraints.

Economically and ecologically justifiable intensified forest management practices to increase total fiber production and timber quality are pursued on the State Forests. These practices are designed and carried out for maximum applicability or demonstration values to private landowners.

Management Plans for Boggs Mountain, Jackson, Latour, Mountain Home, and Soquel Demonstration State Forests are prepared by their respective Forest Managers on behalf of the Department, with appropriate public review, for approval by the Board. The Department presents to the Board a thorough review of each existing plan at least every ten years. After each review, the Board may direct the Department either to continue management under the existing plan, to prepare amendments to the plan, or to prepare a new plan for public review and Board approval. The Department shall submit the requested amendments or plan to the Board within one year after each request. The Department shall continue management under existing plans with appropriate consideration for changes in law or regulation, until amendments or new plans are approved by the Board (14CCR§1153(b)).

History of Mountain Home

Mountain Home Demonstration State Forest lies within the recorded domain of the Foothill Yokuts Indian group. The Yokuts are unique among the California natives in being divided into true tribes, each with its own name, dialect, and territory. One of these tribes was known as the Yaudanchi or Yawdanchi. Their principal territory was the North Fork of the Tule River, to the northeast of modern-day Springville. Mountain Home State Forest was part of this territory although other groups, including the western Mono, Paiute, and Tabatulabal had access to the area (Otter, 1963).

The high elevation dictated seasonal occupation, mainly in the summer. Aside from being a welcome retreat from the hot valley summers, the area around MHDSF provided good food

sources, such as black oak acorns and sugar pine nuts.

Very little is known about the origins of the Yawdanchi or their use of the upper mountains. They were the last Native Americans to occupy the area, but not the only ones to do so. The mysterious prehistoric cultures that preceded them are known only through archaeological investigations.

The 21 prehistoric and 17 historic sites recorded on MHDSF attest to the long period of human occupancy there. The prehistoric sites consist of bedrock mortars and basins, lithic scatters, and combinations of the three. The bedrock basins and associated archaeological remains found at MHDSF are some of the most enigmatic phenomena in the Sierra Nevada, and are unique from a worldwide perspective. Additional undiscovered sites are thought to occur throughout the State Forest.

The historic Euro-American sites consist mainly of early sawmill remains and trees and stumps with historic markings. The Mountain Home Tract has a long history of timbering and recreational use. People would come up to get relief from the heat of the San Joaquin Valley in the summer, hence the name "Mountain Home."

Logging began adjacent to the State Forest in the Happy Camp area around 1870 with the Rand-Haughton Mill. However, very little acreage was cut until A. M. Coburn and L. B. Frasier built mills on Bear Creek in 1885. Records indicate the Coburn and Frasier mills could cut 20 MBF and 40 MBF per day respectively. Due to ongoing financial struggles, the Tule River Lumber Company became owners of the Frasier Mill and surrounding property in 1890.

Yellow and white pine were the primary species that were harvested at Mountain Home until around 1900. During this period, the Enterprise Mill constructed a log skidway and began logging giant sequoia from about 100 acres. The Elster Mill, which operated from 1903-1905, was the last of the early mills to operate on the forest. Virtually no harvest activity occurred from 1905 until the late 1930's.

In the early 1940's, old growth sequoia were subject to accelerated harvesting throughout the southern Sierra Nevada. The rapid rate of sequoia harvesting instilled growing concern from local residents who believed that in little time there would be few of the giants remaining. In the Fresno-Visalia area, the Native Sons and Daughters of the Golden West made a special project of saving the mammoth trees of the Mountain Home Tract¹. As a result of their efforts, the California State Legislature passed the enabling legislation for the purchase of the Mountain Home Tract under Senate Bill 934 in 1945. In 1946, the owners sold the Mountain Home Tract to the State of California for \$548,762.

Shortly after State acquisition in 1946, the first pack station lease was signed. Visitors to the State Forest tended to congregate in specific areas and in 1963 construction of the Frasier Mill Campground began. By 1979, all of the campgrounds currently in use at MHDSF were finished. There have been some expansions in a number of the campgrounds since then.

Due to the unique nature of Mountain Home DSF, particularly the presence of old growth giant sequoia, it has been subject to many demonstration projects not possible on the other Demonstration State Forests. Numerous samples of fallen behemoths have been collected

¹ This tract had been consolidated between 1890 and 1915 by the Tule River Lumber Company and the well-known Michigan lumberman, George Hume. This land was later controlled by the Michigan Trust Company.

from the Forest and shipped around the world for use as exhibits. In 1952 a large sequoia cross section or “round” was sent to the Swedish Museum of Natural History. A year after the “Los Angeles” tree fell across the Camp Lena Road, a 17-foot diameter section was sent to the Los Angeles County Fairgrounds as a permanent exhibit in 1961. Also in 1961, a section of a wind-felled giant sequoia was sent to the Geologic Museum at the University of Cologne in Germany. Additional segments were sent to Mooney Grove in Visalia. In 1980, a 16-foot diameter segment of sequoia was sent to Kobe, Japan to be displayed in a pavilion called Portopia 81. The most recent donation of downed sequoia for display was made to the Santa Barbara Botanical Garden in 2009.

Management Goals and Guidelines

The following is a list of overall management goals for Mountain Home DSF, used to guide decision making. Except for the legislative mandate to provide recreational activities as the primary use, all goals below are of equal importance. In making management decisions, a balance will therefore be sought to optimize as many of these goals as possible. More specific management guidelines have been developed from these goals. These guidelines are described under each subject category in this management plan. In addition, all the management goals and guidelines are compiled in Appendix A, for ease of reference. Included under each goal are key accomplishments and events since the last management plan update. Each item will be discussed further into the document. This Management Plan provides information on the whole program associated with management of MHDSF, and, such as, many of the activities addressed under the Management Plan are subject to further California Environmental Quality Act (CEQA) evaluation on a project by project basis prior to implementation. Many of the projects discussed or proposed in this Management Plan have not been subject to CEQA evaluation. Further CEQA evaluation of these projects will occur prior to project implementation. These project-level evaluations will be conducted in conformance with the regulatory framework of the CEQA guidelines.

1. Provide for recreational opportunities as the primary use of the State Forest. Work toward expansion and improvement of existing facilities and the development of new recreational opportunities in suitable areas. Maintain the system of campgrounds, picnic areas, trails, and roads in such a manner as to provide for safe and enjoyable use by the public.
 - a. A fee system was implemented in 2011 and self-registration stations or “iron rangers” were installed at each campground.
 - b. Volunteer campground hosts have been utilized to assist campers in finding vacant campsites and completing their respective registration forms.
 - c. Contracting management of the campgrounds to a recreational concessionaire is being investigated as of 2019.
 - d. User dynamics have changed considerably since the last management plan update.
 - e. Four equestrian-specific campsites were constructed adjacent to the public corrals located in the Shake Camp area.
2. Maintain an inventory of cultural resources and provide for their protection. Encourage research and interpretive use of these sites.
 - a. The State Forest’s Archaeological Records Check was updated in 2019.
3. Harvest timber under sustained yield management on all productive areas while

maintaining or enhancing recreational values. Harvest timber by the most economical methods that will protect the environmental values and maintain productivity. Ensure prompt regeneration following cutting and maintain optimal stocking throughout the life of the stand. Protect old growth giant sequoia from fire, cutting, and logging damage, and encourage reproduction.

- a. Harvest operations occurred on the 220-acre At Last THP in 2010 and 2011.
 - b. Harvest operations occurred on the 353-acre Dynamite Springs THP in 2011 and 2012.
 - c. Operations for the 600-acre Tub Flat THP will commence in 2020.
 - d. Salvage operations have been conducted each year since 2009 under Class I timber sale agreements.
4. Promote research and demonstration on the Forest. Research and demonstration projects will be aimed at providing practical information for forest landowners who need to manage a variety of forest resources; including but not limited to wildlife, water, soil, sensitive plants, and timber. Efforts at MHDSF will provide an opportunity for neighboring landowners and agencies to observe the application of different silvicultural methods in practice. Due to limited staff resources, cooperative research projects will be sought with other public and private researchers who share a common interest and direction in forest management. This information will be made available to landowners and the public.
- a. A research project to study the effects of climate change in the Sierra Nevada is being conducted by the University of Nevada at Reno (UNR) on the State Forest. The Tub Flat THP is central to this study.
 - b. A study of tree mortality and associated fuel loading is ongoing via an agreement with U.C. Berkeley.
 - c. A research proposal has been submitted for studying climate change by examining stalagmites in Haughton's Cave (Crystal 67).
 - d. A research proposal has been submitted to study the differences between salvage logged and unlogged areas of widespread tree mortality.
 - e. State Forest staff have given tours and presentations to various stakeholder groups, international and local students, local government officials, professional organizations, and members of the public.
5. Improve fire safety and forest health and optimize the use of dead and downed trees, slash, bark, cull logs, and pre-commercial thinning for fuelwood, posts, biomass, and other specialty products. Utilize dead and downed giant sequoia while protecting the recreational and scientific value of selected specimens. Collect cones to satisfy the needs of the State nursery system and sell the excess to private collectors.
- a. Drought mortality has left an excess of dead and downed trees on the State Forest. Salvage operations are ongoing to recover as much usable material as possible.
 - b. Numerous Class I miscellaneous timber sales for cones, old-growth giant sequoia and firewood have been done annually since the approval of the last management plan in 2010.
6. Improve and maintain watershed protection through forest practices, prescribed fire and erosion control efforts. Develop water sources and assure safe drinking water for use at administrative and recreational facilities.
- a. Several successful prescribed fires have been implemented on the State Forest since the last management plan update.

- b. A new 10,000-gallon water tank was constructed for fire suppression and recreational uses.
 - c. State Forest staff continues to disinfect and sample water from the four public water systems that serve our campgrounds to ensure that the water is free of contaminants.
- 7. Prevent site degradation by using erosion controls and soil conservation practices in all management activities.
- 8. Enhance the existing habitat for as many wildlife species as possible. Manage cover, food, and water to sustain or increase wildlife populations. Prevent the degradation of stream and pond habitat that is suitable for fish populations.
- 9. Manage the forest to maintain an aesthetically pleasing forest environment for the recreational visitor. Harvest timber strategically to increase the visibility of old growth giant sequoia. Improve aesthetics in high use areas and along roads by controlling the density of leave stands, treating slash promptly, and promoting rapid regeneration.
- 10. Continue the fire prevention program utilizing education, enforcement, patrol, vegetation management, fuelbreaks, pre-fire planning, and suppression.
 - a. Prescribed fires and managed fires on the State Forest have created an effective fuel break along the eastern edge of the State Forest.
 - b. A fuels reduction project around Shake Camp Campground is ongoing.
 - c. Patrols are conducted every weekend during the active recreation season by State Forest staff, Tulare Unit prevention officers, and Tulare Unit fire engines.
 - d. The State Forest aims to conduct prescribed fire operations on approximately 200-300 acres per year when conditions allow.
- 11. Continue an aggressive pest management program to improve forest health and reduce tree mortality due to insects and diseases utilizing monitoring, established control methods, and stand sanitation.
 - a. Pest management is inherent to the ongoing salvage operations, planned timber sales, pre-commercial thinning, and prescribed fire treatments.
- 12. Continue research into forest-based carbon sequestration and forest management techniques to promote forest adaptation and resiliency to climate change.
 - a. This is the focus of the UNR research project.
- 13. Develop and maintain a fire resilient landscape within the MHDSF to protect the forest, the habitat it contains and the watershed it protects.
 - a. Fire resiliency is inherent to nearly every management activity at MHDSF.
- 14. Investigate and implement societal preferences for giant sequoia management and conservation.
- 15. Research and demonstrate silvicultural methods to establish, restore, and promote sugar pine, ponderosa pine and giant sequoia.
- 16. Maintain as wide a range of seral stages and forest structure types as possible, from regeneration to old growth, from open to closed stands, in order to maintain options for future management and research.

17. Foster the development of giant sequoia stands, both young growth and old growth, to a point that is reflective of current natural forest conditions in this region. Establishing a more natural species mix will in many cases require a dedicated effort to decrease the white fir component of stands and cultivate giant sequoia and pines. Desired forest structure will typically be that of low density, fire resilient stands.
18. Investigate opportunities to increase the land base of MHDSF either through the acquisition of lands for sale or via exchange with other landowners and/or agencies.
 - a. A 262-acre ownership is being donated to the State Forest in 2020. The transaction is pending and the deed is expected to transfer by the end of June 2020.
 - b. Other land acquisitions are currently being investigated.
19. Rehabilitate forest stands that have been impacted by fire, drought, and/or insects to restore the productive capabilities of the site(s). This will be the primary focus for 182 acres of the 262 acres slated for donation mentioned above.
20. Utilize CAL FIRE resources to perform as much project work as possible to provide training opportunities. Training specific to tractor piling, fuelbreak construction, road maintenance, drainage facility installation, brush cutting, hand piling, tree planting, pile burning, broadcast burning, timber sale preparation, timber marking, and cruising are just some examples of work that can be done with CAL FIRE crews, Heavy Fire Equipment Operators (HFEOs), and other personnel.

II. PROPERTY DESCRIPTION

Location

MHDSF is located on the west slopes of the southern Sierra Nevada Mountain Range, in eastern Tulare County, approximately twenty-two miles northeast of Porterville. As indicated on Figure 1, forest land in this area of the State is predominantly Federal lands, National Forests and National Parks. MHDSF is situated in the drainages of the North Fork and the North Fork of the Middle Fork of the Tule River (Figure 2). MHDSF is located in Sections 25, 26 and 34-36, Township 19 South, Range 30 East; Sections 18 - 20 and 28 - 31, Township 19 South, Range 31 East and Sections 1, 2 and 12, Township 20 South, Range 30 East, Mount Diablo Base and Meridian. It ranges in elevation from 4,800 to 7,600 feet with all aspects present. The Forest comprises a total of 4,807 acres.

An 80-acre parcel of land exists near the center of MHDSF in the E $\frac{1}{2}$, SW $\frac{1}{4}$, Section 25, Township 19 South, Range 30 East, Mount Diablo Base and Meridian. MHDSF has owned and actively managed this parcel for the last 30 years since purchase. However, the Miller family, from which the parcel was obtained, maintained a recreational lease to camp on the parcel. The lease expired in April of 2014. With the expiration of the Miller lease, there are no other obligations to the Miller party.

Regional Setting and Adjacent Ownerships

Owners adjacent to or within the boundaries of the State Forest include Tulare County Parks Department, U.S. Forest Service, and private individuals. The 160-acre County-owned Balch Park lies almost entirely within the State Forest in Sections 1 and 36. Of the approximately 30

miles of exterior boundary on the State Forest, 24.5 miles are common with the U.S. Forest Service, 3 miles common with private owners, and 2.5 miles common with Tulare County.

In a regional context, Mountain Home's mandate as a working forest emphasizing sustainable forestry is an exception to the predominant land use. The vast majority of the giant sequoia forest type is Federal land, on which active forest management currently only plays a very minor role (Figure 1).

Mountain Home is surrounded on the north, east and south by the southern section of the Giant Sequoia National Monument (the northern section surrounds Grant Grove and other parts of Kings Canyon National Park). The 328,000 acre Monument was created by President Clinton on April 15, 2000. It is administered by the Sequoia National Forest as part of the United States Forest Service and includes 38 of the 39 Giant Sequoia groves that are in the Sequoia National Forest, about half of the sequoia groves currently in existence. The management objectives for the Monument include ecological restoration. Timber production is explicitly excluded.

The Sequoia and Kings Canyon National Park is located approximately 50 miles north of Mountain Home DSF. MHDSF shares a similar emphasis of protection of giant sequoia groves and management for public recreation and education. However, unlike the Park, our protection strategies are within the context of practicing sustainable forestry on a working forest. The Sequoia and Kings Canyon National Park has a General Management Plan and Comprehensive River Management Plan / Environmental Impact Statement. The plan establishes a 20-year vision for the park, as well as direction on the management of park lands within the corridors of the Middle and South Kings River and the North Fork of the Kern River. These rivers have been designated as part of the National Wild and Scenic Rivers system.

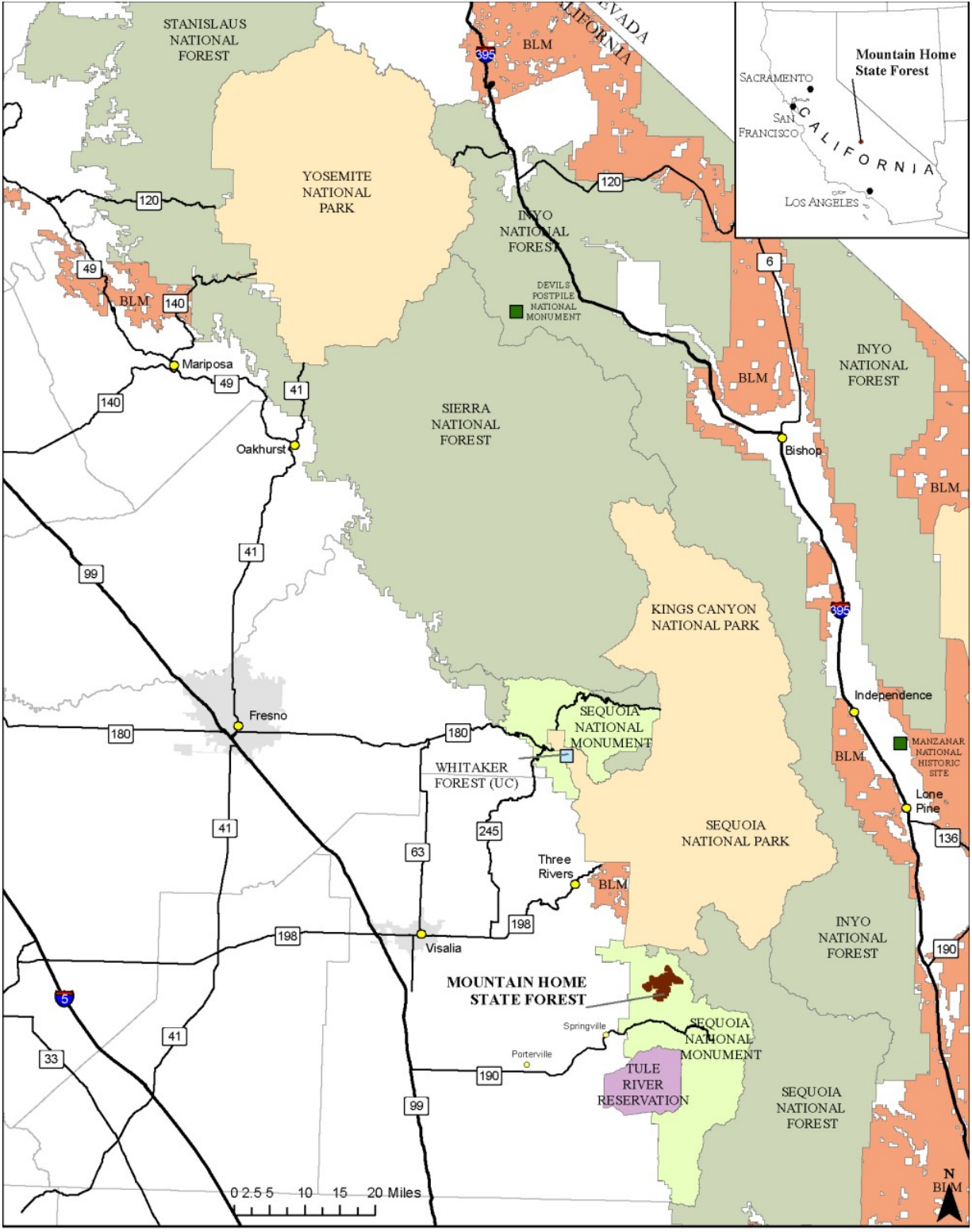


Figure 1. Location of Mountain Home Demonstration State Forest.

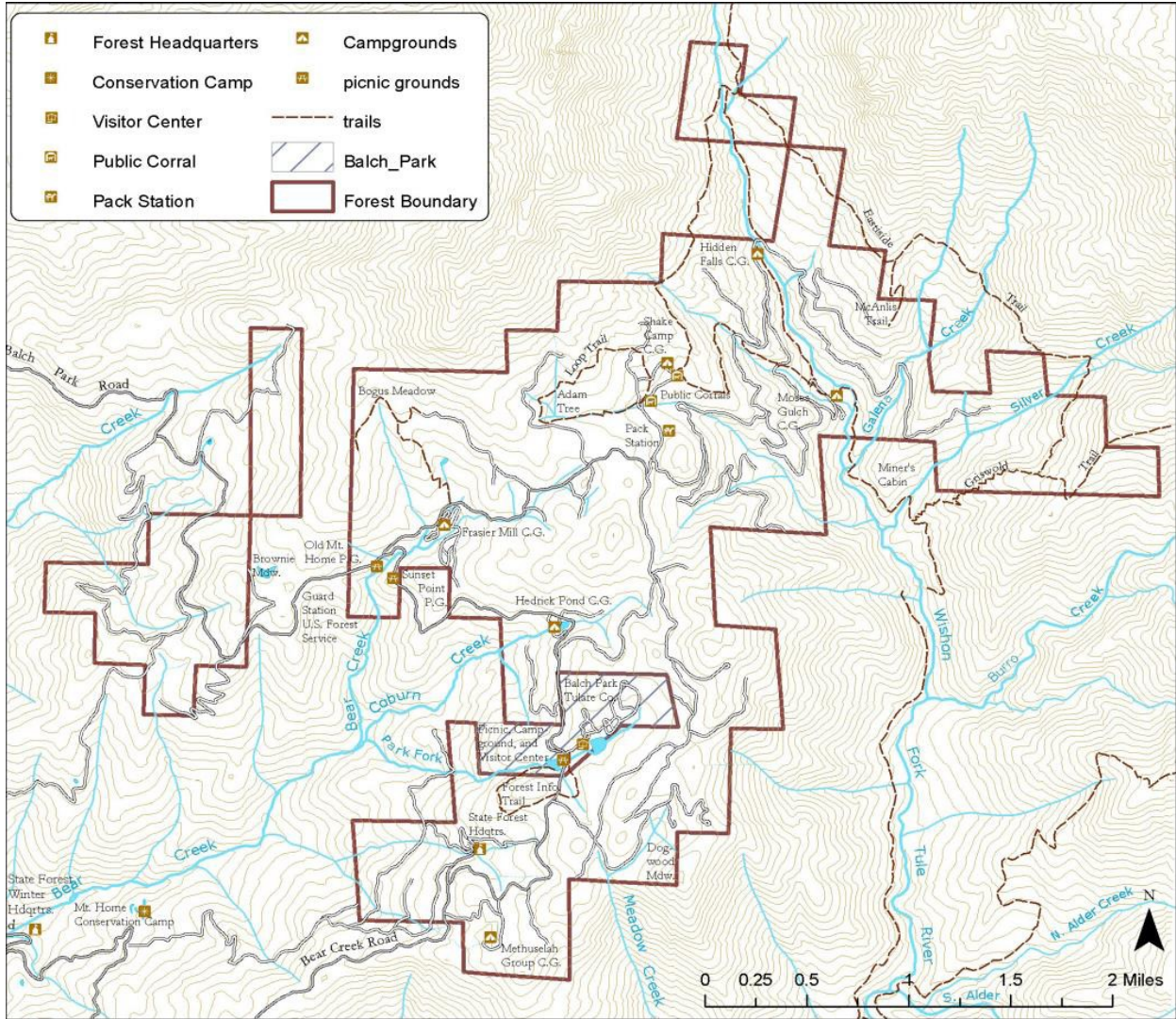


Figure 2. Mountain Home Demonstration State Forest ownership map.

Potential Acquisitions

MHDSF has a history of acquiring or attempting to acquire properties that are either landlocked or lie adjacent to the State Forest. In 1977 records show that MHDSF purchased what was then referred to as the Camp Lena property. Additional records suggest another portion of the Camp Lena property was purchased in 1985 and the final portion of Camp Lena purchased in 1989. Though the acreages acquired at each juncture are not known to the author, the entire acquisition, once complete totaled 80 acres. The Camp Lena is also referred to as the Miller property because they owned the last portion that was sold to the State. The Camp Lena/Miller acquisition is located in the E½, SW¼, Sec.25, T19S, R30E, M.D.B.&M. In 1982 MHDSF acquired 40 acres of “school” land via an exchange with United State Forest Service. Details regarding this acquisition are not known to the author. The parcel is located in the NE¼, NW¼, Sec. 30, T19S, R31E, M.D.B.&M. There is some reference to work being done on a land exchange for 120 acres of USFS land intermingled with State Forest land in 1968. The location of the subject lands and whether the exchange ever occurred is unknown. However, considering the original acreage at the time MHDSF was purchased was 4,560

acres. The addition of the 80 acre Camp Lena, 40 acre “school” and the mysterious 120 acre exchange would have brought the State ownership to 4,800 which is just 7 acres shy of what is currently under State ownership.

The Kemp property is approximately 282 acres in size adjoining the western portion of MHDSF to the north and south (Figure 3). The landowner desires to donate the property to the State and to have it managed by MHDSF foresters. The property has been appraised and donation is pending a review by the Department of General Services. There are no unique or unusual attributes associated with the property so the review should be relatively expeditious. Mountain Home Demonstration State Forest will likely receive ownership of the land in 2020.

The MHDSF Manager has performed numerous cursory surveys of the property during the last five years and has determined that there are opportunities for salvage logging on the property if the transaction is completed in a timely fashion. The property was obviously high-graded in the early to mid-1990’s when the pine market was high. The value of incense-cedar had not yet been realized which is obvious as mature cedar and white fir were retained to meet post-harvest stocking standards for a single tree selection harvest method. The merchantable sized timber has been ravaged via impacts of the drought with mortality rates exceeding 90 percent. Considering the southern parcel is located directly between USFS land and MHDSF, it is easy to surmise that without assistance from a dedicated MHDSF staff, the property will eventually convert to brush. This likely acquisition will provide research opportunities, whether through academia or internal to the State Forest, in the realm of forest restoration and rehabilitation following catastrophic natural events not related to fire.

The Alder Creek parcel is not contiguous to the State Forest. It was purchased in 2019 by Save the Redwoods League from a private individual. Save the Redwoods League’s intent is to implement restoration and fuel modification projects on the property, then turn it over to a government entity. At this time, every indication points to the Forest Service being the likely recipient. CAL FIRE has interest in the Alder Creek tract as it is located just across the Wishon Fork of the Tule River just southeast of MHDSF. Given that the last Timber Harvest Plan on that property was amended by the MHDSF Manager prior to working for CAL FIRE, it would make sense that the land be given to the MHDSF to manage.

A sound argument has been and should continue to be made that CAL FIRE can perform the work necessary to maintain the property following STRLs initial treatment. CAL FIRE has the knowledge, skills and abilities; as well as the resources to perform the cultural treatments that will be necessary into the future. Furthermore, having the status of a Demonstration State Forest will allow for management strategies and operations that could not feasibly be implemented should the property be included in the Sequoia National Monument.

The State Forest Manager has been investigating a potential land swap with the Sequoia National Forest. There are certain areas of the State Forest that are inaccessible for management purposes, particularly the parcel containing Redwood Crossing and the easternmost portion of the Forest around Silver Creek that was subject to the Alder Fire of 2018. The State-owned parcels proposed for exchange currently require annual commitments of State Forest and Conservation Camp staff to maintain trails and roads for recreation and fire suppression purposes. The State lands exhibit qualities that are attractive to the National Forest as they are immediately adjacent to the Golden Trout Wilderness and they contain single tree and small grove specimens of giant sequoia. The Sequoia National Forest lands that are suitable for inclusion into the MHDSF land base lie adjacent to MHDSF and meet all or part of the following criteria. They contain existing harvest infrastructure such as roads,

watercourse crossings, landings and skid trails. They represent “gaps” along major routes of ingress and egress that cannot be treated for fuel reduction because of jurisdictional boundaries. They have been degraded from beetle induced mortality and are quickly converting to brush. They contain the Mountain Home Conservation Camp. Much of this land needs some level of restoration work to reverse the current trend of brush growth by rehabilitating the high mortality areas and planting commercially desirable species. CAL FIRE is better equipped to perform the rehabilitation work and maintain the land in a productive state. Additionally, these lands will provide for more research opportunities, extended field seasons for MHDSF staff, and allow for State ownership of the Mountain Home Conservation Camp land rather than leasing. Applying the similar intensive management strategies practiced regularly on the State Forest will help restore some of the neglected acres currently adjoining the State Forest thus providing an increased level of protection to the Mountain Home Grove.

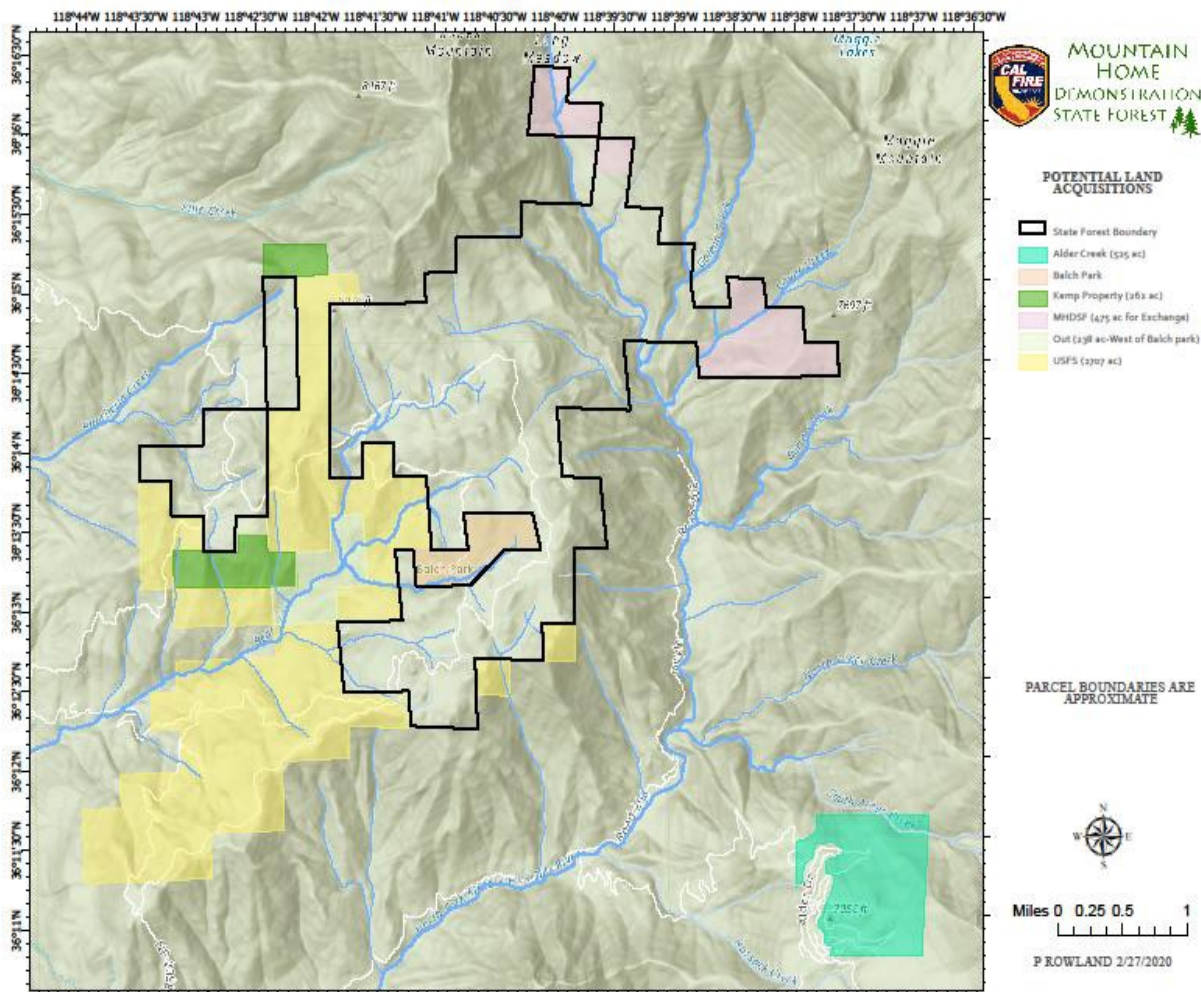


Figure 3. Potential land acquisitions and trades.

Climate

Historically, Mountain Home enjoys a Mediterranean climate characterized by warm dry summers and cold, wet winters. Over most of the past decade, drought conditions of historic

proportions have drastically departed from the norm. This reduction in precipitation prompted widespread tree mortality throughout the region. The effects on forest health and management strategies will be discussed in greater detail later. A shorter and warmer rainy season with less frequent precipitation is currently the general trend. Average precipitation is estimated to be 42 inches per year with the majority falling in the form of snow. Except for sporadic and infrequent summer thunderstorms, the typical rainy season extends from November through April. April 1 average water content of snow at the Old Enterprise Mill Snow Course, at 6,600 feet, is 15.2 inches with an average snow depth of approximately 37.1 inches. The minimum winter temperature recorded at Mountain Home is 1° F. The maximum summer temperature on record is 90° F. Table 1 shows historical average monthly maximum and minimum temperatures at Mountain Home.

Table 1. Average monthly maximum and minimum temperatures at Mountain Home (2002-2019).

Month	Maximum Temperature (°F)	Minimum Temperature (°F)
January	44	23
February	44	23
March	47	26
April	51	29
May	63	37
June	72	43
July	80	51
August	78	48
September	73	42
October	61	36
November	48	28
December	44	25

Geology

Mountain Home Demonstration State Forest (MHDSF) is within the southern portion of the Sierra Nevada Geomorphic Province (California Geological Survey 2002). The Sierra Nevada geomorphic province is a tilted fault block nearly 400 miles long. Its east face is a high, rugged escarpment, contrasting with the gentle western slope that disappears under sediments of the Great Valley. The Sierra Nevada consist of ancient accreted terranes and one or more former subduction zones. The former Farallon oceanic tectonic plate was driven beneath the present-day Sierra where it melted into large molten bodies known as batholiths and plutons approximately 140 to 180 million years ago. The terranes and sediments that accumulated in the subduction zone of this former plate boundary have been metamorphosed by the heat and fluids that radiated off the molten batholiths and plutons that eventually cooled to become the Sierran granitic rocks. Over the last five million years, faults developed along the eastern margin of the Sierra Nevada along which the range has risen to tower above the Basin and Range province to the east. The uplift of the Sierra Nevada changed the climate in California and Nevada forming a barrier to storms originating in the Pacific Ocean that moved eastward over the land. Increased precipitation allowed glaciers to cover the high Sierra during the Ice Ages of the past 100,000 years, especially in massive granites of the higher Sierra that are modified by glacial sculpturing.

Rock Types

In general, MHDSF is roughly divided into two distinct rock types. The eastern portion of the State Demonstration Forest is underlain by metamorphic rocks while the western portion is underlain by granitic rocks (Figure 1). A brief description of these rock types is provided below.

The eastern portion of MHDSF is underlain by metamorphosed sedimentary rocks that represents a “metamorphic roof pendant” known as the Tule River pendant. The Tule River pendant consists of submarine sedimentary rocks (for example mudstones, siltstones, sandstones and limestone) that were metamorphosed when intruded by magmatic plutons and uplifted by faulting. In the area of MHDSF the metamorphic rocks consist of schists and hornfels (USGS, 2013). Schists are described as containing quartz-biotite and calc-silicate rock with sheet-like grains in a preferred orientation. Hornfels are fine-grained metamorphic rocks subjected to the heat of contact metamorphism with intruding magma chambers at a shallow depth (USGS, 2013). Small bodies of marble represent metamorphosed limestone are scattered within these metamorphic rocks (California Geological Survey, 1965 and 2020).

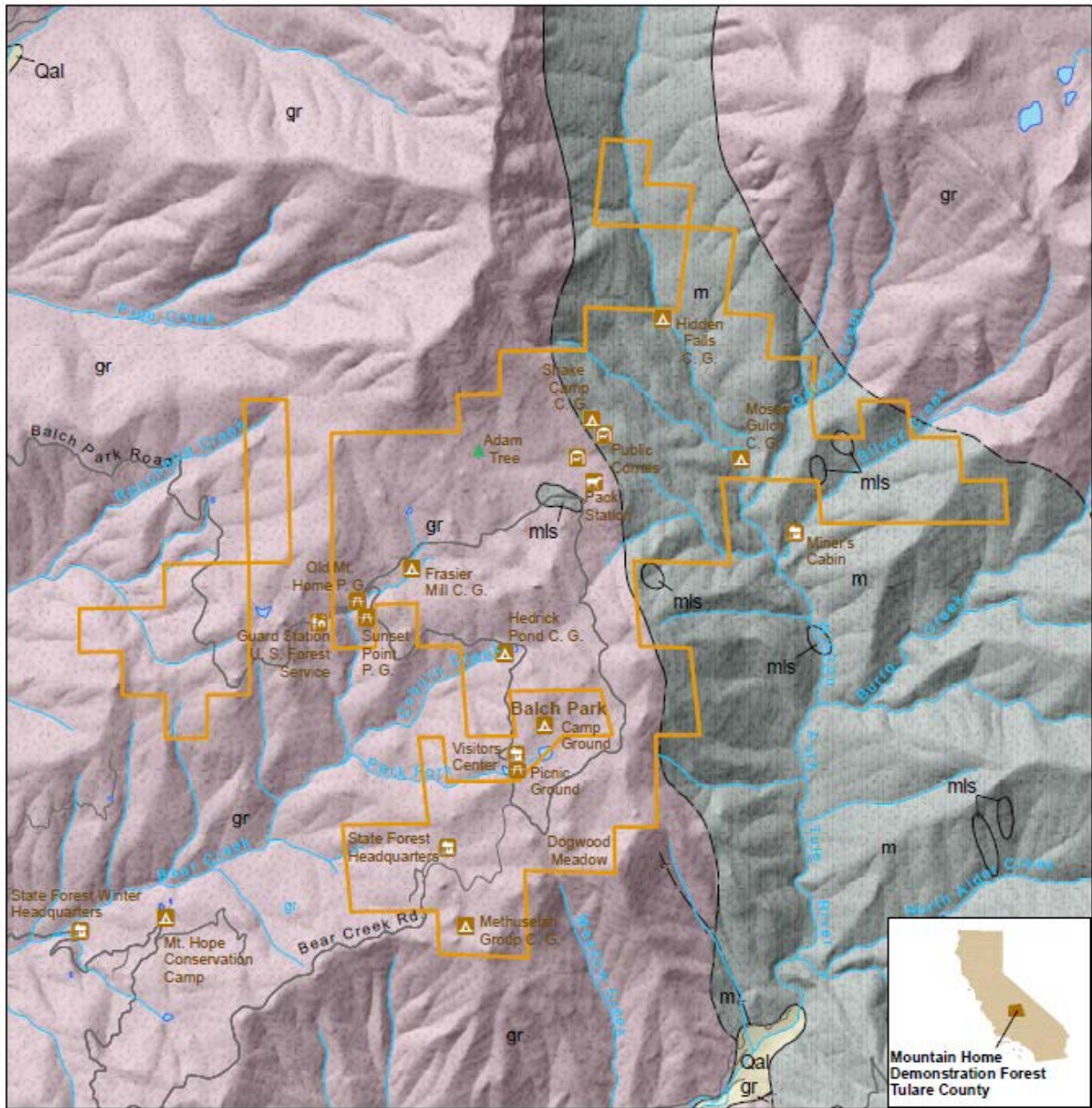
The western portion of MHDSF is underlain by granitic rocks (the granite of Dennison Peak, the Granodiorite of Mountain Home) (USGS, 2013) and undifferentiated granitic rocks (California Geological Survey, 1965 and 2020). Granite contains grains of minerals large enough to be visible with the naked eye that formed from the slow crystallization of magma below the Earth’s surface. Granite is generally composed mainly of quartz and feldspar with minor amounts of mica, amphiboles, and other minerals. In MHDSF granitic rocks form discrete bodies called plutons that are relatively uniform in texture and composition and that have sharp contacts against each other and metamorphic rocks. Radiometric age dating indicates the plutons in and surround MHDSF are on the order of 99 to 103 million years old (USGS, 2013).

Faulting and Landsliding

In general, faults with Historic (last 200 years) or Holocene (Last 11,000 years) rupture are considered “active.” Late Quaternary (last 700,000 years) or Quaternary (last 1.6 million years) age faults are often referred to as “potentially active”. No active faults are known to pass through MHDSF (CGS, Jennings and Bryant, 2010). The closest active or potentially active faults are the Kern Valley Fault (approximately 15 miles east of MHDSF), the Owens Valley fault group and Sierra Nevada Fault Zone (approximately 40 miles east of MHDSF), the San Andreas Fault Zone (approximately 90 miles to the west), and a group of active faults near Bakersfield (approximately 50 miles to the south). Major earthquakes such as the 1906 San Francisco, 1952 Kern County, and 1983 Coalinga quakes were felt and caused some minor to moderate property damage in Porterville (Tulare County General Plan).

Regional Geologic maps do not indicate the presence of large landslide masses within MHDSF, however when CGS has conducted site specific work within the forest we have observed bench step topography suggested the presence of deep-seated landslides. The 2030 updated Tulare General Plan indicates MHDSF to be in an area of competent igneous and metamorphic rocks with a low risk of landsliding. It should be noted that ground shaking due to earthquakes can trigger events ranging from rock falls and topples to massive landslides. Intense or prolonged precipitation can cause flooding and saturate slopes and cause failures leading to landslides. Wildfires can remove vegetation from hillsides, significantly increasing runoff and the potential for post-fire debris flows. Small landslides are a common occurrence along forest roads and may be locally present within MHDSF.

For these reasons, it is recommended that the California Geological Survey (CGS) conduct reconnaissance-level geomorphic mapping to identify the extent of landsliding within MHDSF. It may be necessary to obtain LiDAR of the forest area to accurately identify landslide features. A Certified Engineering Geologist should be consulted as deemed appropriate by an RPF where timber operations are proposed on or upslope of unstable features. As such, CGS will provide geologic evaluation as part of timber harvest document preparation as is done in other demonstration state forests.

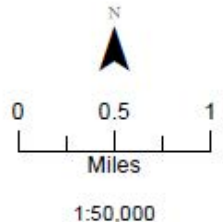


Geology Source: Geologic map California, Fresno Sheet, 1:250,000, Regional Geologic Map Series, O.P. Jenkins, R.A. Matthews, and J. L. Burnett, California Division of Mines and Geology, 1965.

Geology Map Mountain Home Demonstration Forest

- Geologic contact
- Fault
- Solid where accurately located, dashed where inferred, dotted where concealed.
- ~ Roads
- ~ Streams
- ~ Water Bodies
- ☒ Mountain House DF

- Qal** Recent Alluvium
- m** Pre-Cretaceous metamorphic rocks
- mls** Pre-Cretaceous metamorphic limestone rocks
- gr** Undivided Precambrian granitic rocks



Background Source: USGS National Map 3D Elevation Program (3DEP)

Figure 4. Geology Map of Mountain Home Demonstration State Forest

Soils

Approximately two-thirds of the State Forest area is underlain by granite-granodiorite, most of which is decomposed at the surface. The remaining one-third of the area is underlain by metamorphic rocks including schists, quartzite, slate, metavolcanic rocks, lime/silicate hornfels and limestone. The main ridge between the North Fork and the North Fork of the Middle Fork of the Tule River forms the rough dividing line between these two basic parent materials, with the granitics lying to the west of the ridge and the metamorphics to the east.

Known mineral commodities of possible economic value in the area include miscellaneous crushed rock, limestone, decomposed granite for road surfacing, complex copper-zinc ore with minor amounts of lead, silver, and gold, lead-zinc silver ore with minor amounts of gold and tungsten. All known occurrences of metallic minerals are restricted to the metamorphic rocks, particularly the limestone and limey horizons in the slates. Insufficient development work has been done on any mineral prospects in the area to determine whether ore is present in commercial quantities. The State holds all the mineral rights on the State Forest and current policy prohibits prospecting by private individuals. Thirteen soil series have been identified on the State Forest area and are listed in Table 2 below.

Table 2. Soil Series found on Mountain Home.

SOIL SERIES	PARENT MATERIAL	DESCRIPTION	COVER
Boomer	Greenstone	Gravelly loam	Pine, Mixed Conifer
Chaix	Granitic	Coarse, sandy loam	Mixed Conifer
Cieneba	Granitic	Fine, gravelly loam	Chaparral
Crouch	Crystalline igneous	Very coarse, sandy loam	Pine, Mixed Conifer
Dome	Granitic	Sandy loam (deep)	Pine, Fir
Heitz Taxa	Granitic	Gravelly, loamy, coarse	Pine
Holland	Quartz	Loam	Pine, Cedar
Holland Taxa	Quartz	Loam	Pine, Cedar
Marpa Variant	Shale	Very gravelly, heavy loam	Mixed Conifer
Sheetiron	Schist	Gravelly loam	Mixed Conifer
Sierra Variant 2	Granitic	Coarse, sandy loam	Grass, Oak, Pine
Tollhouse Variant	Granitic	Rocky, coarse, sandy loam	Chaparral, Oak
*Miscellaneous soil series include Childs, Cone, Decey, and rock outcrops			

The high site timber producing soils exhibit moderate to high erosion hazard ratings. Some of the shallower granitic soils exhibit high to extreme erosion hazard particularly on steep slopes. Caution should be exercised when planning harvesting activities on slopes that exceed 50 percent where these soils are present.

Areas of geologic instability, such as slides and slumps, are generally associated with high amounts of surface water and springs. These areas should be avoided in harvesting and road construction. If these areas cannot feasibly be avoided, an engineering geologist shall be consulted to help mitigate disturbances.

Water Resources

MHDSF is contained within five CalWater watersheds: Rancheria, Upper North Bear, Hossack, Silver, and Burro Creeks (Figure 4). The Forest is situated on the ridge that separates the North Fork of the Middle Fork of the Tule River (Wishon Fork) from the North Fork of the Tule River. The North Fork of the Middle Fork of the Tule River passes through the forest for approximately 1.5 miles of its length. Tributaries to the North Fork of the Tule River, which

drain out of the Forest, include Rancheria, Bear, and Hossack Creeks. Named tributaries to Bear Creek include Norway Creek, Coburn Creek, and Park Fork of Bear Creek. Named tributaries of the North Fork of the Middle Fork of the Tule River, which occur on State Forest land, include Moses Gulch, Galena Creek, Silver Creek, Burro Creek, and Shake Gulch.

The headwaters of Rancheria Creek are located on the Sequoia National Forest, approximately one-half mile north of Mountain Home. The Rancheria Creek watershed is 7,819.65 acres in size; Mountain Home contains approximately 400 acres or 5.12 percent. The lower reaches of Rancheria Creek and some of its unnamed tributaries are Class I (fish bearing) watercourses. The lowest reach of this watershed that occurs downstream of the confluence with Upper North Bear Creek is named Bear Creek. There are no Class I watercourses present within the bounds of Mountain Home in the Rancheria Creek watershed.

The headwaters of Upper North Bear Creek occur on Mountain Home at the topographic boundary that demarcates this watershed from Silver Creek, Burro Creek and Hossack Creek. The Upper North Bear Creek watershed is 8,638.07 acres in size; approximately 1,945 acres or 22.52 percent falls within Mountain Home. The Upper North Bear Creek watershed joins with Bear Creek approximately 4.5 miles below Mountain Home DSF.

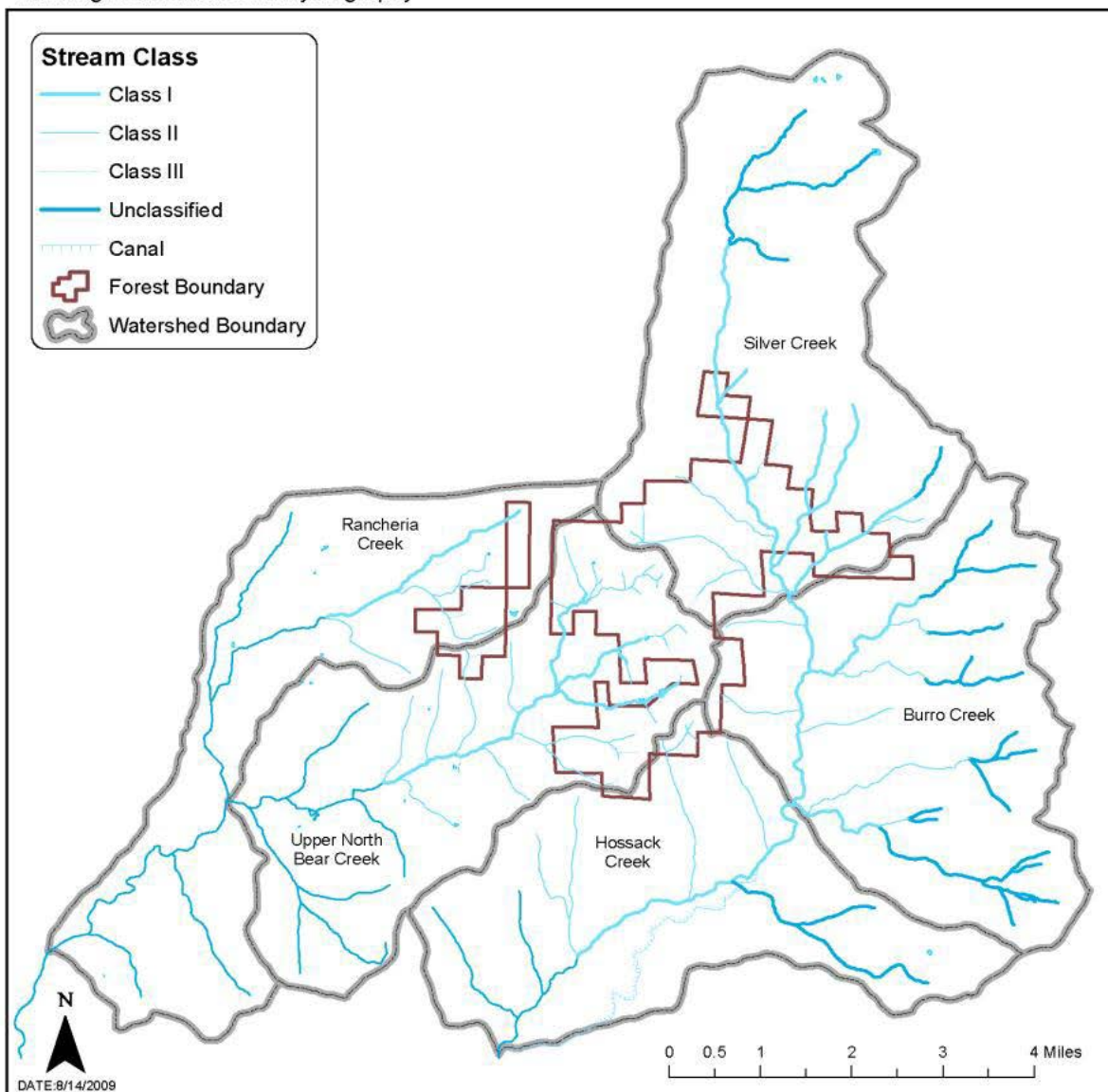


Figure 5. Planning watersheds covering Mountain Home Demonstration State Forest.

Named tributaries such as South Bear Creek and numerous unnamed tributaries of the Upper North Bear Creek watershed are Class I watercourses.

The Hossack Creek watershed lies south of the Upper North Fork Bear Creek and Burro Creek watersheds. The Hossack Creek watershed is 7,882.11 acres in size; approximately 181 acres or 2.3 percent is located on Mountain Home DSF. Those MHDSF lands located within this watershed are flat to gently sloping. There are no classifiable watercourses in this watershed located on MHDSF land.

The headwaters of Silver Creek begin on the Sequoia National Forest about four miles north of Mountain Home DSF. The Silver Creek watershed is 10,129.1 acres in size; 2,010 acres or 19.84 percent is within the boundaries of Mountain Home DSF. The North Fork Tule River

receives drainage from Galena Creek and Silver Creek, all of which are Class I watercourses.

The Burro Creek watershed lies south of the Silver Creek watershed and begins just south of the confluence of Silver Creek and the Middle Fork Tule River. The Burro Creek watershed is 8,595.52 acres in size; approximately 272 acres or 3.16 percent occurs in Mountain Home. Those MHDSF lands located within the bounds of this watershed are steep and inaccessible to ground-based equipment. There are no Class I or II watercourses located on MHDSF within this watershed, except the Middle Fork of the Tule River which is located in the Silver Creek drainage.

There are two man-made ponds on the Forest. Hedrick Pond, located near the center of Section 36, T19S, R30E, is an old mill pond constructed in 1939. Hedrick's sawmill was abandoned not long after State acquisition of the Forest, but the pond remained and is now the focal point of a 14-unit campground. Hedrick Pond is near the headwaters of Coburn Creek, a tributary to Bear Creek. Another pond, located in the NE 1/4, Section 1, T20S, R30E, is partially on State Forest land and partially in Balch Park (Tulare County Parks Department). It is commonly referred to as Upper Balch Pond. The pond was constructed in 1959 for recreational purposes. Balch Park campground is immediately adjacent to the pond on the north and west sides.

Springs are common in many areas of the Forest. Many of these springs have been developed for domestic water supplies for campgrounds, picnic areas, and administrative sites. Developed springs exist in the areas of Shake Camp, Frasier Mill, Hidden Falls, Hedrick Pond, and the State Forest Headquarters. All but two of these springs now feed into a network of horizontal wells that provide drinking water to recreational and administrative facilities while reducing the possibility of contamination.

Other springs are located throughout the Forest that provide unique habitats for wildlife. Many of the meadow areas at Mountain Home are the result of spring activity and marsh like conditions adjacent to watercourses. These areas provide habitat and ecological attributes not found elsewhere at Mountain Home DSF.

Vegetation

There are two major commercial timber types found on MHDSF: mixed conifer and true fir. The mixed conifer type is found at lower elevations on drier south and west facing slopes. The tree components of this type are giant sequoia (*Sequoiadendron giganteum*), ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*), white fir (*Abies concolor*) and incense-cedar (*Calocedrus decurrens*). Introduced Douglas-fir (*Pseudotsuga menziesii*) and some hybrid Jeffrey- Coulter pine occur in limited areas throughout the lower elevations of the forest. At the upper elevations Jeffrey pine (*Pinus jeffreyi*) replaces ponderosa and Shasta red fir (*Abies magnifica* var. *shastensis*) mixes with white fir. The major component of the mixed conifer type is white fir with second growth giant sequoia being a distant second.

The true fir type is found at the higher elevations particularly in the area of the old Enterprise Mill site. This type is characterized by almost pure even aged stands of white and red fir. Other species found in association with the true firs are sugar pine, Jeffrey pine and giant sequoia.

Small amounts of hardwoods found in association with these types include black oak (*Quercus kelloggii*), canyon live oak (*Quercus chrysolepsis*), interior live oak (*Quercus wislizenii*), white

alder (*Alnus rhombifolia*), and Pacific dogwood (*Cornus nuttallii*).

Major components of the understory vegetation include mountain whitethorn (*Ceanothus cordulatus*), bearclover (*Chamaebatia foliolosa*), gooseberry (*Ribes roezlii*), currant (*Ribes nevadense*), California hazelnut (*Corylus cornuta* var. *californica*), bush chinquapin (*Castanopsis sempervirens*), dogwood (*Cornus nuttallii*), deerbrush (*Ceanothus integerrimus*), manzanita (*Arctostaphylos* spp.), bracken fern (*Pteridium aquilinum*), lotus (*Lotus* spp.), lupine (*Lupinus* spp.), snowberry (*Symphoricarpos albus*) and littleleaf ceanothus (*Ceanothus parvifolius*).

Old growth giant sequoia over 40 inches in diameter at breast height (DBH) occurs on approximately 56 percent of the total acreage of the Forest. Recent inventory information determined the total number of old growth giant sequoia trees within the bounds of MHDSF at 4,750.

Young growth giant sequoia is present in dense stands ranging in age from 1-130 years. The origin of these stands can be traced back to historical site disturbances, mainly logging. Many of these stands average 110 years in age corresponding to the early logging around 1900.

Over the past ten years, the Forest has seen an 80% decrease in the number of pines of all species. This is a result of a synergistic relationship between the extended drought in the West and an explosion in bark beetle numbers, specifically *Dendroctonus* beetles. This has greatly affected species composition on the Forest, and every effort is being made to retain healthy pines and encourage regeneration.

Improvements

Five multiple user and one group campground have been developed at Mountain Home DSF. These campgrounds are semi-primitive, as the only developments are pit toilets, tables, bear-proof food lockers, potable water and stoves (campfire pits). All the multi-unit campgrounds have spring-fed wells that collect water in tanks for gravity feed water systems with multiple spigots at each facility. Methuselah group camp does not have running water. Construction of an additional group campground (Pino Grande Group Camp) has commenced and is ongoing. Like Methuselah, it will be equipped with pit toilets, a large barbeque, fire-pits and numerous tables. A 10,000-gallon water tank was constructed between Pino Grande and Methuselah in 2017, however a reliable water source has not yet been established.

The Pack Station located near Shake Camp Campground is operated under a lease agreement with a local packer. This facility consists of a residence, tack room, generator shed, loading dock, feeders, water troughs, one public toilet, two public trash cans, and three corrals. The water that supplies the pack station originates at a spring that feeds the Shake Camp Campground water tank. The Pack Station was remodeled in 2014 by replacing the wooden lap siding and trim with fire-proof "hardy board" and giving the building a new coat of paint. Additionally, a new log constructed porch, steel porch roof, and cedar deck were constructed to replace the deck and railing that were often broken from snow sliding off the Pack Station roof. A new floor was installed in 2015.

There are two public corrals located between the Pack Station and Shake Camp Campground. They are located near the trailhead that leads into the Golden Trout Wilderness area. The corrals are supplied with potable water from the Shake Camp tank. There is ample parking available at each set of corrals to accommodate trucks and trailers. Four new campsites were

constructed adjacent to the public corrals since the last management plan update. The “equestrian only” campsites were determined to be necessary to prevent conflicts between general campers and equestrian users, to allow better security to horses from the public and wildlife, and to reduce violations of 14CCR § 1425(a) which states “no person shall bring saddle, pack or draft animals into a designated camping area unless it has been developed to accommodate them and is posted accordingly.”

The “House that Jack Built” otherwise known as “Jack’s Cabin,” is a small, multi-room cabin located on the north bank of Bear Creek. It is used to house researchers and visiting foresters. Jack’s has been extensively remodeled using salvage timber from the State Forest that was processed into lumber at the Mountain Home Conservation Camp sawmill. The interior received new kitchen cabinets and wooden countertops; as well as a new propane stove and refrigerator and a new sink. All but one room received new paneling on the walls and ceilings. A new shower, toilet, hot water heater, and bathroom sink were installed. The old woodstove was replaced after a new stone hearth was built in the living room.

MHDSF summer headquarters is used during the non-winter period. During the winter the headquarters is inaccessible due to snow. The headquarters compound consists of a small historic office/museum/information center, a four-bedroom barracks with kitchen, a historic warehouse, a concrete building that houses the electrical system, a hazardous materials storage room, 1,000-gallon fuel tank and pump, a 500-gallon propane tank and two 15,000-gallon water tanks. The headquarters barracks provides housing for seasonal Forestry Aides and visiting researchers. It was extensively remodeled in 2013. A steel roof, new floors, a woodstove, and a big- screen TV were installed along with new furniture. The interior received a fresh coat of paint prior to the installation of the flooring.

MHDSF winter headquarters is located approximately seven miles below the forest on Bear Creek Road. This facility consists of an office building, a shop, two garages, and a residence. The residence is used by the resident Forest Manager who is on-call 24 hours a day. Water for the winter headquarters is supplied by a well located at Mountain Home Conservation Camp which is gravity fed to a 15,000-gallon concrete water tank that is located on USFS land approximately 800 feet uphill of the compound. New dual-pane windows were installed in the office building in 2012 and the interior was painted in 2015. A new floor was installed in the Winter Office in 2018.

All water holding tanks located at MHDSF are used for domestic purposes and fire control.

Zoning

The entire Forest has been zoned as Timberland Production Zone (TPZ). This means the land is devoted to and used for growing and harvesting timber and compatible uses. Compatible use is defined as any use that does not detract from the use of the land for growing and harvesting timber. Compatible uses include watershed management, fish and wildlife habitat management, recreation, hunting and fishing, and grazing (though grazing is prohibited on most of MHDSF).

III. RECREATION

Facilities

This section describes existing recreation facilities at Mountain Home DSF. Table 3 lists the camp grounds currently located on the Forest (see also Figure 2). All campgrounds on the forest are rustic with accommodations for tent campers and small to medium sized, self-contained, recreational vehicles. A typical campsite consists of a stove/fire pit, table, bear-proof food locker, sign with site designation, and parking space. Within a short walking distance are garbage cans, pit toilets and potable water.

Table 3. Campgrounds on Mountain Home Demonstration State Forest.

Name	Number of Camp Sites	Year Built
Frasier Mill	49	1963
Hedrick Pond	14	1969
Hidden Falls	8	1971
Shake Camp	15	1975/2014
Moses Gulch	10	1979
Total	96	

Hidden Falls and a portion of the Moses Gulch campgrounds contain walk-in sites where a parking space is provided a short distance from the actual campsite. Campground roads and parking spaces are native soil with crushed rock surfacing in most cases. All campsites were available free of charge on a first-come, first-served basis until August 1, 2011. Currently, camping at a MHDSF general campground costs \$15.00 per site for a single vehicle. An additional vehicle is allowed in an occupied site for an additional \$5.00. Only two vehicles are allowed per site with only a few exceptions. "Iron rangers" have been installed at the main entrance to the above listed campgrounds. Campers must complete a registration form (envelope) by providing some basic information about their stay and include payment for the site. Campfires are not allowed until a camping permit has been paid for.

Four new campsites were constructed near the Shake Camp Campground and have been included to the Shake Camp system. These sites were designed and built for equestrian users only and are adjacent to the public corrals. Campers at these sites must register for their respective site at the Shake Camp Campground.

All five of the general campgrounds had new signs installed in 2014 which better demonstrate that the campgrounds are owned and operated by CAL FIRE rather than Tulare County or the USFS.

Group Campground – Methuselah

Methuselah Group Camp consists of a large parking area, pit toilets, fire ring, amphitheater, barbecue, and tables. Capacity of the area is approximately 100 people. The group camp is available on a reservation basis and is in very high demand. Prior to August 1, 2011, group camping was provided free of charge. Use of the group camp is now \$50.00 per night for a group of at least 20 people. Reservations can be made at the beginning of the new calendar year. Generally, the summer month reservations are typically filled by the end of February.

Americans with Disabilities Act (ADA Compliant) Campsite – Frasier Mill Campground

A wheelchair accessible campsite, Site C2, was constructed in the "C" loop of Frasier Mill

Campground in 2002. This site includes a specially designed table, stove/fire pit, bear-proof food locker, pit toilet and concrete parking pad. This site is specifically designated for handicapped use and is available by reservation only. The ADA compliant site is currently available for a rate of \$15.00 per night.

Picnic Areas – Old Mountain Home and Sunset Point

Old Mountain Home Picnic Area has most of the amenities of a campground: tables, barbeques, water, and pit toilets are present, but there are no food lockers. The Old Mountain Home site also serves as an overflow camping area when the other campgrounds are full. No campfires are allowed when the site is used for camping. Overnight camping is only allowed with permission of the State Forest Manager.

Sunset Point was converted to a picnic area in 1994 after an archaeological dig revealed the presence of a significant prehistoric Indian site. A self-guided interpretive trail was developed that is very popular with State Forest visitors.

The picnic areas are normally for day use only with no overnight camping permitted unless authorized by the State Forest Manager.

Overflow Areas

Camping overflow areas have been designated at Frasier Mill campground, Shake Camp Campground, the Methuselah Group Camp, the Shake Camp public corrals, and Old Mountain Home. These areas may be used for camping only when all regular campsites are totally occupied and with authorization of the State Forest Manager.

Balch Park Pack Station

The State maintains a pack station facility in the Shake Camp area that includes living quarters, a tack room, a public toilet, and corrals. The Pack Station is leased to a private concessionaire to provide a packing service to the public. Horses and pack stock can be rented for hour-long rides or for more extended trips into the backcountry.

Public Corrals

The State maintains two sets of public corrals in the Shake Camp area. The corrals are equipped with water and horse trailer parking is available adjacent to the corrals. Four new campsites have been constructed for those equestrian users that opt to stay overnight.

Trails

Currently, all trails on the Forest are for hiking or equestrian use. No motor vehicles are allowed on any of the trails. The trail systems access various points within the State Forest (as described below) and some lead from State land into the Sequoia National Monument's Golden Trout Wilderness Area.

Sunset Point – 0.1 Mile

This trail is an interpretive trail exemplifying the prehistory of the MHDSF area. This area was subject to an archaeological excavation in 1991 while the site was being used as a public campground. The excavation resulted in the discovery of deep cultural deposits and the campground was subsequently closed in 1994. However, given the close proximity to Bear Creek Road and the presence of toilets and running water, the archaeological team

determined that the best use for the site was a self-guided interpretive trail. The trail is a simple loop that accesses a large granite outcrop containing several bedrock mortars and basins commonly referred to as “Indian bathtubs.” The trail is complete with signage that offers a brief interpretation of the area. A short spur trail accesses an overlook “Sunset Point” that provides a breathtaking view of the foothills and valley below. This site is a popular day use area that receives extensive use during the season.

Forestry Information Trail - 1 Mile

This trail is a self-guided interpretive walk that originates at Balch Park, leads into State Forest land, and loops back into Balch Park. A trail brochure is available at the trailhead; it describes the natural history and management activities in the area. The portion of the trail that extends through MHDSF, was subject to timber harvesting in 2012. Therefore, the trail was closed to the public during harvest activities until hazards could be mitigated. The Information Trail was originally constructed in 1960 and had been outdated for many years. The trail was re-interpreted and new information stop placards were installed in 2015. Three new benches were also installed along the trail during the summer of 2015 but have since been stolen. The benches will be replaced and set in concrete to prevent their theft. This work is scheduled for the Summer of 2020.

Loop Trail - 2 Miles

Beginning and ending at the public corrals, this trail is suitable for short day hikes or one-hour horseback rides. It leads through a beautiful giant sequoia / mixed conifer forest, and passes the Adam and Eve trees, Boxcar Rock, Indian bathtubs, 120-year-old giant sequoia stands, and harvested areas. The Loop Trail will be subject to closure during the 2020 season due to a planned timber harvest.

Redwood Crossing Trail - 2 Miles

This trail originates at the Shake Camp trailhead parking area and continues in and out of the State Forest until it enters the Golden Trout Wilderness area above Redwood Crossing. This trail represents a main access point into the Golden Trout Wilderness from the State Forest and leads into backcountry areas of the Sequoia National Forest and Sequoia National Park. Wilderness permits are required for traveling on this trail beyond Redwood Crossing. Forest staff no longer issues wilderness permits. Permits must be obtained from the U.S. Forest Service office in Springville.

Eastside Trail - 3 Miles

This trail connects the Griswold trail with the Redwood Crossing trail at Redwood Crossing. The trail skirts along the northeast boundary of the State Forest running in and out of State land. This trail is recommended only for foot traffic because of creek crossings that are difficult for horses to negotiate.

McAnlis Trail – ½ Mile

This short trail consists of a spur that connects the upper McAnlis access road east of the North Fork of the Middle Fork of the Tule River with the Eastside Trail.

River Trail – 1½ Miles

The River Trail runs along the North Fork of the Middle Fork of the Tule River from Moses Gulch to Redwood Crossing. It is mainly used as a fisherman's trail.

Griswold Trail - 4 Miles

This trail originates at Shake Camp, leads down into the Tule River Canyon, crosses the North Fork of the Middle Fork of the Tule River at Moses Gulch, follows the river downstream to Silver Creek, then heads uphill to the east up a dry ridge where it leaves the State Forest and enters the Golden Trout Wilderness area. Eventual destinations include Maggie Lakes and the Little Kern River. Because of the steep, arduous, dry climb, the trail is not used extensively and receives only periodic maintenance. The portion of the trail that exists on the State Forest is maintained every three or four years while the upper reaches that extend onto federal land are entirely indiscernible.

Recreational Attractions

The extensive groves of old growth giant sequoia trees are a major attraction of Mountain Home Demonstration State Forest. Views of many of the old - growth trees have been bolstered by the harvesting activity that has taken place in the area since the late 1800's. No other public areas have comparable scenic vistas of old growth veterans. The young growth stands of giant sequoias and other species provide contrast to the old growth component.

Because of the early exploitation of the giant sequoias in the Mountain Home area, sites of historical interest abound. These sites include: historical stumps, trees, logs, sawmills, and old resort locations. The Forest also has many examples of prehistoric rock basins and Indian bedrock mortars which are of archaeological significance.

The two ponds on the State Forest are stocked with trout by the California Department of Fish and Wildlife. These ponds are a major attraction to anglers of all ages during the summer months. Fishing is also available in Bear Creek and the North Fork of the Middle Fork of the Tule River and its tributaries. The Forest is open to hunting except for a buffer area around campgrounds, Balch Park, and the Forest Headquarters. Hunting is allowed in season for deer, bear, gray squirrels, quail, and grouse.

Trails leading out of the State Forest to the north and east eventually lead into the Golden Trout Wilderness Area. This increases the popularity of trailhead areas at Shake Camp, Hidden Falls and Moses Gulch. The Balch Park Pack Station provides pack trips for individuals and groups into the Golden Trout Wilderness and other areas in the Sequoia National Forest and the Sequoia National Park.

Haughton's Cave, also known as Crystal 67 Cave, is a major attraction to speleologists (cavers) in the MHDSF area. The cave is reported to have one of the largest underground chambers in the West. Recent maps show the large underground "Mountain Room" to be 360 feet long and 130 feet wide at its widest point. Total explored depth is 415 feet, making it the fourth deepest cavern in California. The cave is accessible only through an underground stream channel with precipitous drops of up to 65 feet. This makes entrance dangerous for all but the most experienced speleologists. Entry is now controlled through a locked entrance gate by special permit. A waiver of liability and rules of conduct are required to be signed by all members of the party prior to admission. Early studies showed that commercial opportunities existed for the cave if a new and easier entrance could be found into the "Mountain Room". At present, no such entrance has been identified. Other caves may exist in the limestone areas on the Forest as evidenced by numerous sinkholes and disappearing streams.

Changes since 2010

Fee System Implementation

Since the last management plan update, a fee system has been implemented. The current fee schedule is \$15 per night for one vehicle and \$5 per night for one additional vehicle. The purpose of charging a fee and requiring registration is to generate enough revenue to cover the costs of maintaining the campgrounds and to gain some accountability from the public. The registration form requires that campers provide their name and license plate number, which gives the State Forest some recourse when confronted with acts of vandalism or other unacceptable behavior. Full implementation of the fee system has required that forest staff check for compliance by patrolling each of the campgrounds numerous times during the weekends and often during the week.

The fee system and weekend patrols have had a positive impact on the recreation program. Now that campers know they may face penalties for their actions, instances of vandalism, cross-country travel, and general reckless and unruly behavior have decreased significantly. Additionally, camping fees help cover the cost of managing the recreation program (trash bags, toilet paper, laboratory fees, toilet pumping, et cetera).

Since the implementation of the fee system, man-hours dedicated to the recreation program have increased dramatically. The two licensed foresters on staff spend at least a combined 40 man-hours per week collecting fees and checking for rule compliance. A crew of four forestry aides spend a total of 64-80 man hours collecting trash and cleaning bathrooms each week. This does not include the many additional hours spent on mid-week maintenance, trash collection, stocking registration forms, fixing water systems, etc. While the time spent on the recreation program is effective at accomplishing the State Forest's recreation goals, it puts a strain on manpower. There are not enough hours in the day or the week to maintain the recreation program at its current level of involvement and fulfill all other obligations, including resource management and research and demonstration.

Another drawback of the recreation program at its current level of staff involvement is the high turnover rate for Forestry Aides. Few opt to return to MHDSF for another season. Some have even quit mid-season. Almost without exception, they cite the fact that their duties under the recreation program are not consistent with their career goal of becoming a forester. A Forestry Aide at Mountain Home will spend at least all day Saturday and Sunday every week scrubbing toilets and gathering trash. There is additional toilet scrubbing and trash collecting on Mondays and Fridays to prepare for and recover from the weekend. It is not uncommon for recreational duties to consume an entire work week for Forestry Aides (and Registered Professional Foresters, for that matter).

One alternative that is being actively pursued is to contract the management of our recreation program to a recreational concessionaire. Such an agreement would allow a private entity to manage all aspects of the recreation program. The California Department of Parks and Recreation and the U. S. Forest Service have used this option at many parks and campgrounds with generally positive results. The intent of such an agreement would be to reduce the amount of time spent on the recreation program by seasonal and permanent Forest staff.

Another alternative is to create a position for a dedicated recreation program manager. A candidate in this position would collect fees, interact with campers, make arrangements for trash pickup, order supplies, and other things that the State Forest's professional Forestry staff need not be overly involved with.

An additional alternative that should be explored is the installation of solar- or battery-powered electronic registration kiosks. The reason that the State Forest Manager or Assistant Manager (or both) must make the rounds is to collect money and to ensure that fees have been paid. Because several thousands of dollars in cash will be transported to the office during the weekend, seasonal Forestry Aides may not collect money. An electronic registration kiosk would eliminate the need for senior staff to handle money. A Forestry Aide could be trusted to drive around and see that each vehicle has a registration ticket and address any minor rule violations, thus freeing up senior staff's time to focus on forest management.

Changing User Dynamics

Visitor demographics have changed since the last management plan update. In the past, the average user was a single family with one tent and a vehicle. In recent years, it is more common that large, extended families will congregate on the forest, bringing with them many tents and many vehicles, and attempt to cram everybody and everything into the same campsite. This has resulted in heavier impacts both within and at the margins of campsites. Campers who have run out of space to set up more tents have created new space by trampling vegetation and excavating flat spots. Future research should be done on the impacts of these larger groups and restoration opportunities for heavily-impacted campsites. Additionally, these larger groups leave behind disproportionate amounts of trash. Where the volume and number of existing trash cans once sufficed, it is common to find several bags of trash next to a full trash can that had just been emptied earlier in the day. These loose bags of trash that cannot be placed in a trash receptacle, are then subject to dispersal by means of wildlife thus increasing the time spent cleaning up trash that has been reduced to confetti sized pieces.

One way to address overpopulation of campsites is to establish a limit on the number of people who may occupy a campsite overnight. Starting in 2019, a Forest requirement was implemented that limits the number of occupants staying overnight in a campsite to 10 individuals. This doesn't preclude large family groups from getting together for meals and campfires, but it does distribute the impact over more campsites. Consequently, the campgrounds fill up faster and more frequently.

Day-use traffic at the Hidden Falls day use area has become a problem for the following reasons:

- Day users will often park in the parking lot for Hidden Falls Campground. The parking lot is barely big enough to accommodate the maximum number of vehicles per campsite (8 sites X 2 vehicles per site = 16 vehicles). There are signs that say "no day use parking" and "campground parking only" that go largely unheeded. The presence of Forest Officers and the liberal use of violation warning tickets temporarily fixes the problem at the expense of man-hours and frustration by all parties involved.
- Day users also leave an inordinate amount of trash in and around the river. They also tend to set up chairs and generally hang out in the roadway at the river crossing prohibiting emergency vehicle access.
- Most of our medical aid responses are for day users is at the river.

An interesting de facto case study occurred in 2019. A sinkhole developed on River Road (the only road that leads to Hidden Falls), so the road remained closed to vehicle traffic for the duration of the season. It was discovered that the people who really wanted to recreate at the river for the day were willing to walk, rather than rely upon road access. It was also found that

campers and day users that chose to make the hike brought along fewer provisions, resulting in residual refuse. One group of campers liked the road closure so much that they wrote a letter to the Forest Manager to that effect. The rustic, walk-in campsites at Hidden Falls Campground have not been spared the effects of large groups of campers. One could argue that large groups constructing a temporary village at Hidden Falls are not consistent with the serene, remote ethos of that campground.

Before the road closure, Mountain Home staff had been considering closing River Road at the intersection with Moses Gulch Road. This would prohibit vehicle traffic to Hidden Falls while still allowing access to Moses Gulch Campground. A landing exists at the intersection that would allow for enough parking. The distance from the proposed site of the gate to the river is ¼ mile, which is hoped to be sufficient to deter recreationists seeking the easiest of access to Hidden Falls. MHDSF staff continues to monitor in day use Hidden Falls and is still considering road closure during heightened use of the area to mitigate recreational impacts.

Future Development

Mountain Home Demonstration State Forest is committed to placing strong emphasis on recreation as the primary use of the forest. Past decisions and policies have been made to construct and maintain recreational facilities in a rustic condition and discourage commercial recreational development on the Forest.

Existing facilities continue to be adequate to meet public demand for camping facilities. Major campground expansion up to the present 97 sites was completed in 1976 except for the addition of the four equestrian sites at Shake Camp. The emphasis since then has been on maintenance of existing facilities.

Forest staff tracks demand for overnight camping on the State Forest. Based on the historical camper day figures, projected future camper day use is as follows:

Table 4. Estimated and Projected Camper Days by Year

Year	Estimated Camper Days
2010	38,682
2015	41,944
2020	45,207
2025	48,823
2030	52,729

The existing recreational facilities can accommodate 30,000 - 40,000 camper days per year. When weather conditions allow, weekend recreational use tends to be near or over capacity from Memorial Day weekend through Labor Day. Weekday use is normally estimated to be around 25 percent of capacity. However, valley temperatures have the greatest influence on public use. When temperatures reach 100 degrees on the valley floor, public use spikes, even during the week.

Currently, visitor use is concentrated between Memorial Day and Labor Day. In the last 30 years, deer season use during the month of October has seen a steady decline. This is a result of declining deer populations, reduced interest in hunting, and new hunting regulations restricting hunters to one area of the State forest in a given season. Further expected decreases in hunting season use, coupled with higher total visitor use, will concentrate the

camping season into a shorter time frame each year. This will tend to saturate the recreational facilities at a lower total visitor use rate per season.

Another factor that will influence demand for State Forest recreational facilities is the availability of other recreation opportunities in the area. The only other campground in the immediate area is the County-operated Balch Park. Demand for campsites at Balch Park has historically been higher than at State Forest campgrounds. Balch Park has undergone a steady expansion of its facilities and currently has 80 campsites. No additional expansion for Balch Park is planned. As utilization of Balch Park reaches capacity, State Forest use will increase.

At present, there are no US Forest Service or private campgrounds in the immediate area and none are planned. Recreational development on private land adjoining the State Forest is also possible. Any such development would have an impact on State Forest use. Private commercial recreation development could be more sophisticated and include cabins, stores, ponds, swimming facilities, etc. This type of development would tend to increase use of the State Forest, especially day use.

Winter sports use of the Forest is prohibited. Since the last management plan update, permanent gates have been installed on the Bear Creek and Balch Park access roads. These gates remain closed during the winter months.

Potential New Development Sites

Group camps

Construction on the Pino Grande group camp has begun. A 10,000-gallon water tank has been constructed. No water source has yet been secured, but once the system is operational it will supply water to both Pino Grande and Methuselah group camps; as well as, a 1½" fire hose connection. The pits to receive the vaults for two "Sweet Smelling Toilet" (SST) vaults have been excavated. The waste capacity of both toilets will be 1,700 gallons. This will reduce the need for pumping to once or twice a year. Construction is expected to be completed by the end of 2020.

A new vault toilet should be installed at the Methuselah Group Camp. There are currently two 250-gallon vault toilets that tend to fill up relatively quickly. A new "Sweet Smelling Toilet" (SST) vault will increase the waste capacity by an additional 850 gallons.

Shake Camp

Room exists at the current Shake Camp location for expansion to approximately 40 sites. This would be an increase of 29 sites over the existing facility. The existing water system could be used until campsite locations higher in elevation than the present tank are developed. At that time, another tank could be constructed above the present tank location. The spring source has an adequate flow to supply an expanded facility.

Frasier Mill

An additional "loop" could be constructed west of the Camp Lena Road across from the existing Frasier Mill Campground entrance. An existing skid road could easily be upgraded to an access road with little earthwork being needed. The gentle topography of the area would require little work to install up to 20 additional campsites. A new pit toilet would need to be installed and water is already present upslope.

Enterprise Mill (Camp Lena)

This site has possibilities for a large 30-40 site campground or a group campground because of its size and gentle topography. Water is available upslope from the proposed location.

Section 19, East of Tule River

Several small benches and flats in this area are suitable for moderately sized campground development. Vegetation is dense young growth that would give good shielding between campsites. Water is located upslope.

Hidden Falls

This campground area is used heavily for day use. Several picnic sites could be developed immediately east of the river, which could be used for day use only. However, given the congested state of day use in this area on weekends, this kind of expansion must be carefully planned.

Cabins

Several sites have been identified that could accommodate small log or timber framed cabins that the public could rent for a more personal and private camping experience. These sites are located near Tub Flat, Dogwood Meadow, Bogus Meadow and Brownie Meadow.

Recreation Management Guidelines

1. The State Forest is best suited for a rustic type of recreational facility that is less likely to impact the other management goals of the forest. This would eliminate consideration of capital improvements such as paved campground roads, flush toilets, hookups for electricity and sewer, and commercial concessionaires, other than the pack station. Campgrounds shall be designed for tent campers and small to moderate sized recreational vehicles. The existing design of campground facilities has proven to be vandal resistant, attractive, and economical. These standard designs should continue to be used, in addition to experimental use of any other designs that show promise of being superior.
2. Any new recreation areas should not be located in old growth giant sequoia groves. These areas are highly hazardous to campers due to the chance of windthrow and loss of limbs from the old growth trees. Also, site disturbance from campgrounds may have adverse effects on the old growth trees.
3. Maintenance of existing facilities is the top priority. Expansion should occur only if projected operating funds and manpower are adequate to maintain the expanded system.
4. Emphasis will be placed on expansion of existing facilities and concentration of use into moderately sized campgrounds. This will reduce development and maintenance costs. Numerous small facilities scattered over a large area should be discouraged.
5. Major winter sports development is not planned. Winter sports use, such as cross-country skiing and snowmobiling, will continue to be prohibited.
6. Timber management activities must be coordinated with recreation planning. Proposed

recreation sites should be harvested in such a way as to remove all current and projected hazardous trees while leaving the young growth stand and understory intact. Small sales will be planned to remove hazardous trees in existing campgrounds as needed. Roads and landings should be laid out with possible recreational use in mind.

7. Off Highway Vehicles (OHV) use on trails and primary roads within the forest remains prohibited. Only a handful of people bring OHVs to the forest each summer. The Sequoia National Forest has several OHV areas within less than a day's drive of the State Forest, so there is no overwhelming demand from the public to allow OHVs. Additionally, OHV use presents a high likelihood of an increase in medical aid incidents on the State Forest. For these reasons, no OHV infrastructure is under consideration.
8. Use strategically placed and planned silvicultural treatments around and within old-growth giant sequoia groves to maintain scenic vistas. Similar treatments should be performed to enhance vistas of Maggie Peak, Moses Mountain and Dogwood Meadow.
9. Control competing vegetation in vista areas and high use areas, i.e. campgrounds, to lessen the threat of accidental wildfire and to maintain the scenic value. Vegetation shall be maintained through various methods, including but not limited to, prescribed burning, grubbing, mastication and herbicides.
10. It should be noted that any construction of new campgrounds outside of the expansion of existing campgrounds should only be done following strong consideration of recreational impacts on forest management. Campgrounds are typically placed in areas that are gently sloping which coincide with ideal locations for log landings and other harvest related infrastructure. Considering that much of MHDSF exhibits steep slopes that are not conducive to landing construction, one should not make decisions regarding campground construction based solely on developing more camping opportunities. Additionally, increases in user numbers may have another adverse impact on forest management through public perceptions about timber harvesting.

Strategic Plan for Recreation

Campground Facilities

Signs indicating which sites will accommodate trailers should be installed. Stoves, vehicle bumper logs, handrails, foot bridges, and wooden tabletops have the shortest usable life in our campgrounds. These items need to be replaced every 15 to 20 years; sooner if subjected to vandalism. Major maintenance, repairs and improvements have been performed at Frasier Mill, Hedrick Pond, Shake Camp, Moses Gulch and Hidden Falls Campgrounds within the last 15 years. Additional work has been performed at Frasier Mill and Hedrick Pond in 2009. Most maintenance work resulting from routine use can be planned for, i.e. roads, water systems and trash receptacles. However, repairs resulting from abuse, mistreatment and vandalism must be corrected immediately. Therefore, materials commonly used for such corrective action are kept in inventory when funds allow. Campground maintenance is a continuous process that varies from year to year. The emphasis will be to replace high maintenance structures with more durable materials, such as using boulders to replace wooden barriers. Table 5 delineates planned recreation maintenance and construction projects and a timeline for each. All these projects are contingent on adequate funding and staffing.

Roads

Campground road systems will require periodic maintenance depending on use and weather

conditions. All roads and parking areas within campgrounds should be surfaced with crushed rock, which will provide for low maintenance and dust abatement while having a natural appearance. Rocked roads also provide an all - weather roadbed.

At present, 90 percent of the campground road system is surfaced with crushed rock. The parking areas in some campgrounds need base rock applications and should be surfaced as soon as possible. These roads should then be graded as necessary to maintain the surface and improve drainage. Even though most of the campground roads have been rock surfaced, the rock needs to be replenished occasionally to address developing erosion issues.

Water Systems

State and County laws require that public water supplies be treated or protected by sealed sources. Since no electricity is available at any of our campground facilities, we must rely upon sealed springs and gravity fed systems to supply water to campgrounds, picnic areas and administrative facilities. These systems must be maintained so that contamination will not result from surface water or outside sources. Sampling of all water sources for bacterial contamination will continue to be performed monthly during the recreation season. The Division of Drinking Water (DDW) has asserted that State Forest water systems are required to have a flow meter in place yet they have not provided any legal substantiation to support this requirement. Flow meters have not yet been installed nor are there any plans to do so. Once the DDW can provide a regulation that distinctly states that water flow meters are legally required on non-community, transient public water systems, they will be purchased and installed accordingly.

A shallow well exists at Methuselah Meadow adjacent to the Methuselah Group Camp. The well once supplied water for campers by means of a hand pump. However, the hand pump was stolen and the well head has been locked inside a small wooden shed. It is reasonable to assume that this will be the likely source of water for the Methuselah and Pino Grande Group Camps. The existing well will require additional drilling to comply with drinking water standards as the upper 50 feet needs to be sealed to prevent contamination from the surface. Obviously, a power source would need to be used to pump water uphill to the new 10,000-gallon storage tank. At this time, a portable generator seems to be the most reasonable solution to pump water. The well drilling and pumping option shall be further considered and evaluated should an alternative water source not be discovered. In either case, a trench will need to be excavated from the source to the tank for plumbing and additional trenches will need to be dug to plumb in the water supply lines to each of the campgrounds.

Public Corrals

Two sets of public corrals exist in the Shake Camp area. Both sets of these corrals require occasional maintenance for the use of public stock. Both sets of corrals could be expanded to hold more stock. Several small corral paddocks in a series is the preferred design to keep stock separated and increase utilization of the corrals. Given the relatively low use of these corrals, expansion is not being considered at this time.

Pack Station

The present lease at the State-owned pack station facility should continue. A lease term of five to ten years should be encouraged to provide for consistency in the pack station operation. Demand for rented stock by backcountry users is expected to remain at or above present levels.

Hunting and Fishing

Encourage the California Department of Fish and Wildlife to continue the program of stocking the two ponds on the Forest with trout. Expand opportunities for fishing in the North Fork of the Middle Fork of the Tule River and Bear Creek as feasible, through improved access such as trails. Investigate further opportunities for deer hunting on the Forest.

Campground Hazard Tree Program

The Forest currently has a system of hazard tree evaluation in all the recreational facilities. All trees which pose a potential hazard to any person, vehicle, or improvement within a recreation area are evaluated and mapped. This gives a permanent record of all trees and shows that they have been evaluated for hazard. Should a tree be determined to pose an immediate hazard, the campsite shall be closed to public use until the tree can be removed or otherwise mitigated. Hazard trees are typically cut by contractors, MHDSF staff or Mountain Home Conservation Camp. Salvageable logs are then transported to the Conservation Camp or Sierra Forest Products sawmill and the slash is disposed of. This system should be maintained and expanded to cover any new construction.

Fee System

A fee system was implemented in 2011 and has been successful in reducing the amount of vandalism and untoward behavior on the State Forest. A fee increase should be considered to cover increasing operating costs. Any alternatives that may be more efficient or effective should be investigated.

Public-Private Partnership

Considering that State Forest staffing levels are currently the same as they were in 1957, a partnership should be developed between the State Forest and a third-party recreation contractor. Similar partnerships have been successful in other campgrounds and recreational areas on United States Forest Service lands and State Parks. The State Forest Program is investigating such a partnership as a means to utilize professional forest staff for professional forestry work rather than routine maintenance and patrol of campgrounds.

Table 5. Proposed Timeline for Recreational Development and Maintenance.

Activity	Timeline
Maintain and repair campgrounds	as needed
Rock surface roads (Frasier Mill)	ASAP
Rock surface roads (Hedrick Pond)	ASAP
Rock surface roads (Moses Gulch)	ASAP
Rock surface roads (Shake Camp)	2021-2025
Drill well at Methuselah	ASAP
Plumb water system at Methuselah and Pine Grande	ASAP
Construct Pino Grande Group Campground	ASAP
Expand Shake Camp Campground	2025-2030 (if needed)
Expand Frasier Mill Campground	2025-2030 (if needed)
Install Hidden Falls Gate and Parking Areas	2020-2022
Construct Camp Lena Group Camp	2022-2030
Construct Section 19 Campground	No longer considered
Construct Rental Cabins	Postponed
Construct equestrian campsites at public corrals	Done

IV. RESEARCH AND DEMONSTRATION

Background

The mandate for MHDSF research and demonstration program is found in both legislation and Board policy (see “Authority and Statutes”, page 1). This program is expected to provide information to both inform future management decisions by MHDSF staff and for dissemination to the public, landowners, regulators, and scientists. The information gained can play an important role in the often-controversial role that sustainable timber production plays in the health of the State’s forests and watersheds. The heavy recreational pressure from adjacent urban areas makes MHDSF an ideal showcase to educate the general public on active management.

Research in the past has been conducted by cooperators from the California Polytechnic State University at San Luis Obispo, California State University at Fresno, U.S. Forest Service, Pacific Southwest Research Station, University of California at Berkeley, University of Arizona, and private consultants. Additional projects have been carried out by Mountain Home personnel.

Since 1981 variable levels of funding have been available through the Forest Resources Improvement Fund (FRIF) to contract with researchers to conduct studies on the State Forests. Information gained through these projects is reported in various forms. Project results have been written up and disseminated through the California Forestry Note system, peer reviewed journals, and conferences. Project tours are also given for education and demonstration purposes.

Regional Setting

Mountain Home’s mandate as a working forest, emphasizing sustainable forestry, is an exception to the predominant land use in the southern Sierra Nevada. The vast majority of the giant sequoia forest type is federal land, on which active forest management currently only plays a very minor role. It follows that MHDSF plays a very important role as one of the few places where a wide range of silvicultural techniques ranging from clearcutting to light thinning, and cultural treatments such as prescribed burning and herbicide use can be used to address important research questions in this forest type.

Several major research and assessment projects have taken place in the central and southern Sierra Nevada. Some of these are described below.

The 3,200-acre Teakettle Experimental Forest is located about 50 miles east of Fresno. The area includes old-growth mixed-conifer and red fir forest at about 3500 to 9200 feet elevation. Many studies have been conducted since the inception in the 1930s, ranging from early studies of water yields to streamflow and sedimentation data through recent studies of the effects of fire and thinning on mixed-conifer ecosystems (North et al 2002).

The Sierra Nevada Ecosystem Project (SNEP) is a 1996 assessment of the Sierra Nevada ecoregion conducted at the request of Congress in 1992 (SNEP 1996). The report is a scientific assessment that highlights what is known and presents judgments about what this means for meeting the stated goal of protecting the health and sustainability of the Sierra

Nevada while providing resources to meet human needs.

The Sierra Nevada Adaptive Management Program (SNAMP) attempts to answer the question of how to conduct forest vegetation treatments to prevent wildfire, and influence fire risk, wildlife, forest health, and water. SNAMP is made up of researchers from the University of California, University of Minnesota, US Forest Service, US Fish and Wildlife Service, the California Natural Resources Agency, and the public. Other participating agencies include the California Department of Fish and Wildlife, the Department of Water Resources, and CAL FIRE.

MHDSF efforts to foster cooperative research projects with federal researchers are ongoing. There are numerous opportunities for joint research projects with the Giant Sequoia National Monument.

Research Priorities

Recent applied research on the effects of forest management and silviculture on giant sequoia have been done primarily at MHDSF and at the University of California's research forests, Blodgett and Whitaker. Federal lands have seen a preponderance of research on ecosystem function. Management and research at MHDSF continues to focus on a set of broad themes: protection of old growth giant sequoia and recruiting new old growth trees; restoration of new age cohorts of young growth giant sequoia; growth and yield of giant sequoia in a mixed conifer landscape; resilience to fire and changes in climate; and wildlife and recreation.

Protection of old growth giant sequoia and recruiting new old growth trees

1. Old growth giant sequoia trees are one of the iconic tree species in the State of California. Most stands of old growth giant sequoia are in public ownership categories that prevent active management (i.e. national monuments and state parks). As an actively managed forest, MHDSF is in a unique position to study the impacts various forest management activities may have on the maintenance of existing old growth giant sequoia and the recruitment of younger trees into this status.

Restoration of new age cohorts of young growth giant sequoia

1. Giant sequoia reproduction problems and how this relates to past fire suppression and possibly other factors is not well understood. A century or more of aggressive fire suppression has resulted in a lack of regeneration and young age cohorts in giant sequoia stands (Bonnicksen and Stone 1982, Parsons and Debenedetti 1979). Restoring new age cohorts is a high management and research priority on Mountain Home DSF. Long-lived pioneer species such as giant sequoia require relatively severe disturbances to facilitate cohort establishment and recruitment (York et al In Press). Roller (2004) concluded that a combination of silvicultural strategies such as prescribed fire, overstory thinning, and planting are optimal for establishment and growth of giant sequoia.

Growth and yield of giant sequoia in a mixed conifer landscape

1. Spacing and gap openings have a significant effect on height and volume growth of giant sequoia (Heald and Barrett 1999, York et al 2002, 2007), although Peracca and O'Hara (2008) suggest the relationship may not be as clear as previously thought. There is an ongoing need for further research on growth and yield of managed stands of giant sequoia.

2. Young growth giant sequoia has the potential to become an important tree species for wood products utilization. Optimal stand structures, stocking levels and stand composition of giant sequoia in mixed conifer stands is an important research area. Results will be useful for landowners throughout the Sierras who are currently planting or contemplating planting this species.

Resilience to fire and changes in climate

1. We have a unique opportunity to investigate how different forest management techniques can modify the effects of possible climate change on forests in this region. The interaction between fire, climate change and survival and growth of giant sequoia is an increasingly important area of research. Research in this area has been predominantly historical. Swetnam (1993) investigated historical effects of fire and climate on giant sequoia. (Parsons and Debenedetti (1979) concluded that fire suppression caused changes in successional patterns, resulting in higher densities of small trees, notably white fir and increased ground fuel. Given the uncertainty around extent and direction of climate change over the next several decades, an important area of research and demonstration on MHDSF going forward will be identifying robust silvicultural prescriptions. Robust in this case means prescriptions that maintain resilient forests under the widest possible range of unknown future climate regimes.
2. The Forest also provides an excellent opportunity to investigate forest management approaches to mitigate the effects of past fire suppression, and prevent future severe wildfires. Fire suppression has caused forests in this region to become denser in many areas, with increased dominance of shade-tolerant species. Woody debris has accumulated, causing a buildup of surface fuels. Recent drought conditions have had a deleterious effect in these overstocked stands, particularly on Federal lands. Opportunities will soon manifest with the acquisition of 282-acres of privately owned forestland that was subject to similar mortality rates as is found on the surrounding federal land. Likely research into the rehabilitation of substantially damaged timberland will be a top priority assuming the acquisition is successful.
3. Given the Department's new directive to increase the pace and scale of prescribed fire use, MHDSF plans to work closely with the Fire and Resource Assessment Program (FRAP) to conduct forest fuel inventories prior to and immediately following prescribed burns. This effort will help quantify the effectiveness of using fire to reduce fuel loads, prepare seed beds, reduce competition, and promote regeneration.

Wildlife and Recreation

1. Recreation is the legally mandated primary land use at Mountain Home DSF. Research on recreation experiences in a range of different managed and unmanaged forest conditions should be a high priority. Surveys of user receptivity to various intensities of forest management within old growth giant sequoia groves could be informative to adjacent forestland owners. The impacts of our recreation program, specifically the location of campsite improvements, on old growth giant sequoia could inform our future campground improvement projects.
2. Surveys, monitoring and protection measures for the identified listed, candidate listed

and sensitive wildlife species in Appendix C and their habitats is a high priority. This includes, but is not limited to, Pacific fisher, Sierra Nevada red fox, northern goshawk, foothill yellow-legged frog, deer, fish and sensitive forest bat species. As a research forest, MHDSF continues to accumulate its knowledge base of these species. In addition to surveys, existing resource inventories such as the Continuous Forest Inventory will be used to characterize and monitor habitat on the Forest. We will seek to develop cooperative research priorities with academic institutions and State and Federal agencies. Examples of potential partners include California Polytechnic State University, The Giant Sequoia National Monument / Sequoia National Forest, Tule River Indian Reservation and the Department of Fish and Wildlife.

3. As funding allows, MHDSF plans to continue to conduct various wildlife inventory studies to improve our knowledge of wildlife species habitat use and improve the detection of rare, threatened, or endangered species. All detections of rare, threatened, or endangered species will be documented and assessed to determine if these biological resources are being impacted by any projects conducted under the guidance of this management plan.
4. Beginning in 2020, CAL FIRE Environmental Scientist Michael Baker will be installing a series of audio detection devices to determine the presence of various bat species. The results of this effort will aid MHDSF foresters with designing future projects.

Research Outcomes and Remaining Questions

Research Projects

Historical and Ongoing Research Projects

Appendix B contains a summary of historical research projects at Mountain Home DSF. Ongoing research and demonstration projects at Mountain Home are summarized below.

Growth and Yield of Young Growth Sierra Redwood

This study continues work published in California Forestry Note #72. A second Forestry Note, # 113, was published in 2000. Future plans call for continued measurement of the existing growth plots and further projections of yield based on volume.

Photo Point Study

This ongoing experiment documents changes in the forest landscape over time, using a system of permanent photo points.

Hybrid pines

Performance of 15-year-old hybrid pines was reported in California Forestry Note #81. This study may be continued to evaluate growth for a longer period.

Vegetation Responses and Fire Hazard With and Without Burning in Uneven-aged Harvests

This study looks at vegetation responses in various sizes of group selection units to three methods of slash treatment: broadcast burning, lopping, and piling and burning. Scott Stevens published an article in Forest Ecology and Management in 1999. Re-measurement of these plots should be performed within the next five years.

Response to Management Strategies in Young - Growth Giant Sequoia Stands at Mountain Home Demonstration State Forest

Contract with California Polytechnic State University at San Luis Obispo. This study investigates the growth response of young-growth giant sequoia to variable levels of thinning and prescribed fire. Field work was completed in 2011 and a copy of the report is on file at the MHDSF office.

Old growth giant sequoia inventory

This was an exhaustive inventory of all old growth giant sequoia trees on the Forest. In addition to measurements of dimensional and structural characteristics, each tree is tagged and a GPS position recorded. Started in 2001, this inventory was completed in 2014. Forest staff including retired Forest Manager Dave Dulitz are responsible for this intensive project.

Climate Change Project

This project is part of a larger research project out of University of Nevada Reno. The goal is to assess the resistance and resiliency of Sierra Nevada forests to climate change, as well as experimental plantings of different species and seed stocks. The research is supported by the Tub Flat Timber Harvest Plan prepared by the State Forest.

Planned Future Research Projects

Mountain Home Demonstration State Forest is rich in biological and cultural resources. The Forest's mandate emphasizes recreation, and conservation of old growth giant sequoia ecosystems. This combination of factors drives the priorities for research and demonstration projects identified below. The proposed projects identified below constitute a wish list under ideal conditions. Actual implementation of these projects is contingent on adequate funding.

Quantitative and qualitative study of recreation use

The study prepared in 1990 should be updated when funding is available to stay current on meeting the needs of the public. Outputs would include statistical information on recreational use; a new projection of campground capacity is also needed. The study will also document public perceptions on how well our existing facilities serve their needs.

Visitor need for interpretive programs

Conduct a survey of preferred topics for show-me trips, nature trails, auto tours, and campfire talks. Determine level and type of program desired and how conservation messages can best be woven in. This will require additional staffing and funding to accomplish.

Hardwood management

Study the effects of different levels of black oak management on production and growth of sprouts, mast production, growing stock levels, and growth of other species.

Campground impact

Determine the condition of soils and vegetation in existing recreational sites, using points and soil profile measurements. Study tree growth rates, crown vigor, root development, physical damage, and seed production of each species and relate results to varying degrees of recreational impact.

Monitor the status of old growth giant sequoia and investigate techniques to encourage giant sequoia regeneration and ecosystem sustainability

A 100 percent inventory of old growth giant sequoia (4,750 trees) has been completed. GPS location, size, and other attributes were recorded. This will facilitate a monitoring of the sustainability of the old growth ecotypes. Group selection openings created a decade ago for regeneration status will be measured and analyzed. A study to examine methods to re-introduce fire into old growth giant sequoia groves will also be performed.

Explore the utility of bedrock basins to pre-settlement Native Americans

Conduct a study to examine bedrock basin associations with other cultural evidence. This should indicate their use by Native Americans, and is a separate issue from the ongoing one regarding whether the bedrock basins are natural or man-made.

Optimum stand structure for uneven-aged mixed conifer stands that include a young-growth giant sequoia component

Investigate the optimal stocking levels and stand composition of giant sequoia in mixed conifer stands. Conduct experiments to thin to low densities that approach natural spacing, and monitor over time to investigate effects of drought. This data will be useful for landowners throughout the Sierras who are currently planting this species.

Uneven-aged management study

Proposed literature review and field study of uneven-aged management in different stand types on the State Forest.

Comparative fuel volumes

Conduct a study to compare fuel volumes in the undisturbed old-growth giant sequoia type, recently burned old-growth stands, slash in old cuts, slash in new cuts, and different slash treatments required by the Forest Practice Act.

Campground rejuvenation

Document results of different techniques to revegetate deteriorating camp areas. Methods used could include planting, cultivation, fertilization, and irrigation.

Visitors' aesthetic preferences

Study visitor responses to scenic groves of giant sequoia in a virgin state and compare to appearance of stands harvested by different methods.

Strategic Research Plan

The goal of this plan is to build upon the current demonstration program by emphasizing research infrastructure, applied demonstration targeted towards small forest landowners and outreach. This plan identifies specific objectives to be accomplished within the life of this management plan, and resource requirements.

Research Infrastructure

A demonstration forest is also a research forest. Some projects are accomplished by simply observing the process and the outcome (strictly demonstration). Many others, however, require the rigors of the scientific process to further the state of knowledge about forest

resources (research or experimental).

Infrastructure is defined as the basic elements necessary to facilitate further activity. For this plan, research infrastructure includes researcher facilities, baseline data and information systems.

Objective: Maintain the available housing, office, and outbuildings.

This will be an ongoing function of MHDSF staff that will include routine maintenance, materials for minor building repairs, and necessary supplies including propane, gasoline, and cleaning supplies. It also includes the need to replace items that are subject to exposure or have a limited lifespan, such as paint, roofing, siding and plumbing. Of top priority at this time is a need to re-roof all the structures that are located at the summer headquarters.

Woodpeckers tend to peck holes into the siding of the summer office, however, given this building is a historic resource, State archaeologists require the shakes to be replaced with similar material. Maintaining historic buildings in their historic state takes additional time and manpower. New roofs (steel) have been installed on the barracks and the warehouse.

The winter office facilities consist of an office, living quarters, a small shop, and two garages. The shop is relatively new but the garage and office need repair. The office windows have been replaced since the last revision to the Management Plan. Roofing material has been purchased and should be installed in 2020. All “winter” buildings need a new coat of paint to prevent damage from the weather as well. When such repairs are made, some emphasis should be placed on using materials with a long useable lifespan, i.e. metal roofs as opposed to composite shingles.

Objective: Collect, organize, and store data on tree and plant inventories; wildlife and fish inventories; and soil, geologic, meteorological, and watershed data so that it is available to researchers.

Continuous Forest Inventory (CFI) data is updated every five years. Significant MHDSF staff time is allocated to collecting and managing this data. These inventories will be periodically reviewed for appropriateness and efficiency by MHDSF staff and the State Forests’ Biometrician and Research Coordinator. A complete overhaul of the CFI inventory is scheduled for 2021. The upgrade will replace the old variable plot methodology with a series of fixed radius plots. The MHDSF Manager and State Forest Biometrician agree that the old method has specific nuances not found on other Demonstration State Forests. In particular, the sheer size of the old growth giant sequoia trees results in trees being “in” that are so far away from plot center that they do not have much, if any, effect on growth of other trees near plot center. Also, when trees are so far from plot that they cannot be seen or are located on the other side of a ridge, the laborious task of measuring and calculating limiting distances to determine whether a tree is “in” or “out” is often difficult or impossible to do.

Documents relating to historical inventories of any of the above elements will be scanned so that they are available via either CD or the Demonstration State Forests web site. Raw data sets that are not currently being used by the collecting researcher(s) for publication will be made available via flat data files that will be included along with the scanned documents. A key to the data fields shall be included with each data file.

An information system will allow researchers to access data stored by the Forest. Relational databases containing the CFI data will be developed. User’s guides and installation wizards will be developed for these databases. GIS data layers will also be available for boundaries, public land survey, roads, watercourses, soils, and other attributes including CFI plot locations.

Downloads of these databases and files will be available by request on CD or on the Demonstration State Forests web site. A key to these resources will be maintained. This list will be searchable by keyword, title, and author.

Research Infrastructure Costs

The CFI data collection is part of the ongoing operational cost of Mountain Home DSF. The plant survey and raptor study will be funded from Sacramento Research and Monitoring funds at approximately \$50,000 and \$30,000 respectively.

The State Forests Publications Coordinator in Sacramento will scan research documents. Data set organization and key definitions will be the responsibility of the Research Coordinator in Sacramento in cooperation with the MHDSF and State Forests Program Managers.

The CFI database development, maintenance and support will be the responsibility of Sacramento. Data entry is the responsibility of Mountain Home DSF. Forest staff will maintain a key to these resources with assistance from Sacramento staff.

The existence of these research infrastructure elements will draw increased interest to MHDSF from a variety of wildland researchers. This will entail additional workload requirements on MHDSF and Sacramento staffs. An increased volume of proposals is expected with an associated increased request for funding from the research funds in Sacramento.

Applied Demonstration

Objective: Projects dealing with impacts to sensitive species and their habitat from various harvesting methods should be emphasized.

Objective: Demonstrate effects of various methods of managing younger forest stands.

Because this is a general trend, work concentrated on young growth management should be considered. Studies concerning optimum growing stock levels, young growth harvesting equipment, reduction of stand damage during harvest, and comparisons of even-aged and uneven-aged management are possible examples.

Objective: Experimental work in all aspects of regeneration is still needed.

Also of prime importance in the Sierra Nevada are solutions to both natural and artificial regeneration problems.

Objective: Investigate effects of the California Forest Practice Act on timber harvesting.

Investigate effects in terms of costs, environmental impacts, mitigations, and productivity.

Applied Demonstration Costs

The archeology study of rock basins will cost approximately \$50,000 and will be funded by the Sacramento research fund.

These projects also will result in MHDSF staff time requirements for outreach projects such as report writing, presentations, and tours.

Outreach

Background

The State Forest is utilized by approximately 45,000 – 60,000 visitors each year, including both overnight and day use. They are the primary target for existing educational efforts on the Forest. At present, the State Forest is involved with a modest level of public education. Tours and programs are provided for various groups on request. Groups have included local and international students, environmental educators, resource managers, local government officials, Scout troops, and groups from the general public. Special programs could be developed to draw additional groups, such as lawmakers or school teachers, to the forest.

The focus of educational efforts on the Forest has been three-fold: to explain visitor rules on topics such as hunting, fire use, and off-road vehicles; to provide site specific information on topics including the local natural history, archaeology, and recent human history; and to include conservation messages such as explaining basic concepts of silviculture and multiple-use management.

In order to convey these messages to as many people as possible, a variety of interpretive facilities have been developed. Since staffing on the Forest is limited, most are self-guided or self-explanatory. Methods used include self-guided trails and tours, outdoor displays, handout materials, and bulletin boards. All facilities are designed to be as vandal-resistant and maintenance free as possible.

Inventory

A Visitor Center and outdoor kiosk are located at the Headquarters facility. They provide visitors with interpretive information including handouts, maps, fire prevention information, and answers to other basic questions. An outdoor interpretive center was also constructed by the Mountain Home staff at Balch Park at the beginning/end of the Forestry Information Trail.

Educational materials are also posted on bulletin boards at the Visitor Center, and at the entrance to campgrounds. These emphasize campground rules, registration instructions, fire danger, and avoiding bear problems.

The Forestry Information Trail, which starts at Balch Park, is used by a large number of people each year. There is a booklet describing the natural history and management of the area that accompanies this self-guided trail. Having been in existence for many years, the trail signs and information booklet are outdated. New numbered trail markers were installed by MHDSF staff in 2015 and the notable trail stops were reinterpreted. The new information needs to be put together in booklet form and printed so it can be used by trail users. This information should also be made available via a downloadable application so users can utilize their smart phones as an interpretive guide.

Starting in 2018, State Forest staff have been inviting Boy Scout Troops from nearby cities to visit the Forest and earn their Forestry merit badge. This requires a local forester to sign off on their task book. This is a recent outreach program undertaken by MHDSF foresters and is expected to grow in popularity as time goes on. MHDSF foresters have signed off on several merit badges for one troop from Tulare.

A self-guided motor tour was developed years ago for State Forest and County roads. It uses road junctions and other landmarks as cues tied to descriptive information in a handout. This guide needs to be reinterpreted to make it current to recent management activities at MHDSF.

This guide should be revised every 5 years to remain current and to increase visitor education and enjoyment.

Objectives: Develop additional interpretive trails near existing campgrounds and other heavily used areas.

Possible locations include the Loop Trail at Shake Camp, Frasier Mill, and the River Trail from Hidden Falls to Moses Gulch. Descriptive handouts placed at these trailheads would increase the education and enjoyment of the public while explaining State Forest management activities. On the other hand, providing free brochures or handouts will likely become another form of litter to be found strewn along the trails. This is another good reason to make the information available by electronic application downloads.

Tours of different areas of the Forest could be organized and led by staff. Topics and locations could include historical areas, recent or active timber sales, experimental plots, etc. The public could be informed of tour dates and times through posting notices in campgrounds and press releases to local newspapers. Groups could be encouraged to request guided tours on specific topics. Development of an environmental program for various school groups should also be initiated.

A strong outreach program to convey information and display results complements the investment in research and demonstration. Outreach is accomplished through papers, articles, presentations, tours, and the internet.

Public outreach and education will require a significant time commitment by Forest staff and will be somewhat limited without additional personnel.

Objective: Research results from MHDSF are provided to customers.

Each project will be evaluated as to the most appropriate outlet for dissemination. The following provides some guidance.

Guidelines for publications

The following are ideas and guidelines for choosing the best types of publications for different research and demonstration studies.

- Peer reviewed scientific journals such as Forest Science, Canadian Journal of Forestry, Journal of Forestry, Journal of Wildlife Management. These are appropriate for rigorous scientific studies, and enforce objectivity and thorough review of methods.
- Applied peer reviewed scientific journal such as the Western Journal of Applied Forestry. This is appropriate for studies with direct field applicability.
- Institution-specific publications such as Hilgardia (UC), General Technical Reports (USDA Forest Service). These are appropriate for lengthy publications.
- California Forestry Note. This is appropriate for applied articles of six pages or less, that may be a shorter summary of a journal paper.
- California Forestry Report. This is appropriate for applied articles of greater than six pages. This may be a longer, more detailed version of a journal paper.

- California Demonstration State Forests Newsletter. This is a quarterly publication that includes research, demonstration, recreation, and other news. All State Forests staff may contribute articles.
- Poster presentations at conferences, professional workshops, meetings and symposia. These are appropriate at any stage of development for a project.
- Oral Presentations at conferences, professional workshops, meetings and symposia. These are appropriate for critical research results.
- Tours, educational. These may be conducted for any interest group including professionals, politicians, or students.
- Tours, workshop. These are usually directed towards natural resource professionals.
- State Forests Web Site (part of the CAL FIRE web site). This can contain electronic copies or links to all relevant publications, posters, etc.

Objective: The public has access to information about the State Forest mission as well as past and current projects at Mountain Home.

This will be facilitated by the California Demonstration State Forests web site, which will be housed at the CAL FIRE web site. Past and current project reports and publications will be available, as will data sets. This will encourage building on past projects and using multidisciplinary approaches when researchers are developing proposals.

Outreach Costs

MHDSF staff time requirements for outreach will vary with the number of publications produced in-house and the number of tours and workshops put on. Editing of contracted publications by MHDSF staff also consumes staff time and will vary with the number and complexity of projects.

Many of the outreach costs are borne over the entire Demonstration State Forests system, such as the web site or newsletter. This assumes that the biometrician, research coordinator and publications coordinator positions in Sacramento are fully staffed and that operating funds are available. At least \$10,000 per year will be needed in Sacramento to fund publishing costs.

Conclusion

This research and demonstration plan for MHDSF provides a planned direction for the continued success of Mountain Home DSF. It is not an enforceable standard for management of Mountain Home DSF, but rather a plan for what Forest staff would like to achieve given their desired funding level. The plan is contingent on an ideal scenario of estimated funding becoming available. If funding fails to materialize, we will scale down implementation of this plan as necessary.

The costs provided are intended to facilitate budgeting over the period. Growth in demonstrations and experiments will result from attention to research infrastructure, outreach

and available funding. The specific demonstration projects outlined above will add significant value to current operational practices by using them as models for sustainable forest management.

V. FOREST MANAGEMENT

Vegetation Resources Inventory

Productive coniferous forest covers 4,783 acres out of a total of 4,807 acres of Mountain Home. The remaining 24 acres are covered with brush and rock. Figure 5 shows vegetation types and site classes on the Mountain Home Demonstration State Forest.

MHDSF is famous for its giant sequoia trees. They occur in small groves and as scattered individuals throughout the Forest. The sixth largest tree in the world, the Methuselah tree, is found on Mountain Home DSF. Old growth giant sequoia trees are protected from harvesting. In addition to old growth giant sequoia, young growth giant sequoia, ponderosa pine, sugar pine, white fir, incense-cedar, black oak, and other minor hardwood species. The Forest is predominantly mixed conifer stand types of these species.

MHDSF surveys resource conditions on the Forest through measurements of inventory plots. These form the information base for management planning and supporting research projects. Three complementary resource inventory and monitoring systems exist, the Continuous Forest Inventory (CFI) system, the Forest Resources Inventory (FRI) system and the Old Growth Giant Sequoia inventory. The FRI samples represent a detailed snapshot of the resource conditions at a point in time. The CFI is designed to track change on the Forest, such as growth rates, mortality, harvest, changes in species composition, and overall stocking trends. The Old Growth Giant Sequoia inventory is primarily for research purposes.

The Forest Resources Inventory (FRI) system consists of temporary plots on a 5 X10 chain grid. These plots are re-established periodically, approximately every 10-15 years. In addition to timber characteristics, data measured includes snags, species, size, and other characteristics of all live trees, and unique characteristics such as goose pens, fire scars and broken tops with potential wildlife habitat value. The last FRI inventory was completed in 2007, with the next measure scheduled for 2022.

A Continuous Forest Inventory (CFI) system of permanent plots that are re-measured every five years has been in place since 1970, and it continues to be measured. A 20 X 20 chain grid system was placed over the ownership and 120 permanent plots were established. Each tree is uniquely tagged and identified. The plots are re-measured every five years. Information gained from the CFI data includes gross and net merchantable volume, number of trees per acre, regeneration, volume per acre, and volume growth per acre. The CFI inventory provides a record of detailed re-measurements on the same trees over time and provides the most accurate record possible of forest development changes over time, such as growth and mortality, not only by species but even by size classes within a species. This information is used to make forest management decisions, and to support research and demonstration activities.

The Old Growth Giant Sequoia is an exhaustive enumeration of all the old growth giant sequoia trees on the State Forest. Each tree is identified with a uniquely numbered metal tag, and its location is recorded with a GPS system. Measurements include dimensional and structural characteristics. This inventory was completed in 2014 and resulted in 4,750 old growth trees located on the Forest, which equates to 0.95 trees per acre on average across the Forest. Primarily intended for research and monitoring, this inventory is going to be

Vegetation Type and Site Class

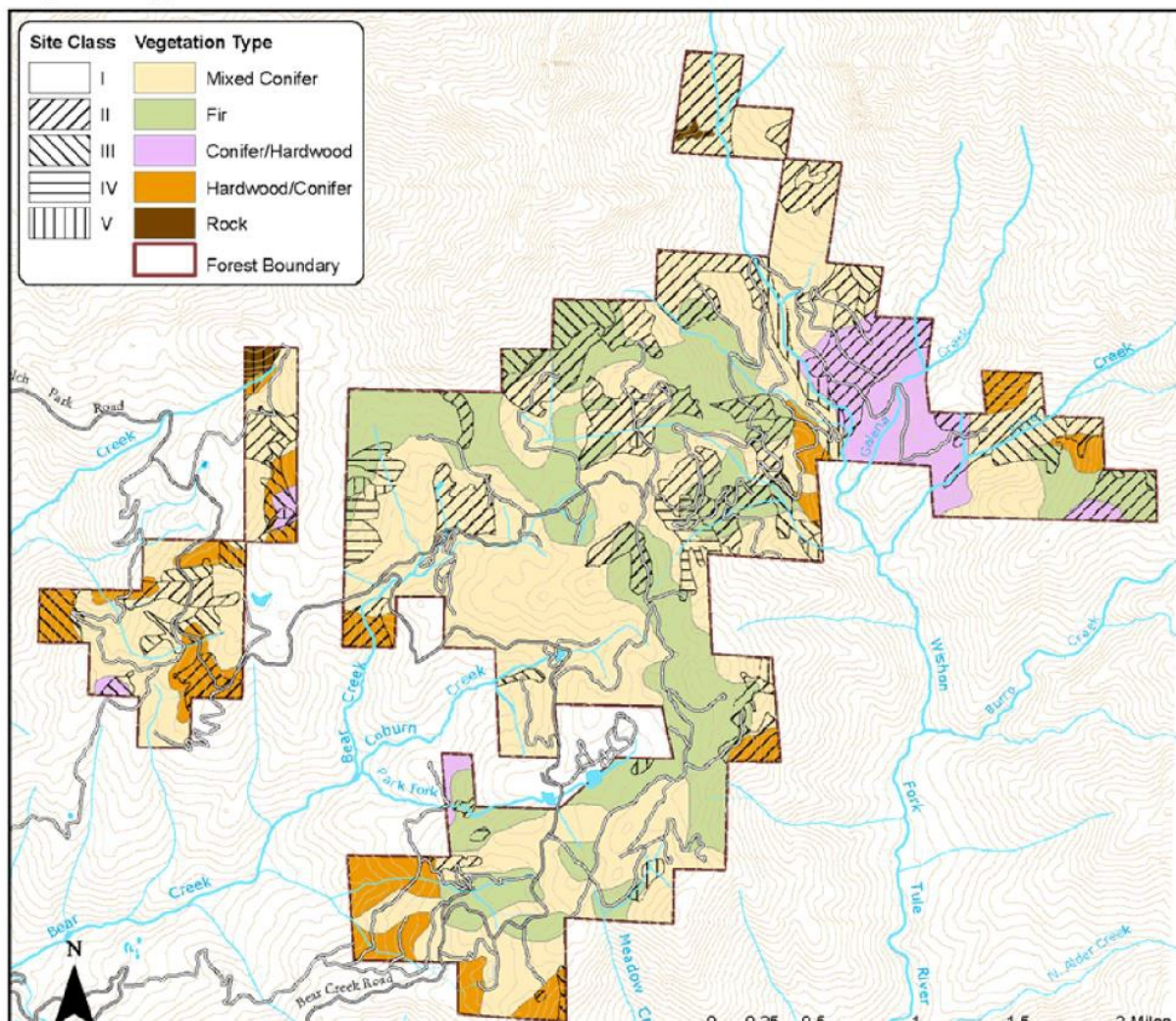


Figure 6. Vegetation types and site class map of Mountain Home.

immensely valuable for tracking the status of the old growth giant sequoia resource in the region. It has already been utilized to develop a height – diameter relationship for use in the FRI and CFI inventories.

Current Inventory and Resource Trends

Current stocking based on the 2017 CFI measurement, which is the most current data, is 42,664 BF/acre of conifer including old growth giant sequoia. Excluding the old growth giant sequoia, the conifer stocking is 24,187 BF/acre. Hardwoods remain a small component of all stand types. The current inventory for the MHDSF is summarized in tables 6-8 below.

As can be seen in Table 6, the recent drought and bark beetle epidemic has had a dramatic impact on all non-giant sequoia species, with the pine species losing about 70 percent of its stocking over the 5-year period, 2012-2017. The pine mortality likely continued through 2018, but is now slowing. White fir mortality is not as dramatic but it usually lags behind the pine mortality and will likely be ongoing through at least 2020. These losses in stocking and shifts in species composition create management challenges that will need to be addressed in the proposed future management of the State Forest.

Table 6. Summary of forest inventory conditions and trends, 2012-2017.

	TPA	TPA	BA/ac	BA/ac	BF Vol/ac	BF Vol/ac	
Conifers	2012	2017	2012	2017	2012	2017	% Loss BF
WF	66.3	49.1	87.0	69.3	16,936	14,083	16.8
PP/JP	7.3	4.1	9.0	4.2	1,765	646	63.4
SP	7.1	2.0	18.0	4.2	4,412	1,046	76.3
IC	36.0	26.5	43.2	38.3	3,964	3,767	5.0
YGGs	7.8	7.7	24.7	26.2	4,344	4,644	-6.9
Non OG Total	124.5	89.5	181.8	142.2	31,421	24,187	23.0
OGGS	0.89	0.87	66.3	66.7	18,377	18,478	-0.5
All Conifer	125	90	248	209	49,798	42,664	14.3
Hardwoods							
	2012	2017	2012	2017	2012	2017	% Loss CF
BO	15.3	10.7	12.6	10.8	382	342	10.5
LO	1.2	1.0	0.7	0.5	19	13	32.9
HW Total	16.5	11.7	13.3	11.3	401	355	11.3
OGGS=old growth giant sequoia, YGGs=young growth giant sequoia, PP/JP=ponderosa pine/Jeffrey pine, SP=sugar pine, WF=white fir, IC=incense cedar, BO=black oak, LO=live oak.							

Table 7. Stand Table, 2017. Number of trees per acre by diameter class and species.

DBH Class	OGGS	YGGs	PP/JP	SP	WF	IC	Conifer Totals	BO	LO	Totals
5-10		1.385	1.714	1.316	22.552	9.102	36.069	4.151	0.967	41.186
10-15		1.992	1.380		9.224	7.652	20.247	3.879		24.127
15-20		0.884	0.620	0.108	7.079	4.692	13.384	1.651		15.035
20-25		1.211	0.140	0.136	4.609	2.803	8.898	0.561	0.053	9.511
25-30		0.584	0.123	0.176	2.786	1.112	4.781	0.302		5.083
30-35		0.509	0.054	0.085	1.504	0.425	2.578	0.083		2.660
35-40		0.396	0.046	0.107	0.863	0.442	1.854	0.042		1.896
40-45		0.258	0.018	0.085	0.373	0.134	0.868	0.017		0.885
45-50	0.028	0.208			0.098	0.095	0.429	0.014		0.444
50-55	0.046						0.046			0.046
55-60	0.019	0.165		0.020	0.022	0.054	0.281			0.281
60-65	0.016	0.040			0.008	0.008	0.072			0.072
65-70	0.079	0.033				0.007	0.119			0.119

70-80	0.064	0.061				0.006	0.131			0.131
80-90	0.087						0.087			0.087
90-100	0.069						0.069			0.069
100-110	0.077						0.077			0.077
110-120	0.060						0.060			0.060
120-130	0.083						0.083			0.083
130-140	0.051						0.051			0.051
140-150	0.035						0.035			0.035
150-160	0.036						0.036			0.036
160-170	0.032						0.032			0.032
170-180	0.018						0.018			0.018
180-190	0.021						0.021			0.021
190-200	0.018						0.018			0.018
200-210	0.009						0.009			0.009
210-220	0.012						0.012			0.012
220-230	0.007						0.007			0.007
230+	0.006						0.006			0.006
Totals	0.87	7.73	4.10	2.03	49.12	26.53	90.38	10.70	1.02	102.10

OGGS=old growth giant sequoia, YGGs=young growth giant sequoia, PP/JP=ponderosa pine/Jeffrey pine, SP=sugar pine, WF=white fir, IC=incense cedar, BO=black oak, LO=live oak.

Table 8. Stock table. Conifer gross scribner board foot volume by diameter class and species. Hardwoods in cubic feet.

DBH Class	OGGS BF/acre	YGGs BF/acre	PP/JP BF/acre	SP BF/acre	WF BF/acre	IC BF/acre	Conifer Totals	BO CF/acre	LO CF/acre	HWD Totals
10-15		56	65		736	252	1110	79		79
15-20		142	133	21	1622	544	2461	88		88
20-25		389	53	56	2405	743	3645	58	5	63
25-30		337	120	156	2695	552	3860	40		40
30-35		483	92	133	2458	346	3513	20		20
35-40		560	107	268	2149	552	3636	14		14
40-45		506	75	270	1343	276	2470	6		6
45-50	82	550			464	229	1324	7		7
50-55	195						195			0
55-60	90	646		142	137	177	1192			0
60-65	94	223			74	39	430			0
65-70	585	220				39	845			0
70-80	602	496				40	1138			0
80-90	1022						1022			0
90-100	1030						1030			0
100-110	1356						1356			0
110-120	1311						1311			0
120-130	2078						2078			0
130-140	1444						1444			0
140-150	1119						1119			0
150-160	1276						1276			0
160-170	1234						1234			0
170-180	772						772			0
180-190	1002						1002			0
190-200	902						902			0
200-210	484						484			0
210-220	720						720			0
220-230	479						479			0
230+	602						602			0
Totals	18,478	4,606	646	1,046	14,083	3,790	42,649	313	5	318

OGGS=old growth giant sequoia, YGGs=young growth giant sequoia, PP/JP=ponderosa pine/Jeffrey pine, SP=sugar pine, WF=white fir, IC=incense cedar, BO=black oak, LO=live oak.

Historic Trends

Prior to the purchase of the Mountain Home Tract in 1946, the entire tract was cruised at least twice. The first cruise was performed by the James D. Lacey Company of Portland, Oregon in 1907 or 1908. It is not known what merchantability standards or cull percentages were used in the Lacey cruise. The tract was partially cruised by the U. S. Forest Service in 1936 and the remainder in 1945 using a 10 percent sample.

In 1945, the California Division of Forestry hired Belknap C. Goldsmith to appraise the value of the tract. According to his notes, the Mountain Home Tract had a total of 92.45 MMBF in whitewoods (young growth sequoia was not counted). He arrived at this by subtracting the amount of lumber cut from the tract since the Lacey cruise. Goldsmith's method of using 37-year old cruise data and then subtracting the estimated amounts cut with no consideration for growth, gave a very conservative estimate of volume and value. In his notes, he concedes that much of the cut redwood was from dead and down trees, but he was not able to estimate an exact amount. He, therefore, subtracted the entire amount of harvested redwood from Lacey's estimate of standing redwood volume. It is therefore probable that his volume figures were under estimates of the actual stand condition. Table 9 summarizes these earlier inventory efforts and the most recent 2017 CFI.

Table 9. Summary of historical forest resource inventories.

	Volume, gross board feet per acre					
	PP	SP	WF & IC	Total WW	GS	Total, All Spp.
Lacey (1908)	2,290	9,342	10,300	21,932	28,622	50,554
Goldsmith (1945)	2,180	8,116	8,819	19,115	23,443	42,558
USFS(1936, 1945)	2,635	8,422	10,687	21,744		
FRI (2007)	1,628	5,555	22,894	30,077	26,124	56,201
CFI (2017)	646	1,046	17,850	19,542	23,142	42,684

Clearly a comparison of these data must be tempered with a recognition of their differences. Because they are from different eras, objectives and priorities are different. Log rules, merchantability standards, cruising methods and analysis methods were no doubt different and are largely unknown for the older inventories. This includes the use of a new Height-Diameter equation based on the Old Growth Inventory. Nevertheless, we believe these data sets witness some general trends in vegetation dynamics on MHDSF over the last 100 years: whether through growth, fire exclusion, timber harvest, bark beetles or a combination of these and possibly other factors, the species mix on the Forest has changed since the early 1900's. The proportion of pine species, which had been slowly decreasing over time, was dramatically reduced due to the recent drought and bark beetle caused mortality.

Implications for management on Mountain Home include the need for thinning to reduce stand density and protect old-growth giant sequoia trees. Another priority highlighted by these data is the need to encourage shade intolerant species like ponderosa pine and sugar pine, and recruit new age cohorts of giant sequoia.

Growth and Mortality

Table 10 shows the growth estimates for the two most recent CFI re-measurements, 2012-

2017. The survivor growth on all species, not including old growth giant sequoia, averaged about 455 board feet per acre per year. As shown in Table 11, during the same period mortality averaged 1,897 board feet per acre per year. It is notable that only giant sequoia had growth rates that exceeded mortality rates in the period. No active THPs have been logged on MHDSF since 2011 so it was assumed that all trees logged since then were dead or dying prior to harvest and therefore considered mortality for the purposes of this report.

No old growth giant sequoia mortality was found in the inventory. This is likely due to the lack of bark beetles that are specific to giant sequoia, but may also be due in part to the extensive thinning operations that have been implemented over the past decade in the old growth groves, as well as the improved ground water relations that are found coincidental with the groves. The steeper fringes and lower elevation portions of the State Forest experienced the highest levels of mortality, with some areas experiencing more than a 90 percent loss of standing inventory. There are likely multiple factors for this, including the species composition which includes more pine, less available water, and the progression of bark beetles from the adjacent densely stocked lands.

Table 10. Survivor growth 2012-2017, board feet per acre per year, cubic feet for hardwoods.

Conifers	BF/ac/yr Growth	Hardwoods	CF/acre/yr Growth
WF	286.7	BO	5.5
PP/JP	11.5	LO	0.5
SP	25.6	HW Total	6.1
IC	54.7		
YGGS	68.4		
Non OG Total	446.9		
OGGS	7.7		
All Conifer	454.6		

Table 11. Mortality 2012-2017, gross board feet per acre per year, cubic feet for conifers.

Conifers	BF/ac/yr Mortality	Hardwoods	CF/acre/yr Mortality
WF	830.5	BO	10.6
PP/JP	264.4	LO	1.4
SP	703.8	HW Total	11.9
IC	85.9		
YGGS	12.0		
Non OG Total	1,896.6		
OGGS	0.0		
All Conifer	1,896.6		

Ten one-acre plots were established on the forest in 1952 and 1953. They were used to determine tree mortality caused by insects and diseases, and compare growth data with that of areas recently cut. Nine plots were set up in mixed conifer stands and one was placed in a second-growth giant sequoia stand logged around 1885. The characteristics of the plots varied

to represent the different conditions existing on the forest. All trees larger than 11.6 inches DBH were measured, numbered, and tagged. In addition to the growth and mortality data collected for these trees, the smaller trees were counted and seedlings were sampled. Plots were measured every five years from 1954 to 1976. Prior to the establishment of these plots, net growth in old growth giant sequoia had been considered to be nonexistent. Measurements from these plots indicated that the periodic annual increment ranged from 385 to 786 board feet per acre per year.

Site Quality

Site quality on the Forest is generally very high. Ninety-one percent of the Forest is classified as Dunnings Site II or better. MHDSF site quality estimates are based on a site map developed by a previous Forest Manager, Dave Dulitz (Figure 5). Site determination is based on a combination of information gathered from the Dulitz site class map and actual measured site trees from the FRI and CFI inventories.

Planned Management and Forest Structure

This section describes the planned management of MHDSF for the next ten years and will guide the development of the Forest through the next century. The goals for management of the State Forest are described in terms of desired forest structural conditions. MHDSF balances protection of giant sequoia groves and other public trust resources with sustained productivity and the long term biological productivity of the timberland. The timber management program under this plan is expected to produce a moderate, perpetually sustainable harvest level. Harvest levels will support a financially viable timber management program to remain relevant as a research laboratory for sustainable forestry on private timberlands. Planned harvest rates are somewhat lower than that of many private owners due to additional landscape and wildlife habitat constraints imposed on Mountain Home as a public forest, and the need to maintain the widest possible range of forest conditions to accommodate potential future research studies.

A primary goal at MHDSF is to foster the development of giant sequoia stands, both young growth and old growth, to a point that is reflective of current natural forest conditions in this region. Stands will remain a mixture of conifer and hardwood species typical of the southern Sierra Nevada. As is typical of this area, barring regular fire disturbance or aggressive thinning operations, the characteristically shade tolerant white fir has in many areas of the State Forest been able to affect a species shift towards white fir dominance over time, at the expense of pine and other less shade tolerant species. Extended drought conditions and an explosion in bark beetle populations have greatly exacerbated this trend. Establishing a more natural species mix will in many cases require a dedicated effort to decreasing the white fir component of stands and cultivating giant sequoia and pine species. Desired forest structure will typically be that of low density, open canopy, fire resilient stands.

Changes in forest ecosystems over time involve a substantial degree of unpredictability which renders static forest structure goals undesirable. We aim to maintain as wide a range of seral stages and forest structure types as possible, from regeneration to old growth, open and closed stands, in order to maintain options for future management and research.

Maintaining a representation of all seral stages and forest structure types at MHDSF is important for at least two reasons. First, directions of future research, and the associated need for different forest structures for research, is hard to predict. We wish to maintain maximum

flexibility for research and demonstration, and not foreclose on future research options. Second, evidence of large-scale changes in climate is accumulating. There is massive uncertainty about the extent and direction of these changes. It is essential for MHDSF to maintain the broadest possible range of seral stages and forest structure types to be able to evaluate species responses to different management regimes under a range of possible future climate situations. Research undertaken by the University of Nevada at Reno is currently underway at MHDSF to study these effects.

An important part of our management is to restore and maintain the full range of age cohorts on MHDSF to recruit old growth giant sequoia and replace old growth trees that are lost to natural forces.

Giant Sequoia Management

Giant sequoia occurs in distinct groves throughout its range. Numerous names have been assigned to the groves within the Forest. The Mountain Home Grove is universally used to describe the central grove area. The western fringes of the Mountain Home Grove have also been called the Rancheria Grove. The southern fringes have been referred to as the Crystal Springs Grove. The grove along the North Fork of the Middle Fork of the Tule River is known as the Middle Fork Grove. This document refers to this entire area as the Mountain Home Grove.

A separate grove exists in the Silver Creek drainage; it will be referred to as the Silver Creek Grove. This convention agrees with that used in Giant Sequoia Groves of the Sierra Nevada (Willard, 1994).

Definitions differentiating old growth and young growth giant sequoia trees were developed during the initial years of the Continuous Forest Inventory system. The definitions are based on tree characteristics that indicate age.

Table 12 below lists various tree characteristics to be used in determining the age category for giant sequoia trees.

Table 12. Structural characteristics of young growth and old growth giant sequoia trees.

YOUNG GROWTH	OLD GROWTH
Branches (alive or dead) or knot indicators in the lower 1/3 of the trunk.	Lower 1.3 of the trunk free of branches or knot indicators.
Branches small, generally less than 4 inches	Large branches, many larger than 4 inches in
Pointed crown, height growth rapid.	Top of crown rounded.
Growth rings large, averaging 0.1 inch or	Narrow growth rings, less than 0.1 inch.
DBH generally less than 80 inches.	DBH generally greater than 80 inches.
No evidence of fire scars.	Many trees with fire scars.
Excessive taper in open grown trees.	Very little taper in trunk.
Shallow bark furrows.	Deep bark furrows.
Total height is generally less than 200 feet.	Height is often more than 200 feet.

Diameter growth is highly variable and not a reliable indicator of age. It is also difficult and time consuming to determine the age of large standing trees. Height growth is less variable than diameter growth, and is one of the factors used in the definition. Maximum height of giant

sequoias at the State Forest is approximately 240 feet. As this maximum is reached, the tree crown becomes more rounded. This begins at an approximate age of 200 years.

Limb characteristics are another good indicator of age. Giant sequoias tend to retain the lower branches longer than most other trees. Limbs can also obtain a very large size. Young trees typically have limbs on the lower third of the bole. The trunks of old-growth trees will be clear except for an occasional large limb or burl.

Old Growth Inventory

Giant sequoia is present on approximately 2,677 acres of the State Forest. Per the recently completed Old Growth Giant Sequoia inventory (2014), there are 4,750 old growth sequoia trees within the bounds of Mountain Home State Forest. The CFI indicates that old growth giant sequoias occupy about 66.7 square feet of basal area per acre.

In 2001, staff began inventorying and mapping all the old growth giant sequoias on Mountain Home DSF. The inventory was completed in 2014 resulting in 4,750 old growth trees being measured and mapped using a Global Positioning System. Stand and stock tables were developed to assist in the management of the giant sequoias. In addition, a stump inventory has been completed for all giant sequoias cut during the historical logging period. These inventories, along with research and development projects, will assist the staff in managing the giant sequoia groves.

Young Growth Inventory

The 2017 inventory of young growth giant sequoias based on the Continuous Forest Inventory plots shows a total of 20,613 trees. There is an average of 7.7 young growth trees per acre. They represent a total net volume of 12,330 MBF.

Additional planting of giant sequoia trees has occurred outside the giant sequoia groves. There are no statistics for these young trees because they have either not reached sufficient size to be included in the inventory plots or they were not included in the inventory plots.

Other Tree Species

The stand structure for the other mixed conifer tree species on the Forest will be primarily uneven-aged, in which individual trees of a range of ages and size classes are present in the stands. Once the desired long-term forest structure conditions have been accomplished, we anticipate that the oldest trees other than the giant sequoias on the State Forest will be roughly 200 years old.

Structural characteristics such as snags, downed woody debris, decadent trees and irregular tree characteristics (large branches, irregular form, hollows) will be retained to a density where they do not pose a safety hazard, fire hazard, impede the establishment and growth of new trees on the site, or provide a source of pest and disease to infect nearby healthy trees. Due to the high density of snags resulting from drought mortality, there is no need to actively create snags by girdling or topping live trees, unless prescribed on individual research installations. A key component of late-succession forest stands are the decadent components, snags and down large logs. Snags from the dominant and predominant members of the stand are preferred, to later become down logs.

Forest Management Guidelines

1. Standing old-growth giant sequoias will not be harvested and shall be protected from damage during all management activities. Old growth trees will be protected during harvest activities. Care must also be taken to avoid cutting or removal of the shallow root system when constructing roads, skid trails, and landings. Timber falling must be done carefully so that damage to the tops or trunks of adjacent trees does not occur. Old-growth sequoias that contain fire scars and are in areas planned for prescribed fire use, shall be protected to the fullest extent possible. Protection shall be implemented by removing accumulated fuels from within the fire scar “goosepens” and handline shall be constructed down to bare mineral soil around the fire scarred portion of the circumference of the root collar. Furthermore, during firing operations, ring firing tactics shall be used when advancing fire towards such trees.
2. Young growth giant sequoias shall be managed primarily as replacements for old growth trees lost to natural death or historical logging (prior to the establishment of the State Forest). Young-growth trees will be commercially thinned where density is too great for all trees to grow into old growth replacements. Estimates of the density and distribution of old-growth giant sequoia trees prior to 1860 shall be used to determine the optimal stand structure.
3. It is recognized that reproduction of giant sequoia requires disturbance in the form of fire or timber harvesting (preferably both). Harvesting will remain the primary means used to encourage giant sequoia reproduction. Prescribed fire will be used in certain situations to reduce fuel loading, create an appropriate seedbed, and provide heat to open giant sequoia cones for seed dispersal.
4. Salvage harvesting occurred in the Silver Creek Grove in 2019 following the Alder Fire of 2018. Salvage operations were confined to the north side of Silver Creek where tractor operations were feasible. All dead or otherwise fire damaged trees south of Silver Creek shall be left as is. The logged area shall be monitored during the Spring and Summer of 2020 to determine if natural regeneration is successful. If not, the area shall be planted to accelerate reforestation of the burned and harvested area.
5. Giant sequoia planted outside of the natural groves will be managed as a timber resource. No attempt will be made to expand the grove area by allowing these planted giant sequoias to become old growth.
6. Selective harvesting of white fir, pine, and incense-cedar within the groves will be managed to improve vistas of individual old growth giant sequoia and protect them from wildfire. This harvesting can be performed effectively to enhance the aesthetic appearance of the forest for recreational visitors.
7. A harvest level of 1.5 to 2 million board feet annually will be implemented. This harvest level is less than the indicated net growth of the forest on a sustainable basis. It will permit harvests in perpetuity without depleting the productivity of the soil, the forest stands or other public trust resources.
8. Continue to use uneven-aged management as the primary silviculture system in future harvests on the State Forest. Artificially regenerate openings caused by the removal of

trees in group selection cuts. Rely on natural regeneration in other areas.

9. Salvage operations will be used to address widespread tree mortality from drought and bark beetles. Mountain Home foresters will make every effort to utilize as much of this material as operationally feasible to avoid waste and to prevent accumulations of large fuels. Due to the narrow window of merchantability for dead and dying trees, salvage operations will be given a high priority. Salvage harvest volumes may exceed the annual harvest level stated in Item 7 above to fully realize timber values and better utilize those resources that are dead or dying. Subsequent planned harvests will likely be delayed to allow for forest recovery should those limits be exceeded.
10. The cutting cycle for operational management will range from 10 to 30 years.
11. Prescribed fire shall be utilized to the fullest extent possible to treat post-harvest slash accumulations and prepare the forest floor as a more receptive seedbed. Post-harvest and pre-burn fuel treatments shall include the construction of fire breaks, pruning, felling of small diameter snags that provide a fuel ladder, piling, mastication, lopping, scattering, and orientation of fuels away from residual trees.

Silvicultural Systems

A variety of silvicultural systems are applicable due to the diversity of the timber stands, age and size classes, species composition, and goals for research and demonstration, wildlife habitat diversity, etc., on Mountain Home DSF. The wide variability in structure conditions within timber stands will necessitate mixing silvicultural systems in some stands while in other stands there may be large areas managed under one system.

Uneven-aged management is the primary silvicultural system, and is used on approximately 75 percent of State Forest lands. This system is the most compatible with the high recreational use of MHDSF because the stands remain aesthetically pleasing after logging. It is also desirable on sites where tree planting is difficult. Natural regeneration will mainly be used with this system, with some supplemental tree planting. This system can be used effectively where the current stands are of mixed species and ages.

Even-aged management is used on the forest where the existing stands contain few or no understory trees or in areas of severe infestation or infection. The resulting small clearcuts have been limited to small areas no larger than ten acres; in general, they are patch cuts under two acres. Artificial regeneration has been used in these areas, resulting in the growth of young ponderosa and Jeffrey pines throughout the Forest.

Most of the forest management activities will be conducted using the following silvicultural methods:

Selection (uneven-aged)

Under the selection method, trees are harvested individually or in small groups sized from 0.25 acres to a maximum of 2.5 acres. Single tree selection will be the primary prescription for the true fir and mixed conifer stands. Group selection will be prescribed within the mixed conifer stands to avoid species conversion and to maintain species diversity. Openings will be created to obtain pine regeneration rather than the more shade tolerant species that are favored by single tree selection. Artificial regeneration will be used if necessary to supplement natural regeneration and prevent brush species from invading the site.

Commercial thinning (Intermediate)

Well-stocked plantations with trees at eight to ten-foot spacing need pre-commercial thinning at 15 to 25 years. One or more commercial thinnings can be expected in these stands after approximately 25-40 years. Commercial thinning is the removal of trees in a stand to maintain or increase average stand diameter of the residual crop trees, promote timber growth, and/or improve forest health. The residual stand will consist primarily of healthy and vigorous dominant and codominant trees from the preharvest stand. The residual stand will be managed by the single-tree selection or group selection methods during future harvests. It is unlikely that commercial thinning will occur within the life of this management plan as local market conditions are not favorable to small sawlogs, chips, or hog fuel.

Sanitation-Salvage (Intermediate)

Sanitation is the removal of insect attacked or diseased trees to maintain or improve the health of the stand. Salvage is the removal of only those trees that are dead, dying, or deteriorating, because of damage from fire, wind, insects, disease, flood, or other injurious agents. Salvage provides for the economic recovery of trees prior to a total loss of their wood product value. These methods will be used judiciously to also consider the commitment to retain forest structural characteristics such as snags and downed woody debris. Sanitation and salvage may be combined into a single operation.

Rehabilitation of Understocked Areas (Special)

The rehabilitation prescription will be used for the purposes of restoring and enhancing the productivity of any forest land that does not meet the stocking standards defined in the California Forest Practice Rules.

Fuelbreak/Defensible Space (Special)

Trees and other vegetation and fuels are removed to create a shaded fuel break or defensible space in an area to reduce the potential for wildfires and the damage they might cause. Shaded fuelbreaks shall be given strong consideration in strategic locations such as ridges and adjacent to high-use recreational areas. Fuelbreaks shall be maintained at lower stocking levels to slow wildfire spread and enhance suppression efforts.

Shelterwood (even-aged)

The shelterwood regeneration method reproduces a stand via a series of harvests (preparatory, seed, and removal). The preparatory step is utilized to improve the crown development, seed production capacity and wind firmness of designated seed trees. The seed step is utilized to promote natural reproduction from seed. The removal step is utilized when a fully stocked stand of reproduction has become established, and this step includes the removal of the protective overstory trees. The shelterwood regeneration method is normally utilized when some shade canopy is considered desirable for the establishment of regeneration.

Seed tree (even-aged)

The seed tree regeneration method can be viewed as a simplified version of the shelterwood method above. Using just the seed step, several mature seed bearing trees are left after harvest to ensure natural reproduction from seed. The overstory seed trees can be removed after new regeneration has become established, or they may be retained as legacy structure and habitat trees for the duration of the next generation of trees on the site. Older seed tree cuts on the Forest have produced young stands with mixed species.

Clearcutting (even-aged)

Under this method, all trees on a harvest area are removed. Harvest areas are limited by the State Forest Practice Rules to 20 acres with exceptions up to 30 acres under special circumstances.

Even-aged management at MHDSF has historically been used when the preharvest stand contained little or no understory trees. The resulting small clearcuts were usually less than ten acres in size with most the “patch cuts” being under two acres. While this method maintains a soft, gap phase regeneration appearance and function, it is difficult to manage as a unit and would better be classified as group selection, an uneven-aged system. The majority of these patches at MHDSF have been neglected over time. The resulting edge effect often results in the planted species (predominantly pine) eventually succumbing to competition from more tolerant species.

Aesthetic issues that sometimes arise from clearcutting will be mitigated by the following methods: Harvest areas will be designed to mimic natural features such as fires and wind storms, to avoid abrupt straight boundaries. Units will be planned to maintain the wildlife habitat characteristics of the preharvest stand. Clearcut openings will be staggered on the landscape to maximize the connectivity of interior forest conditions, thereby allowing for wildlife migration. The clearcutting prescription will be used in a balanced mix of prescriptions to maintain a spatially diverse forested landscape.

Clearcutting will only be used in areas where significant soil erosion or other harmful environmental impacts can be avoided. Units will be planned on stable ground, where slopes generally do not exceed 40 percent. Clearcut openings will be located outside of Watercourse and Lake Protection Zones (WLPZs) unless the harvest is for certain experimental reasons. Slash will be lopped to minimize negative aesthetic impacts. Brush will be controlled to maintain site productivity and protect the developing stand from fire. This shall be accomplished by hand piling and burning, grubbing, masticating, and/or chemical treatment.

Clearcutting will be used on a limited portion of the Forest acreage. It will primarily be utilized where it is necessary to create gaps to establish regeneration, in connection with natural catastrophic events, such as fire, severe disease or insect damaged areas, or windthrow; or for research purposes. The clearcutting prescription will typically be used in the following situations:

- Promote species composition back to more intolerant species as were present historically.
- Rehabilitate stands that have been severely damaged by fire, insects, disease, or weather.
- Conduct experiments on regeneration methods (natural and artificial) for giant sequoia.
- Restore a stand that has been “high-graded”.
- Study different spacing regimes and management strategies to obtain optimal growth of high quality timber products.
- Transition to species more resilient to climate change.
- Demonstrate that properly planned, implemented and maintained harvest areas exhibit accelerated growth rates, are less costly to harvest, reduce fuel loads, protect water quality, enhance wildlife habitat, and aid in creating a landscape level mosaic

of various forest attributes while being aesthetically pleasing.

Variable Retention (Special)

Variable retention is an approach to harvesting based on the retention of structural elements or biological legacies (trees, snags, logs, etc.) from the pre-harvest stand for integration into the post-harvest stand to achieve various ecological and social objectives. The major variables in the variable retention harvest system are retention types, densities, and spatial arrangement of retained structures.

Alternative Prescriptions

An alternative prescription will be used when, in the judgment of the Forest Manager, it offers a more effective or more feasible way of achieving the management objectives than any of the standard silvicultural methods provided in the Forest Practice Rules.

Cutting Cycles

Research projects may investigate any range of different cutting cycles. For management purposes, outside of specific research projects, the cutting cycle on the Forest has been approximately 30 years. The cycle will need to be adjusted as stand structure changes due to harvesting, mortality, vigor, and fuels reduction projects. It may be reduced to 10 years in some areas to create research opportunities in managed forest conditions that are representative of private land ownerships in the area.

The shorter harvest cycle would tend to decrease the size of harvested areas, concentrate visual impacts to smaller areas, reduce mortality by removing high-risk trees more frequently, and make timber sales more manageable. The continuing goal is to maintain a healthy, vigorous forest that is aesthetically pleasing with a diverse assemblage of stand structures.

Plantation Management

Well stocked plantations with trees at eight to ten-foot spacing need to be pre-commercially thinned at 8 to 15 years after planting. One or more commercial thinnings can be expected in these stands after approximately 25 to 40 years. The management of these plantations will vary, depending upon the plantation age, stocking level, site class, competing vegetation, and overall health of the trees. Plantation management activities will include, but not be limited to, pruning to improve log quality, pre-commercial thinning to maintain growth and remove defective trees, remove competing vegetation, control pests, inter-planting, and possibly rehabilitation.

Brush shall be controlled to maintain site productivity and protect the developing stand from fire. This shall be accomplished by hand piling and burning, grubbing, masticating, and/or chemical treatment. Should herbicides be used as a site preparation or release treatment, a Pest Control Advisor (PCA) shall be utilized to prepare an appropriate recommendation and a holder of a Qualified Applicators License will oversee the application of chemicals. All herbicide applications will comply with the herbicide label and the PCA's recommendation. Herbicides may also be used to maintain areas that have been designed to function as fuel breaks.

Invasive Species Management

Non-indigenous plants shall be managed by monitoring the forest and inspection of products (mainly erosion control) that may be introduced to the forest. Such plants may be accidentally introduced by the public or a contractor to the forest. It shall be forest policy that all heavy

equipment be cleaned and inspected before transport to MHDSF. This shall include logging and excavation equipment as well as Department bulldozers and graders. Horses are not allowed within the campground areas to prevent the introduction of weeds from various kinds of feed (among other things). Should invasive plants be discovered at MHDSF, they will be treated with herbicides to prevent spread. Treated areas will be monitored to ensure that seed does not germinate and the plants do not proliferate. Herbicide treatment shall be performed as outlined above in the Plantation Management discussion.

Sustainable Harvest Levels

The annual volume of timber harvested between 1946 and 2019 averaged around 2.2 MMBF, with a large amount of old growth remaining and the stocking and volume grown remaining constant. Figure 5 shows harvest history of planned harvests (THPs) on the Forest from 2009 to the present. Additional harvesting to salvage drought and beetle killed trees has occurred on the tractor operable ground throughout the forest to address both endemic and epidemic rates of mortality during the reporting period.

As reported in the 2009 General Forest Management Plan, the long term sustainable harvest levels for the Forest, while accounting for limits on productivity due to constraints imposed from consideration of other forest values², was between 2.4 and 3 million board feet per year, depending on silvicultural methods used. The unrestricted sustainable harvest level on the Forest was approximately 4.4 million board feet per year. However, these numbers have changed considerably because of the 8-year drought. Per the 2017 CFI, the annual growth for non-old growth giant sequoia resources is 2.16 MMBF. Much of the reduction is from an almost catastrophic decline of the pine species. During the drought, an aggressive approach to salvage harvesting the dead and dying trees was initiated resulting in annual harvest levels on approximately 2.25 to 2.75 MMBF per year. The annual allowable cut has therefore been reduced to 1.5 to 2 MMBF per year.

Logistical considerations, such as the demand for logs from the local sawmill and limiting impacts on recreation from logging operations, is expected to influence the harvest levels in any given year. The harvest level may also vary from year to year to permit salvage of some of the younger large diameter trees, insect-killed trees, fire damaged trees, fuel reduction treatments, and stand sanitation to maintain a healthy, vigorous forest.

²Recreation, watersheds, wildlife, range and forage, fisheries, regional economic vitality, employment and aesthetic enjoyment.

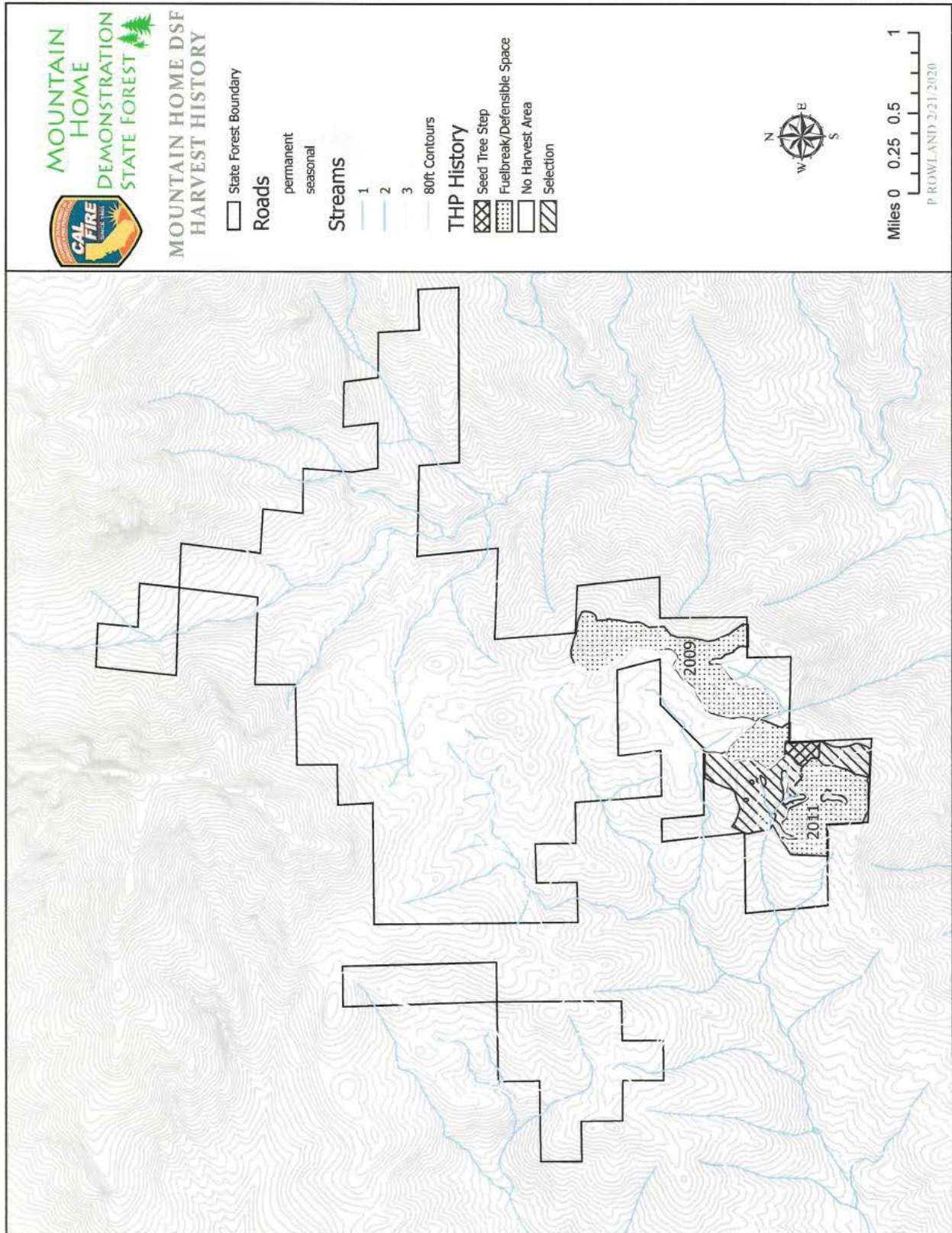


Figure 7. Harvest History (THPs) on MHDSF since 2009.

Harvest Methods

Ground skidding equipment will continue to be the main yarding system utilized on the forest. This system has the advantages of being able to utilize existing roads and skid trails, resulting in associated reduced costs and environmental impacts that would be associated with new road construction. Areas potentially suitable for cable yarding are believed to exist in the North Fork of the Middle Fork of the Tule River and will be investigated in the future as opportunities arise.

Markets for Forest Products

The uncertain economy, decreased demand for lumber, increased regulation, and dedication of forestland to non-timber uses has significantly reduced the number of available mills within an economically-viable hauling distance of the State Forest. Currently, Sierra Forest Products has the only major sawmill in Tulare County. It is located in Terra Bella, 46 miles away. One small sawmill in the local area provides a market for salvaged timber.

Forest Products

Dead and Down Material

The forest contains a considerable amount of dead and down giant sequoia. This material consists of various sizes and types of material, ranging from small pieces and waste from logging operations 100+ years ago to recent wind-thrown trees of various ages. Because of the remarkable decay resistance of the giant sequoia heartwood, some of the material may have fallen 500 years ago and still be marketable.

Some of the down material includes logs of special scenic, historical, or research value. All down giant sequoia that has historical, scenic, or research value should be protected. Therefore, any material that is sold must be approved by the Forest Manager.

From 1974 to 1978 a cruise was done of all down material. Size, type, and condition of the material were recorded and volumes were calculated in cubic feet. The logs were numbered and plotted on maps. This information is updated periodically to document new wind-thrown trees and harvested material.

The inventory of dead and down material increases with time as trees are lost to natural causes. Since State acquisition, wind throw tends to down one or two trees per year. This figure validates the calculated loss estimates based on the number of standing old growth trees and their life span of over 3000 years.

Dead and down giant sequoia has been sold to private operators through small sales since 1946. Total volume removed from the forest from 1946 to 2001 was 5,165 thousand board feet. Downed material has also been utilized by State Forest staff on a regular basis. Mountain Home Conservation Camp harvests this material for manufacturing signs, lumber and displays that are used at Department facilities statewide.

Dead and down sequoia is still available for purchase at MHDSF with a Class I timber sale permit. Given the sheer size of the logs and chunks from which the lumber or split products are derived, there are few sales of old-growth material from the forest. Recognizing the ecological value of large down sequoia logs, we have limited the sales of down sequoia logs not to exceed 2 MBF per purchaser per year. MHDSF sells an average of 4 MBF of down logs per

year. We will continue to monitor the removal of down sequoia logs. If necessary, limits will be restricted further to ensure that removal of down sequoia logs always remains an insignificant portion of the inventory. With accumulation far exceeding utilization, there will continue to be an abundance of down sequoia logs at MHDSF.

Fuel wood

Demand for fuel wood from the State Forest declined steadily this past decade. Fuel wood permits have remained constant with 20 to 25 permits issued per year. In recent years, fuel wood cutting has been limited to dead and down wood only. At the current level of cutting, the supply of wood exceeds demand. Allowing fuel wood cutting on the forest is desirable for reducing fire hazards along roads and cleaning up slash in harvested areas. We should continue to encourage the removal of dead and down fuel wood for commercial or personal use through the existing Class I timber sale permit process. Fuel wood can also be collected by the public for use at MHDSF campgrounds without a permit.

Firewood sales slowed significantly during the drought as the Sequoia National Forest was giving away firewood permits for up to 40 cords per permit holder free of charge. This spurred a reduction of firewood processing on MHDSF. A fair number of trees were felled in the MHDSF campgrounds in the last 5 years to mitigate hazards. Though the limbs were severed and chipped, the boles were accumulating. These logs were visually disruptive and created tripping hazards for the public. Mountain Home Conservation Crews were directed to process these logs into firewood for use in the campgrounds. This program is labor intensive and detracts from other projects being done. However, the wood is consumed by mid-summer and the campgrounds are cleaner as a result. This should be continued to address hazard tree removals within the campgrounds when there is no other feasible means of removing the logs.

Salvage

Prompt removal of salvage logs is important to utilize recently dead or damaged trees before the wood deteriorates. Standing dead timber left in the woods for more than one year seriously degrades in value. Efforts should be made to sell this timber as quickly as possible. State policy allows for the removal of 100 MBF or \$10,000 worth of timber on a small sales basis without a formal bid process. This is the most expedient way to remove salvage trees quickly and should be used as much as possible. Due to unprecedented tree mortality, salvage operations have been a yearly occurrence for the last 8 years.

Incidental sales of miscellaneous products such as firewood, OGGS windfalls, and cones will be made as conditions warrant and markets permit.

Forest Resiliency

Management strategies that are utilized at MHDSF have been performed at varying levels of intensity since the Forest was purchased in 1946. These treatments have maintained the Forest in a state of increased resiliency long before Forest Resilience became a statewide, contemporary goal.

Forest vegetation treatments, such as commercial timber harvest, pre-commercial thinning, and fuel reduction have been a regular occurrence at Mountain Home. Timber harvests are planned not to exceed annual allowable harvest levels and an aggressive program of salvage harvest has been employed to remove trees that have been killed outside the bounds of planned harvest areas.

The use of prescribed fire has accelerated since the last Management Plan revision in 2009. Approximately 1,200 acres or 24 percent of MHDSF has had fire reintroduced in some form. An additional 850 acres were treated via mechanical mastication, of which 133 acres were further treated with prescribed fire (understory broadcast burn) in September of 2019. It was determined that mastication can be an effective pre-fire treatment if the unit is burned at the hotter end of a prescription, i.e. warmer air temperatures, lower relative humidity values, and drier fuels.

The old-growth giant sequoia trees (OGGS) at MHDSF are protected through regulation and practice and remain the primary attraction to the Forest. It is our intent to maintain and protect these 4,750 OGGS for generations to come. All our forest management activities promote their preservation and invite a new cohort to become established. In general, forest management focuses on the removal of trees that are beneath the drip line of these specimens and the further removal of trees that provide a direct fuel ladder into their crown.

Extensive and timely thinning of significant areas of MHDSF and reintroduction of fire will maintain forest health and increased resilience to insects and disease for many generations to come. These treatments will continue to reduce threats to life, property, forest carbon stocks, and other forest benefits.

VI. These treatments were exemplified during the recent drought. Visitors must pass through USFS land that has received little, if any treatment since the late 1980s. These forests were severely overstocked prior to the onset of the drought. Trees of all size and age classes, regardless of species, died by the thousands because of insect activity and lack of available water. Though not completely spared from insect attack, MHDSF remains a green island amid a sea of dead trees. OTHER FOREST MANAGEMENT VALUES

Fisheries

Trout occur in the larger streams and ponds on the State Forest. During summer months, the California Department of Fish and Wildlife stocks the three man-made ponds in the Forest and Balch Park. These ponds are stocked with catchable rainbow trout (*Oncorhynchus mykiss*), and constitute a “put and take” fishery with heavy fishing pressure and few fish that carry over to the winter. Various species of minnows and shiners have also become established in these ponds.

Streams on the Forest containing trout include: Bear Creek below Frasier Mill Campground; Coburn Creek below Hedrick pond; Park Fork of Bear Creek below Balch Park; North Fork of the Middle Fork of the Tulare River; and Galena and Silver Creeks below 6,000 feet elevation. All other streams contain self-sustaining native populations. Rainbow trout (*Salmo gairdnerii*)

and brown trout (*Salmo trutta*) are found on Mountain Home DSF.

The desired future condition for watersheds and fisheries includes maintaining or improving current riparian conditions and in-stream habitat. Degradation of the fisheries can occur if stream or pond environments are altered by recreational use, pollution, litter, timber harvesting, road construction, or wildfire. The following general guidelines for watershed and fisheries resources will be adhered to on Mountain Home DSF:

1. Watercourse protection shall be incorporated in timber operations adjacent to fisheries. Retention of overstory and understory vegetation within watercourse protection zones shall provide for water temperature control, filtration of organic and inorganic material, and bank and channel stabilization.
2. Deposition of any substances in streams or ponds that will degrade fish habitat shall be avoided.
3. Road crossings of fish bearing streams must be designed to allow fish passage.
4. Allow for the natural recruitment of large woody debris to the stream channel to improve or maintain in-stream habitat quality and stream ecosystem function.
5. Minimize the number of temporary watercourse crossings.
6. Dredge Hedrick and Upper Balch Pond as needed to improve water depth, clarity, and oxygen content.

Wildlife and Plants

Due regard will be given to the conservation or enhancement of wildlife values during management activities at MHDSF. There are two existing primary California Wildlife Habitat Relationship (CWHR) System habitat types on MHDSF: Sierran mixed conifer and true fir. The Sierran mixed conifer habitat type consists primarily of ponderosa pine (*Pinus ponderosa*), giant sequoia (*Sequoiadendron giganteum*), incense-cedar (*Calocedrus decurrens*), white fir (*Abies concolor*) and sugar pine (*Pinus lambertiana*), and is located throughout MHDSF. The true-fir habitat type is located at the higher elevations in the northeastern section of MHDSF and consists of a mix of both red and white fir. Brush, rock, or meadows cover approximately 0.5 percent of the total land base.

Hunting, urbanization, recreation and resource extraction have the potential to impact wildlife and their habitats in the State Forest. MHDSF is open to hunting in accordance with State Fish and Game laws and Section 4656 of the Public Resources Code. Although the management of MHDSF has little control over hunting pressures placed on wildlife and their habitat, which is regulated by CDFW, it does have a responsibility to consider the maintenance and enhancement of biological diversity when proposing forest management projects. Biological diversity can be defined as the variety and variability of living organisms and the ecological complexes in which they occur. Biological diversity is an important ecosystem characteristic for a variety of ecological, economic, and aesthetic reasons. For snag recruitment, on a case by case basis, trees larger than 40 inches DBH (currently 0.2 per acre on average) will be evaluated for retention based on aesthetic, wildlife, and genetic values.

The development of MHDSF as a true all-aged forest will provide for a more biologically

diverse habitat than is found in the current predominantly young forest. A variety of silvicultural systems will be used. Single tree selection, group selection, commercial thinning, and sanitation-salvage harvesting will improve the forest habitat by developing and maintaining a variety of crown levels, stand densities, and small openings at MHDSF. Group selection openings will provide habitat for wildlife species that prefer and need edge cover. The openings themselves will provide feeding habitat for rodents and the predators that feed on the rodents. The multilevel forest canopy will provide habitat for the wildlife that lives in the various levels of the forest canopy. The variable crown canopy density will allow varying amounts of light to reach the forest floor which will determine the amount and types of vegetation which may grow on the forest floor and provide cover, food, and shelter for wildlife that utilizes the forest floor.

Critical wildlife habitat elements that are considered during project and forest management related activities include snags, large woody debris, decadent trees, hardwood, aquatic and riparian habitats. Each of these elements provides unique opportunities for wildlife foraging and reproduction that occurs within a sustainable, healthy forest ecosystem. Forest managers at MHDSF regularly monitor snags, hardwoods, and LWD during timber inventories. Projects developed for THPs, prescribed burns, or recreation consider these elements in the planning processes prior to implementation. High consideration is given to ensure that the most diverse array of wildlife habitats will be created, enhanced, or maintained across the landscape.

Special Habitat Types

Big Trees Forest

The Big Trees Forest community of giant sequoias present at MHDSF has priority management objectives in research, recreation, and forest management goal implementation. The overall ecological objective is to protect the current forest status and ensure that the giant sequoias at MHDSF will regenerate, maintain their existing overall ecosystem health and sustain growth and replacement numbers in the future. Further information is included in the research, recreation, and forest management sections.

Oaks

Hardwoods, and California black oaks in particular, have been identified as a special management habitat element due to the wildlife foraging benefits and reproductive habitat (crevices, foliage) that these trees provide. Hardwoods, as a general practice, are retained at MHDSF, unless they pose a safety hazard. Hardwoods are also included in the discussion under forest and research management.

Meadows

Meadows at MHDSF are often associated with springs and provide excellent foraging and reproduction opportunities for wildlife and add to the diversity of forest habitats over the landscape. General meadow management practices include removal of encroaching conifer species, and riparian protection and restoration opportunities. Meadows at MHDSF are identified further in the forest management section.

Riparian Habitats

Riparian habitats have established protections defined in the Forest Practice Rules under Watercourse and Lake Protection (14 CCR 916.4 [936.4, 956.4]). Also, referred to as Watercourse and Lake Protection Zones, they provide additional cover, stormwater provisions, fish habitat, and wildlife corridors between managed and unmanaged forest vegetation types.

Additional protections, if identified for forest health, sensitive plants or animal species assessed during management activities, will be developed in coordination with CDFW as necessary.

Chaparral/Shrub Habitats

old growth giant sequoia, provides for a more biologically diverse habitat than is found in a predominantly young managed forest. The use of a variety of silvicultural systems will improve forest habitat by developing and maintaining a variety of crown levels, stand Chaparral habitats provide unique foraging and refuge opportunities for numerous wildlife species. Management for forest health and diversity includes identifying key shrub habitats that provide the added diverse habitats that increase opportunities for wildlife foraging and nesting habitats. Management activities will retain or enhance desirable brush species in the understory.

Rocky/Open (Primary Succession) Habitats

Open, rocky habitats and talus slopes provide unique habitats for reptiles, mollusks and other invertebrates, and a variety of denning wildlife species. Management for rocky habitats increases forest diversity and health by offering additional wildlife foraging and reproductive opportunities within the forest area.

Timber Harvest Best Management Practices

Timber harvest activities on the State Forest could adversely impact biological resources, but such impacts can be avoided or reduced through application of best management practices. Some impacts of timber harvest activities are beneficial and enhance biological resources. The following best management practices will be followed to minimize impacts from timber harvest:

1. Utilize a wide range of management tools which will continue to maintain a landscape that is varied and has a mixture of various wildlife habitats. Mountain Home DSF, as a multiple aged forest, including densities, and small openings in the forest. Prescribed burns will replenish the soils and result in prompt germination of a variety of species used as forage. A management strategy of maintaining a variety of forest types and habitats provides a robust ecosystem that is resilient to disturbance.
2. Maintain, restore, and enhance the occurrence of special habitat elements and unique habitats to promote species diversity and habitat quality for species identified as a candidate, sensitive, or special status.
3. Individual projects conducted under the guidance of this management plan may require a separate biological assessment based upon site-specific conditions. If during the project assessment, survey or project layout, species identified as candidate, sensitive, or special status or their habitats are identified, the management plan specifies that protection measures developed in consultation with appropriate State or Federal wildlife agencies will be incorporated into the project.
4. Incorporate protection measures for all riparian areas or other sensitive natural communities. Protect all natural wetlands, springs, and ponds on the Forest.
5. Plan for additional pond construction or expansion where desirable. A likely location for implementation is at the State Forest Headquarters facility. There once was a small pond located on an unnamed tributary of Bear Creek. The dam failed during a rain-on-snow event in 1966 and has remained in its current condition since. The pond would

be ideal as a drafting source for fire suppression needs.

6. Retain overstory and understory vegetation consistent with the Forest Practice Rules for watercourse protection zones so that water temperatures will not increase, and to provide other biological benefits. Allow for the natural recruitment of large woody debris to the stream channel to improve or maintain in- stream habitat quality and stream ecosystem function. Avoid deposition of any substances in streams or ponds that will degrade fish habitat. Design road crossings of fish-bearing streams to allow fish passage.
7. Design forest management activities based on criteria that include horizontal and vertical forest structure, vegetation density, edge effect, corridor size, and biological diversity, to allow unrestricted movement of wildlife species.

Management Guidelines

MHDSF will work to restore, maintain, or enhance the occurrence of special habitat elements and unique habitats to promote species diversity and habitat quality. Measures to achieve this include:

1. Minimize the number of temporary watercourse crossings.
2. Dredge Hedrick and Upper Balch Pond as needed to improve water depth, clarity, and oxygen content.
3. Retain oaks that produce quality mast.
4. Native grasses will be planted on landings and skid trails planned for re-use to provide an additional food source for wildlife.
5. Roads not needed for management access will be closed in certain areas to reduce wildlife disturbance.
6. Retain or enhance desirable brush species in the understory.
7. Maintain or enlarge meadows by removing encroaching trees and other vegetation.
8. Retain snags and down woody material as allowed by the Forest Practice Rules. Attempt to maintain a minimum of three snags and three dead and down logs per acre in recently harvested areas.
9. Protect and restore riparian zones.
10. Protect sensitive fauna and flora known to occur on the Forest.
11. As far as possible, utilize the existing road system thereby avoiding the need for new road construction.

Wildlife habitat enhancement opportunities are identified during the planning and implementation of timber sales, prescribed burns, demonstration and education activities, and recreational facilities. We will incorporate control or eradication of exotic plant species into

management activities, as opportunities are identified.

Several management goals of MHDSF describe the need to maintain the widest possible diversity of managed forest stands in different successional stages, maintain or increase functional wildlife habitat, and provide research and demonstration opportunities for various biological resources. One of the goals of MHDSF is to balance sustained timber production with the long term biological productivity of the land and protection of public trust resources. The forest management program under the guidance of this plan is expected to produce a moderate perpetually sustainable harvest level. Because approximately 40 percent of the current standing inventory by volume is protected old growth giant sequoia, the need to maintain the widest possible range of successional stages for research, and the need to maintain an attractive recreation destination, it follows that timber harvest rates will be lower than that of most comparable managed timberlands.

Watercourses will be provided protection measures that will meet or exceed the Forest Practice Rules. The buffer zones will assist in achieving the goals of MHDSF by providing filter strips for sediment reduction and migration corridors for wildlife.

MHDSF staff individually mark all harvest or leave trees. Forest staff maintains a marking guide to assist personnel in the marking of timber for timber sales. This management measure ensures that all trees will be evaluated for the presence of nesting structures, potential snag and LWD recruitment, and the existence of any other special habitat elements. It is also CAL FIRE policy that all harvest trees or leave trees are to be marked. All timber marking performed at MHDSF is done under the supervision of a Registered Professional Forester (RPF).

As funding allows, MHDSF plans to continue to conduct various wildlife inventory studies to improve our knowledge of wildlife species habitat use and improve the detection of rare, threatened, or endangered species. All detections of rare, threatened, or endangered species will be documented and assessed to determine if these biological resources are being impacted by any projects conducted under the guidance of this Management Plan.

Initial Biological Scoping

Resources consulted to identify plant and wildlife species that may occur on Mountain Home Demonstration State Forest include the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDDB), U. S. Fish and Wildlife Service species lists, the California Native Plant Society (CNPS) database, the 2010 Mountain Home Management Plan species list, the California Wildlife Habitat Relationships System (CWHR), and the Sierra National Forest biological resources database. A 12-quadrangle query of the CNDDDB was conducted which included the Camp Wishon and Moses Mtn. 7.5 minute quadrangles and the surrounding ten quads.

Appendix C identifies species that may occur at MHDSF, their listing status, habitat type, and likelihood of occurrence at MHDSF. A detailed discussion of species in Appendix C that are formally listed or candidate listed and known to occur on MHDSF is provided below. It is the intent of MHDSF to avoid potential significant impacts by developing biological resource management strategies that are compatible with other management strategies identified for recreation and sustainable forestry.

Wildlife Species of Concern

A twelve-quad search of processed CNDDDB data centered on the Camp Wishon and Moses Mtn. quads identified species of concern for which habitat exists and occurrence is possible on MHDSF. The following is a discussion of the life history requirements and potential protection measures for species that are formally/candidate listed and occur or have the potential to occur on the Forest. If potential impacts to these, or other species of concern, are identified during development of individual projects such as timber harvest plans, determination of specific habitat needs and protection measures on the Forest will be made in consultation with CDFW.

California Spotted Owl

The CNDDDB revealed the presence of two California spotted owl (CSO) territories within the biological assessment area. The records indicate that the sightings were made in 1991 and 1992. Surveys conducted at MHDSF in 2003 yielded five spotted owl areas. Two of the sightings were in the biological assessment area within the Upper North Bear Creek watershed. The remaining occurrences were in the Rancheria Creek and Silver Creek watersheds and are over two miles from the project area outside of the biological assessment area. Only one of the Upper North Bear Creek occurrences is located closer than 1 mile of the project area. Carlson (2006) noted California spotted owls in the vicinity of Deer Ridge and Long Meadow on Federal land adjacent to MHDSF. The Forest Manager, while performing some recreational hooting in 2010, received audible responses from CSO at the Old Mountain Home Day Use area and the Shake Camp Campground. The California Spotted Owl is a CDFW Species of Special Concern.

California spotted owls are an uncommon, permanent resident in suitable habitat. In this part of the Sierra Nevada it resides in dense, old-growth, multi-layered stands of mixed conifer, and oak- conifer habitats. This species requires mature forest stands with large trees and snags. It is very sensitive to habitat destruction and fragmentation.

The owl's breeding range extends west from the Cascades through the North Coast ranges, the Sierra Nevada, and in more localized areas of the Transverse and Peninsular Ranges. It may move downslope in winter along the eastern and western slopes of the Sierra Nevada.

The species breeds from early March through June. It produces one brood per year, with a clutch size of 1 to 4, usually 2. Young owls may not be sexually mature for 3 years. A pair may use the same breeding site for 5-10 years but may not breed each year. The species usually nests in tree or snag cavities, or in broken tops of large trees. Less frequently, it will nest in large mistletoe clumps, abandoned raptor or raven nests, in caves or crevices, on cliffs, or on the ground. Mature, multi-layered forest stands are required for breeding. Nests are generally located 30 to 180 feet above the ground. It requires blocks of 100-600 acres of mature forest with permanent water and suitable nesting trees and snags. This species tends to prefer narrow, steep-sided drainages with north aspects.

Northern Goshawk

The Northern Goshawk is a CDFW Species of Special Concern and a Board of Forestry and Fire Protection (BOF) Sensitive species. Northern Goshawks breed in the North Coast Ranges, throughout the Sierra Nevada, Klamath, Cascade, and Warner mountains, and possibly in the San Jacinto, San Bernardino, and White Mountains. Northern Goshawks initiate breeding by mid-June in northern California. Nest construction can begin as early as two

months before egg laying. Nests are constructed and many pairs will have two to four alternate nest areas within their home range. One nest may be used in sequential years, but often the pair switches to an alternate nest. The young fledge within 45 days and begin to hunt within 50 days. Only one brood per season is produced. After fledgling, the family group stays together and remains in the general vicinity of the nesting territory. This post-fledging area tends to be larger than the nesting territory. The diet of Goshawks consists mostly of birds (from robin to grouse in size), though small mammals such as ground and tree squirrels are also taken.

Throughout its range, the Northern Goshawk forages in diverse habitat, which can vary from open sagebrush to dense forests. However, in California, mature and old growth forest with DBH greater than 20 inches (52 cm) and canopy closure greater than 40 percent is used for foraging, and open habitats such as meadows and seedling or sapling stands are avoided.

Carlson (2006) noted two Northern Goshawk nest sites on Mountain Home Demonstration State Forest near Hedrick Pond and within Section 34.

Golden Eagle

Golden Eagles are designated fully protected by CDFW and are a BOF Sensitive Species. Golden Eagles occur throughout California except in the Central Valley. Nesting by Golden Eagles typically occurs on cliffs or large trees in rugged open areas such as canyons and escarpments. Foraging occurs in open terrain such as grasslands, deserts, sage-juniper flats, and savannas, early successional stages of forest and shrub habitats, desert edges, farms, or ranches. Golden Eagles hunt over large open areas and feed on a variety of lagomorphs, other mammals, birds, reptiles, and occasionally carrion.

Although no cliffs occur on MHDSF, Golden Eagles could nest in older conifer and mixed conifer stands.

Pacific Fisher

The Southern Sierra Evolutionary Significant Unit of Pacific Fisher is listed as Threatened by CDFW and is a Species of Special Concern. Pacific fisher is federally listed as Endangered by United States Fish and Wildlife Service in the Southern Sierra Nevada Distinct Population Segment which includes MHDSF. Pacific Fishers exhibit a discontinuous distribution in Washington, Oregon, and California from the more continuous populations of Canada and the eastern United States. Observations compiled between 1961 and 1982 show fishers occurring in the northwestern portion of the state and throughout the Sierra Nevada Mountains. Recent survey information indicates that the current distribution of fisher in California is now smaller with a gap between the northwestern population and the Sierra Nevada population (Zielinski et al. 1995). Currently, the primary threat to the Pacific fisher is the reduction and fragmentation of late-successional forests, and the associated loss of habitat components necessary for resting and denning.

Breeding, resting, and foraging habitat for Pacific fisher usually consists of old-growth or late successional coniferous forests with greater than 50 percent canopy closure. Denning and resting occur in live trees with cavities, snags, downed logs, and a variety of other cavities. Young are born between February and May. In northern California, natal and maternal dens have been found in medium to large (21 to 58 inches dbh) live trees and snags, and in a 39-inch downed log. Riparian areas serve as travel corridors for Pacific fishers. Although Pacific fishers tend to avoid open areas with less than or equal to 40 percent canopy cover, they are known to use heavily harvested riparian areas for travel.

Foothill Yellow-legged Frog

The foothill yellow-legged frog is listed by CDFW as Candidate Threatened and is a Species of Special Concern. *Rana boylei* is endemic to Oregon and California. Historically, foothill yellow-legged frogs ranged throughout the western slopes of the Sierra Nevada south to Kern County. They range from near sea level to 5,800 feet in California.

Foothill yellow-legged frogs have declined dramatically in the Sierra Nevada. Lannoo (2005) speculates that airborne pesticides (that move east on the prevailing winds blowing across the highly agriculturalized Central Valley) are likely to be the primary threat to foothill yellow-legged frogs in the Sierra Nevada foothills. The populations of foothill yellow-legged frogs in greatest decline are all downwind of highly impacted (mostly agriculturalized) areas, while the largest, most robust frog populations are along the Pacific coast.

In the southern Sierra Nevada populations, breeding may occur after the snows melt from April to July. Foothill yellow-legged frogs mate and lay eggs exclusively in streams and rivers. Tadpoles typically transform after 3 to 4 months.

Foothill yellow-legged frogs are primarily stream dwelling. Stebbins (2003) describes foothill yellow-legged frogs as stream or river frogs found mostly near water with rocky substrate, as found in riffles, and on open, sunny banks. Habitat suitable for reproduction is defined by Jennings and Hayes (1994) as a stream with riffles containing cobble-sized (7.5 cm diameter) or larger rocks as substrate, which can be used as egg laying sites. These streams are generally small- to mid-sized and shallow.

This species may occur in suitable habitat at lower elevations on the Forest, but extant populations are unknown. Given this species' close association with streams and rivers, establishment of watercourse and lake protection zones as described in the Forest Practice Rules are expected to provide the necessary habitat protection.

Sierra Madre (Southern Mountain) Yellow-legged Frog

The southern mountain yellow-legged frog is listed by both CDFW and the Federal government as endangered.

Rana muscosa is endemic to California. The southern mountain yellow-legged frog once ranged from Palomar Mountain in San Diego County through the San Jacinto, San Bernardino and San Gabriel Mountains of Riverside, San Bernardino and Los Angeles counties in southern California. These formed four isolated clusters of montane populations. The species also occurred as an isolated cluster of populations on Breckenridge Mountain, south of the Kern River in Kern County, and in the Sierra Nevada mountains in Tulare, Inyo, and Fresno counties, extending north to Mather Pass. The distribution of *Rana muscosa* in the Sierra Nevada is bordered by the crest of the mountains. No populations occur east of the crest. The mountain ridges that separate the headwaters of the South Fork Kings River from the Middle Fork Kings River, from Mather Pass on the John Muir Trail to the Monarch Divide, form the northern border of the range. *R. muscosa* has been extirpated from Palomar and Breckenridge mountains.

The amphibian species complex including *Rana muscosa* and *Rana sierrae* was once the most common vertebrate in the high elevation Sierra Nevada. *Rana muscosa* have declined dramatically despite the fact that most of the habitat is protected in National Parks and National Forest lands. A study that compared recent surveys (1995-2005) to historically

surveyed localities (1899- 1994; based on specimens from the Museum of Vertebrate Zoology and the California Academy of Sciences) found that 96.2% of populations had gone extinct, with only 3 remaining out of 79 resurveyed sites (Vredenburg et al. 2005). The two most important factors leading to declines in *R. muscosa* are introduced predators and disease.

In the southern Sierra Nevada populations, breeding may occur after the snows melt from May to July. Fertilization is external. A cluster of eggs is laid in shallow water and is left unattached in still waters, but may be attached to vegetation in streams. Tadpoles in the Sierras may overwinter, possibly taking as many as 3 or 4 summers before they transform.

The species inhabits lakes, meadow streams, isolated pools and sunny riverbanks in the Sierra Nevada. It seems to prefer open stream and lake edges with a gentle slope up to a depth of 5-8 cm ranging from 984 feet to over 12,000 feet (370 - 3,660 m) in elevation. In the Sierra Nevada, adult mountain yellow-legged frogs occupy wet meadows, streams, and lakes; adults typically are found sitting on rocks along the shoreline, usually where there is little or no vegetation. In the Sierra Nevada, most frogs are seen on a wet substrate within 1 m of the water's edge. Both adults and larvae are found most frequently in areas with shallow and warmer water.

Although unlikely, Mountain Home Demonstration State Forest may support a population of this species. The California Natural Diversity Database notes two occurrences from 1904 in Sequoia/Kings Canyon National Park at the Middle Fork Tule River and Summit Lake. Given this species' close association with wet areas, establishment of watercourse and lake protection zones as described in the Forest Practice Rules are expected to provide the necessary habitat protection

Sierra Nevada Red Fox

The Sierra Nevada red fox (*Vulpes vulpes necator*) is a State Threatened subspecies and a candidate for Federal listing. Grinnell (1937) described the distribution of the red fox as occupying "high elevations throughout the Sierra Nevada from Tulare County to Sierra County, and the vicinities around Mt. Lassen and Mt. Shasta." The current range and distribution of red fox is unknown. The only known current population is near Lassen Peak, with periodic sightings by inexperienced observers throughout its historic range.

It is highly unlikely that the distribution of the Sierra Nevada red fox would include Mountain Home Demonstration State Forest.

Wolverine

The wolverine is a State Threatened species. Verifiable wolverine sightings in California are very rare. California wolverine sightings within the CNDDDB search area are no more recent than 1973, where one occurrence is noted on Blue Ridge within the Dennison Peak quadrangle near the Milo Fire Station. Earlier sightings include an observation in 1970 at the Quinn Ranger Station in Sequoia/Kings Canyon National Park; a 1962 observation on the Sequoia National Forest (T19S, R31E, Section 27); and a 1907 observation of wolverine sign by Grinnell at Grouse Flat, 8 miles southeast of Lake Kaweah. In February 2008, a remote camera captured the image of a wolverine on the Tahoe National Forest, an area from which the species was believed to be extirpated since 1922. Genetic studies of this individual indicate that it is most closely related to Rocky Mountain populations, of which the nearest is 600 miles away in the Sawtooth Range of Idaho.

Bats

The four bat species that are known to occur on MHDSF property and are CDFW Species of Special Concern are Townsend's big-eared bat, spotted bat, pallid bat, and red bat. The western mastiff bat, though not known to occur, may occur and is included in this discussion.

Townsend's big-eared bat occurs throughout Western North America, from British Columbia to central Mexico. They tend to roost and maintain maternal colonies in caves, buildings, and large mines. This species has seen a marked decline in population over the past 50 years (Pierson and Rainey, 1994).

The spotted bat is found in the foothills, mountains, and desert regions of southern California, in habitats including deserts, grasslands, and mixed-conifer forests. They tend to roost in rock crevices and cliffs, but will also utilize buildings and caves. Mating occurs in autumn, and births generally occur in June (California Department of Fish and Wildlife, 2000).

Pallid bats are well distributed throughout California, and occupy a wide variety of habitats, including mixed-conifer forests in the mid- to lower-elevations of the Sierra Nevada. During the day, pallid bats roost in caves, crevices, mines, and occasionally large basal hollows and buildings. Pallid bats prefer cooler temperatures, so day roosts are generally areas that maintain a low temperature during the day. Maternity colonies form in early April, and young are born in May and June (California Department of Fish and Wildlife, 1990).

The western red bat is locally common in some areas of California, occurring from Shasta County to the Mexican border west of the Sierras. Roosting habitat includes forests and woodlands, including mixed-conifer forest. They tend to roost in trees adjacent to edge habitats near streams, fields, or urban areas (California Department of Fish and Wildlife, 1990a).

The western mastiff bat was historically known to be distributed across southern California. Recent surveys suggest that the range extends as far north as the Oregon border, and west into the Sierra Nevada mountains. They require rock crevices for breeding and roosting, but beyond that they occur in a variety of habitat types (Pierson and Rainey, 1998).

Great Gray Owl

The great gray owl is listed as endangered by CDFW and a Sensitive Species by the BOF. They are uncommon but geographically widespread in California. The largest concentration, and generally their southernmost extent, is in and around Yosemite. There has been a documented sighting on the Sequoia National Forest in Tulare County, so it is possible that the species may occur at MHDSF.

Suitable habitat includes mixed-conifer and red fir forests. They require meadows for foraging. Evidence in Yosemite suggests that meadows must be at least 25 acres to support persistent occupancy and reproduction. Meadows as small as 10 acres will support infrequent breeding (Beck and Winter, 2000). One of their preferred prey taxa is pocket gophers, which are found at MHDSF.

There are no meadows of sufficient size to support great gray owl breeding on or adjacent to the State Forest. Most of the meadows on MHDSF are associated with springs or other waters, and are therefore protected pursuant to Article 6 of the Forest Practice Rules.

California Condor

Gymnogyps californianus is State and Federally endangered. Mountain Home is within the range of the California Condor, and the species has been known to historically occupy giant sequoia (Snyder et al 1986), however tree nesting by the species is thought unlikely given present numbers and habitat utilized. All recent California Condor nest sites have been located on public lands within the Los Padres, Angeles, and Sequoia National Forests.

California Condor are not known to occur at Mountain Home Demonstration State Forest. The California Natural Diversity Database does note however an important roosting area typically utilized from April through September on Blue Ridge within the Frazier quadrangle west of the State Forest.

Great Blue Heron

Although not documented as occurring on or near the State Forest, a single great blue heron has been observed cruising the lower Balch Pond on Balch Park property in the Spring for the last three years. No rookery has been observed.

Terrestrial Vertebrate Species Richness

The California Natural Diversity Data Base (CNDDDB) and the Spotted Owl Database are based on actual observations of rare plant and animal species and communities statewide with the goal of providing the most current information available on the state's most imperiled elements of natural diversity. Consequently, the data provided does not represent an exhaustive and comprehensive inventory.

To assess the likelihood of additional terrestrial vertebrate species of concern occupying habitats present within the Mountain Home Demonstration State Forest, the California Wildlife Habitat Relationships System was queried³. Types and extent of CWHR types on MHDSF are shown in Table 13 below. The CWHR query yielded a total of 13 amphibian, 17 reptile, 210 bird and 80 mammal species. All habitat elements that occur on the State Forest, regardless of size or abundance, were factored into the query. Therefore, the species richness numbers are likely an overestimate.

Table 13. Mountain Home Demonstration State Forest CWHR habitat types and extent.

CWHR Type	Acres
MC5M	2771
MC5P	61
MHC4D	206
MHW 4D	346
MHW 5D	164

³ The California Wildlife Habitat Relationships System (CWHR) is the principal model used to predict species occurrence and change in habitat capability. Habitat capability in this context is an acreage weighted numerical expression derived from the arithmetic mean of habitat values for breeding, feeding, and cover for each species in each CWHR habitat stage. The CWHR System (<https://wildlife.ca.gov/Data/CWHR>) contains life history, management, and habitat relationships information on 675 species of amphibians, reptiles, birds, and mammals known to occur in California. The model was developed to predict species occurrence and abundance response to habitat alteration. Species prediction accuracy varies based on habitat types, taxonomic class, presence or absence of special habitat elements, and level of habitat relationship model validation. CWHR Version 9.0 was used.

WFR4P	103
WFR 5M	1177
<i>MC = Mixed Conifer</i> <i>5=Medium/Large Tree</i> <i>MHC = Montane Conifer-Hardwood</i> <i>6=Multi-layered Tree</i> <i>MHW = Montane Hardwood</i> <i>M=Moderate Cover</i> <i>WFR = White Fir</i> <i>P=Open Cover</i> <i>D=Dense Cover</i>	

Mountain Home is a research and demonstration forest, and we plan to continue to add to our knowledge of biological resources over time, and incorporate that knowledge into our management practices. An essential part of this adaptive management process is to collaborate with, and draw upon knowledge from, neighboring landowners.

Plant Species of Concern

A plant scoping assessment for the area including MHDSF is included in Appendix 1. A twelve-quad search of processed CNDDDB data centered on the Camp Wishon and Moses Mtn. quads and Mountain Home State Forest, identified 44 plant species. Four listed plants and Eighteen CNPS list 1B plants were identified. The listed plants are discussed below. A 1999 botanical survey found occurrences of two 1B species: Shirley Meadows star-tulip (*Calochortus westonii*) and Keil’s daisy (*Erigeron inornatus* var. *keilii*) (Trayler and Mallory, 1999). While it is unlikely that all or even most of these species would find suitable habitat on Mountain Home, the number of species provide a rough indicator of the extent of plant species of concern in the general vicinity of the Forest. Additional survey effort for currently undocumented species may add to this list or make additional adjustments specific to species occurring on Mountain Home.

Listed Plants

The California Natural Diversity Database overlays indicated the presence of Keck’s Checkerbloom (*Sidalcea keckii*), Tracy’s Eriastrum (*Eriastrum tracyi*), Kaweah Brodiaea (*Brodiaea insignis*), and Springville Clarkia (*Clarkia springvillensis*).

Keck’s Checkerbloom

Keck’s Checkerbloom is listed as Endangered by the Federal government. It is known to occur in the foothills of southern Tulare County and is associated with the Valley Grassland and Foothill Woodland plant communities. The bloom period is April and May. The nearest known occurrence to the State Forest is east of the town of Springville, approximately 11 miles away. Given the distance from the nearest known occurrence and its known habitat associations, it is unlikely that Keck’s Checkerbloom occurs on the State Forest (Calflora 2020).

Tracy’s Eriastrum

Tracy’s Eriastrum is listed as Rare by the State of California. The nearest known occurrence is approximately 1.6 miles South of the State Forest boundary, along the Middle Fork of the Tule River. It is known to occur at elevations ranging from 2,690 to 4,330 feet. The bloom period in June and July. It is possible that Tracy’s Eriastrum occurs on the State Forest (Calflora 2020).

Kaweah Brodiaea

The Kaweah Brodiaea is listed as endangered by the State of California. There are several confirmed occurrences north of the State Forest in the Kaweah River drainage, and one occurrence within the Camp Wishon USGS 7.5’ Quadrangle. Given its local distribution, it is

possible that the Kaweah Brodiaea occurs on the State Forest (Calflora 2020).

Springville Clarkia

Springville Clarkia is listed as Threatened by the Federal government and Endangered by the State of California. The nearest occurrence is approximately two miles from the Southern boundary of the State Forest. It is associated with the Chaparral, Valley Grassland, and Foothill Woodland plant communities. Given the proximity to the State Forest and habitat associations, it is possible but unlikely that the Springville Clarkia occurs on the State Forest (Calflora 2020).

Protection Measures

Surveys for plant species of concern will be conducted prior to implementation of individual projects. If any of the above species are encountered, a 50 foot no entry buffer will be flagged. No heavy equipment or herbicides will be used within the buffer. Directional falling away from the buffer will be implemented. The same protection measures will be used if other plant species of concern are encountered on individual projects.

Prescribed Burning

Prescribed fire is being used extensively in many giant sequoia stands to stimulate reproduction and reduce fuel loads. This is occurring mainly in parks, monuments, and wilderness areas where timber harvesting is not a management option. On the State Forest, timber harvesting provides the soil disturbance needed for giant sequoia reproduction in most cases. Prescribed burning may provide for increased production of natural giant sequoia seedlings, as well as serving to reduce the fire hazard from slash and facilitate planting in harvested or understocked areas. Prescribed fire was used experimentally in the Moses Mountain study area to compare giant sequoia reproduction following fire and logging activity. The results of this study were published in California Forestry Note #111, 1998.

Since the last management plan update, MHDSF has successfully burned approximately 1,200 acres. Support for prescribed burning at all levels within the Department, as well as a better understanding of ecological burning at the Unit level, have allowed the State Forest to implement a relatively aggressive prescribed fire program.

Historically, there has been some apprehension about prescribed burning at the State Forest. Prescribed fire in the context of forest management was a relatively foreign concept in the Tulare Unit until fairly recently. Through education, communication, and demonstration we have been able to relieve some of the apprehension within the Unit and show that appropriately-timed prescribed fire poses minimal threat to natural resources.

The number of acres treated by fire is dependent on the number of acres that are harvested or pre-treated by some method other than logging. It is reasonable to expect pre-fire treatments in the form of crushing, mastication, hand-piling, tractor piling, lopping, herbicide application or a combination of the above. The State Forest relies heavily on Mountain Home Conservation Camp labor to prepare a burn unit. During an average fall, under good climatic conditions, a prescribed burn resulting in 200 to 300 treated acres should be expected. However, this figure will tend to fluctuate from year to year for a variety of reasons.

Burning should be planned to occur before or after peak recreational activity so that smoke does not become a nuisance or threat to public safety. The nearest smoke sensitive area is

Happy Camp, a small community of cabins and other forest dwellings with a population estimated to be about 25 individuals. The Mountain Home Conservation Camp is located 0.5 air miles west of the Forest and Camp Wishon is located about 1.25 miles south. The prevailing winds usually direct smoke to the east.

Prior to the onset of winter weather, MHDSF or the Tulare Unit Forester will prepare and file a Smoke Management Plan with the Tulare County APCD. Burning shall only occur on permissive burn days or under a variance if one is granted by the APCD. Burning shall be done in accordance with the Smoke Management Plan and Forest Practice Rules (if applicable). Signage to notify the public of prescribed burning will be placed around the Forest during burning should the Forest be open to the public at the time.

In general, four methods are utilized on planned burns at the State Forest. They are described as follows.

Pile Burning (Hand Piles)

Pile burning is a safe and effective method to reduce forest fuels where the visual impact of charred trees may be disturbing to the public such as near campgrounds and day use areas. This is also an effective treatment for roadside fuel-breaks where fire-lines are not constructed. Piles are constructed by State Forest and Conservation Camp crews by severing brush and small trees and stacking tight piles by hand. If logging slash is present, it is included into the pile as well. Because the material to be burned has been piled and allowed to cure, State Forest staff has a broad window of opportunity to burn the piles. Pile burning typically takes place after sufficient wet weather eliminates the threat of fire creep through adjacent fuels.

Pile Burning (Tractor Piles)

Tractor piling of logging slash and undesirable vegetation is generally done following planned harvest operations in areas that were harvested to create shaded fuel-breaks and/or include some type of aggressive reforestation effort such as clearcutting, rehabilitation, seed tree – seed step, or alternative prescription. Group cuts within group selection prescription areas may also be tractor piled for burning. The process described in the hand pile discussion remains the same except that it results in larger piles across a larger area. Tractor piling at MHDSF is performed with crawler tractors equipped with brush rakes and/or excavators equipped with a hydraulic thumb.

Broadcast Burning – In a broad and historical sense, broadcast burning is a method of treating logging slash in clearcut areas as it lies within prepared fire-lines. Practically all the remaining vegetation, except for that of sprouting species, is destroyed. This precludes reliance on advance reproduction but eliminates much of the undesirable vegetation that is present. The extent of exposure of mineral soil is actually rather variable depending on the moisture content of the forest floor at the time of burning. Usually an ample amount of mineral soil is exposed; the areas where fires burn with such sustained heat as to damage the physical properties of the soil are rarely large enough to be of much significance. The sites are left in reasonably good condition for artificial regeneration or natural seeding from adjacent stands.

In a more contemporary and practical sense as is being utilized at MHDSF, broadcast burning is typically favored to “underburn” existing stands to reintroduce fire to a fire dependent landscape. This allows Forest staff to reduce unnaturally heavy fuel loads, economically and efficiently reduce stand density, enhance wildlife habitat, and prepare a receptive seedbed for shade intolerant species. Planning these burns for early fall or late spring when fuel and

climatic conditions come into prescription, affords managers the opportunity to burn these fuel laden areas under ideal conditions to lessen the threat of catastrophic wildfire.

Areas selected for broadcast burning beyond any requirements of a Timber Harvest Plan, are generally prepared as follows. Fire-lines are constructed to surround the burn area if natural boundaries don't already exist. Dead trees and brush are severed and lopped so that the resulting material is in contact with the ground. Green trees are not felled as smaller diameter, thin barked trees will typically die as a result of the burn. Forest fuels with a lag time of greater than 10-hours are raked away from residual trees for a distance of approximately 3 feet (depending on the size of the fuel being removed) to prevent cambial damage. Accumulated fuels from within fire scars of old-growth sequoia specimens are removed and a handline is constructed to prevent fire from entering the scar. Any historic resources that are flammable, i.e. split products, shall be protected with a handline. Downed old-growth sequoia logs and windfalls shall be protected with handline. All preparatory work shall be done under the supervision of MHDSF permanent staff and/or a CAL FIRE Fire Captain B.

Observations made since the last Management Plan revision (2009) strongly support the notion that firing tactics and patience are the largest determining factors for reducing damage to the residual stand. It is imperative that firing operations progress from the highest elevations to the lowest. Backing fire is the best method to prevent unnecessary damage. In fact, once the fire becomes established it will progress slowly downslope over time until it reaches the fire-line assuming there is a continuous fuel bed. Recent burns at MHDSF have smoldered for weeks as the Forest reaps its benefits.

Pile-Cast Burning

This method is essentially a combination of pile burning and broadcast burning. The burn units are prepared by gathering and piling slash and other forest debris from the base of desirable live trees and creating hand piles throughout the unit. The piles are typically smaller and of greater number than those that would be constructed in an area prepared exclusively for just burning piles. This method is dependent upon the presence of preconstructed fire-lines as the fire will likely creep to the boundaries. This method allows more flexibility since much of the creep (cast) is provided via the heating and drying of fuels adjacent to the piles. A limited number of personnel can treat a large area with relative ease under a broader range of fuel and climate conditions. The piles are ignited from the highest portions of the unit first with firing operations progressing along the contour as the firing team works their way downslope. Fire will spread slowly once it reaches the base of the piles until the fuels on the forest floor eventually connect. This method shows great promise for treating areas with significant fuel loads as much of the coarser fuels can be piled, yielding better consumption. This produces more radiant heat for a longer duration providing the mechanism for fire creep. This method has recently been employed at MHDSF with what appears to be successful results.

Management Objectives

1. Utilize prescribed fire to reduce fuel loads and provide a seedbed and heat to open giant sequoia cones.
2. Investigate the use and efficacy of different firing methods.
3. Increase the use of broadcast burning for slash treatment and maintenance of shaded fuel breaks.

4. Utilize prescribed fire to maintain a fire resilient landscape within the bounds of Mountain Home Demonstration State Forest. Manipulate stand structure and composition to reduce the white fir component and create suitable conditions for pines.

Training Opportunities

Mountain Home Demonstration State Forest provides a natural classroom for training. Training opportunities include all aspects of forest management, fire suppression, fire prevention, law enforcement, recreational studies, wildlife management, erosion control, hydrology, logging administration, logging, and road design. The following list of potential activities may occur at MHDSF as a training exercise. The list is not comprehensive and is intended to provide examples only.

Table 14. Potential training opportunities at MHDSF.

Timber Felling	Fire-Line Construction	Heavy Equipment Operation
Meadow Restoration	Forest Practice Inspection	Road Maintenance
Crossing Installation	Erosion Control Methods	Campground Design
Trail Improvements	Pre-Commercial Thinning	Proper Herbicide Use
Cone Collection	Wildlife Survey Methods	Public Speaking
Timber Cruising	Timber Marking	Log Scaling
Watercourse Protection	Archaeological Surveying	Site Protection Techniques
Site Preparation	Burn Pile Construction	Broadcast Burning

These are just examples of training opportunities that could be provided at MHDSF. These opportunities should be utilized whenever time and funding allow. It should be noted that many of these training categories could affect the forest environment. Therefore, all training that takes place at MHDSF shall be done under the tutelage of a professional in any particular field.

Archaeological Resources

Starting in 1979, archaeological surveys of potential timber sale areas were performed by professional archaeologists and sites were recorded and protected. In 1982 and 1983 a seasonal archaeologist was hired to do a complete survey of the forest and record all known sites. Twenty- six sites were found and recorded during that major survey. To date, a total of 22 prehistoric and 17 historic sites have been recorded on Mountain Home. The prehistoric sites consist of bedrock mortars and basins, lithic scatters, and combinations of the three. The historic Euro-American sites consist mainly of early sawmill remains and trees and stumps with historic markings. Additional undiscovered sites are thought to occur throughout the State Forest.

These sites are extremely important Forest resources. They are an irreplaceable source of information providing clues about the prehistoric and historic occupation of the area, as well as having educational, aesthetic, and recreational values for forest visitors.

The following procedures shall be followed for discovery of human remains: In accordance with the California Health and Safety Code (CHSC) 7050.5(b), if human remains are discovered during ground-disturbing activities, CAL FIRE and/or the project contractor(s) shall immediately

halt potentially damaging excavation in the area of the burial and notify the Tulare County Coroner and the CAL FIRE archaeologist to determine the nature and significance of the remains. The coroner is required to examine all discoveries of human remains with 48 hours of receiving notice of a discovery on private or state lands. If the remains are determined by the coroner to be Native American, he or she must contact by telephone, within 24 hours, the Native American Heritage Commission (NAHC) per CHSC 7050.5(c). The NAHC will in turn immediately identify and notify the Most Likely Descendent (MLD) in accordance with PRC 5097.98(a). CAL FIRE shall continue to protect the discovery area from damage or disturbance, per PRC 5097.98(b), until staff has discussed and conferred with the MLD regarding their recommendations for treatment of the discovery.

1. The MLD preferences for treatment of the discovery may include the following:
 - a. The nondestructive removal and analysis of human remains and items associated with Native American human remains.
 - b. Preservation of Native American human remains and associated items in place.
 - c. Relinquishment of Native American human remains and associated items to the descendants for treatment.
 - d. Other culturally appropriate treatment.
2. The parties may also mutually agree to extend discussions, taking into account the possibility that additional or multiple Native American human remains, as defined in PRC 5097, are located in the project area providing a basis for additional treatment measures.

Management Objectives

1. All known sites on the Forest shall be protected during all management activities, especially road construction, timber harvesting, and prescribed burning. Procedures for protection of cultural resources will be followed; see Appendix for further discussion. Additional protective measures for specific sites may also be prescribed.
2. The cultural resource sites should also be managed for their educational information. Studies including surface collections, test excavations, site mapping and other projects should be encouraged when appropriate. The activities must be approved in advance by the CAL FIRE Archaeologist and the Forest Manager. Through archaeological study we will develop the interpretive value of these resources for the benefit of our forest visitors.
3. In general, there shall be a policy of allowing no collection of archaeological artifacts and materials. When appropriate, specimens such as flakes, manos, pestles, pot shards, projectile points, shell objects, or bone tools may be collected and forwarded to a CAL FIRE Archaeologist for recording and analysis.
4. A public interpretive display should be developed and located at the Visitor Center or the State Forest headquarters. A pamphlet outlining the Forest Policy concerning collections and site protection should accompany the display. Artifacts recovered during previous surveys will eventually be curated on the Forest, and can be used for public display and enjoyment. We want to encourage the public to enjoy, visit, and learn from the Forest sites, but we also want to emphasize the rules that protect

them. An artifact display could tend to encourage illegal digging and collecting if the policies were not also displayed.

5. Interpretive trails and signs at archaeological and historic sites should be developed and maintained. The location and wording used for the signs should be selected in consultation with the CAL FIRE Archaeologist to minimize potential losses from collecting, and to use accurate descriptive language.

Range Resources

The area of the State Forest has had a long history of livestock use dating back over 110 years. Extensive livestock use of the Forest occurred until State acquisition in 1946. The effects of severe over-grazing were evident at that time, especially in meadow areas. Plant species composition had changed drastically in the meadows and the water table had dropped due to livestock trampling of stream channels. Drift fences were installed to end livestock access soon after State acquisition. No grazing permits have ever been issued by the State Forest, although minor grazing has occurred over the years by stray cattle from adjacent U.S. Forest Service grazing permit and nearby private land.

A grazing survey of the State Forest was completed in 1956. Ten years after the removal of livestock, the meadow areas showed marked recovery from past abuses. Forage values for both the Forest and meadow ecosystems were estimated and the grazing capacity was calculated. The total Forest grazing capacity was estimated to be 80 animal unit months (AUM), with 26 AUMs in the 37 acres of meadows and 54 AUMs in the forested areas. Since livestock tend to concentrate use in the meadow areas, the actual carrying capacity was given as 26 AUMs. Because of the low carrying capacity and the conflicts between grazing and the other uses of the State Forest (especially recreation), the report recommended that grazing not be allowed.

The range conditions on the State Forest have changed since 1956. An updated grazing study should be implemented to determine the current potential for livestock use. It is estimated that the carrying capacity has increased due to continued recovery from historic over-grazing.

In some forested areas grazing can be managed to control vegetation in young stands. Any livestock management would require fencing to restrict stock to desired areas. The potential benefits of potential increased tree growth from livestock control of vegetation on the State Forest is unknown.

The Balch Park Meadows, Methuselah Meadows, and Frasier Mill Campgrounds have all been constructed adjacent to prime grazing areas. Fencing of the meadows would be needed to limit livestock entry into the campground areas, although this would entail substantial investment of capital for installation and maintenance.

Income from grazing permits would be minimal due to the low carrying capacity of the forest and the low value of the forage. Based on the 2019 U.S. Forest Service grazing fee of \$1.35 per AUM, the total gross income to the State Forest would be \$35.10.

Management Objectives

1. Due to the low value of grazing permits and the potential conflicts in the recreation areas, it is recommended that grazing not be permitted on the State Forest except for research purposes.
2. The existing drift fence system shall be maintained to exclude cattle from adjacent private land and the U.S. Forest Service.
3. Update the 1956 grazing study with a new survey and calculate an updated carrying capacity for livestock use. The main goals of a new forage study would be to document the recovery of the meadow system from past over-grazing and identify stands that could benefit from vegetation control.
4. Evaluate the cost of building and maintaining fences against the benefits of increased tree growth due to reduced competition in designated areas.

Carbon Sequestration and Greenhouse Gas Emissions

The Sierra Nevada Ecosystem Project identified rapid anthropogenic climate change as one of five factors that are drastically affecting the long-term health of the Sierra ecosystems and that could drastically alter it (SNEP, 1996). In 2007 the State of California passed the Global Warming Solutions Act (AB 32), which set targets to reduce greenhouse gas emissions to 1990 levels by 2020 and 80 percent below 1990 levels by 2050. Forests will play a significant role in meeting these targets. This will likely occur both as offsets within a cap and trade system and through voluntary measures. The California Forest Carbon Plan has set forth ambitious goals for forest management as a climate mitigation strategy within the state.

Recognized strategies to mitigate GHG emissions and enhance terrestrial sequestration include reforestation, prescribed fire, thinning, and sustainable timber harvest (FCAT, 2018). Mountain Home will continue to contribute to the targets of AB32 and the Forest Carbon Plan by increasing the resiliency of the Forest to catastrophic mortality by improving the general health of stands, pre-fire implementation of shaded fuel breaks and maintenance of firefighting infrastructure such as roads, signage, and water sources. The long-term carbon stocks of the Forest are anticipated to increase over time. Forest products produced from Mountain Home will sequester carbon during their life cycle. Further sequestration will occur when timber is harvested, made into forest products where it is stored for an indefinite period, and then regenerated. Biomass fuels produced on the Forest also provide an opportunity to replace fossil fuels with an alternative energy source that is close to carbon neutral.

VII. Resource Protection

Abiotic Factors

Human Activity - Human activities, including recreational use, timber harvesting, prescribed burning, and road construction, can cause tree damage including scarring and debarking trunks, severing or burying roots, crown scorching, or cambial damage. These injuries weaken

trees, making them more susceptible to insects, diseases, and windthrow.

Activity around recreational sites may affect the growth and value of older conifers through soil compaction and scarring. Campground activities prevent establishment of seedlings and reduce the number of saplings and pole-sized trees. Trunks of campground trees are often damaged by nails used for hanging clothing, lanterns, tents, etc.

Air Pollution – Ozone causes most of the air pollution damage to conifers in the Forest. Ozone develops primarily from automobile emissions. Two by-products of engine combustion, nitrogen dioxide and gasoline vapors, combine with sunlight to produce ozone in the atmosphere. Prevailing wind currents move air pollution from the Central Valley into the Forest. Ozone damage to conifers was monitored for a period at Mountain Home DSF. However, ozone levels have been decreasing for several years and the damage is subsequently diminishing. Ozone effects needle retention. It does not usually cause the death of a tree, but predisposes it to attack from insects or disease.

While there is some disagreement about the order of tree species' sensitivity to ozone, sensitivity of species found on the forest (ranked from most to least sensitive) is thought to be: red fir, ponderosa pine, Jeffrey pine, white fir, incense-cedar, sugar pine, and giant sequoia (USDA Handbook #521, 1993).

Insects and Diseases

Appendix D contains a list of the primary insects and diseases occurring on the forest.

Insect Pests

Bark beetles attack trees by boring through the bark to the cambial region to lay eggs. The construction of their egg galleries causes injury or death to the host tree. Fungi introduced by insects cause additional injury and deterioration of wood fiber. Trees under stress, generally from over-crowding and lack of available water, are the most susceptible to insect attack. Unfortunately, over the past decade, those conditions have resulted in an 80% reduction in the number of pines of all species on the State Forest.

Methods for reducing beetle activity include felling and removal of infested trees, and lopping and scattering and/or removing the bark from downed wood to limit its use for beetle reproduction. Control can also be encouraged by thinning overstocked stands to help avoid initial attack by bark beetles. Bark beetles can travel long distances, and generally complete their life cycle and fly away before the attack is detected, limiting the usefulness of control efforts. Pre-commercial thinning, masticating, and burning are some of the methods used on the State Forest to prevent the overstocked conditions that lead to widespread mortality from beetles. Additionally, aggressive salvage logging and associated lopping and scattering of brood material have been effective in slowing the beetle epidemic.

Mistletoe

True mistletoe occurs on conifer and broadleaf tree species. They are disseminated by birds, which ingest seeds then excrete them onto a host tree. This tends to concentrate tree mistletoes in the tops of trees. They are primarily found in older trees. It takes years for their presence to build up and cause damage.

Dwarf mistletoe is a parasite almost wholly dependent on the host tree for food and water. Generally, dwarf mistletoes do not kill their hosts directly, but predispose them to attack by

bark beetles or diseases. Dwarf mistletoes are host specific, and have long life cycles. The rate of spread through a stand is relatively slow.

Heart Rot

Heart rots are caused by fungi entering and destroying the heartwood. As a rule, heart rots do not invade sound wood, but need an opening or disease court providing access to the heartwood. Wounds caused by fires or human activity are common points of entry. Trees with heart rot are more prone to windthrow and breakage.

Root Diseases

Armillaria root disease is usually present in stands with oaks. Armillaria has a very wide range of host species. Most conifers found in the West are at least moderately susceptible. The disease is dependent on stressed or dead oaks for the growth of root-like structures called rhizomorphs. The removal of standing oaks increases the risk of the infection moving into a stand.

Annosus root rot damages tree roots. All conifers in California are susceptible to it, but most hardwoods are not. It can move from pine to fir, but not from fir to pine. The disease can also survive in the soil in the absence of trees for as long as 50 years. Annosus is spread by spores and through root contacts. Spores can be carried by the wind and become established on freshly cut tree stumps or basal wounds. Root contact with infected roots can spread the disease to adjacent trees, moving it primarily from pine to pine or from fir to fir.

Annosus is an especially important disease on Mountain Home because it kills or weakens trees that may then pose a hazard to the public. The pines and firs will usually succumb to bark beetle attack after infection and need to be removed. Giant sequoia and incense-cedar are resistant to insect attack; nevertheless, the fungus may rot most of their roots, making them more susceptible to windthrow.

White Pine Blister Rust

White pine blister rust is native to Asia and was introduced to the United States around 1900. The blister rust has been known to infect almost all species of white, five- needle pines in the world. Blister rust was discovered on sugar pine in the State Forest in 1968. At that time the blister rust was confined to relatively small infection centers. Since then, the disease has spread throughout the Forest and occurs on all sugar pine sites in the area.

In 1980 a survey of blister rust was made in conjunction with the CFI measurements. That survey found that 27 percent of the sugar pine on the Forest were infected with blister rust. Approximately 85 percent of the sugar pine around the State Forest Headquarters had been lost due to a combination of blister rust and bark beetle attacks. Young trees in particular have been impacted by the disease.

The State Forest implemented control measures for the disease in an effort to reduce the loss of sugar pine. From 1968 to 1978, blister rust disease centers were scouted and their boundaries were identified. Trees with cankers within 12 inches of the trunk were cut down. Almost all sugar pine less than 36 feet tall were eventually removed from the disease centers. Trees to be retained were selected based on their size, spacing, and disease resistance. These trees were pruned to a height of 18 feet.

During the early stages of control effort, it was thought that the disease could be eradicated by

thorough treatment of all disease centers. By 1974, the control program had made some progress. The number of infected trees in the main disease centers had been reduced. At that time blister rust was confined mainly to the lower parts of the crown, and the remaining trees were thought to be protected from further infections by pruning. The thinning of the stand had also increased the growth of the remaining trees.

However, it soon became evident that the cankers were too difficult to detect and the problem was too extensive to remove all infections. A marked increase in blister rust infections began in 1975. Cankers were found higher in the crown, above the 18-foot pruning height. Bole cankers were more prevalent, with increased mortality and top kill. The disease spread rapidly to other areas of the Forest and onto adjacent private land. Control strategies were changed; intensive blister rust control work was confined to campgrounds and road sides. Elsewhere, all non- or lightly-infected young sugar pines and sugar pines over ten inches DBH were retained until the next commercial harvest of the stand.

In 1981, blister rust control again shifted direction, to developing resistant planting stock. A total of eight trees were identified as carrying major gene resistance (MGR). Seedlings grown from these resistant trees were planted in 12 test plots in 1983 and 1984. The hope was that the resistance could provide a temporary solution until a more permanent one was developed. These plantations seemed promising until 1996, when the virulent race of blister rust was discovered on Mountain Home. The virulent race is capable of overcoming MGR in sugar pine. These MGR plantations have been a complete failure with nearly 100% mortality in the resistant stock.

Current control strategies for white pine blister rust include planting a mix of rust resistant and susceptible sugar pines. This may slow down the progression of the disease until more "slow rusting" seedlings become available (sugar pines that are not completely "immune" to the normal rust fungus but show partial resistance to the disease, and surviving the infection for long periods of time). Mountain Home Demonstration State Forest will do any planting in consultation with researchers on white pine blister rust genetics from the USDA Forest Service, possibly using the site with its virulent strain of the fungus as a test site for sugar pine genetic resistance.

Management Objectives:

1. Minimize tree losses to insects and diseases and maintain thrifty and vigorous trees by thinning dense stands and removing high-risk trees during sanitation-salvage cuts.
2. Minimize injury to trees during logging operations. Harvest later in the summer when bark is less likely to be removed easily. Designate skid trails prior to harvesting. Adequately administer sales to minimize tree damage. Limbing and bucking should be required prior to skidding. Skinned-up trees will be evaluated by a qualified Forest Officer to determine if removal is necessary.
3. Expose slash to direct sunlight or time thinning and pruning operations for late summer to prevent buildup of a breeding population of Ips.
4. Close camping areas for 10 to 15 years on a rotational basis to allow recreation area trees to grow and establish new seedlings. Further study is needed to provide a schedule. This effort will likely prove to be extremely difficult to implement.

5. Develop handout materials to educate the public on the damage caused by nails, defacing trees, and litter.
6. When artificial regeneration is utilized, plant a mixture of conifer species, thereby avoiding monocultures and reducing the threat of host-specific diseases and pests.
7. When oaks are cut, leave a stump no more than eight inches high to allow sprouts to grow and keep the root system alive. Removing or chemically treating oak stumps is counter-productive to managing Armillaria.
8. Favor pine when planting in or near annosus disease centers. Do not plant the susceptible species, incense-cedars or giant sequoia, in known or suspected disease centers in recreation areas.
9. Treat freshly-cut pine stumps with granular borax (sodium tetraborate decahydrate, also known by the product name, "Sporax").
10. Use a two-pronged approach to blister rust control: silviculture and genetic selection.
 - a. Continue to work with U.S. Forest Service Geneticists and CAL FIRE Pest Management Specialists on identifying slow-rusting trees and researching the rust outbreak.
 - b. Use harvesting as an opportunity to remove trees infected with blister rust and improve the genetic resistance of the remaining stand. We have developed a blister rust silvicultural prescription. It allows retention of non-infected trees and trees with less than 20 percent of branches infected and with no unprunable lethal infections (defined as a canker within 24 inches of the trunk). Branches with cankers more than four inches from the trunk may be pruned off to keep the canker from reaching the trunk and girdling the tree. Pruning is practical only up to 16 feet due to the inordinate time and effort required to prune above this height.

Present hopes for finding genetic resistance to blister rust lies with 26 sugar pine trees identified as potentially being ontogenetic. These trees do not carry the MGR gene but have another form of genetic resistance. Cones will be collected from these trees for a future project. The goal will be to secure funding and develop a study design for out-plantings that could assist in identifying the resistance mechanism. It should be noted that many of these trees died because of bark beetle activity during the recent drought.

Most, if not all of the above mentioned control methods may likely be in haste. The vast majority of sugar pine trees located on MHDSF have died as a result of the recent prolonged drought and subsequent bark beetle infestation. Those sugar pines that remain appear to be healthy and should be subject to some level of study.

Though not a control method for blister rust, Managers and Forest staff should strongly consider the planting of Douglas-fir in areas that are to be artificially regenerated. Douglas-fir shares a similar tolerance for shade as sugar pine and is not susceptible to the disease.

Animal Damage

Animal damage occurring on the Forest can normally be attributed to either gophers

(Thomomys sp.) or deer (*Ondocoillus halmonus*). Deer browsing has not been a significant problem on the Forest so far. There appears to be a very small resident population. The few Douglas-firs occurring on the forest are the only trees deer appear to browse. Where necessary, deer browsing could be controlled by spraying with an approved deer repellent.

Pocket gophers are not normally a Forest resident. They prefer open areas where their principle foods, grasses and broad-leafed herbs, grow in abundance. Logging may increase gopher habitat by expanding meadows and grassy areas. Planted trees may be damaged or killed by gophers cutting their roots. Pocket gophers will forage near their burrow openings and burrow through snow to gnaw the bark of young trees. Fan-shaped mounds and earth cores (winter casts) left from snow tunneling are indications of pocket gopher activity. Gophers can be controlled by vegetation management or by poison baits. Removal of grasses prior to planting is usually sufficient to cause gophers to move out of the area.

Fire Protection

Fire occurrence on the Forest has been historically low. A significant fire event has not occurred in the Mountain Home area in over 100 years. However, in 2004, Mountain Home was threatened by the Deep Fire that ran up the Wishon Fork of the Tule River. In 2008, a lightning strike caused a 1 acre fire to burn below the Vantage Point Road. Most fires that have occurred originate from illegal campfires or were started by careless smokers. A five-acre fire was the largest prior to this plan revision; it was started by a careless smoker on a hiking trail. Fire prevention, fire suppression, and appropriate law enforcement are the keys to averting significant fires on the State Forest. This responsibility falls on the State Forest Manager.

In 2015, MHDSF participated in a “managed wildfire” that started east of the Forest boundary on Sequoia National Forest land. The ultimate goal of the burn from the Federal perspective, was to utilize MHDSF infrastructure (roads and trails) to build a containment box to allow the fire to burn upslope and up canyon into the upper reaches of the Tule River drainage. Mountain Home State Forest was able to capitalize on Federal resources working with CAL FIRE resources to effectively treat approximately 485 acres of State land in areas that would have otherwise been difficult to do in house. The fire crossed jurisdictional boundaries as it crept its way through the forest before being extinguished by weather.

Another wildfire was allowed to burn onto MHDSF land in 2018. The Alder Fire started in the Alder Creek drainage southeast of MHDSF following a lightning storm in October. The fire advanced slowly northward until eventually entering the Burro Creek Grove on MHDSF. The fire continued to advance across that portion of the State Forest located east of the Wishon Fork of the Tule River. Significant damage within the Silver Creek Grove occurred on approximately 40 acres. This fire was never officially deemed a “managed wildfire” and was kept in a “wildfire” status. The end result is that a confine and contain management strategy was employed that allowed the fire to burn across State land until it eventually reached the 2015 burn scar from the Hidden Fire and other burn areas that were treated with prescribed fire on MHDSF.

In the future, depending on the timing and status of the wildfire, Mountain Home will participate in “managed wildfires” if the Forest Manager determines that there are management objectives that can be accomplished to contribute to forest health and a return to historical fire return intervals. Should the status of wildfire originating on Federal or private land remain as a “wildfire,” CAL FIRE suppression tactics shall be employed. Mountain Home staff will take prompt action on fires occurring in or near Mountain Home depending on timing, resource

availability, and benefit to the overall health of the Forest. Upon the arrival of a Tulare Unit fire control representative, control and patrol activities pertaining to the fire will become their responsibility. State Forest staff will be available as needed.

During fire season, all permanent Forest personnel are on call day and night as required for the State Work Week group. Forest personnel will be fire trained, if possible.

During summer weekends, the Forest will be patrolled by the State Forest Manager or Assistant. It will be their responsibility to meet the public, explain State Forest rules and regulations, and report and take appropriate action if any fires occur on the Forest. This responsibility may be transferred to CAL FIRE Tulare Unit Law Enforcement personnel and/or prevention staff.

MHDSF maintains several strategically located water sources to be used for emergency firefighting efforts. There are two fire fill stations located on the Forest that are supplied by dependable springs. These springs were developed to supply the Frasier Mill campground, Shake Camp campground, Pack Station and public corrals with drinking water. The Shake Camp filling station is located in the Shake camp area west of the first set of public corrals just north of the Pack Station. The second station is located at the entrance of the Frasier Mill campground on the side of the Camp Lena Road. Both filling stations are equipped with a 1½" fire hose connection to provide water to an engine, water tender or the State Forest pumper. Each of these systems include water storage tanks that hold 15,000 gallons of water.

Two 15,000-gallon storage tanks are located at the State Forest Summer Headquarters that are available for fire suppression needs. There is a 1½" fire hose connection that can provide gravity fed water in just a few minutes to fill fire apparatus.

Drafting locations are found at Hedrick Pond, Balch Park, and the Wishon Fork of the Tule River at Hidden Falls campground. A small pond located at the summer headquarters should be reconstructed for fire suppression needs. The pond was located on a class II watercourse that flows beneath the headquarters driveway. It is strategically located at the facility to provide water to all the structures in the event of a wildfire. The dam reconstruction project would result in an area measuring roughly 90 feet long by 60 feet wide and approximately 12 feet deep. These dimensions would yield approximately 1.5 acre feet of water when full.

In 2015, a 10,000-gallon suppression tank was constructed near the Methuselah Group Camp. However, a reliable water source has yet to be determined and the tank remains unplumbed and empty. Every effort should be made to secure a water source and install appropriate plumbing to provide another emergency source of water for this fire suppression system.

High levels of tree mortality in and around Mountain Home have contributed to exceptionally high fuel loading. Prescribed burning and mechanical fuels treatments have greatly diminished this threat across much of the State Forest. Strategically-placed shaded fuel breaks provide an additional impediment to fire spread. The greater threat is from the untreated Federal lands surrounding the Forest. Bear Creek and Balch Park Roads are lined with snags and large downed material all the way up to the State Forest boundary.

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IX. Appendices

Appendix A. Management Guidelines

These guidelines represent goals for management of the different resource values on the Forest. They are not enforceable standards. They cannot all be accomplished on all projects at all times. Some of the guidelines for different resource values conflict with each other. The goal is to meet the optimal combination of these guidelines on each particular project. On some projects, one or a small subset of these guidelines may be overriding, to the exclusion of all others. On other projects, it may be a case of meeting as many of the guidelines as possible.

Overall Forest Management Goals and Objectives

1. Provide for recreational opportunities as the primary use of the State Forest. Work toward expansion and improvement of existing facilities and the development of new recreational opportunities in suitable areas. Maintain the system of campgrounds, picnic areas, trails, and roads in such a manner as to provide for safe and enjoyable use by the public.
2. Maintain an inventory of cultural resources and provide for their protection. Encourage research and interpretive use of these sites.
3. Harvest timber under sustained yield management on all productive areas while maintaining or enhancing recreational values. Harvest timber by the most economical methods that will protect the environmental values and maintain productivity. Ensure prompt regeneration following cutting and maintain optimal stocking throughout the life of the stand. Protect old growth giant sequoia from fire, cutting, and logging damage, and encourage reproduction.
4. This information should be made available to the public, small forest landowners, resource professionals, timber operators, and the timber industry. Research and demonstration projects will be aimed at providing practical information for forest landowners who need to manage a host of forest resources, including but not limited to, wildlife, water, soil, sensitive plants, and timber. Due to limited staff resources, cooperative research projects will be sought with other public and private researchers who share a common interest and direction in forest management. Staff will seek opportunities to disseminate information to landowners and the public regarding Best Management Practices to maintain healthy forest ecosystems.
5. Improve fire safety and forest health and optimize the use of dead and down trees, slash, bark, cull logs, and pre-commercial thinning for fuelwood, posts, pulpwood, and other specialty products. Utilize dead and down giant sequoia while protecting the recreational and scientific value of selected specimens. Make cone collections to satisfy the needs of the State nursery system and sell the excess to private collectors.
6. Improve and maintain watershed protection through forest practices and erosion control efforts. Develop water sources and assure safe drinking water for use at administrative and recreational facilities.

7. Prevent site degradation by using erosion controls and soil conservation practices in all management activities.
8. Enhance the existing habitat for as many wildlife species as possible. Manage cover, food, and water to sustain or increase wildlife populations. Prevent the degradation of stream and pond habitat that is suitable for fish populations.
9. Manage the forest to maintain an aesthetically pleasing forest environment for the recreational visitor. Harvest timber strategically to increase the visibility of old growth giant sequoia. Improve aesthetics in high use areas and along roads by controlling the density of leave stands, treating slash promptly, and promoting rapid regeneration.
10. Continue the fire prevention program utilizing education, enforcement, patrol, vegetation management, fuelbreaks, pre-fire planning, and suppression.
11. Continue an aggressive pest management program to improve forest health and reduce tree mortality due to insects and diseases utilizing monitoring, established control methods, and stand sanitation.
12. Continue research into forest-based carbon sequestration and forest management techniques to promote forest adaptation and resiliency to climate change.
13. Develop and maintain a fire resilient landscape within the MHDSF to protect the forest, the habitat it contains, and the waters from which it drains.
14. Investigate and implement societal preferences for giant sequoia management and conservation.
15. Research and demonstrate silvicultural methods to establish and promote sugar pine, ponderosa pine, and giant sequoia.
16. Maintain as wide a range of seral stages and forest structure types as possible, from regeneration to old growth, open and closed stands, to maintain options for future management and research.
17. Foster the development of giant sequoia stands, both young growth and old growth, to a point that is reflective of current natural forest conditions in this region. Establishing a more natural species mix will in many cases require a dedicated effort to decreasing the white fir component of stands and cultivating giant sequoia and pine species. Desired forest structure will typically be that of low density, fire resistant stands.
18. Increase the pace and scale of conducting prescribed burns giving preference to areas that have received some level of pre-treatment, particularly in the form of commercial harvest operations.
19. Continue to strengthen relations with cooperators and adjacent landowners, particularly in the area of prescribed fire to utilize more logical boundaries such as roads, trails, ridges, drainages, and rock outcroppings when developing prescriptions and units. Utilize Good Neighbor Authority agreements if possible.

Recreation Management

1. The State Forest is best suited for a rustic type of recreational facility that is less likely to impact the other management goals of the forest. This would eliminate consideration of capital improvements such as paved campground roads, flush toilets, hookups for electricity and sewer, and commercial concessionaires, other than the pack station. Campgrounds shall be designed and maintained for tent campers and small to moderate sized recreational vehicles. The existing design of campground facilities has proven to be somewhat vandal resistant, attractive, and economical. These standard designs should continue to be used with experimental use of any other designs that show promise of being superior.
2. New recreation areas will not be located in old-growth giant sequoia groves. These areas are highly hazardous to campers due to the chance of windthrow and loss of limbs from the old growth trees. Also, site disturbance from campgrounds may have adverse effects on the old growth trees.
3. Maintenance of existing facilities is the top priority. Expansion should occur only if projected operating funds and manpower are adequate to maintain the expanded system.
4. Emphasis will be placed on expansion of existing facilities and concentration of use into moderate sized campgrounds. This will reduce development and maintenance costs. Numerous small facilities scattered over a large area should be discouraged.
5. Major winter sports development is not planned. Winter sports use, such as cross-country skiing and snowmobiling, will continue to be limited by controlling winter access to roads and parking areas.
6. Timber management activities must be coordinated with recreation planning. Proposed recreation sites should be harvested in such a way as to remove all current and projected hazardous trees while leaving the young growth stand and understory intact. Small sales will be planned to remove hazardous trees in existing campgrounds as needed. Roads and landings should be laid out with possible recreational use in mind.
7. ATV use on public roads has been decreasing since the last Management Plan revision. Currently, ATV travel is restricted to the secondary roads found at Mountain Home that are not secured with locked gates. These roads are not surfaced and do not access any campgrounds or day use areas. With the decline of OHV use, no ATV or OHV trails are being evaluated.
8. Electronic bicycles (E-Bikes) are gaining popularity throughout California and at other State Forests. E-Bikes should be discouraged on MHDSF trails because they are silent and may not interact well with pedestrian and equestrian users.

Research and Demonstration

1. Maintain the available housing. This will be an ongoing function of Mountain Home staff that will include routine maintenance, materials for minor building repairs, and necessary supplies including propane, gasoline, and cleaning supplies.

2. Collect, organize, and store data on tree and plant inventories; wildlife and fish inventories; and soil, geologic, meteorological, and watershed data so that it is available to researchers.
3. Projects dealing with impacts to sensitive species and their habitat from various harvesting methods should be emphasized.
4. Demonstrate effects of various methods of managing younger forest stands. Because this is a general trend, work concentrated on young growth management should be considered. Studies concerning optimum growing stock levels, young growth harvesting equipment, reduction of stand damage during harvest, and comparisons of even-aged and uneven-aged management are possible examples.
5. Experimental work in all aspects of regeneration is still needed. Also of prime importance in the Sierra Nevada are solutions to both natural and artificial regeneration problems.
6. Investigate effects of the California Forest Practice Act on timber harvesting. Investigate effects in terms of costs, environmental impacts, mitigations, and productivity.
7. Develop additional interpretive trails near existing campgrounds and other heavily used areas. Possible locations include the Loop Trail at Shake Camp, Frasier Mill, and the River Trail from Hidden Falls to Moses Gulch. Descriptive handouts placed at these trailheads would increase the education and enjoyment of the public while explaining State Forest management.
8. Tours of different areas of the forest could be organized and led by staff. Topics and locations could include historical areas, recent or active timber sales, experimental plots, etc. The general public could be informed of tour dates and times through posting in campgrounds and press releases to local newspapers; as well as, social media.. Groups could be encouraged to request guided tours on specific topics. Development of an environmental program for various school groups should also be initiated.
9. Research results from Mountain Home are provided to customers. Each project will be evaluated as to the most appropriate outlet for dissemination. The CAL FIRE publications will be distributed to appropriate libraries in the State. Relevant abstract publishers will be asked to include references to these publications. Search engines will be contacted with the link to the web site and it will be advertised in applicable publications.
10. The public should have access to information about the State Forest mission; as well as, past and current projects at Mountain Home. This will be facilitated by the California Demonstration State Forests web site, which will be housed at the CAL FIRE web site. Past and current project reports and publications will be available, as will data sets. This will encourage building on past projects and using multidisciplinary approaches when researchers are developing proposals.
11. Quantify pre- and post-burn fuel loads on prescribed fire units to evaluate consumption of fuels under various prescriptions and environmental conditions.
12. Investigate land acquisition opportunities to broaden the research potential on lands

more reflective of private forestland in the Tulare County area.

13. Investigate marketing opportunities for young growth giant sequoia as a standalone commercial species.
14. Erect signage in areas of research and demonstration projects for public education.

Forest Management

1. Standing old-growth giant sequoias will not be harvested and shall be protected from damage during all management activities. Old growth trees will be protected during harvest activities. Care must also be taken to avoid cutting or removal of the shallow root system when constructing roads, skid trails, and landings. Timber falling must be done carefully so that damage to the tops or trunks of adjacent trees does not occur.
2. Young growth giant sequoias shall be managed primarily as replacements for old growth trees lost to natural death or historical logging (prior to the establishment of the State Forest). Young-growth trees will be commercially thinned where density is too great for all trees to grow into old growth replacements. Estimates of the density and distribution of old-growth giant sequoia trees prior to 1860 shall be used to determine the optimal stand structure.
3. It is recognized that reproduction of giant sequoia requires disturbance in the form of fire or timber harvesting. Harvesting will remain the primary means used to encourage giant sequoia reproduction. Prescribed fire will be used in certain situations to reduce fuel loading, clear the ground, and provide heat to open giant sequoia cones.
4. Giant sequoia planted outside of the natural groves will be managed as a timber resource. No attempt will be made to expand the grove areas by allowing these planted giant sequoias to become old growth.
5. Selective harvesting of white fir, pine, and incense-cedar within the groves will be managed to improve vistas of individual old growth giant sequoia and protect them from wildfire. This harvesting can be performed effectively to enhance the aesthetic appearance of the forest for recreational visitors.
6. A harvest level of 1.5 to 2 million board feet annually will be implemented. This harvest level is less than the indicated net growth of the forest on a sustainable basis. It will permit harvests in perpetuity without depleting the productivity of the soil, the forest stands, or other public trust resources.
7. Continue to use uneven-aged management as the primary silviculture system in future harvests on the State Forest. Artificially regenerate openings caused by the removal of trees in group selection cuts. Rely on natural regeneration in other areas.
8. The cutting cycle for operational management will range from 10 to 30 years.

Watershed and Fisheries

1. Watercourse protection shall be incorporated in timber operations adjacent to fisheries.

Retention of overstory and understory vegetation within watercourse protection zones shall provide for water temperature control, filtration of organic and inorganic material, and bank and channel stabilization.

2. Deposition of any substances in streams or ponds that will degrade fish habitat shall be avoided.
3. Road crossings of fish bearing streams must be designed to allow fish passage.
4. Allow for the natural recruitment of large woody debris to the stream channel to improve or maintain in-stream habitat quality and stream ecosystem function.
5. Minimize the number of temporary watercourse crossings.
6. Dredge Hedrick and Upper Balch Pond as needed to improve water depth, clarity, and oxygen content.

Wildlife

1. Retention of oaks that produce quality mast.
2. Native grasses will be planted on landings and skid trails planned for re-use to provide an additional food source for wildlife.
3. Roads not needed for management access will be closed in certain areas to reduce hunting pressure.
4. Retain brushy sprouts beneath established trees.
5. Enlarge meadows by cutting encroaching trees and other vegetation.
6. Retain snags and down wood material as allowed by the Forest Practice Rules. Attempt to maintain a minimum of three snags and three dead and down logs per acre in recently cut areas.
7. Maintain natural springs and maintain ponds in a healthy manner. Plan for additional pond construction with little, if any human use.
8. Protect and restore riparian zones
9. Design forest management activities based on landscape perspectives. Components to consider will include horizontal and vertical forest structure, vegetation density, edge effect, corridor size, and biological diversity.

Prescribed Burning

1. Utilize prescribed fire to reduce fuel loads and provide a seed bed for shade intolerant species and heat to open giant sequoia cones.
2. Continue the use of broadcast burning for slash treatment and maintenance of shaded

fuel breaks.

Archaeological Resources

1. All known sites on the forest shall be protected during all management activities, especially road construction and logging. Procedures for protection of cultural resources will be followed. Additional protective measures for specific sites may also be prescribed.
2. The cultural resource sites should also be managed for their educational information. Studies including surface collections, test excavations, site mapping, and other projects should be encouraged when appropriate. The activities must be approved in advance by the CAL FIRE Archaeologist and the Forest Manager. Through archaeological study we will develop the interpretive value of these resources for the benefit of our forest visitors.
3. In general, there shall be a policy of allowing no collection of archaeological artifacts and materials. When appropriate, commonly found specimens such as flakes, manos, pestles, pot shards, projectile points, shell objects, or bone tools may be collected and forwarded to a CAL FIRE Archaeologist for recording and analysis.
4. A public interpretive display should be developed and located at the Visitor Center or the State Forest headquarters. A pamphlet outlining the forest policy concerning collections and site protection should accompany the display. Artifacts recovered during previous surveys will eventually be curated on the forest, and can be used for public display and enjoyment. We want to encourage the public to enjoy, visit, and learn from the forest sites, but we also want to emphasize the rules that protect them. An artifact display could tend to encourage illegal digging and collecting if the policies were not also displayed.
5. Interpretive trails and signs at archaeological and historic sites should be developed and maintained. The location and wording used for the signs should be selected in consultation with the CAL FIRE Archaeologist to minimize potential losses from collecting, and to use accurate descriptive language.

Range Resources

1. Due to the low value of grazing permits and the potential conflicts in the recreation areas, it is recommended that grazing not be permitted on the forest except for research purposes.
2. The existing drift fence system should be maintained to exclude cattle from adjacent private land and the US Forest Service.
3. Update the 1956 grazing study with a new survey and calculate an updated carrying capacity for livestock use. The main goals of a new forage study would be to document the recovery of the meadow system from past over-grazing and identify stands that could benefit from vegetation control.
4. Evaluate the cost of building and maintaining fences against the benefits of increased

tree growth due to reduced competition in designated areas.

Resource Protection

1. Minimize tree losses to insects and diseases and maintain thrifty and vigorous trees by thinning dense stands and removing high-risk trees during sanitation-salvage cuts.
2. Minimize injury to trees during logging operations. Harvest later in the summer when bark is less likely to be removed easily. Designate skid trails prior to harvesting. Adequately administer sales to minimize tree damage. Limbing and bucking should be required prior to skidding. Skinned-up trees will be evaluated by a qualified forest officer to determine if removal is required.
3. Expose slash to direct sunlight or time thinning and pruning operations for late summer to prevent buildup of a breeding population of Ips.
4. Close camping areas for 10 to 15 years on a rotational basis to allow recreation area trees to grow and establish new seedlings. Further study is needed to provide a schedule.
5. Develop handout materials to educate the public on the damage caused by nails, defacing trees, and litter.
6. When artificial regeneration is utilized, plant a mixture of conifer species, thereby avoiding monocultures and reducing the threat of host-specific diseases.
7. When oaks are cut, leave a stump no more than eight inches high to allow sprouts to grow and keep the root system alive. Removing or chemically treating oak stumps is counter-productive to managing Armillaria.
8. Favor pine when planting in or near annosus disease centers. Do not plant the susceptible species, incense cedars or giant sequoia, in known or suspected disease centers in recreation areas.
9. Treat freshly-cut pine stumps with granular borax (sodium tetraborate decahydrate, also known by the product name, "Sporax").
10. Use a two-pronged approach to blister rust control: silviculture and genetic selection.
 - a. Continue to work with US Forest Service Geneticists and State Forest Pest Management Specialists on identifying slow-rusting trees and researching the rust outbreak.
 - b. Use harvesting as an opportunity to remove trees infected with blister rust and improve the genetic resistance of the remaining stand. We have developed a blister rust silvicultural prescription. It allows retention of non-infected trees and trees with less than 20 percent of branches infected and with no unprunable lethal infections (defined as a canker within 24 inches of the trunk). Branches with cankers more than four inches from the trunk may be pruned off to keep the canker from reaching the trunk and girdling the tree. Pruning is practical only up to 16 feet due to the inordinate time and effort required to prune above this height.

Appendix B. Historical Research and Demonstration Projects

The following is a summary of research and demonstration projects completed on Mountain Home from 1952 to the present:

Western Speleological Survey Special Report #1: Preliminary Assessment of the Haughton's Cave, Mountain Home State Park Tulare County, California – Arthur Lange, 1952

Sierra Redwood Christmas Trees from Natural Stands – unpublished report, 1954
Growth Plots on Mountain Home State Forest – California Forestry Note #1, 1960
Timber Stand Improvement by Poisoning Black Oak on Mountain Home State Forest - California Forestry Note #2, 1960

Tree Planting and Seeding on Mountain Home State Forest - California Forestry Note #18, 1963

Artificial Protection of First-Year Natural Seedlings on the Mountain Home State Forest in 1963 - California Forestry Note #22, 1964

Growth of Sierra Redwood and White Fir Trees Before and After Release as a Result of Harvesting Nearby Sawlog Trees – unpublished reports, 1964 and 1969

Quantitative Study of Recreation Use in the Mountain Home Area in 1964 – unpublished report, 1965

Chemical Control of Vegetation – unpublished report, 1967

Artificial Protection of Natural First-Year White Fir Increases Survival - California Forestry Note #32, 1967

Sierra Redwood Reproduction on the Mountain Home, a Preliminary Survey - unpublished report, 1967

Mulching Planted Trees – unpublished report, 1972

Growth of Young Sierra Redwood Stands on Mountain Home State Forest - California Forestry Note #72, 1978

Measuring the Adam Tree, Largest Sierra Redwood on the Mountain Home State Forest - California Forestry Note #73, 1979.

Effects of Fertilizer Starter Pellets on Growth and Mortality of Planted Seedlings on Mountain Home Demonstration State Forest - California Forestry Note #80, 1982

Performance of 15 and 13 Year Old Hybrid Pines at Two Sites on Mountain Home Demonstration State Forest - California Forestry Note #81, 1982

Control of Western Bracken Fern with Asulam Herbicide on Mountain Home Demonstration State Forest - California Forestry Note #85, 1983

Mountain Home State Forest Recreation Needs Study: Final Report – Community Development by Design, Berkeley, California, 1990

Young-Growth Sierra Redwood Volume Equations for Mountain Home Demonstration State Forest - California Forestry Note #103, 1991

Tree Ring Reconstruction of Giant Sequoia Fire Regimes - Laboratory of Tree-Ring Research, University of Arizona, 1992

Excavation at Sunset Point Site (CA-TUL-1052), Mountain Home Demonstration State Forest – Dillon, 1992

An Annotated Species List of Terrestrial Vertebrates - Mountain Home Demonstration State Forest - Reginald H. Barrett and David W. Bise, UC Berkeley, 1995

Survey of Sensitive Wildlife on Mountain Home Demonstration State Forest – Reginald H. Barrett, UC Berkeley, 1996

Enterprise Mill Historic Site CA-TUL-814H. Mountain Home Demonstration State Forest – David Dulitz, 1998

Vegetation Responses Following Three Management Strategies in a Giant Sequoia Forest on Mountain Home Demonstration State Forest - California Forestry Note #111, 1998

Growth of Young Giant Sequoia Stand on Mountain Home Demonstration State Forest - California Forestry Note #113, 2000

Commercial Thinning to Reduce Forest Fuels, Mountain Home Demonstration State Forest - California Forestry Note #114, 2000

White Pine Blister Rust at Mountain Home Demonstration State Forest: A Case Study of the Epidemic and Prospect for Genetic Control – USDA, Pacific Southwest Publication, PSW-204

Preliminary Young-Growth Sierra Redwood Stem Analysis and Heartwood Volume Equations for Mountain Home Demonstration State Forest – Technical Report 10, California Polytechnic University, San Luis Obispo, CA 2000

Mountain Home Demonstration State Forest Botanical Survey – William Traylor and Thomas Mallory, California State University, Fresno, 2000

Mountain Home Demonstration State Forest on North Fork Tule River (Watershed Assessment) – prepared under contract by the US Forest Service, Sequoia National Forest, 2002

Forest Carnivore Survey Report, Mountain Home Demonstration State Forest, Fall 2001 and Spring 2002

Two-year raptor study started 2003. Cal Poly. Master's thesis by Jennifer Carlson.

Young Growth Giant Sequoia Response to Management Strategies at Mountain Home State

Forest . Cal Poly. Master's thesis by Gary Roller, 2004

Radial growth responses to gap creation in large, old sequoiadendron giganteum. 2004.
University of California, Berkeley.

Appendix C. Potential Wildlife Species & Associated Habitats

Table 15. Potential Wildlife Species and Habitats Occuring on Mountain Home

Common Name	Species Name	Status	Habitat Types and Range	Species or Suitable Habitat Present
California wolverine	<i>Gulo gulo</i>	ST, FPT, FB	Generalist; remote, high elevation habitats; forest, meadow, rocky	Historic occurrences nearby, suitable habitat present
Pacific fisher	<i>Martes pennanti</i>	ST, SSC	Mature forested habitats with hardwoods, snags, and LWD.	Known to occur, suitable habitat present
American (pine) marten	<i>Martes iparian sierra</i>	Native fur-bearer	Mature forested habitats with snags, rock outcrops, and LWD	Known to occur, suitable habitat present
Southwestern river otter	<i>Lontra canadensis sonora</i>	SSC	Perennial streams with well-developed riparian and aquatic components (forage/denning)	Marginal habitat present
Sierra Nevada red fox	<i>Vulpes vulpes necator</i>	ST, FC	Generalist; remote, high elevation habitats; forest, meadow, rocky	Historic occurrences nearby, suitable habitat present
Mountain lion	<i>Felis concolor</i>	Protected	Generalist; remote, high elevation habitats; forest, meadow, rocky	Known to occur, suitable habitat present
Bobcat	<i>Felis rufus</i>		Boreal zone riparian, deciduous thickets; often near meadows	Known to occur, suitable habitat present
Black bear	<i>Ursus americanus</i>	Harvest	Mid-elevation shrubby/forested habitats with rocky and riparian areas	Known to occur, suitable habitat present
Ring-tailed cat	<i>Bassariscus astutus</i>		Dense forest & shrubby riparian habitats with friable soils; dens in burrows	Known to occur, suitable habitat present
Sierra Nevada snow shoe hare	<i>Lepus americanus tohoensis</i>	SSC	Generalist; caves and thickets used for denning	Known to occur, suitable habitat present
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	SSC	Mesic habitats; roosts/dens in mines, caves, or vacant buildings, maternity roosts sensitive	Known to occur, suitable habitat present
Spotted bat	<i>Euderma maculatum</i>	SSC	Deserts to forests; likely roosts in rock crevices, maternity roosts sensitive	Known to occur, suitable habitat present
Pallid bat	<i>Antrozous pallidus</i>	SSC	Low to mid-elevation riparian habitats; roosts in trees, bridges, buildings; maternity roosts sensitive	Known to occur, suitable habitat present
Red Bat	<i>Lasiurus blossevillii</i>	SSC	Mature riparian hardwood forests; cottonwood; maternity roosts sensitive	Known to occur, suitable habitat present

Common Name	Species Name	Status	Habitat Types and Range	Species or Suitable Habitat Present
Long-legged myotis	<i>Myotis volans</i>		Mixed conifer & giant sequoia forest habitats; tree & rock crevice roosts	Known to occur, suitable habitat present
Fringed bat	<i>Myotis thysanodes</i>		Mixed conifer & giant sequoia forest habitats; tree & rock crevice roosts	Known to occur, suitable habitat present
Silver-haired bat	<i>Lasionycteris noctivagans</i>		Mixed conifer habitats w/black oak component; roosts in crevices and snags	Known to occur, suitable habitat present
Hoary bat	<i>Lasiurus cinereus</i>		Conifer and deciduous hardwood habitats; generally roosts in foliage	Known to occur, suitable habitat present
Long-eared myotis	<i>Myotis evotis</i>		Mixed conifer habitats w/black oak component; roosts under bark, hollow trees, rock crevices & soil fissures.	Known to occur, suitable habitat present
Western mastiff bat	<i>Eumops perotis californicus</i>	SSC	Variety of vegetative conditions; roosts exclusively in rock crevices	Suitable habitat present
Badger	<i>Taxidea taxus</i>	SSC	Open areas and forest edges with porous soils for dens	Known to occur nearby, suitable habitat present
Black-tailed deer (migratory)	<i>Odocoileus hemionus columbianus</i>	Harvest	Generalist; Beds down in dense forest thickets, hollows, and retention areas	Known to occur, suitable habitat present
California condor	<i>Gymnogyps californianus</i>	FE, SE, BOF, FP	Rocky, shrub or mixed conifer habitats, cliff nesting sites & tall open-branched trees/snags for roosting	No suitable nesting habitat present
Great gray owl (nesting)	<i>Strix nebulosa</i>	SE, BOF	Forests near meadows; nests in broken-topped snags/trees	Potentially suitable habitat present
Golden eagle (nesting/wintering)	<i>Aquila chrysaetos</i>	BOF, FP, WL	Nests in large trees or cliffs near expansive open habitats	Known to occur, suitable habitat present
Northern goshawk (nesting)	<i>Accipiter gentilis</i>	BOF, SSC	Nests in mature mixed conifer stands with an open understory.	Known to occur, suitable habitat present
Willow flycatcher (nesting)	<i>Empidonax traillii</i>	SE, FE	Willow/alder thickets in wet meadows and along watercourses.	No suitable nesting habitat present
Bank swallow	<i>Riparia riparia</i>	ST	Nests in sandy banks along streams	No suitable nesting habitat present
Cooper's hawk (nesting)	<i>Accipiter cooperii</i>	WL	Nests in dense conifer stands, mixed forests, and riparian areas	Known to occur, suitable habitat present
Sharp-shinned hawk (nesting)	<i>Accipiter striatus</i>	WL	Early to mid-seral forest and riparian zones	Known to occur, suitable habitat present
American peregrine falcon (nesting)	<i>Falco peregrinus anatum</i>	FD, BOF, FP	Nests on cliffs and high ledges near open areas.	No suitable nesting habitat present

Common Name	Species Name	Status	Habitat Types and Range	Species or Suitable Habitat Present
Flammulated owl (nesting)	<i>Ptiloscops flammeolus</i>		Forests with snags and openings; nests in cavity in live or dead trees	Known to occur, suitable habitat present
California spotted owl (nesting)	<i>Strix occidentalis occidentalis</i>	SSC	Mature conifer forests; nests in abandoned cavity/platform in trees	Known to occur, suitable habitat present
Long-eared owl	<i>Asio otus</i>	SSC	Riparian areas and dense live oak stands near meadow edges	Suitable habitat present
Pileated woodpecker	<i>Dryocopus pileatus</i>		Forested habitats with numerous large snags, logs, and stumps	Known to occur, suitable habitat present
California red-legged frog	<i>Rana draytonii</i>	FT, SSC	Ponds, marshes, and streams.	Extirpated from Tulare County
Southern Mountain yellow-legged frog	<i>Rana muscosa</i>	FE, SE, WL	Mountain streams, lakes, and ponds above 5900' elevation	Suitable habitat present
Foothill yellow-legged frog	<i>Rana boylei</i>	SCT, SSC	Streams and rivers, sea level to 5,800 feet	Suitable habitat present
Western pond turtle	<i>Emys marmorata</i>	SSC	Ponds and slow-moving waters, sea level to 4,690 feet	Suitable habitat present
Little Kern golden trout; critical habitat	<i>Oncorhynchus mykiss whitei</i>	ST, FT	Perennial stream tributaries to the Little Kern River	No suitable nesting habitat present
California (Volcano Creek) golden trout	<i>Oncorhynchus mykiss aguabonita</i>	SSC	Native to high elevation tributaries of the Kern River – also high elevation lakes of the Sierra Nevada Mts.	No suitable nesting habitat present

FT = Federally Threatened; SE = State Endangered; ST = State Threatened; FC = Candidate for Federal listing as Threatened or Endangered; BOF = Board of Forestry Sensitive, Title 14 CCR 898.2(d); FP = Fully Protected, Title 14 CCR 3511 or 4700; SSC = California Species of Special Concern. Federal listing refers to Central Valley ESU: Sacramento River and tributaries.

Appendix D. Important Insect Pest Species

Table 16. Important beetle and borers on Mountain Home

FAMILY	GENERICNAME	COMMONNAME
Scolytidae	<i>Dendroctonus brevicomis</i>	Western pine beetle
	<i>D. ponderosae</i>	Mountain pine beetle
	<i>D. valens</i>	Red turpentine beetle
	<i>Scolytus ventralis</i>	Fir engraver beetle
	<i>Ips spp.</i>	Pine engraver beetle
Buprestidae	<i>Melanophila californicae</i>	California flathead borer
	<i>M. Drummondi</i>	Fir flathead borer

Table 17. Important mistletoes on Mountain Home.

FAMILY	GENERIC NAME	COMMON NAME
Loranthaceae	<i>Arceuthobium abietinum f. concoloris</i>	White fir dwarf mistletoe
	<i>A. californicum</i>	Sugar pine dwarf mistletoe
	<i>A. campylopodum</i>	Western dwarf mistletoe
	<i>Phoradendron juniperium ssp. Libocedri</i>	Incense-cedar mistletoe
	<i>P. vilosum</i>	Oak mistletoe

Table 18. Important fungi on Mountain Home

FAMILY	GENERICNAME	COMMON NAME
Basidiomycetes coleosporiaceae	<i>Cronartium ribicola</i>	White pine blister rust
	<i>C. ribicola</i>	Blister rust
Polyporaceae	<i>Echinodontium tinctorum</i>	Indian paint fungus
	<i>Phellinus pini</i>	Red ring rot
	<i>Fomes officinalis</i>	Brown trunk rot
	<i>Heterobasidium annosus</i>	Annosus root disease
	<i>Polyporos sulphureus</i>	Brown cubical rot
	<i>P. schweinitzii</i>	Velvet top root rot
	<i>P. amarus</i>	Pocket dry rot