RESPONSE TO MANAGEMENT STRATEGIES IN YOUNG-GROWTH GIANT SEQUOIA STANDS AT MOUNTAIN HOME DEMONSTRATION STATE FOREST - REMEASUREMENT TWENTY YEARS AFTER TREATMENT

A Thesis

presented to

the Faculty of California Polytechnic State University,

San Luis Obispo

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Forestry Sciences

by

Joshua Soderlund

December, 2011

© 2011

Joshua Soderlund

ALL RIGHTS RESERVED

COMMITTEE MEMBERSHIP

TITLE:	Response to Management Strategies in Young-Growth Giant Sequoia Stands at Mountain Home Demonstration State Forest - Remeasurement Twenty Years After Treatment
AUTHOR:	Joshua Soderlund
DATE SUBMITTED:	December, 2011
COMMITTEE CHAIR:	Dr. Douglas D. Piirto, Department Head Natural Resources Management and Environmental Sciences Department
COMMITTEE MEMBER:	Dr. Samantha J. Gill, Professor Natural Resources Management and Environmental Sciences Department
COMMITTEE MEMBER:	Dr. Scott L. Stephens, Associate Professor Environmental Science, Policy and Management Department, University California, Berkeley

ABSTRACT

Response to Management Strategies in Young-Growth Giant Sequoia Stands at Mountain Home Demonstration State Forest - Remeasurement Twenty Years After Treatment

Joshua Soderlund

There is limited information on how young-growth giant sequoia (*Sequoiadendron giganteum* [Lindl.] Buchholz)/mixed conifer stands respond to forest management strategies. An applied research study was initiated in 1989 when 35 approximately 0.1 acre (0.04 hectare) plots were installed in six young-growth giant sequoia/mixed conifer stands. The objective of this study was to determine if there was a difference after 20 years between treatments (a) thin only, (b) thin and prescribe burn, and (c) control in terms of the effect on overstory growth and yield, understory plants, tree regeneration and downed woody debris. Analysis of variance (ANOVA) for cubic-foot growth over 20 years showed significant difference (p = 0.016) between the three treatments. Three diversity indices (richness, evenness, and heterogeneity) showed varied results with environmental factors of slope and elevation major variables affecting plant diversity. Regeneration study showed significant seedlings per acre difference (p = 0.010) between treatment (b) and treatments (a) and (c) with white fir (*Abies concolor* [Gord. & Glend.] Lindl. ex Hildebr.) the majority at 87%. These collected and analyzed data will benefit Mountain Home Demonstration State Forest along with other forest managers who actively manage giant sequoia stands, whether natural or plantation.

ACKNOWLEDGMENTS

This project was made possible by funding from California Department of Forestry and Fire Protection. I would like to thank Helge Eng for guidance and for securing the funding necessary for this project. I would like to thank Jim Kral, the manager at Mountain Home Demonstration State Forest, for the use of the barracks and trailer, and especially forestry technicians Eric Hedge, Damian Bean, Steve Ricchiazzi, and Nick Estrada who helped me collect all of the data.

I would like to thank my committee chairman Dr. Douglas Piirto for all of his support, guidance, and direction for this project. I am thankful for our weekly meeting where we discussed research issues and sometimes just talked about life.

I would like to thank my other committee members Drs. Samantha Gill and Scott Stephens for research help and answering my many questions. I would like to thank Gary Roller for helping me find many of the research plots and responding to my questions. I would like to thank Lori Ann Walters for all of her formatting work and for dealing with my long awkward sentences.

I thank my wife Ruth most of all, for she inspired me to pursue my master's degree and has experienced all the joys and frustrations of graduate school along with me.

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

Appendices

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF FIGURES

CHAPTER 1

Introduction

The giant sequoia, big tree, sierra redwood (*Sequoiadendron giganteum* [Lindl.] Buchholz) (syn. *Sequoia gigantea* [Lindl.] Decne) is a tree that has captured the admiration of society in general, and John Muir in particular when he wrote, "Do behold the King in his glory, King Sequoia! Behold! Behold! seems all I can say" (Muir, 1870). These long lived trees, reaching ages of 2,000 to 3,000 years, can grow to heights of 250 feet (76 m) and diameters of 20 feet (610 cm). The largest recorded giant sequoia is the General Sherman Tree located within Sequoia National Park's Giant Forest with a height of 274.9 feet (83.8 m) and circumference of 102.6 feet (31.3 m), for a total volume of 52,508 cubic-feet (Flint, 2002; Rigg, 2001; Schubert, 1957). The physical characteristics of this evergreen is a decurrent growth form having a young conical and old irregular crown of green awl-like foliage, red-brown fibrous bark, and small 1.6 – 3.5 inches (4 – 9 cm) elliptical cones (Hickman, 1993). The requirements for regeneration and growth of giant sequoia are adequate sunlight and soil moisture as well as mineral soil free of debris plus a seed source. Fires can provide an adequate seed bed and growth conditions by removing duff and competing vegetation (Shellhammer and Shellhammer, 2006; Stephens et al., 1999). Giant sequoia's sacred object status and its limited natural range have restricted research using active stand management (Piirto et al., 1997).

Giant sequoia trees naturally occur in 65 to 75 isolated groves, according to different authorities Rundel (1972b) and Willard (1994), (Figure 1) located within a 270 miles (420 km) long and about 15 miles (24 km) wide strip in the mixed-conifer forest on the west-facing slope of the Sierra Nevada Mountains of California. The northern limit is the small Placer County Grove on the Middle Fork of the American River, Tahoe National Forest, Placer County, and the southern limit is the Starvation Creek Grove on Starvation Creek (Deer Creek watershed), Sequoia National Forest, Tulare County (Rundel, 1972b; Schubert, 1957; Willard, 1994).

Society has shown that it values the giant sequoia as an important element of the environment both scientifically and socially beginning as early as 1864, just 12 years after its discovery, with the protection of the Mariposa Grove in Yosemite (Basey and Basey, 1998). These early protective tendencies did not stop the aggressive logging of giant sequoia starting in 1856 thru 1935 and continuing less aggressively until the 1950s. The commitment of California's citizens to giant sequoia protection circa late 1880s resulted in formation of Sequoia, General Grant, and Yosemite Parks in 1890. Between 1900 and 1975 the remaining groves that are on public land were acquired, notably Calaveras Big Trees in 1909, Nelder Grove in 1928, Converse Basin in 1935, Redwood Mountain Grove in 1940, and Mountain Home in 1946 (Leisz, 1992; Tweed, 1992). Presently, approximately 90% of giant sequoia groves are on public land where they are preserved and protected from logging and fire (Hartesvelt, 1975). Agency and percentage managed are as follows: federal (United States Forest Service 49%, National Park Service 28%, Bureau of Land Management <1%), state and county (Cal Fire, State

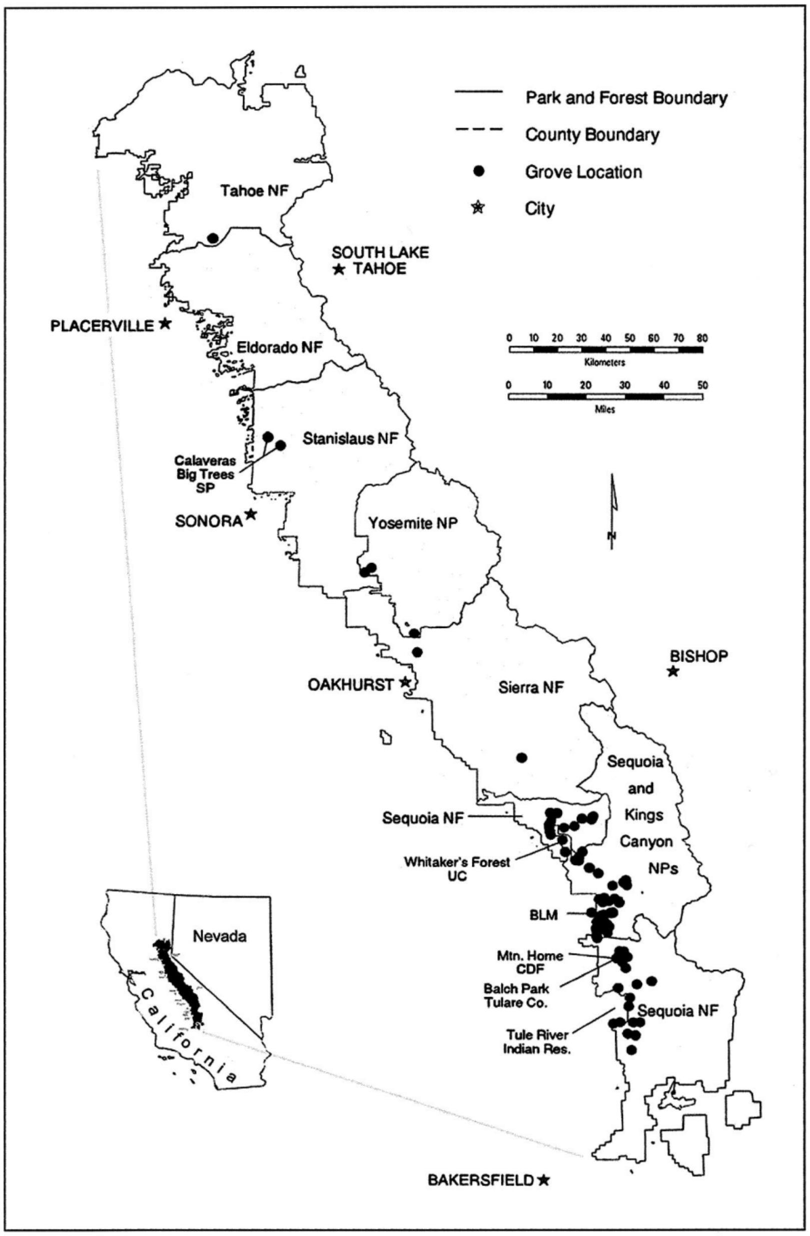


Fig. 1. Location of Giant Sequoia Groves (from Aubert, 1996).

Parks and Recreation, University of California and Tulare County 11%) and tribal (Tule Indian Reservation 4%) (Willard, 1994).

People from around the world travel to the Sierra Nevada Mountains of California and stand in awe of the old-growth giant sequoia trees. In order for future generations to have the same privilege, the groves must continue to produce old-growth trees. Foresters agree that regeneration is crucial, yet recommend many different methods to provide the mineral soil conditions and canopy openings; essential elements for seedling establishment and growth (Piirto et al., 1997). Giant sequoia grove management involving prescribed fire started in the National Park Service as early as the 1960s (Piirto and Rogers, 1999). Throughout the 1980s the Forest Service grove management included prescribed fire and timber harvests, which caused public outcry within the environmental community and led to a Mediated Settlement Agreement (MSA) for Sequoia National Forest in 1990 (Piirto et al., 1997). The (MSA) agreement ceased timber harvests in the groves and provided a general objective "to protect, preserve, and restore the groves for the benefit and enjoyment of the present and future generations" (USDA Forest Service, 1990).

The present management of giant sequoia ranges from custodial protection (i.e., fire suppression and controlling recreational impacts), to stand management (i.e., the selective removal of trees followed by prescribed burning, or prescribed burning only) (Benson, 1986; Fontaine, 1986; Harrison, 1986; Heald, 1986; Parsons and Nichols, 1986; Rogers, 1986; Roller, 2004). A trend toward ecosystem management instead of stand management is occurring which takes into consideration biological, physical, and social/cultural dimensions to reach desired condition (Piirto and Rogers, 2002). What are the best management practices for the perpetuation of giant sequoia from seedling to specimen tree? Much remains to be determined and that is why sound scientific research is important.

One of the few long-term studies investigating how young-growth giant sequoia stands will react to different management treatments is the “Response to Management Strategies in Giant Sequoia Forests” study first established by Dr. Robert E. Martin and Mr. Donald P. Gasser in 1989 at Mountain Home Demonstration State Forest, Tulare County, California. Their initial proposal submitted to the California Department of Forestry and Fire Protection sought funding to initiate long-term studies evaluating the effect of three treatments: a) thinning only, no burning; b) thinning then burning; and c) control, no thinning, no burning) on overstory growth and yield, understory vegetation, downed woody debris, and regeneration. Funding was approved and six young-growth giant sequoia stands at Mountain Home Demonstration State Forest were partially thinned and burned in a controlled study in the fall of 1989 and spring and fall of 1990. Inventory plots were established and measured within the six stands during this same time frame. Overstory and understory data were collected, yet the initial downed woody debris dataset was incomplete. Regeneration data were not measured until 2001 and 2009 (Martin and Gasser, 1989; Roller, 2001).

There have been three subsequent remeasurements of these data. The 1994 data are presented in Todd Bates’ 1998 master’s thesis which focused on diameter and height growth. There was significant difference in diameter growth between the treatments with average of 0.34 inch (0.86 cm) of diameter growth per year and the control with average of 0.12 inch (0.30 cm) of diameter growth per year. The height growth was significantly different between the treatments with average of 1.5 feet (0.46 m) per year and the control with average of 0.9 feet (0.27 m) per year. The understory plant data were collected but incomplete and downed woody debris data were not collected (Bates, 1998). The 2001 data are presented in Gary Roller's 2004 master's thesis and his 2001 senior project which compiled the 1989, 1994, and 2001 raw data. Roller focused on growth and yield and found that the cubic-foot and board-foot growth over the 12 year period were both significantly different for both treatments compared to control. Understory plant data were collected but not fully analyzed. Roller initiated the regeneration study and found that seedlings per acre were significantly greater on the thin and burn plots compared to the thin and control plots. Roller found that the 1, 10, 100 hr fuel levels were significantly different between thin only and both thin and burn and control (Roller, 2001; Roller, 2004). The 2009 data are presented in Joshua Soderlund's 2011 master's thesis.

Objective/Hypothesis Statement

The objectives of this study are to conduct a 20 year remeasurement of young-growth giant sequoia stands' response to different management treatments: a) thinning only, b) thinning and prescribed burning, and c) control, no thinning or prescribed burning; specifically, to determine the treatments' effects upon the overstory growth and yield response of young growth giant sequoia and other mixed conifer species, the understory plant response, downed woody debris response, and the regeneration response of giant sequoia and other mixed conifer species. Data from this fourth measurement will be compared with past measurements done in 1989, 1994, and 2001 to determine whether or not trends are developing.

The null hypothesis is that there will be no significant difference between treatment and control in relation to overstory growth and yield, understory plant response, downed woody debris levels, and tree regeneration; H_0 : treatment = control and H_A : treatment $\neq$ control.

CHAPTER 2

Literature Review

A review of key literature related to giant sequoia and its management is needed to lay a foundation for the present study. Key findings of previous studies are in relation to the topics of ancient range, cultivation outside natural range, ecological restoration, forest growth, understory vegetation, forest regeneration, and downed woody debris.

Ancient Range

The genus *Sequoiadendron*/*Sequoia* was once widely spread across North America, Europe, and Asia Minor during the Tertiary period, and fossils within coal have been found in Montana, central Europe, Croatia, and Turkey (Kayacık et al., 1995; Muller-Stoll, 1947; Spoljaric, 1952; Wilson and Webster, 1946). The closest ancestral species with similar foliage and reproductive structures to *S. giganteum* was *Sequoiadendron chaneyi* of the late Tertiary period. *S. chaneyi* was located in western Nevada within a plant community that has fossil associates similar to those of the present giant sequoia/mixed-conifer community. The migration of the ancient big tree communities westward to the eastern slope, then the summit, and then to the western slope of the Sierra was due to climatic changes in western Nevada. The typical precipitation during the summer of the Tertiary was being replaced by winter precipitation of snow due to cooler winters, while the summer was becoming hot and dry during the Quaternary (Axelrod, 1959). *S. giganteum* pollen from Mono Lake east of the Sierra Nevada showed a decline starting during the transition from the late glacial Pleistocene to the early Holocene (11,000 ya) with the last occurrence during the hot and dry middle Holocene (7,800 ya) (Davis, 1999a). These hot temperatures segregated the big trees to higher elevations with less evaporation and sufficient ground water throughout the year provided by the snow pack (Anderson and Smith, 1994). Prior to the early Holocene (9,000 ya), *S. giganteum* was abundant at lower elevations along streams that flowed into Tule Lake yet by the middle Holocene they had disappeared (Davis, 1999b; Cole, 1983). Even within its present range area *S. giganteum* was rare prior to the late Holocene (4,500 ya) when the climate changed to a cooler and wetter regime which allowed for the development of the sequoia-mixed conifer forest (Anderson, 1994; Anderson and Smith, 1994). This perhaps continuous big tree forest was thought to be disturbed by the glaciation of the Sierra Nevada with an absence of big trees where the glaciers carved valleys and canyons. This would have isolated the remaining groves in the refugia areas in between (Muir, 1876). The more recent theory is that during the hot period of the early and middle Holocene the giant sequoia's range retreated to mesic areas for refuge and then slowly expanded during the late Holocene creating the isolated nature of groves (Anderson, 1994; Anderson and Smith, 1994).

Cultivation Outside Natural Range

Many *S. giganteum* have been planted outside its limited natural range, primarily as an ornamental in parks and botanical gardens across the United States and many countries around the world, especially across Europe from England to the Black Sea region of USSR (Hartesvelt et al., 1975). The giant sequoia had its first exposure outside the United States within London's Gardeners' Chronicle in 1853 (Lindley, 1853). Trials were planted in the Crimea and Trans-Caucasus regions of USSR as early as 1858 (Molotkov, 1958; Jaroslavcev, 1963) and a plantation was started in Gottweig, Austria in 1880 (Rannert, 1955). The first true giant sequoia stands in Europe were planted around the turn of the 20th century with the first in Weinheim, Germany, the second at Groenendaal Experiment Station in Belle Etoile, Belgium, and the third at the Domaine Royal in Tervuren, Belgium (Kleinschmit, 1984, as cited in Knigge, 1994). Subsequently during the 20th century, plantations were established and research concerning commercial viability was done in Europe (Afanasijev, 1951; Antipova, 1952; Bonev, 1966; Commonwealth Agriculture Bureaux, 1949-1950; Holubčík, 1960; Jaroslavcev, 1963; Knigge, 1994; Radler, 1956).

Ecological Restoration

To what reference or natural condition is the forest or landscape being restored and what methods will be applied? The reference condition for the giant sequoia ecosystem is either that of no human influence or pre-Euro-American contact. The National Park Service and many resource managers are using the pre-Euro-American contact as a reference condition (Stephenson, 1999).

Two elements of the ecosystem that are compared to reference condition for restoration are fire regimes and forest structure (species composition, age, size, and arrangement) (Stephenson, 1999). The pre-Euro-American forest condition for giant sequoia ecosystems within Giant Forest, Sequoia National Park had a frequent fire regime of approximately two years (Swetnam et al., 2009). The Sierran mixed-conifer forest structure of Teakettle Experimental Forest within Sierra National Forest in 1865 had 67 stems/ha with species composition of 51% shade tolerant and 49% shade intolerant. Fire exclusion has caused the forest structure to change at Teakettle to be 469 stems/ha with species composition of 84% shade tolerant and 14% shade intolerant in 2000 (North et al., 2007).

The process of restoring the ecosystem to the natural condition is a debate between structural restoration, which uses fire only after forest structure is restored mechanically, and process restoration, which says only fire is necessary. The use of fire without any prior mechanical removal may restore the pre-Euro-American structure of sequoia groves (Stephenson, 1999). A study comparing stand structure for mixed-conifer forest using combinations of thinning, overstory and understory, and burning treatments against a reconstruction of the same forest as it would have looked in 1865 was done at Teakettle Experimental Forest. The study found that the treatment of understory thinning and prescribed burn produced a spatial pattern closest to historical conditions (North et al., 2007).

Forest Growth

Management treatments such as prescribed burning and mechanical thinning can affect the continued growth after regeneration has been established. The continued height growth for giant sequoia is dependent on elevated light levels (Shellhammer and Shellhammer, 2006). Comparison of 0.1 to 1.0 ha openings after three years of sapling growth showed an increase in height growth as opening size increased with giant sequoia having the highest mean height compared to other species; incense cedar (*Calocedrus decurrens* Torr.), Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco), ponderosa pine (*Pinus ponderosa* Dougl. Ex Laws.), white fir (*Abies concolor* [Gord. & Glend.] Lindl. ex Hildebr.) and sugar pine (*Pinus lambertiana* Dougl.). Height growth for giant sequoia was correlated to light availability and water (York et al., 2003). Between 7 and 20 foot spacing significantly affected the early height growth development of giant sequoia. A positive linear relationship between spacing and height, crown diameter, and stem diameter was observed. At year seven, the 14 - 20 foot spacing had trees with 45 - 78% greater diameter growth and 29 - 67% greater height compared with trees at 7 - 10 foot spacing, evidence of less inter tree competition for light, moisture, and nutrients (Heald and Barrett, 1999).

A similar study by Perraca and O'Hara (2008) showing relationship between tree growth components and tree growing space for three species; giant sequoia, ponderosa pine, and Douglas-fir had varied growing space per tree from 4.1 ft^2 to 411.0 ft^2. A significant relationship for all three species were observed between tree growing space and tree height, diameter and live crown ratio; all increased as space increased. Giant sequoia had its greatest volume with growing space of 103.2 ft^2 while Douglas-fir and ponderosa pine had greatest volume with growing space of 26.0 ft^2 and 10.3 ft^2 (Perraca and O'Hara et al., 2008). There is very little information on how natural young-growth giant sequoia stands respond to management strategies.

Understory Vegetation

Species diversity and its relationship to forest management have been an important topic for the last 35 years since the National Forest Management Act of 1976 stated that the provision of plant and animal community diversity should be a main concern of the USDA Forest Service (Lewis et al., 1988; Roberts and Gilliam, 1995). The northern hemisphere temperate forests, including the mixed conifer forest of California's Sierra Nevada Mountains, have a rich amount of plant species and the majority are within the understory plant community (Halpern and Spies, 1995; Shevock, 1996). These forests on private lands are actively managed for timber production involving activities ranging from clearcuts to selective single tree harvest along with site preparation and regeneration planting (Battles et al., 2001). How is understory plant diversity measured and how do these management techniques affect the understory plant diversity?

The three approaches to measuring species diversity are species richness, evenness, and heterogeneity (Krebs, 1999). Species richness describes the number of species in the area or community to be measured (McIntosh, 1967). Evenness means measuring the quantity of each species and then comparing those numbers against a community with all species quantities equalized (Magurran, 1988; Krebs, 1999). Heterogeneity combines species richness and evenness stating that a community with five species having equal quantity has greater diversity than that same community of five species with one dominant species having the majority of quantity (Krebs, 1999). Understory plant diversity has been assessed in relation to specific treatments of thinning prescriptions, prescribed burning techniques, and various combinations of each. For example management regimes of plantation, shelterwood, group selection, and single-tree had greater average species richness and Simpson index values compared to reserve/control at a study conducted at Blodgett Forest Research Station, with significantly greater diversity values for plantation and shelterwood than for reserve/control (Battles et al., 2001). Another study at Teakettle Experimental Forest within the mixed conifer forest type showed that the burn and understory thin treatment produced significantly greater species richness than the control, burn only, understory thin only, and overstory thin only treatments (Wayman and North, 2007). Green tree retention treatment, leaving 5 to 60 large trees per hectare, had significantly greater average species richness compared to intact forest/control along with highest Berger-Parker evenness value representing more evenly distributed species (North et al., 1996). A prescribed burn study showed one year after late season burn there was no significant difference in species richness compared to unburned control, while one year after early season burn there was significantly greater species richness compared to unburned control (Knapp et al., 2007). A mixed conifer study at Grand Canyon National Park found a significant difference in species richness between burned plots with greater richness and unburned plots with lesser richness (Huisinga et al., 2005). The general disturbance created by different treatments has positive effects upon species diversity by providing regeneration conditions for many species, yet specific regeneration conditions are needed for giant sequoia (Rundel, 1972a).

Forest Regeneration

The requirements for regeneration of giant sequoia are adequate sunlight and soil moisture as well as mineral soil free of debris plus a seed source. Fires can provide an adequate seed bed and growth conditions by removing duff and competing vegetation, and providing canopy openings (Hartesveldt et al., 1975; Shellhammer and Shellhammer, 2006; Stephens et al., 1999). The average seedling survival rate 34 and 35 years later for a study done in Kings Canyon National Park between the surface treatments of burn pile and non-burn pile was 19% to 1%, respectively (Shellhammer and Shellhammer, 2006). Another study having burn and non-burn treatments showed regeneration was low in broadcast burn and tractor pile and burn plots while absent in the lop-and-scatter plots (Stephens et al., 1999). The variables affecting primarily the establishment and height growth of giant sequoia after experimental burn were soil moisture measured with a moisture meter (Model 200, Aquaterr) and light levels measured with a light meter (Model 250, Li-Cor) (Shellhammer and Shellhammer, 2006). Burn pile seedlings with higher soil moisture and light levels were significantly taller than non-burn pile seedlings with similar soil moisture and light levels (Shellhammer and Shellhammer, 2006). Planted seedlings initial growth was greater on burned substrate than unburned or bare substrate (York et al., 2011). A comparison study with opening sizes small (15m), medium (30m), and large (61m) all had a low number of giant sequoia seedlings yet it showed a trend of large openings with the most and small opening with the least seedlings but no significant difference was detected based on opening sizes (Stephens et al., 1999). Seedling height and basal diameter growth increased as gap size increased

(York et al., 2011). Survival and growth of giant sequoia regeneration requires site disturbance whether provided by natural or human means (Stephenson et al., 1991; York et al., 2011).

Downed Woody Debris

The fire regime of the giant sequoia mixed-conifer forest type prior to the 1870s was high frequency and low intensity small acreage fires (Kilgore and Taylor, 1979). A Redwood Mountain study found that between 1700 and 1875 the fire return interval within a given drainage was two to three years and as area scale decreased the fire return interval increased to 11 to 39 years on individual trees (Kilgore and Taylor, 1979). A recent study at Giant Forest developed a 3,000 year chronology and found a fire return interval of 2.2 years for grove scale that increased to 15.5 years for tree scale (Swetnam et al., 2009). These frequent low intensity fires kept fuel levels low by consuming litter and downed woody debris, also killing understory tree regeneration which minimized risk of crown fire. Since 1900 with the policy of fire suppression, these low intensity fires have been replaced by high intensity fires over large areas due to accumulation of fuel loads and understory shade tolerant trees (Kilgore and Taylor, 1979).

The fuel load accumulations due to fire suppression vary throughout areas of the giant sequoia mixed-conifer forest. Sixty years of fuel accumulation at Kings Canyon National Park led to 55.89 tons per acre for downed woody debris and 29.1 tons per acre for litter and duff (Parson, 1978). Other studies within Sequoia and Kings Canyon National Parks showed accumulation of between 35.16 and 49.39 tons per acre for downed woody debris and between 52.95 and 55.63 tons per acre for litter and duff

(Keifer, 1998; Keifer et al., 2006). A predominantly giant sequoia stand at Mountain Home Demonstration State Forest having no fires since 1900 had 3.0 tons per acre for downed woody debris and 33.1 tons per acre for forest floor loads relative equivalent to litter and duff loads. A giant sequoia mixed-conifer stand, predominantly white fir and incense-cedar, with no recorded fire history and having been selectively logged with lopping for slash treatment had 72.4 tons per acre for downed woody debris and 34.0 tons per acre for forest floor loads (Weise et al., 1997). Studies have been done that reintroduced fire into these systems to reduce the heavy fuel loads and dense understory trees which can cause high intensity and damaging fires (Kilgore, 1973).

Prescribed burn studies have recorded the reduction of fuel loads and tracked the accumulation of fuels after the treatment. The Kings Canyon National Park study showed a reduction of 88% for downed woody fuels and 92% for litter and duff levels and within seven years the downed woody fuels and litter/duff levels reached 54% and 45% of pre-fire levels, which are sufficient levels to support fire (Parson, 1978). Another study showed a total fuel load (downed woody debris, litter and duff) reduction of 75% immediately after treatment, and ten years later the total fuel load was 66% of pre-fire level (Keifer et al., 2006). After a prescribed burn the live crown weight of the lower 55 feet (16.8 m) of stand was reduced from 7.2 to 3.1 tons per acre and the mean height crown base was increased from 3 to 16 feet (0.9 to 4.9 m), thus reducing the ladder fuels and risk of a crown fire (Kilgore and Sando, 1975).

CHAPTER 3

Methods and Materials

Study Site

The study site is located at Mountain Home Demonstration State Forest (MHDSF) established in 1946 as the first state forest after land was purchased from the Michigan Trust Company for $548,762. The California Department of Forestry and Fire Protection manages the forest with regard to Public Resource Code (PRC) 4631 - 4658 and 4701 - 4703 granting maximum sustainable timber production while providing for public recreation the primary land use at Mountain Home. MHDSF is located in the southern Sierra Nevada Mountain Range in Tulare County, California, northeast of Porterville (36^{o}14’23.71” N and 118^{o}40’23.71” W) (Figure 2). This MHDSF mixed-conifer forest is approximately 4,858 acres (1966 ha) located within the drainages of the North Fork of the Tule River and the North Fork of the Middle Fork of the Tule River. The elevation ranges from 4,800 to 7,600 feet (1463 to 2316 m). The climate is Mediterranean with dry, warm summers and cold, wet winters along with an average precipitation of 42 inches (1067 mm) per year (CDF, 2010).

Common trees species within MHDSF other than giant sequoia are: incense cedar (*Calocedrus decurrens* Torr.), white fir (*Abies concolor* [Gord. & Glend.] Lindl. ex

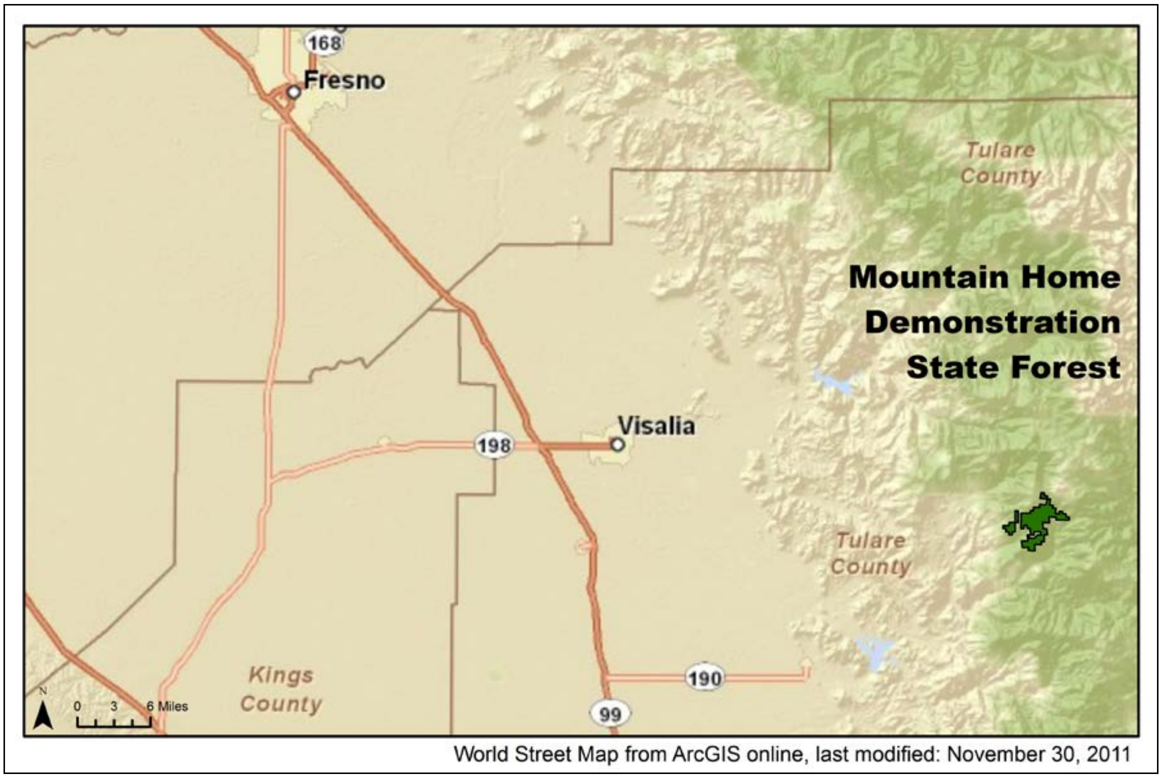


Fig. 2. Mountain Home Demonstration State Forest Location Map.

Hildebr.), red fir (*Abies magnifica* A. Murr.), ponderosa pine (*Pinus ponderosa* Dougl. Ex Laws.), sugar pine (*Pinus lambertiana* Dougl.), black oak (*Quercus kelloggii*), Jeffrey pine (*Pinus jeffreyi*), canyon live oak (*Quercus chrysolepsis*), and white alder (*Alnus rhombifolia*).

The common understory species are: mountain whitethorn (*Ceanothus cordulatus*), deerbrush (*Ceanothus integerrimus*), dogwood (*Cornus nuttalli*), sierra gooseberry (*Ribes roezlii*), sierra currant (*Ribes nevadense*), blackcap raspberry (*Rubus leucodermis*), thimbleberry (*Rubus parviflorus*), mountain misery (*Chamaebatia foliosa*), bracken fern (*Pteridium aquilinum*) and various species of lotus (*Lotus* spp.), lupine (*Lupinus* spp.), and manzanita (*Acrtostaphylos* spp.) (CDF, 2010).

Stand Location/Attributes

The two principal investigators of the original study, Dr. Robert E. Martin and Mr. Donald P. Gasser (1989), located young-growth giant sequoia stands that met the following criteria: 1.) include relatively a significant component of young-growth giant sequoia; 2.) contain no old-growth giant sequoia trees; 3.) be accessible for the removal of cut trees; and 4.) represent the natural variability of growth conditions at MHDSF. Six young-growth giant sequoia stands were found with the above criteria and named in relation to historical or natural features (Table 1 and Figure 3) (Martin and Gasser, 1989; Roller, 2004). Plot maps can be found in Appendix H.

Table 1. *Characteristics of Forest Stands*

Name	Aspect/Slope	Legal Land Description	Latitude	Longitude	Elevation
Bogus Meadow	southwest aspect with 20% slopes	T19S R30E SW ¼ of section 25	36°14’24.3”	118°41’21.0”	6,289 ft. 1,920 m
Frasier Mill	southwest aspect with 20% slopes	T19S R30E SE ¼ of section 26	36°14’21.0”	118°41’26.7”	6,250 ft. 1,905 m
Headquarters	southwest aspect with 20% slopes	T20S R30E NW ¼ of section 1	36°12’53.9”	118°41’2.5”	6,167 ft. 1,880 m
Indian Bath	southeast aspect with 30% slopes	T19S R30E SE ¼ of section 26	36°14’25.8”	118°41’54.9”	6,725 ft. 2,050 m
Methuselah	northwest aspect with 20% slopes	T20S R30E SW ¼ of section 1	36°12’28.2”	118°40’56.0”	6,259 ft. 1,908 m
Tub Flats	southwest aspect with 35% slopes	T19S R30E NW ¼ of section 25	36°14’55.2”	118°40’55.9”	6,916 ft. 2,108 m

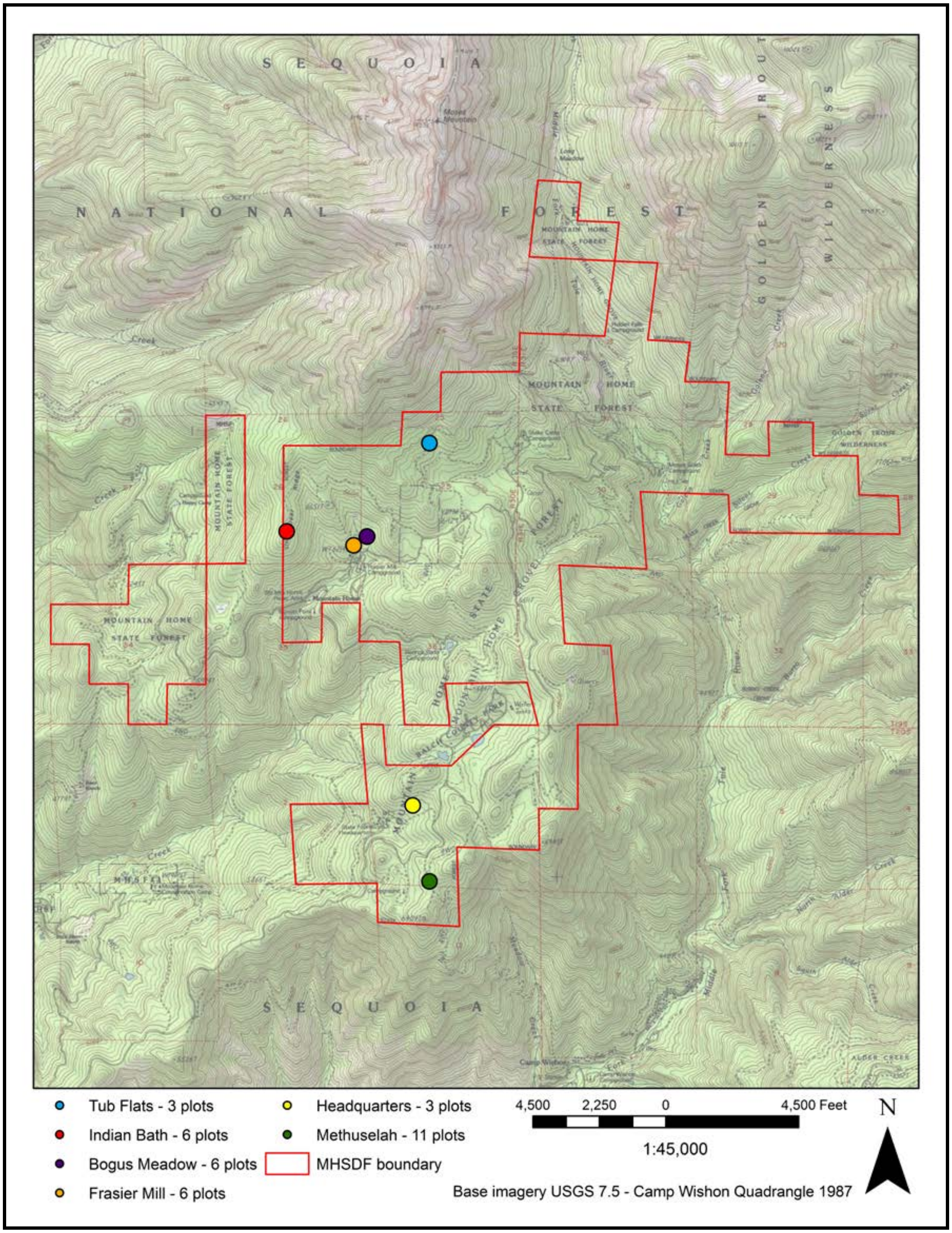


Fig. 3. Mountain Home Demonstration State Forest Stand Map.

Treatments (Experimental Design)

The original planned design was a complete block design with 54 plots but this was not possible due to different size and shapes of suitable giant sequoia stands. This study is a not a completely random design but assume random for practical purposes of simple random analysis approach with the experimental unit represented by forest stands and the sampling units represented by inventory plots. Each of the six stands represents an experimental unit having all three treatments established by Martin and Gasser (1989). The 35 inventory plots representing a sampling unit were chosen randomly to receive treatment with the constraint that treatment plots are near a skid trail to allow tree removal. Headquarters and Tub Flats each had three plots total with one for each treatment; Bogus Meadow, Frasier Mill, and Indian Bath had six plots total with two plots for each treatment; and Methuselah had eleven plots total with four plots of thinning only and thinning and prescribed burning yet with only three control plots. The reason for the omission of a fourth control plot for Methuselah was unknown. The treatments were given an alphanumerical code: (A) thinning only, (B) thinning and burning, and (C) control, no thinning or burning. The location, size, and shape of suitable young-growth giant sequoia stands caused the variation in number of plots per stand (Martin and Gasser, 1989).

The specific thinning type used was low thinning or thinning from below which removes the smaller suppressed trees and poor intermediates that would have been lost to natural mortality and leaves the larger dominant and co-dominant trees with more room to grow (Nyland, 2002). The study kept the larger dominant and co-dominant giant sequoia along with an occasional dominant secondary species. To reduce edge effect, 66 feet (20 m) beyond the thinned plots was thinned to comparable residual basal area. Similarly, most of the control plots were grouped together in order for establishment of a surrounding buffer strip to help reduce any potential edge effect (Martin and Gasser, 1989). The thin and burn plots utilized prescribed fire defined as using fire as a management tool within a predetermined area. The burning schedule developed constraints due to weather, time and prescribed burning logistics permitting all stand plots except Indian Bath to be burned in late fall of 1989 and summer of 1990. The Indian Bath plots were burned in 1991. This difference of a year was not expected to cause significant result differences compared to plots burned earlier (Martin and Gasser, 1989; Roller, 2004; Stoddard and Stoddard, 1987).

Data Collection/Measurement

Each inventory plot is permanently monumented with a piece of rebar pounded flush to the ground at plot center and given an alphanumeric code. A five-foot (1.5 m) piece of aluminum conduit with the top two feet (0.6 m) painted neon orange was placed next to the rebar to aid in locating the plots. The plots are approximately 0.1 acre (0.04 ha) in size with a radius of 39.37 feet (12 m). The alphanumeric code starts with two digits represented by the first letter of each word for the stand name. The second two digits are represented by the treatment type and treatment plot number. For example, FM-B1 represents Frasier Mill stand, thin and burn treatment, and plot #1 (Roller, 2004). The number of treatment plots for each of the six stands is:

- Bogus Meadow (BM) with 2 Thin only, 2 Thin and Burn, 2 Control.

- Frasier Mill (FM) with 2 Thin only, 2 Thin and Burn, 2 Control.
- Headquarters (HQ) with 1 Thin only, 1 Thin and Burn, 1 Control.
- Indian Bath (IB) with 2 Thin only, 2 Thin and Burn, 2 Control.
- Methuselah (ME) with 4 Thin only, 4 Thin and Burn, 3 Control.
- Tub Flats (TF) with 1 Thin only, 1 Thin and Burn, 1 Control.

There was some misnaming of plots within the Frasier Mill and Indian Bath stands for unknown reasons in 1989 with plots FM-A2 and IB-A2 as thinned and burned and plots FM-B1 and IB-B1 as thinned only. These plots were field verified in 2001 by Roller and in 2008 by Roller, Piirto, and Soderlund by observed scorch marks on remaining trees. Original plot names were kept and data collection and analysis were done appropriately taking into consideration the misnaming issue (Roller, 2004).

Overstory Sampling

In 1989 all trees within the plots were tagged and measured for height and diameter at breast height (DBH) 4.5 feet (1.37 m) above ground creating the original data set. The tags were placed with aluminum nails at DBH marking where DBH was measured and should be measured in the future. The tags faced plot center and trees were sequentially numbered clockwise from due north, which should help future researchers locate and identify trees with missing tags. The 2001 study re-established all tags and replaced missing tags with blue aluminum circular tags. The 2009 measurement utilized the same tags when replacing due to missing or bark enveloped tags since the 2001 measurement (Martin and Gasser, 1989; Roller, 2004).

The overstory data of total height and DBH were collected for all trees within the entire 0.1 acre inventory plot. The diameter was measured with a standard diameter tape at DBH indicated by the tag. The height was measured with a Vertex III manufactured by Haglof © Inc., which was calibrated in the morning before field work and in the afternoon to ensure accurate reading. Overstory data measurements for 1989, 1994, 2001 and 2009 can be found in Appendix A. Graphs and stand tables for DBH distribution can be found in Appendix B.

In order to distinguish trees from the regeneration portion of the study, only trees with a DBH threshold of at least one inch were measured as in-growth trees. The Roller 2001 measurement chose the one inch minimum threshold because it represented an established tree that was able to be tagged and had measurable basal area (Roller, 2004).

Some trees experienced negative height growth at some time during the 20 years since the first measurement. Trees with negative growth since last measurement were measured twice to ensure correct measurement and104 of the 802 trees measured had negative height growth. Fifty-seven of the 104 trees had negative growth due to broken, deformed or forked tops. The remaining 47 trees, only 5% of the total, had negative growth for unknown reasons. These differences in tree height could be attributed to using tape and a clinometer for the first two measurements; a method that may yield less precise results than using a hypsometer. The present study, like the Roller 2001 study, is concentrating on the volume growth and yield, so negative height trees are not a significant concern. There is always some degree of measurement error both underestimating and overestimating, so negative growth trees are kept in the data set.

Removing these trees could cause upward bias in heights since only the underestimated trees are removed (Roller, 2004).

The location data set of all overstory trees within the plots relative to plot center was first collected during the Roller 2001 measurement. Spatial maps were created by Roller (2004) which show tree diameter and location relative to plot center and each other. This data set aided in the location and identification of trees with missing tags. The in-growth trees of 2009 were added to this dataset by taking bearing from plot center with a hand compass and distance from plot center to middle of tree with a cloth tape.

After remeasuring the distance from plot center to the residual trees the Roller 2001 study found 5 trees greater than the 39.37 feet (12 m) radius from plot center. These trees were identified within the dataset and not used in summary tables or statistical analysis. During this remeasurement 9 trees not measured during the previous studies located within the 39.37 feet (12 m) radius plot were measured and added to the dataset.

Understory Sampling

Understory study utilized nine subplots in a 3 x 3 grid pattern with 19.7 feet (6 m) spacing, setting the center subplots as the center of the inventory plots, as established by Martin and Gasser (1989). The subplots were marked at plot center with a piece of rebar stake. A metal detector was especially helpful in finding rebar stakes that had been buried in litter and duff. Missing rebar stakes were re-established in approximately the original position by measuring from adjacent subplots and plot center.

Each subplot was 21.5 square feet (2.0 sq. m) with a radius of 2.6 feet (0.8 m). The understory vegetation was measured by a total count of each stem per species and an ocular estimate of percent cover for each species for each subplot. Graminoid and unidentified forb stems were counted by number and estimated for ocular percent cover only and not assessed by species (Roller, 2004). The 2009 data added lady fern (*Athyrum filix-femina* [L.] Roth var. *cyclosorum* Rupr.), sedge (*Carex* sp.), chinkapin (*Castanopsis sempervirens* [Kellogg] Hjelmq.), paintbrush (*Castilleja* sp.), deer brush (*Ceanothus integerrimus* Hook. & Arn.), California hazelnut (*Corylus cornuta* Marsh. var *californica* [A. DC.] W. Sharp), horsetail (*Equisetum* sp.), iris (*Iris* sp.), wintergreen (*Pyrola picta* Smith), false Solomon's seal (*Smilacina racemosa* [L.] Link), and violet (*Viola* sp.) to the shrub/herbaceous plant species list. The added herbaceous plant species that related to the graminoids and unidentified forbs were lumped into these categorizes in order to compare with 1989 dataset. They are recorded in the footnotes of the data sheets located in Appendix C. Duff and litter measurements were taken at two random spots within each subplot. Understory vegetation species list and dataset are located in Appendices D and C (Martin and Gasser, 1989; Roller, 2004).

Understory plant data of species and stem counts (number of individuals) for each inventory plot were entered into Diversity Calculator 4.0 (Zippi, 2003) that calculates 11 diversity indices. The two used were species richness and Simpson Index. Richness was analyzed using raw species richness which is represented by S (the number of species recorded in each inventory plot). Evenness as related to dominance was analyzed with the Berger-Parker index, which uses N (the sum total of the individuals of all S species) and N_{max} (the sum total of the individuals of the most abundant species). The reciprocal form of Berger-Parker index is expressed as 1/*d* so that an increase in value accompanies an increase in diversity/evenness (Berger and Parker, 1970; May, 1975).

$$d = N_{\max}/N$$

Heterogeneity (the combination of richness and evenness) was analyzed with Simpson Index of Diversity which uses n_i (number of individuals in the *i*th species) and N (sum total of the individuals of all S species). The reciprocal form of Simpson's Index is expressed as 1/*D* so that value increases with increasing diversity. This index gives the probability that two individuals collected randomly and independently from a population will be from different species/plants. This index is most sensitive to changes in the more abundant species within the study (Magurran, 1988; Simpson, 1949).

$$D = \sum \left(\frac{n_i(n_i - 1)}{N(N - 1)} \right)$$

Regeneration/ Seedlings Sampling

The regeneration seedling survey was first done by Roller (2001) to address Dr. Piirto's concern that there was no data related to new seedlings within the plots in response to the management strategies and this study contains the second regeneration seedling survey. The seedling data were collected by conducting a 100% count of seedling species. The seedlings were counted inside a nested plot with a 19.7 feet (6 m) radius from the inventory plot center, approximately 0.03 acres (0.01 ha). Every seedling less than 1 inch DBH was counted by species and by one-foot height classes: 0 = (0.0 - 0.9 feet); 1 = (1.0 - 1.9 feet); 2 = (2.0 - 2.9 feet); 3 = (3.0 - 3.9 feet); 4 = (4.0 - 4.9 feet) and 5 = (over 5.0 feet). Trees that were one inch and greater in diameter represented an ingrowth tree and were counted in the overstory sampling (Roller, 2004). Regeneration data is located in Appendix F of this thesis and trees per acre graphs for regeneration are located in Appendix G of this thesis.

Downed Woody Debris Sampling

The fuel data were determined by measuring downed woody debris using the planar intersect method (Brown, 1974). In each of the four cardinal directions a 33 foot (10 m) transect line was established from plot center. A go-no-go gauge was used to inventory the downed woody debris along the transect line classifying them as 1, 10, 100, or 1,000 hour fuels based on diameter:

- up to 0.25 inch (0.64 cm) in diameter are 1-hour fuels;
- greater than 0.25 inch to less than 1.0 inch (2.54 cm) in diameter are 10-hour fuels;
- greater than 1.0 inch to less than 3 inches (7.62 cm) in diameter are 100-hour fuels; and
- greater than 3.0 inches in diameter are 1,000-hour fuels.

The 1 and 10 hour fuels are recorded from plot center to 6.5 feet (2 m), 100 hour fuels from plot center to 10 feet (3 m) and 1,000 hour fuels from plot center to 33 feet (10 m) along each transect line. The 1,000 hour fuels also had the diameter measured and determined if sound or rotten. The litter layer depth was measured at 10 feet (3 m) and 33 feet (10 m) along the transect (Brown, 1974). The downed woody debris dataset was incomplete in 1989, not collected in 1994, and fully collected in 2001. For the 2009 dataset refer to Appendix E (Roller, 2004).

Photographic Record

The 2009 study took digital photographs of each plot to record present stand conditions. The 2001 general photograph protocol was followed with photographs taken in each of the four cardinal directions from plot center facing out and a canopy photograph taken from plot center with lens facing straight up. Plot photos of 1989 pre-treatment, 2001, and 2009 are located in Appendix I. The group of photos for each plot can themselves tell a story involving the changes in understory vegetation, fuel load, and light infiltration in relation to the different treatments. Progression photos can show the chronological changes occurring in the plots (Roller, 2004).

Statistical Analysis

The data were analyzed as a random design using descriptive statistics, analysis of variance (ANOVA) and Tukey's multiple pairwise comparison test generated by SAS/STAT® software, version 9.2 of the SAS system for Windows 7. Copyright © 2002-2008 SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA. The standard assumptions for an (ANOVA) are: 1) Independence - each sampling unit randomly assigned treatment (a), (b) or (c); 2) Populations have equal variances - accept H_0: Variances are equal if homogeneity of variance test result is a p-value greater than $\alpha = 0.05$, Levene's test was used; 3) Population has a normal distribution - accept H_0:

Normal Population if normality test result is a p-value greater than $\alpha = 0.05$, Anderson-Darling test was used.

The data met the assumptions for an (ANOVA) with the following data sets needing transformations (Table 2). The following data sets did not meet the assumptions of variance after many transformations so the (ANOVA) could not be done: understory plant study functional groups – all frequency data, control shrubs abundance by year, control and thin and thin/burn graminoids abundance by year, thin trees abundance by year and 2009 control diversity indices by stand.

One way analysis of variance (ANOVA) with a significance level of 0.05 was used to determine if there are statistically significant differences between treatments. Tukey's multiple pairwise comparison tests with $\alpha = 0.05$ were used to determine which specific treatments were significantly different from each other if the (ANOVA) determined a significant difference existed.

Table 2. *Transformations of datasets to meet assumptions for ANOVA.*

Transformations	Datasets
Ln(dataset)	Board-foot growth from 2001 – 2009 by treatment, 2009 cubic-foot yield by treatment, 2009 board-foot yield by treatment, 2001 total fuel tons per acre by treatment, 2001 litter tons per acre by treatment, Thin/burn litter tons per acre by year
Ln(dataset – 1)	2009 total fuel tons per acre by treatment
Ln(dataset – 400)	Cubic-foot growth from 2001 – 2009 by treatment
Ln(dataset + 0.1)	2009 Trees abundance by treatment,
Ln(dataset + 0.2)	2001 1,000 hr. fuel tons per acre by treatment
Ln(dataset + 0.25)	2009 Thin/burn trees abundance by year
Ln(dataset + 0.5)	2009 Graminoids density by treatments
Ln(dataset + 1.0)	2009 Seedlings per acre by treatment, 2009 shrubs density by treatment, 2009 graminoids abundance by treatment, Thin shrub density by year, Thin/burn shrubs density by year, Thin/burn trees density by year, Thin shrubs abundance by year, Thin/burn shrubs abundance by year, Thin forbs abundance by year, Thin/burn forbs abundance by year, 2009 1,000 hr. fuel tons per acre by treatment, Thin 1,000 hr. fuel tons per acre by year, Thin/burn 1,000 hr. fuel tons per acre by year, Thin total fuel tons per acre by year, Thin/burn fuel tons per acre by year,
Ln(dataset + 2.0)	Thin trees density by year
Ln(dataset + 10)	2009 Forb abundance by treatment
Ln(dataset + 50)	2009 Forbs density by treatment,
√(dataset)	2009 Shrubs abundance by treatment, Control shrub density by year, Control trees density by year, Control forbs abundance by year, Control trees abundance by year
√(dataset + 5.0)	Thin litter tons per acre by year
arcsin(dataset)	2009 Species richness by treatment, 2009 Simpson Index by treatment

CHAPTER 4

Results

Overstory Growth and Yield Response

The overstory data were analyzed using board-foot per acre and cubic-foot per acre parameters. The analysis was separated into stand volume growth and stand volume yield using the local volume equations created for Mountain Home Demonstration State Forest refer to Appendix J (Pillsbury et al., 1990, 1991). Each measurement year - 1989, 1994, 2001, and 2009 has a stand attribute summary table comparing the treatments (A) thinned, (B) thin and burn, and (C) control in relation to average and maximum diameter breast height (DBH), average and maximum height, average basal area, average trees per acre, average cubic-foot volume per acre, and average board-foot volume per acre (Tables 3, 4, 5 and 6). The volume range varies in relation to stands with 2009 Bogus Meadow (A) thinned at 19,617 cubic-feet/acre compared to 2009 Tub Flats (A) thinned at 7,498 cubic-feet/acre, 2009 Bogus Meadow (B) thin and burn at 26,758 cubic-feet/acre compared to Methuselah (B) thin and burn at 7,114 cubic-feet/acre, and Frasier Mill (C) control at 44,182 cubic-feet/acre compared to Tub Flats (C) control at 13,586 cubic-feet/acre (Table 6). The overstory species composition across all treatments shows giant sequoia with 90% of the cubic-foot volume yield validating that these mixed-conifer stands are primary young-growth giant sequoia (Table 7). The summary of significance for parameters of growth and yield across years and treatments are represented with overall significance relating to (ANOVA) and significance between treatments to Tukey’s pairwise comparison (Table 8).

Table 3. *Stand Attribute Summary for 1989.*

	Bogus Meadow	Frasier Mill	Headquarters	Indian Bath	Methuselah	Tub Flats
Elevation	6,289 ft.	6,250 ft.	6,167 ft.	6,725 ft.	6,259 ft.	6,916 ft.
Aspect	SW	SW	SW	SE	NW	SE
# of Thinned Plots (A)	2	2	1	2	4	1
# of Thin & Burn Plots (B)	2	2	1	2	4	1
# of Control Plots (C)	2	2	1	2	3	1
Total Plots	6	6	3	6	11	3
Avg. DBH (A plots)	35.1	24.8	18.0	15.9	17.7	11.4
Avg. DBH (B plots)	27.9	24.2	19.9	13.4	16.6	13.8
Avg. DBH (C plots)	13.3	15.7	14.4	13.3	12.2	9.5
Max. DBH (A plots)	52.3	46.3	33.7	24.7	28.9	20.9
Max. DBH (B plots)	49.4	35.7	27.1	29.3	28.8	20.5
Max. DBH (C plots)	46.9	52.5	31.4	36.0	31.0	23.5
Avg. Height (A plots)	152	118	76	77	65	57
Avg. Height (B plots)	120	107	89	77	64	69
Avg. Height (C plots)	64	75	68	59	53	47
Max. Height (A plots)	173	159	129	100	96	92
Max. Height (B plots)	169	145	112	105	108	86
Max. Height (C plots)	164	165	108	134	95	103
Avg. Basal Area (A plots)	289	259	175	235	134	139
Avg. Basal Area (B plots)	427	241	207	240	130	130
Avg. Basal Area (C plots)	532	887	521	621	307	369
Avg. Trees per Acre (A)	41	64	73	164	82	173
Avg. Trees per Acre (B)	77	59	91	223	77	119
Avg. Trees per Acre (C)	346	419	328	497	296	538
Avg. CF Volume (A plots)	10,970	8,980	4,835	5,702	2,703	3,027
Avg. CF Volume (B plots)	15,203	8,017	5,263	6,412	2,701	3,743
Avg. CF Volume (C plots)	16,713	29,539	13,360	16,472	6,420	8,584
Avg. BF Volume (A plots)	68,492	51,211	25,401	26,769	12,093	13,680
Avg. BF Volume (B plots)	92,357	45,749	25,902	30,840	12,089	19,576
Avg. BF Volume (C plots)	95,492	171,776	64,901	83,806	28,186	40,885

Table 4. *Stand Attribute Summary for 1994.*

	Bogus Meadow	Frasier Mill	Headquarters	Indian Bath	Methuselah	Tub Flats
Elevation	6,289 ft.	6,250 ft.	6,167 ft.	6,725 ft.	6,259 ft.	6,916 ft.
Aspect	SW	SW	SW	SE	NW	SE
# of Thinned Plots (A)	2	2	1	2	4	1
# of Thin & Burn Plots (B)	2	2	1	2	4	1
# of Control Plots (C)	2	2	1	2	3	1
Total Plots	6	6	3	6	11	3
Avg. DBH (A plots)	37.9	26.0	20.0	16.9	19.9	12.3
Avg. DBH (B plots)	29.6	25.3	21.4	14.1	19.5	14.7
Avg. DBH (C plots)	14.1	16.5	15.3	13.9	13.2	9.9
Max. DBH (A plots)	56.0	47.6	37.5	26.2	32.0	22.6
Max. DBH (B plots)	51.1	36.9	29.7	31.3	31.2	22.3
Max. DBH (C plots)	47.2	54.1	33.3	36.4	31.7	24.3
Avg. Height (A plots)	164	123	84	79	71	61
Avg. Height (B plots)	137	122	102	82	77	71
Avg. Height (C plots)	67	78	73	60	60	51
Max. Height (A plots)	188	164	138	102	98	97
Max. Height (B plots)	186	158	120	115	111	87
Max. Height (C plots)	152	175	123	142	101	105
Avg. Basal Area (A plots)	338	282	220	269	164	163
Avg. Basal Area (B plots)	467	235	241	267	149	149
Avg. Basal Area (C plots)	556	965	567	656	354	404
Avg. Trees per Acre (A)	41	64	73	182	75	173
Avg. Trees per Acre (B)	77	55	91	223	68	119
Avg. Trees per Acre (C)	346	419	328	497	298	538
Avg. CF Volume (A plots)	13,607	10,085	6,661	6,589	3,545	3,636
Avg. CF Volume (B plots)	18,273	9,223	6,926	7,450	3,383	4,021
Avg. CF Volume (C plots)	17,522	32,400	16,035	17,977	7,980	9,649
Avg. BF Volume (A plots)	87,861	58,494	36,901	31,370	16,392	16,816
Avg. BF Volume (B plots)	115,718	54,205	36,059	36,742	16,073	20,915
Avg. BF Volume (C plots)	99,514	191,620	82,674	93,024	36,127	46,777

Table 5. *Stand Attribute Summary for 2001.*

	Bogus Meadow	Frasier Mill	Headquarters	Indian Bath	Methuselah	Tub Flats
Elevation	6,289 ft.	6,250 ft.	6,167 ft.	6,725 ft.	6,259 ft.	6,916 ft.
Aspect	SW	SW	SW	SE	NW	SE
# of Thinned Plots (A)	2	2	1	2	4	1
# of Thin & Burn Plots (B)	2	2	1	2	4	1
# of Control Plots (C)	2	2	1	2	3	1
Total Plots	6	6	3	6	11	3
Avg. DBH (A plots)	41.4	28.6	23.0	18.6	22.4	14.1
Avg. DBH (B plots)	32.2	28.8	24.2	15.6	23.2	17.0
Avg. DBH (C plots)	15.5	18.0	16.3	15.4	14.3	11.0
Max. DBH (A plots)	59.9	51.2	41.8	28.5	36.3	25.6
Max. DBH (B plots)	54.2	40.3	33.7	33.7	35.7	23.7
Max. DBH (C plots)	48.4	56.8	34.1	38.6	35.7	22.1
Avg. Height (A plots)	167	133	94	91	83	66
Avg. Height (B plots)	139	126	107	93	91	79
Avg. Height (C plots)	74	85	79	72	69	57
Max. Height (A plots)	189	168	149	117	114	102
Max. Height (B plots)	200	159	123	129	123	95
Max. Height (C plots)	187	192	139	156	114	110
Avg. Basal Area (A plots)	400	355	333	353	207	219
Avg. Basal Area (B plots)	550	361	306	314	201	197
Avg. Basal Area (C plots)	659	1,052	623	751	419	435
Avg. Trees per Acre (A)	46	73	109	187	116	182
Avg. Trees per Acre (B)	87	77	91	214	66	119
Avg. Trees per Acre (C)	337	433	328	488	340	556
Avg. CF Volume (A plots)	16,092	12,604	11,057	9,630	5,126	5,200
Avg. CF Volume (B plots)	21,935	12,439	8,897	9,607	5,141	5,465
Avg. CF Volume (C plots)	22,694	37,817	19,341	22,896	10,588	10,778
Avg. BF Volume (A plots)	105,381	75,053	64,486	48,474	25,419	25,277
Avg. BF Volume (B plots)	141,812	73,467	47,396	49,661	26,091	28,913
Avg. BF Volume (C plots)	135,679	230,071	104,902	124,736	50,674	51,990

Table 6. *Stand Attribute Summary for 2009.*

	Bogus Meadow	Frasier Mill	Headquarters	Indian Bath	Methuselah	Tub Flats
Elevation	6,289 ft.	6,250 ft.	6,167 ft.	6,725 ft.	6,259 ft.	6,916 ft.
Aspect	SW	SW	SW	SE	NW	SE
# of Thinned Plots (A)	2	2	1	2	4	1
# of Thin & Burn Plots (B)	2	2	1	2	4	1
# of Control Plots (C)	2	2	1	2	3	1
Total Plots	6	6	3	6	11	3
Avg. DBH (A plots)	42.0	30.7	21.1	20.7	18.8	15.4
Avg. DBH (B plots)	34.3	31.3	28.3	16.9	26.2	19.2
Avg. DBH (C plots)	16.1	19.2	18.1	17.3	14.1	11.6
Max. DBH (A plots)	64.7	52.3	50.5	30.8	39.8	29.0
Max. DBH (B plots)	59.3	44.0	41.1	36.6	39.7	24.8
Max. DBH (C plots)	49.1	60.0	39.3	40.7	38.8	23.9
Avg. Height (A plots)	157	142	81	101	69	76
Avg. Height (B plots)	141	136	121	102	103	93
Avg. Height (C plots)	77	94	88	81	67	62
Max. Height (A plots)	188	178	156	126	127	117
Max. Height (B plots)	202	166	140	138	135	107
Max. Height (C plots)	182	192	150	162	118	110
Avg. Basal Area (A plots)	491	404	463	424	280	277
Avg. Basal Area (B plots)	661	421	420	368	254	249
Avg. Basal Area (C plots)	725	1,141	768	817	502	505
Avg. Trees per Acre (A)	59	73	164	187	203	201
Avg. Trees per Acre (B)	105	82	91	219	75	119
Avg. Trees per Acre (C)	369	474	346	479	368	538
Avg. CF Volume (A plots)	19,617	15,132	15,704	12,460	7,510	7,498
Avg. CF Volume (B plots)	26,758	15,264	13,383	12,102	7,114	7,660
Avg. CF Volume (C plots)	26,257	44,182	25,807	26,332	13,588	13,586
Avg. BF Volume (A plots)	129,951	92,625	94,883	65,489	39,439	38,501
Avg. BF Volume (B plots)	176,202	92,910	75,784	65,060	37,941	42,025
Avg. BF Volume (C plots)	160,311	277,016	147,154	148,122	67,725	68,157

Table 7. *Species Attribute Summary for 2009*[1].

Species	*Sequoiadendron giganteum*	*Abies concolor*	*Calocedrus decurrens*	*Pinus lambertiana*	*Pinus ponderosa*
Avg. Dbh (A plots)	27.6	3.5	10.3		3.2
Avg. Dbh (B plots)	27.6	11.0	1.1	29.0	
Avg. Dbh (C plots)	19.2	8.4	6.0	13.6	20.9
Max Dbh (A plots)	64.7	18.7	32.9		3.2
Max Dbh (B plots)	53.0	24.8	1.1	36.6	
Max Dbh (C plots)	51.9	49.1	33.3	22.9	20.9
Avg. Ht. (A plots)	116	17	36		14
Avg. Ht. (B plots)	120	50	10	125	
Avg. Ht. (C plots)	92	41	26	64	109
Max Ht. (A plots)	188	99	94		14
Max Ht. (B plots)	202	170	10	150	
Max Ht. (C plots)	191	182	99	93	109
Avg. Basal Area (A plots)	362	4	9		0.04
Avg. Basal Area (B plots)	358	13	0.01	11	
Avg. Basal Area (C plots)	661	45	26	7	2
Avg. Trees per Acre (A plots)	88	37	20		1
Avg. Trees per Acre (B plots)	92	13	1	2	
Avg. Trees per Acre (C plots)	278	62	43	5	1
Avg. CF/acre Volume (A plots)	12,002	120	215		0.3
Avg. CF/acre Volume (B plots)	12,396	491	0.04	403	
Avg. CF/acre Volume (C plots)	22,202	1,859	568	181	71
Avg. BF/acre Volume (A plots)	70,774	701	921		0.35
Avg. BF/acre Volume (B plots)	73,609	3,097	0.03	2,301	
Avg. BF/acre Volume (C plots)	128,825	12,533	2,054	756	320

[1]Did not include hardwoods due to only 4 trees of insufficient size and frequency.

Table 8. *Parameter Summary of Significance.*

Parameter	Overall Significance[1]	P - value	Significance Between Treatments[2]		
			A vs. C	B vs. C	A vs. B
Cubic-Foot Volume Growth 2001-2009	Y	0.0324	N	N	N
Cubic-Foot Volume Growth 1989-2009	Y	0.0164	Y	Y	N
Board-Foot Volume Growth 2001-2009	N	0.0611	N	N	N
Board-Foot Volume Growth 1989-2009	Y	0.0437	N	N	N
Cubic-Foot Yield 1989	Y	0.0009	Y	Y	N
Cubic-Foot Yield 1994	Y	0.0013	Y	Y	N
Cubic-Foot Yield 2001	Y	0.0016	Y	Y	N
Cubic-Foot Yield 2009	Y	0.0018	Y	Y	N
Board-Foot Yield 1989	Y	0.0058	Y	Y	N
Board-Foot Yield 1994	Y	0.0078	Y	Y	N
Board-Foot Yield 2001	Y	0.0089	Y	Y	N
Board-Foot Yield 2009	Y	0.0106	Y	Y	N

[1](ANOVA) shows significant difference between the three treatments if p-value ≤ 0.05.
[2]Tukey's pairwise comparison shows significant difference between specific treatments at 0.05 level.

Cubic-Foot Growth

This inherent variability is also apparent when observing the range of cubic-foot growth per acre (Table 9). The measurement year intervals for this analysis are 2001 - 2009 and 1989 - 2009 looking at overall cubic-foot volume growth difference between treatments. The prior year intervals of 1989 - 1994, 1994 - 2001, and 1989 - 2001 were analyzed by Roller (2004).

Table 9. *Summary Statistics for Cubic-Foot Growth/Acre.*

2001 – 2009					
Treatment	Mean	SE[1]	Max	Min	*N*
A - Thinned	2,853.93 a[2]	243.36	4,647.69	1,789.63	12
B - Thin\Burn	2,921.78 a	343.19	5,625.81	1,818.14	12
C - Control	4,092.75 a	476.63	7,006.34	2,582.55	11
1989 – 2009					
Treatment	Mean	SE	Max	Min	*N*
A - Thinned	6,460.44 a	661.39	10,869.18	3,540.17	12
B - Thin\Burn	6,667.78 a	802.72	12,874.96	3,912.52	12
C - Control	9,731.05 b	1,028.19	17,419.64	5,002.71	11

[1]SE = Standard Error. [2]Means followed by the same letter do not differ at the 0.05 level.

The 2001 - 2009 ANOVA result shows a significant difference (p = 0.0324) in volume between the three treatments (Table 10). Tukey's pairwise comparison is not able to show which treatments are significantly different from each other (Table 11).

Table 10. *Results of ANOVA for Cubic-Foot Growth from 2001-2009.*

Source	DF	SS	MS	F Value	Pr > F
Model	2	1.13821393	0.56910697	3.83	0.0324
Error	32	4.75993705	0.14874803		
Corrected Total	34	5.89815098			

Table 11. *Results of Pairwise Comparison for Cubic-Foot Growth from 2001-2009.*

Tukey's Studentized Range (HSD) Test Critical Value of Studentized Range 3.47525			
Treatment Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
C - A	0.3856	-0.0100	0.7812
C - B	0.3912	-0.0044	0.7868
A - C	-0.3856	-0.7812	0.0100
A - B	0.0056	-0.3813	0.3925
B - C	-0.3912	-0.7868	0.0044
B - A	-0.0056	-0.3925	0.3813

The 1989 - 2009 ANOVA result shows a significant difference (p = 0.0164) in volume between the three treatments (Table 12). Tukey's pairwise comparison shows that there was a significant difference between the thin only treatment and the control and also between the thin and burn treatment and the control. However there was no significant difference between the thin only and the thin and burn treatments (Table 13).

Table 12. *Results of ANOVA for Cubic-Foot Growth from 1989-2009.*

Source	DF	SS	MS	F Value	Pr > F
Model	2	75908865.4	37954432.7	4.69	0.0164
Error	32	259087430.7	8096482.2		
Corrected Total	34	334996296.0			

Table 13. *Results of Pairwise Comparison for Cubic-Foot Growth from 1989-2009.*

Tukey's Studentized Range (HSD) Test

Critical Value of Studentized Range 3.47525
Comparisons significant at the 0.05 level are indicated by ***.

Treatment Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
C - B	3,063	145	5,982	***
C - A	3,271	352	6,189	***
B - C	-3,063	-5,982	-145	***
B - A	207	-2,647	3,062	
A - C	-3,271	-6,189	-352	***
A - B	-207	-3,062	2,647	

Board-Foot Growth

This inherent variability is also apparent when observing the range of board-foot growth per acre (Table 14). The measurement year intervals for this analysis are 2001 - 2009 and 1989 - 2009 looking at overall board-foot volume growth difference between treatments. The prior year intervals of 1989 - 1994, 1994 - 2001 and 1989 - 2001 were analyzed by Roller (2004).

The 2001 - 2009 ANOVA result shows no significant difference ($p = 0.0611$) in volume between the treatments (Table 15). Tukey's pairwise comparison is not necessary since the ANOVA shows no significant differences between the treatments.

Table 14. *Summary Statistics for Board-Foot Growth/Acre.*

2001 – 2009					
Treatment	Mean	SE[1]	Max	Min	*N*
A - Thinned	18,167.79 a[2]	1,867.01	30,397.14	10,907.31	12
B - Thin\Burn	18,947.12 a	2,647.08	40,275.83	9,922.74	12
C - Control	27,227.01 a	3,801.81	51,475.14	14,632.06	11
1989 – 2009					
Treatment	Mean	SE	Max	Min	*N*
A - Thinned	40,572.66 a	5,001.72	69,482.52	19,633.16	12
B - Thin\Burn	42,633.59 a	6,460.90	93,894.19	21,799.90	12
C - Control	63,353.83 a	8,433.75	125,026.24	27,277.09	11

[1]SE = Standard Error. [2]Means followed by the same letter do not differ at the 0.05 level.

Table 15. *Results of ANOVA for Board-Foot Growth from 2001-2009.*

Source	DF	SS	MS	F Value	Pr > F
Model	2	1.01519911	0.50759956	3.05	0.0611
Error	32	5.31914808	0.16622338		
Corrected Total	34	6.33434719			

The 1989 - 2009 ANOVA result shows a significant difference (p = 0.0437) in volume between the three treatments (Table 16). Tukey’s pairwise comparison is not able to show which groups are significantly different from each other (Table 17).

Table 16. *Results of ANOVA for Board-Foot Growth from 1989-2009.*

Source	DF	SS	MS	F Value	Pr > F
Model	2	3593959414	1796979707	3.46	0.0437
Error	32	16636478055	519889939		
Corrected Total	34	20230437469			

Table 17. *Results of Pairwise Comparison for Board-Foot Growth from 1989-2009.*

Tukey's Studentized Range (HSD) Test Critical Value of Studentized Range 3.47525			
Treatment Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
C - B	20,720	-2,668	44,109
C - A	22,781	-607	46,170
B - C	-20,720	-44,109	2,668
B - A	2,061	-20,814	24,935
A - C	-22,781	-46,170	607
A - B	-2,061	-24,935	20,814

Cubic-Foot/Board-Foot Yield

This inherent variability is also apparent when observing the range of cubic-foot yield per acre and board-foot yield per acre (Table 18). The cubic-foot per acre and board-foot per acre yield measurement year for this analysis is 2009. The prior years of 1989, 1994, and 2001 were analyzed by Roller (2004).

Table 18. *Summary Statistics for Cubic-Foot Yield/Acre and Board-Foot Yield/Acre 2009.*

Cubic-Feet/Acre					
Treatment	Mean	SE[1]	Max	Min	*N*
A - Thinned	12,305.09 a[2]	1,606.18	21,887.86	5,735.79	12
B - Thin\Burn	13,252.51 a	2,095.55	30,835.35	6,520.29	12
C - Control	24,881.51 b	3,769.60	55,881.52	11,532.14	11
Board-Feet/Acre					
Treatment	Mean	SE	Max	Min	*N*
A - Thinned	72,272.54 a	11,470.81	143,959.09	29,421.00	12
B - Thin\Burn	78,159.84 a	14,977.51	203,475.33	29,299.74	12
C - Control	144,489.60 b	25,050.90	342,108.40	57,399.09	11

[1]SE = Standard Error. [2]Means followed by the same letter do not differ at the 0.05 level.

The 2009 cubic-feet yield/acre ANOVA result shows a significant difference (p = 0.0018) in volume between the three treatments (Table 19). Tukey's pairwise comparison shows that there was a significant difference between the thin only treatment and the control and also between the thin and burn treatment and the control. However there was no significant difference between the thin only and the thin and burn treatments (Table 20).

Table 19. *Results of ANOVA for Cubic-Foot Yield 2009.*

Source	DF	SS	MS	F Value	Pr > F
Model	2	3.38825360	1.69412680	7.75	0.0018
Error	32	6.99522772	0.21860087		
Corrected Total	34	10.38348131			

Table 20. *Results of Pairwise Comparison for Cubic-Foot Yield 2009.*

Tukey's Studentized Range (HSD) Test Critical Value of Studentized Range 3.47525 Comparisons significant at the 0.05 level are indicated by ***.				
Treatment Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
C - B	0.6436	0.1640	1.1232	***
C - A	0.6938	0.2143	1.1734	***
B - C	-0.6436	-1.1232	-0.1640	***
B - A	0.0503	-0.4188	0.5193	
A - C	-0.6938	-1.1734	-0.2143	***
A - B	-0.0503	-0.5193	0.4188	

The 2009 board-foot yield/acre ANOVA result shows a significant difference ($p = 0.0106$) in volume between the three treatments (Table 21). Tukey's pairwise comparison shows that there was a significant difference between the thin only treatment and the control and also between the thin and burn treatment and the control. However there was no significant difference between the thin only and the thin and burn treatments (Table 22).

Table 21. *Results of ANOVA for Board-Foot Yield 2009.*

Source	DF	SS	MS	F Value	Pr > F
Model	2	3.32618649	1.66309325	5.26	0.0106
Error	32	10.12354398	0.31636075		
Corrected Total	34	13.44973047			

Table 22. *Results of Pairwise Comparison for Board-Foot Yield 2009.*

Tukey's Studentized Range (HSD) Test Critical Value of Studentized Range 3.47525 Comparisons significant at the 0.05 level are indicated by ***.				
Treatment Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
C - B	0.6421	0.0652	1.2191	***
C - A	0.6839	0.1069	1.2608	***
B - C	-0.6421	-1.2191	-0.0652	***
B - A	0.0417	-0.5225	0.6060	
A - C	-0.6839	-1.2608	-0.1069	***
A - B	-0.0417	-0.6060	0.5225	

The 1989 - 2009 control cubic-feet and board-feet volume growth was greater than the thin only and thin and burn treatments (Table 9 and 14). However the 20 year growth of the thin only and thin and burn treatment plots expressed as percentage of post-treatment volume was greater than the growth of the control plots (Table 23). The thinned only plots added 110.5% of the cubic-feet volume that was on the post-treatment thinned plots in 1989 and the control plots added 65.0% of the cubic-feet volume that was on the control plots in 1989.

Table 23. *Percent Volume Growth Between Treatments from 1989-2009.*

	Thinned (%)	Thin/Burn (%)	Control (%)
Cubic-Feet	110.5	101.3	65.0
Board-Feet	128.0	120.0	79.3

Periodic Annual Increment Trend 1989-2009

The cubic-feet periodic annual increment (PAI) for the three time periods 1989 - 1994, 1994 - 2001, and 2001 - 2009 within the 20 year study were calculated. The 20 year (PAI) showed control with the highest at 487 ft^2 per acre per year. The results showed an upward or increasing volume trend for all treatments from 1989 through 2001. The thin only and thin and burn both showed this increasing volume trend starting to level off for the time period 2001 through 2009. The control has started to show a decrease volume trend for the time period 2001 through 2009 (Figure 4). In contrast the PAI mortality per acre per year for the control plots had increasing trend from 25.3 for 1994 – 2001 to 41.1 for 2001 – 2009 (Figure 5).

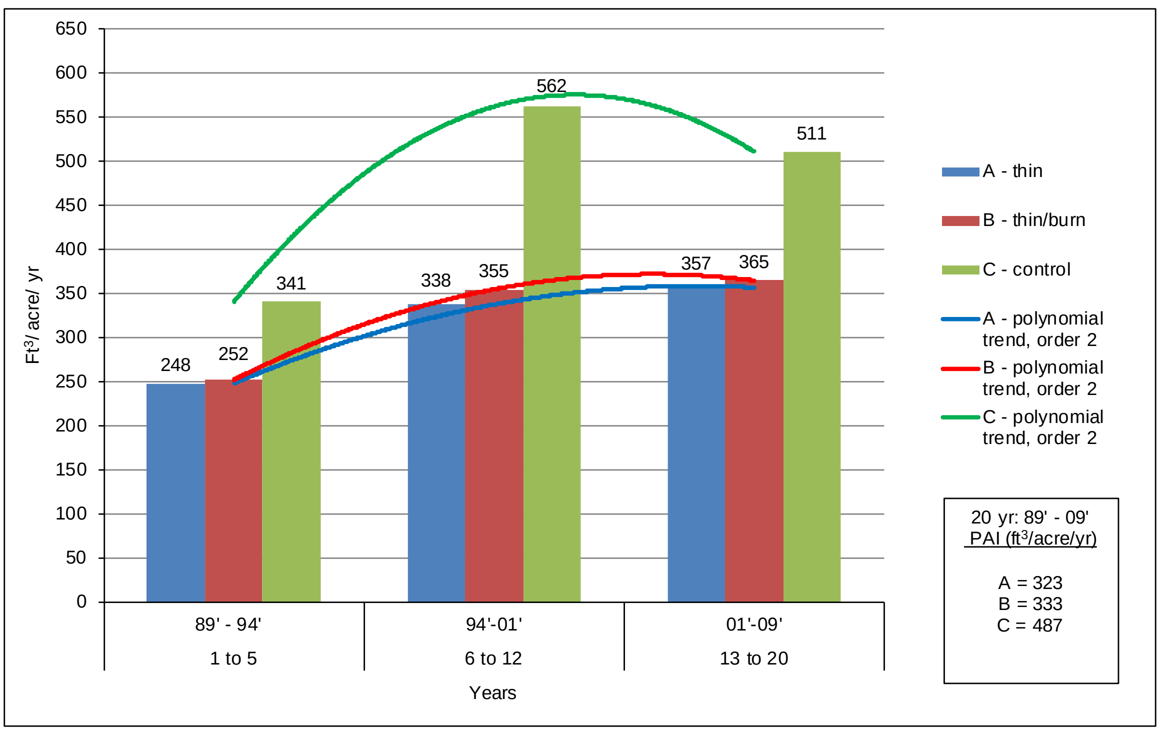


Fig. 4. Periodic Annual Increment ($ft.^3$/acre/year) from 1989-2009.

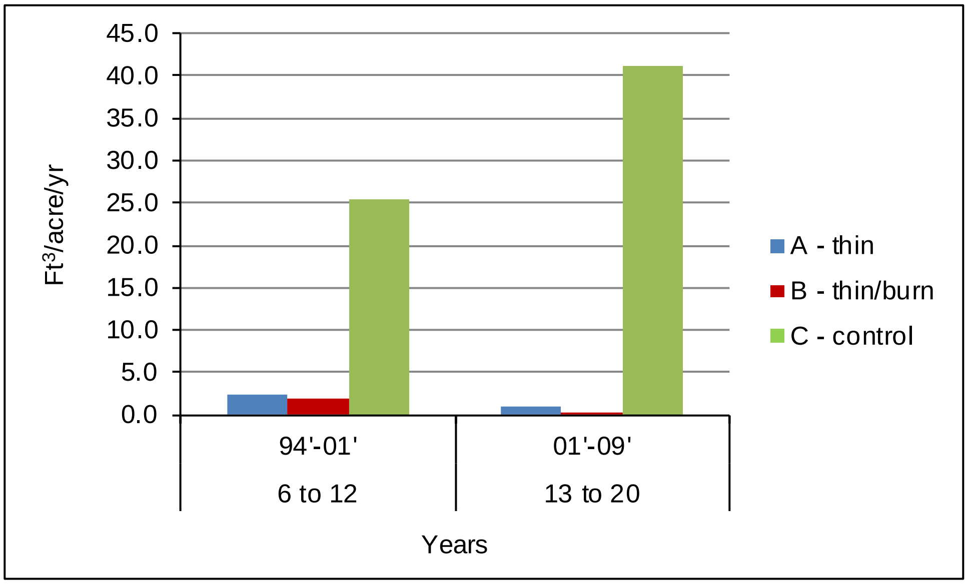


Fig. 5. Periodic Annual Mortality (ft.^{3}/acre/year) from 1994-2009.

Understory Plant Response

The understory plant species raw data are displayed in frequency (number of plot occurrences), density (average stems per acre), and abundance (average percent cover) tables in relation to the different treatments and years 1989 and 2009 (Tables 24 - 26). There are 26 different plants represented with 23 species, ferns (Bracken and Lady Ferns lumped together), graminoids (grasses, sedges and rushes lumped together), and unidentified forbs (lumped together) with the top half of occurrences for 2009 above the double line. Frequency is the presence or absence of a specific plant per inventory plot leading to the total number of inventory plot occurrences in relation to treatment and year. All plants above the double line for 2009 occur in all treatments and only the top five plants occur in approximately 50% or greater of the total 35 plots with *Abies*

Table 24. *Understory Plant Species: Frequency (Number of Plot Occurrences per Treatment)*[1].

Species	Common Name	Growth [7] Form Category	1989 [2] Treatments [3] A	B	C	2009 [2] Treatments A	B	C
Abies concolor	white fir	T	6	5	6	12	12	9
Unidentified Forbs [4]	unidentified forbs	F	5	8	8	10	11	9
Ribes roezlii	sierra gooseberry	S	6	6	5	11	9	7
Graminoids [5]	grasses, sedges and rushes	G	2	1	4	9	10	6
Ferns [6]	bracken fern and lady fern	F	5	5	4	6	6	5
Calocedrus decurrens	incense-cedar	T	3	4	5	4	6	5
Galium trifidum	threepetal bedstraw	F	0	0	0	5	5	5
Adenocaulon bicolor	trail plant	F	0	0	0	5	4	4
Cornus nuttallii	western dogwood	T	1	2	0	2	3	4
Quercus kelloggii	california black oak	T	3	3	3	2	2	4
Rosa californica	california wild rose	S	2	4	1	2	4	2
Pinus lambertiana	sugar pine	T	3	1	1	2	7	2
Corylus cornuta	california hazelnut	S	1	0	1	2	2	3
Chamaebatia foliolosa	bear clover/ mountain misery	S	1	0	1	3	1	2
Arctostaphylos patula	greenleaf manzanita	S	0	0	0	3	3	0
Ribes nevadense	mountain pink currant	S	0	2	1	1	2	2
Lupinus polyphyllus	bigleaf lupine	F	0	0	0	2	3	0
Ceanothus cordulatus	mountain whitethorn	S	0	0	1	1	3	0
Ceanothus integerrimus	deer brush	S	0	1	0	1	3	0
Ceanothus parvifolius	littleleaf ceanothus	S	0	0	0	3	1	0
Lotus crassifolius	big deervetch	F	0	0	0	0	4	0
Prunus emarginata	bitter cherry	S	0	2	0	0	2	1
Rubus leucodermis	blackcap/ western raspberry	S	0	0	0	1	2	0
Rubus parviflorus	thimbleberry	S	0	0	1	0	0	2
Sequoiadendron giganteum	giant sequoia	T	1	0	1	0	0	1
Chrysolepsis sempervirens	evergreen/bush chinquapin	S	0	2	0	0	1	0

[1]Top 50% occurrence for 2009 are those species above the double line.
[2] 1989 is pretreatment, 2009 is 20 years after treatment.
[3] Treatments: A = thin only, 12 plots; B = thin and burn, 12 plots; C = control, no thin or burn, 11 plots.
[4] Unidentified Forbs: Forbs where possible were identified while other forbs were lumped into this category.
[5] Graminoids: Poaceae, Cyperaceae and Juncaceae.
[6] Ferns: *Pteridium aquilinum* and *Athyrum filix-femina* var *cyclosorum.*
[7] Growth Form Category: T = tree, F = Forb/Herb/Fern, S = shrub, G = graminoid.

Table 25. *Understory Plant Species: Density (Average Stems Per Acre per Treatment)*[1].

Species	Common Name	Growth [7] Form Category	1989 [2] Treatments [3] A	B	C	2009 [2] Treatments A	B	C
Abies concolor	white fir	T	356.0	224.8	224.8	1,742.4	4,833.8	2,268.7
Unidentified Forbs [4]	unidentified forbs	F	n/a	n/a	n/a	59,222.9	76,178.5	53,529.0
Ribes roezlii	sierra gooseberry	S	2,360.7	1,049.2	1,267.2	3,915.7	2,154.6	1,246.8
Graminoids [5]	grasses, sedges and rushes	G	n/a	n/a	n/a	10,585.6	22,089.1	2,779.7
Ferns [6]	bracken fern and lady fern	F	2,042.2	2,079.6	2,084.7	5,470.8	4,234.2	2,350.5
Calocedrus decurrens	incense-cedar	T	187.4	168.6	183.9	187.4	393.4	286.1
Galium trifidum	threepetal bedstraw	F	0.0	0.0	0.0	18,210.9	8,899.4	18,129.1
Adenocaulon bicolor	trail plant	F	0.0	0.0	0.0	1,236.5	112.4	12,242.8
Cornus nuttallii	western dogwood	T	37.5	74.9	0.0	37.5	224.8	306.6
Quercus kelloggii	california black oak	T	149.9	131.1	183.9	206.1	74.9	224.8
Rosa californica	california wild rose	S	1,180.3	693.2	633.6	3,784.6	2,510.6	1,921.2
Pinus lambertiana	sugar pine	T	56.2	18.7	20.4	56.2	131.1	102.2
Corylus cornuta	california hazelnut	S	18.7	0.0	61.3	56.2	393.4	163.5
Chamaebatia foliolosa	bear clover/ mountain misery	S	149.9	0.0	143.1	11,522.3	74.9	2,779.7
Arctostaphylos patula	greenleaf manzanita	S	0.0	0.0	0.0	74.9	168.6	0.0
Ribes nevadense	mountain pink currant	S	0.0	318.5	347.5	187.4	449.7	388.3
Lupinus polyphyllus	bigleaf lupine	F	0.0	0.0	0.0	5,845.5	6,688.6	0.0
Ceanothus cordulatus	mountain whitethorn	S	0.0	0.0	20.4	18.7	2,454.3	0.0
Ceanothus integerrimus	deer brush	S	0.0	37.5	0.0	18.7	430.9	0.0
Ceanothus parvifolius	littleleaf ceanothus	S	0.0	0.0	0.0	112.4	37.5	0.0
Lotus crassifolius	big deervetch	F	0.0	0.0	0.0	0.0	880.6	0.0
Prunus emarginata	bitter cherry	S	0.0	243.6	0.0	0.0	805.6	20.4
Rubus leucodermis	blackcap/ western raspberry	S	0.0	0.0	0.0	524.6	337.2	0.0
Rubus parviflorus	thimbleberry	S	0.0	0.0	40.9	0.0	0.0	449.7
Sequoiadendron giganteum	giant sequoia	T	18.7	0.0	20.4	0.0	0.0	20.4
Chrysolepsis sempervirens	evergreen/bush chinquapin	S	0.0	37.5	0.0	0.0	37.5	0.0

[1] Top 50% occurrence for 2009 are those species above the double line.
[2] 1989 is pretreatment, 2009 is 20 years after treatment.
[3] Treatments: A = thin only, 12 plots; B = thin and burn, 12 plots; C = control, no thin or burn, 11 plots.
[4] Unidentified Forbs: Forbs where possible were identified while other forbs were lumped into this category.
[5] Graminoids: Poaceae, Cyperaceae and Juncaceae.
[6] Ferns: *Pteridium aquilinum* and *Athyrum filix-femina* var *cyclosorum.*
[7] Growth Form Category: T = tree, F = Forb/Herb/Fern, S = shrub, G = graminoid.

Table 26. *Understory Plant Species: Abundance (Average Percent Cover per Treatment)*[1].

Species	Common Name	Growth Form Category [7]	1989 [2] Treatments [3] A	B	C	2009 [2] Treatments [4] A	B	C
Abies concolor	white fir	T	0.57	0.14	0.18	2.00	3.40	1.10
Unidentified Forbs [4]	unidentified forbs	F	2.39	2.33	3.93	2.90	3.30	2.50
Ribes roezlii	sierra gooseberry	S	0.56	0.44	0.64	1.30	0.70	0.30
Graminoids [5]	grasses, sedges and rushes	G	0.20	0.07	0.21	0.30	0.40	0.10
Ferns [6]	bracken fern and lady fern	F	2.30	2.40	2.40	5.70	5.60	2.80
Calocedrus decurrens	incense-cedar	T	0.26	0.38	0.41	0.40	0.10	0.40
Galium trifidum	threepetal bedstraw	F	0.00	0.00	0.00	0.50	0.30	0.40
Adenocaulon bicolor	trail plant	F	0.00	0.00	0.00	0.20	0.03	1.40
Cornus nuttallii	western dogwood	T	0.04	0.27	0.00	0.01	1.30	0.10
Quercus kelloggii	california black oak	T	0.42	0.03	0.18	0.20	0.10	0.30
Rosa californica	california wild rose	S	0.31	0.14	0.33	0.40	0.20	0.40
Pinus lambertiana	sugar pine	T	0.01	0.005	0.01	0.03	0.10	0.10
Corylus cornuta	california hazelnut	S	0.02	0.00	0.06	0.02	0.20	0.20
Chamaebatia foliolosa	bear clover/ mountain misery	S	0.05	0.00	0.11	2.30	0.01	0.80
Arctostaphylos patula	greenleaf manzanita	S	0.00	0.00	0.00	0.30	0.20	0.00
Ribes nevadense	mountain pink currant	S	0.00	0.21	0.30	0.30	0.10	0.50
Lupinus polyphyllus	bigleaf lupine	F	0.00	0.00	0.00	0.70	1.40	0.00
Ceanothus cordulatus	mountain whitethorn	S	0.00	0.00	0.01	0.02	2.60	0.00
Ceanothus integerrimus	deer brush	S	0.00	0.02	0.00	0.02	3.40	0.00
Ceanothus parvifolius	littleleaf ceanothus	S	0.00	0.00	0.00	0.40	0.10	0.00
Lotus crassifolius	big deervetch	F	0.00	0.00	0.00	0.00	0.60	0.00
Prunus emarginata	bitter cherry	S	0.00	0.28	0.00	0.00	0.50	0.01
Rubus leucodermis	blackcap/ western raspberry	S	0.00	0.00	0.00	0.10	0.20	0.00
Rubus parviflorus	thimbleberry	S	0.00	0.00	0.22	0.00	0.00	0.30
Sequoiadendron giganteum	giant sequoia	T	0.10	0.00	0.03	0.00	0.00	0.03
Chrysolepsis sempervirens	evergreen/bush chinquapin	S	0.00	0.02	0.00	0.00	0.10	0.00

[1]Top 50% occurrence for 2009 are those species above the double line.
[2] 1989 is pretreatment, 2009 is 20 years after treatment.
[3] Treatments: A = thin only, 12 plots; B = thin and burn, 12 plots; C = control, no thin or burn, 11 plots.
[4] Unidentified Forbs: Forbs where possible were identified while other forbs were lumped into this category.
[5] Graminoids: Poaceae, Cyperaceae and Juncaceae.
[6] Ferns: *Pteridium aquilinum* and *Athyrum filix-femina* var *cyclosorum.*
[7] Growth Form Category: T = tree, F = Forb/Herb/Fern, S = shrub, G = graminoid.

concolor, unidentified forbs, and *Ribes roezlii* in greater than 75%. When aggregated by treatment, thin shows the top five plants occur in 50% or greater of the plots, thin/burn shows the top six plants plus *Pinus lambertiana* occur in 50% or greater of the plots, and control shows the top four plants occur in 50% or greater of the plots (Table 24). Density is the average stems per acre for each plant in relation to treatment and year. *A. concolor* is the 2009 understory tree with the greatest stems per acre across all the treatments compared with other understory trees and the thin/burn plots having the most with 4,833 stems per acre. *Galium trifidum* is the 2009 understory herbaceous species having the greatest average stems per acre; the thin only having the most with 18,210 stems per acre. *Adenocaulon bicolor* is the 2009 understory herbaceous species having the second greatest average stems per acre yet the density in relation to treatment ranges from 12,242 stems per acre for control plots to 112 stems per acre for thin/burn plots. The graminoids 2009 greatest density is 22,089 stems per acre on the thin/burn plots (Table 25). Abundance is the average percent cover for each plant in relation to treatment and year. The percent cover for 2009 understory trees *A. concolor* and *Conus nuttallii* are greatest on thin/burn plots. The ferns have similar percent cover in 1989 and then in 2009 the thin and thin/burn plots have the greatest values. The percent cover and stems per acre for 2009 shrub *Ribes roezlii* are greatest on the thin plots (Table 26).

Whereas the focus is the species above the double line some below showed interesting results. The 2009 shrubs *Ceanothus cordulatus* and *Ceanothus intergerrimus* and 2009 forb *Lupinus polyphyllus* are only found on treatment plots with the greatest values for percent cover and stems per acre on thin/burn plots. The 2009 shrub

Chamaebatia foliolosa stems and percent cover per acre are greatest on the thin plots (Tables 25 and 26).

Understory Plant Functional Groups

The plants were aggregated into functional groups: shrubs (woody plants), Forbs/Herbs (flowering and non-flowering herbaceous plants), graminoids (grasses, sedges, or rushes) and trees (all tree species < 1 inch DBH) with frequency, density, and percent cover calculated by treatment and year. Twenty years after treatment there was a significant difference between treatments and control for some functional groups (Table 27). The frequency data for the functional groups show a greater increase between 1989 and 2009 for the treatment plots compared with the control plots except by Forbs/Herbs on thin/burn plots (Figure 6).

The 2009 ANOVA results for functional groups density show no significant difference for shrubs ($p = 0.271$) and forb/herbs ($p = 0.774$) between the treatments and the control while there is a significant difference at 0.10 level for graminoids ($p = 0.086$), and at the 0.05 level for trees ($p = 0.011$). Tukey's pairwise comparison for graminoid density at $\alpha = 0.1$ shows a significant difference between thin/burn and control while no significant difference between thin and thin/burn or thin and control. Tukey's pairwise comparison for tree density at $\alpha = 0.05$ shows a significant difference between thin/burn and both thin and control, which is similar to the regeneration results later in this study (Table 27).

The 2009 ANOVA results for functional groups abundance show no significance for shrubs ($p = 0.128$), forb/herbs ($p = 0.542$) and trees ($p = 0.110$) between the

Table 27. *Understory Plant Species Aggregated by Functional Group per Treatment and Year (standard errors in parentheses).*

Functional Groups	1989[1] Treatments[2] A	B	C	2009[1] Treatments[3,4] A	B	C	2009 p-value[5]	2009-1989 comparison A, B, C p-values[5]
Frequency (number of plot occurrences per treatment)								
Shrubs	6.0	7.0	6.0	11.0	11.0	7.0	n/a	n/a
Forbs/Herbs[6]	6.0	10.0	8.0	10.0	11.0	9.0	n/a	n/a
Graminoids[7]	2.0	1.0	4.0	9.0	10.0	6.0	n/a	n/a
Trees[8]	7.0	6.0	9.0	12.0	12.0	10.0	n/a	n/a
Density (average stems per acre per treatment)	Treatments A	B	C	Treatments A	B	C		
Shrubs	3,709.6	2,379.4	2,514.0	20,215.6 a*	9,854.9 a*	6,969.6 a	0.271	[0.018] [0.007] [0.231]
	(1,861.9)	(1,215.3)	(1,182.2)	(8,721.4)	(2,715.3)	(2,993.7)		
Forbs/Herbs	n/a	n/a	n/a	89,986.5 a	96,993.6 a	86,251.4 a	0.774	n/a
				(33,830.7)	(31,256.6)	(33,371.4)		
Graminoids	n/a	n/a	n/a	10,585.5 ab	22,089.1 a	2,779.7 b	0.086	n/a
				(4,388.0)	(8,272.4)	(1,464.7)		
Trees	805.6	618.3	633.6	2,229.5 b*	5,658.1 a*	3,208.9 b*	0.011	[0.001] [<0.0001] [0.011]
	(342.8)	(291.7)	(288.9)	(366.6)	(975.2)	(895.3)		
Abundance (average percent cover (avg of subplots) per treatment)	Treatments A	B	C	Treatments A	B	C		
Shrubs	0.90	1.10	1.70	5.30 a*	8.40 a*	2.40 a	0.128	[0.008] [0.003] [n/a]
	(0.50)	(0.70)	(0.70)	(1.90)	(2.70)	(1.00)		
Forbs/Herbs	4.70	4.70	6.30	10.10 a*	11.20 a	7.20 a	0.542	[0.044] [0.152] [0.932]
	(2.50)	(2.00)	(2.20)	(2.70)	(4.40)	(3.00)		
Graminoids	0.20	0.10	0.20	0.30 ab	0.40 a	0.10 b	0.035	n/a
	(0.20)	(0.06)	(0.18)	(0.10)	(0.10)	(0.03)		
Trees	1.30	0.80	0.80	2.60 a	5.00 a*	2.00 a	0.110	[n/a] [0.002] [0.156]
	(0.60)	(0.50)	(0.30)	(1.20)	(1.60)	(0.80)		

[1] 1989 is pretreatment, 2009 is 20 years after treatment.
[2] Treatments: A = thin only, 12 plots; B = thin and burn, 12 plots; C = control, no thin or burn, 11 plots.
[3] 2009 values followed by the same letter do not differ at the 0.10 level (Tukey's pairwise comparison).
[4] 2009 value with an asterisk differs from 1989 value at the 0.10 level.
[5] p-value from analysis of variance (ANOVA).
[6] Forbs/Herbs/Ferns: Flowering and Nonflowering herbaceous plants lumped together.
[7] Graminoids: Grasses, Sedges or Rushes.
[8] Trees: All tree species < 1inch DBH.

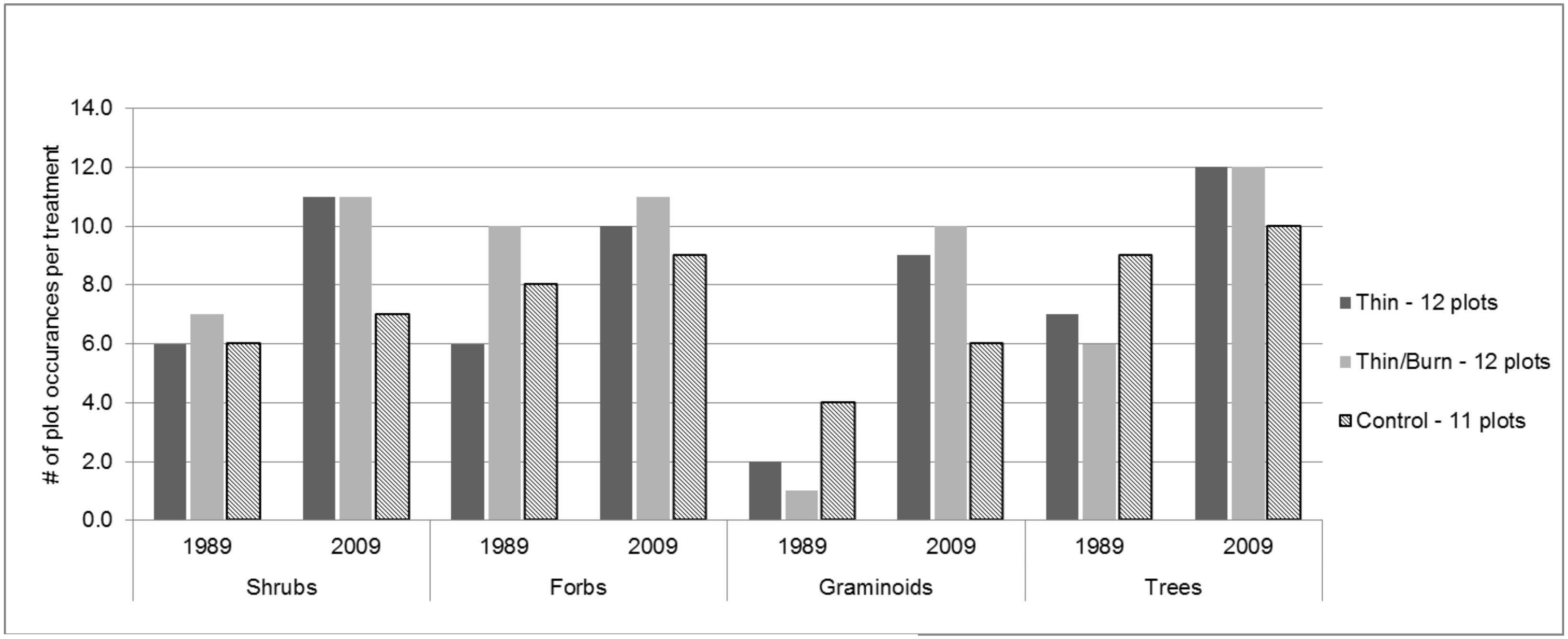


Fig. 6. Frequency of Understory Plant Functional Groups by Treatment and Year.

treatments and the control, while there is significance for graminoids ($p = 0.035$). Tukey's pairwise comparison for graminoid abundance at $\alpha = 0.05$ shows a significant difference between thin/burn and control while no significant difference between thin and thin/burn or thin and control (Table 27).

A significant difference for the density and abundance values between 2009 and 1989 were found for some functional groups. The ANOVA results for shrubs density show a significant difference between 2009 and 1989 for thin ($p = 0.018$) and thin/burn ($p = 0.007$) but not for control (0.231). The ANOVA results for trees density show a significant difference between 2009 and 1989 for thin ($p = 0.001$), thin/burn ($p = <0.001$) and control ($p = 0.011$). The density comparison between 2009 and 1989 was not possible for forbs/herbs and graminoids because the 1989 data did not record density for unidentified forbs and graminoids (Table 27).

The ANOVA results for shrubs abundance show a significant difference between 2009 and 1989 for thin ($p = 0.008$) and thin/burn ($p = 0.003$). The ANOVA results for forbs/herbs abundance show a significant difference between 2009 and 1989 for thin ($p = 0.044$) but not for control ($p = 0.932$) or thin/burn ($p = 0.152$), even with its similar value difference. The ANOVA results for trees abundance show a significant difference between 2009 and 1989 for thin/burn ($p = 0.002$) but not for thin (p = n/a) or control ($p = 0.156$) (Table 27).

Understory Plant Diversity

The 2009 ANOVA results for the diversity indices show no significant difference for *S* - species richness (p = 0.453), Berger-Parker Index (p = 0.721), or Simpson Index (p = 0.807) between the treatments and the control, likely due to variability caused by different environmental conditions throughout the stands (Table 28). The control plots' values for *S* - species richness, Berger-Parker Index, and Simpson Index vary by stand (Table 29). A principle components analysis (PCA) shows that slope and elevation are the most influential of the environmental conditions. All three diversity indices display a negative slope trend showing that as elevation and slope values increase the indices' values decrease with *S*-species richness the most pronounced, Berger-Parker Index the least pronounced, and Simpson Index in the middle (Figures 7 - 9).

Table 28. *2009 Summary Table Diversity Indices by Treatment (standard errors in parentheses)*[1].

Treatment	Richness Species Richness	Evenness Berger - Parker Index	Heterogeneity Simpson Index
A –Thinned	7.3 a[2]	1.8 a	53.1 a
	(0.9)	(0.1)	(5.6)
B – Thin/Burn	8.5 a	1.9 a	52.1 a
	(1.0)	(0.2)	(7.2)
C - Control	6.6 a	1.7 a	46.1 a
	(1.2)	(0.2)	(8.0)
p - value[3]	0.453	0.721	0.807

[1] Richness- number of species per sample, Evenness- measure of the relative abundance of the different species making up richness, Heterogeneity- accounts for both richness and evenness.
[2] Means followed by the same letter do not differ at the 0.05 level (Tukey's pairwise comparison).
[3] p-value from analysis of variance (ANOVA).

Table 29. *2009 Control Summary Table for Diversity Indices by Stand (standard errors in parentheses)*[1].

Stand	Richness	Evenness	Heterogeneity
	Species Richness	Berger - Parker Index	Simpson Index
Bogus Meadow	9.0 (0.0)	2.5 (0.1)	68.7 (0.5)
Frasier Mill	5.0 (0.0)	1.8 (0.2)	57.1 (7.6)
Headquarters	12.0 (0.0)	1.3 (0.0)	40.3 (0.0)
Indian Bath	1.0 (0.0)	1.0 (0.0)	0.0 (0.0)
Methuselah	9.7 (0.3)	2.0 (0.4)	62.7 (7.0)
Tub Flats	2.0 (0.0)	1.2 (0.0)	27.8 (0.0)

[1] Richness- number of species per sample, Evenness- measure of the relative abundance of the different species making up richness, Heterogeneity- accounts for both richness and evenness.

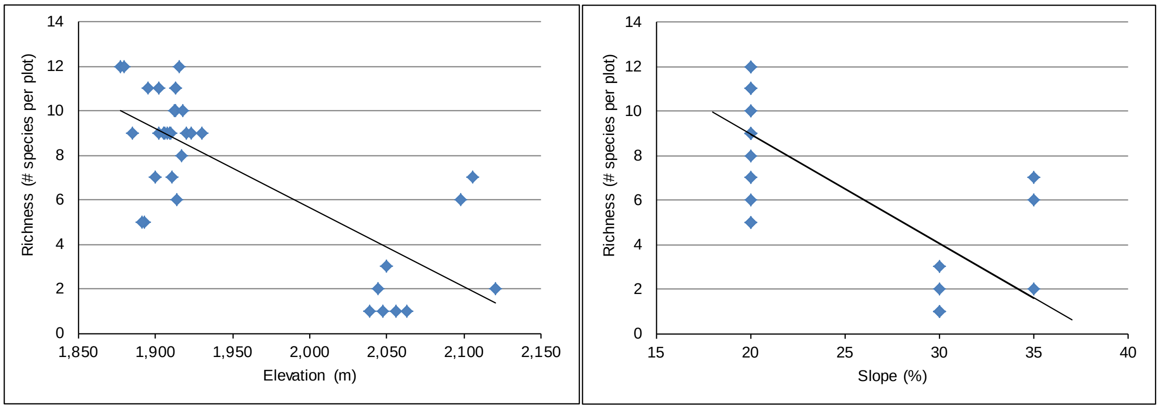


Fig. 7. Species Richness vs. Elevation (m) and Slope (%).

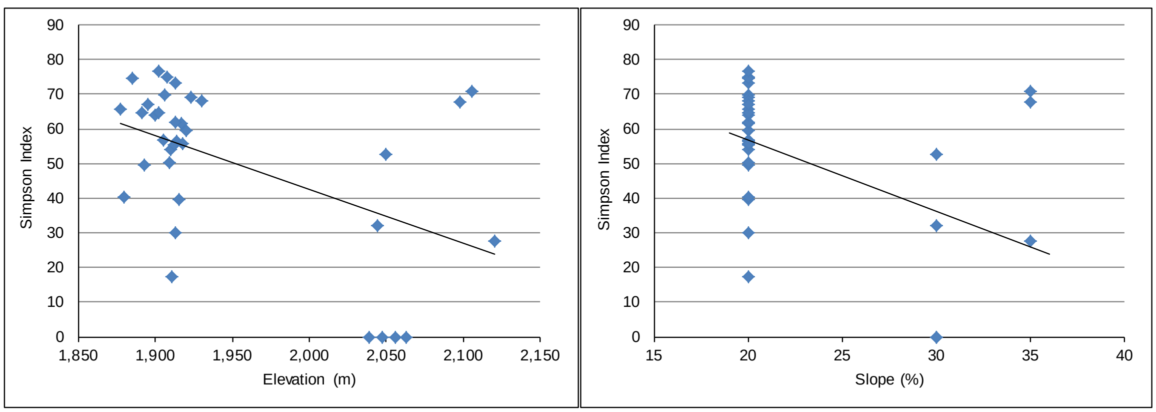


Fig. 8. Heterogeneity: Simpson Index vs. Elevation (m) and Slope (%).

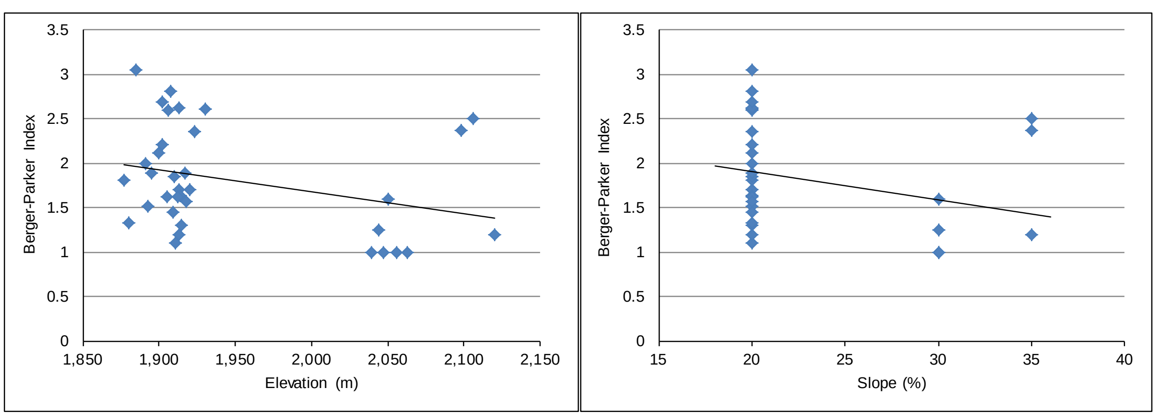


Fig. 9. Evenness: Berger-Parker vs. Elevation (m) and Slope (%).

Regeneration/Seedlings Response

The natural regeneration data were analyzed using seedlings per acre parameters. The number of seedlings per acre range varies in relation to stands with 2009 Methuselah (A) thinned at 2,140.50 seedlings/acre compared to 2009 Indian Baths (A) thinned at 242.65 seedlings/acre, 2009 Headquarters (B) thin and burn at 8,596.66 seedlings/acre compared to Methuselah (B) thin and burn at 1,785.19 seedlings/acre, and Methuselah (C) control at 3,408.62 seedlings/acre compared to Frasier Mill (C) control at 207.98 seedlings/acre. This inherent variability is also apparent when observing the range of seedlings per acre (Table 30).

Table 30. *Summary Statistics for Seedlings Per Acre 2009.*

2009					
Treatment	Mean	SE[1]	Max	Min	*N*
A - Thinned	1,250.79 a[2]	280.01	3,085.09	242.65	12
B - Thin\Burn	4,341.66 b	957.49	8,908.63	1,005.25	12
C - Control	1,654.42 a	501.87	5,407.58	0.00	11

[1]SE = Standard Error. [2]Means followed by the same letter do not differ at the 0.05 level.

The 2009 ANOVA result shows a significant difference (p = 0.0100) in density between the three treatments (Table 31). Tukey's pairwise comparison shows that there was a significant difference between the thin and burn treatment and the control and also between the thin and burn treatment and the thin only treatment. However, there was no significant difference between the thin only and the control treatments (Table 32). The results of Roller's (2004) study were similar having a p-value of 0.005 and Tukey's pairwise comparison yielding a significant difference between thin only treatment and thin and burn treatment and control and thin and burn treatment. The thin only treatment and the control likewise were not significantly different (Roller, 2004).

Table 31. *Results of ANOVA for Seedlings per Acre 2009.*

Source	DF	SS	MS	F Value	Pr > F
Model	2	12.07548545	6.03774272	5.34	0.0100
Error	32	36.19811813	1.13119119		
Corrected Total	34	48.27360357			

Table 32. *Results of Pairwise Comparison for Seedlings per Acre 2009.*

Tukey's Studentized Range (HSD) Test

Critical Value of Studentized Range 3.47525
Comparisons significant at the 0.05 level are indicated by ***.

Treatment Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
B - A	1.2182	0.1512	2.2852	***
B - C	1.2575	0.1666	2.3485	***
A - B	-1.2182	-2.2852	-0.1512	***
A - C	0.0394	-1.0516	1.1304	
C - B	-1.2575	-2.3485	-0.1666	***
C - A	-0.0394	-1.1304	1.0516	

The percent seedling composition per acre across all treatments shows white fir with 78%, then incense-cedar with 6%, black oak with 4%, sugar pine with 3%, and giant sequoia and ponderosa pine both having less than 1% (Figure 10). These results are similar with Roller's (2004), the only difference being that incense-cedar was 8% and black oak was 2%.

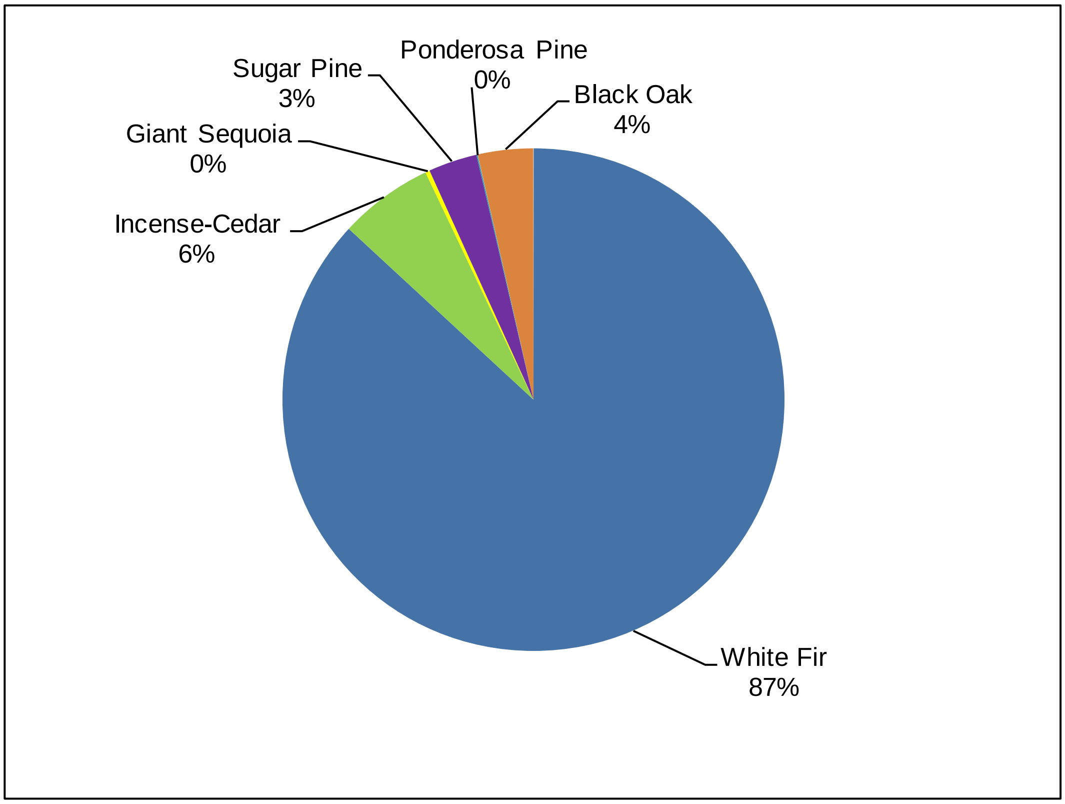


Fig. 10. Percent Seedling Composition in 2009.

The seedlings per acre by treatment also show white fir the greatest across all treatments (Figure 11), which agree with Roller's 2004 results. This study's results for giant sequoia concur with Roller (2004) both having the thinned only treatment with the most seedlings per acre, yet 2009 results show no seedlings for the thinned and burned and control treatments (Figure 11).

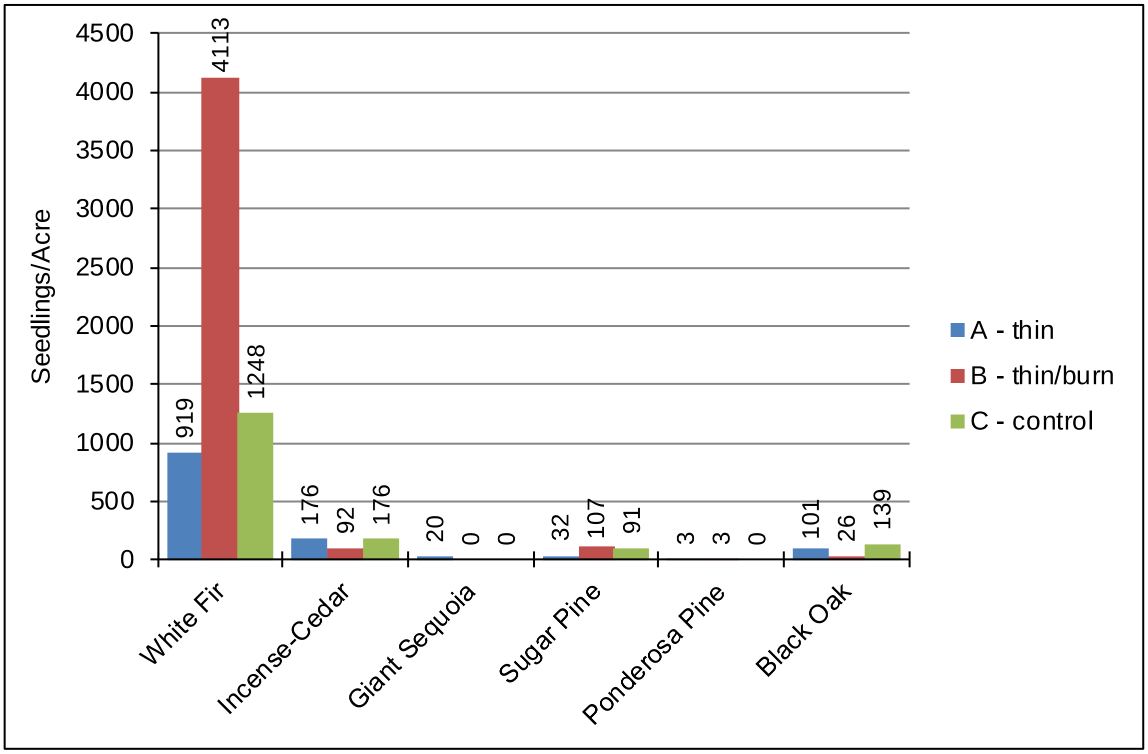


Fig. 11. Seedlings per Acre on Thin Only, Thin and Burn, and Control Plots.

Downed Woody Debris Response

The following results for downed woody debris are presented in tons per acre calculated using van Wagtendonk, Benedict and Sydoriak (1996) coefficients and aggregated by fine surface (1 hr., 10 hr., 100 hr.) fuels, 1,000 hr. fuels and total fuels. Litter is presented in tons per acre calculated using van Wagtendonk, Benedict and Sydoriak (1998) coefficients. Only the data for the years 2001 and 2009 are represented because no fuel data were collected in 1994 and the 1989 fuel data are incomplete. The 1989 fuel data has two data sets - the pre-treatment measurements and the post-treatment measurements, one of which is incomplete and due to the lack of dates on the data sheets there is no certainty on the identity of either data set.

The 2001 ANOVA results for fine surface (1 hr., 10 hr., 100 hr.) fuels tons per acre shows a significant difference ($p = 0.0001$) between the three treatments (Table 33). The 2009 ANOVA results for surface fuel (1 hr., 10 hr., 100 hr.) tons per acre shows a significant difference ($p = 0.008$) between the three treatments (Table 33). Tukey's pairwise comparison for 2001 shows a significant difference between thin only and both thin/burn and control, but no significant difference between thin and burn and control (Table 33). Tukey's pairwise comparison for 2009 shows a significant difference between thin and burn and both thin only and control, but no significant difference between thin only and control (Table 33, Figure 12).

The 2001 ANOVA results for 1,000 hr. fuels tons per acre show no significant difference ($p = 0.103$) between the three treatments (Table 33). The 2009 ANOVA results for 1,000 hr. fuels tons per acre show a significant difference ($p = 0.041$) between the three treatments with Tukey's pairwise comparison showing a significant difference between thin and burn and control, but no significant difference between thin only and control or thin only and thin and burn, yet the raw data values show thin only is greater than thin and burn (Table 33).

The 2001 ANOVA results for total fuels tons per acre show a significant difference ($p = 0.017$) between the three treatments with Tukey's pairwise comparison showing a significant difference between thin only and control, but not significant

Table 33. *Summary Table Downed Woody Debris Levels and Litter per Treatment by Year (standard errors in parentheses).*

Downed Woody Debris and Litter - Tons per Acre										
	2001 [1] Treatments [2,3]			2001 p - value[5]	2009 [1] Treatments[3,4]			2009 p- value[5]	2009 -2001 comparison A, B, C p-values[5]
	A	B	C		A	B	C		
Surface Fuels (1,10,100hr)	2.90 a (0.31)	1.21 b (0.20)	1.50 b (0.28)	0.0001	2.24 a (0.26)	1.32 b (0.17)	2.30 a* (0.26)	0.008	[0.109] [0.665] [0.048]
1000hr Fuels	23.76 a (9.67)	14.25 a (4.73)	2.62 a (0.84)	0.103	30.05 ab (14.57)	23.13 a (7.06)	3.52 b (1.01)	0.041	[0.996] [0.318] [0.501]
Total Fuels	26.67 a (9.64)	15.54 ab (4.62)	4.12 b (0.80)	0.017	32.29 a (14.56)	24.45 a (7.05)	5.81 a (0.90)	0.115	[0.845] [0.285] [0.176]
Litter	28.2 a (4.35)	18.49 a (2.85)	25.72 a (2.38)	0.061	26.76 a (1.98)	20.44 b (1.29)	25.28 ab (1.99)	0.040	[0.933] [0.254] [0.890]

[1] 2001 is 12 years after treatment, 2009 is 20 years after treatment.
[2] Treatments: A = thin only, 12 plots; B = thin and burn, 12 plots; C = control, no thin or burn, 11 plots.
[3] 2001 and 2009 values followed by the same letter do not differ at the 0.05 level (Tukey's pairwise comparison).
[4] 2009 value with an asterisk differs from 2001 value at the 0.05 level.
[5] p-value from analysis of variance (ANOVA).

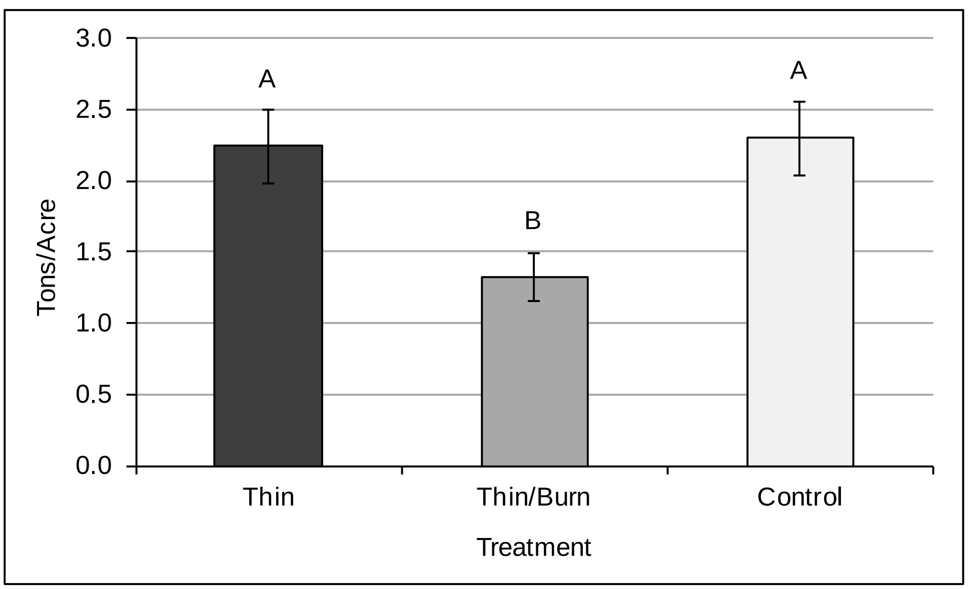


Fig. 12. Downed Woody Debris – Surface (1, 10, 100 hr.) Fuels in 2009 (columns with same letters do not differ at the 0.05 level).

difference between thin only and thin and burn or thin and burn and control (Table 33). The 2009 ANOVA results for total fuels tons per acre show no significant difference ($p = 0.115$) between the three treatments (Table 33).

The ANOVA results for surface (1 hr., 10 hr., 100 hr.) fuels tons per acre show a significant difference comparing 2009 to 2001 for control plots ($p = 0.048$) but not for thin only ($p = 0.109$) and thin and burn ($p = 0.665$). The ANOVA results for 1,000 hr. fuels and total fuels tons per acre show no significant difference comparing 2009 to 2001 for thin only ($p = 0.996$ and 0.845), thin and burn ($p = 0.318$ and 0.285), or control ($p = 0.501$ and 0.174) (Table 33, Figures 13 - 15).

The 2001 ANOVA results for litter tons per acre show no significant difference ($p = 0.061$) between the three treatments (Table 33). The 2009 ANOVA results for litter tons per acre show significant difference ($p = 0.040$) between the three treatments with Tukey's pairwise comparison showing a significant difference between thin only and thin and burn, but no significant difference between control and thin only or control and thin and burn (Table 33). The ANOVA results for litter tons per acre show no significant difference between 2009 and 2001 for thin only ($p = 0.933$), thin and burn ($p = 0.540$) or control ($p = 0.890$) (Table 33).

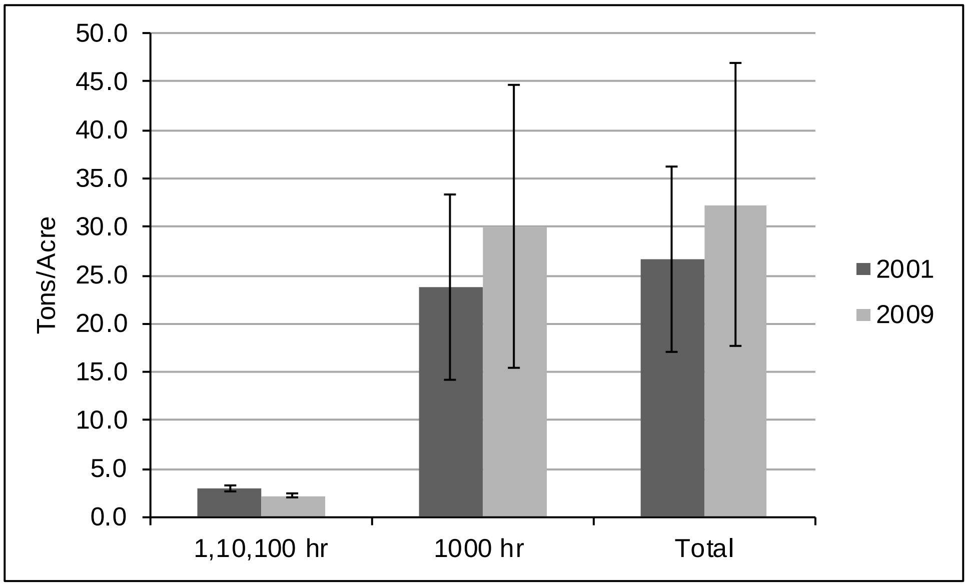


Fig. 13. Downed Woody Debris on Thin Only Plots in 2001 and 2009.

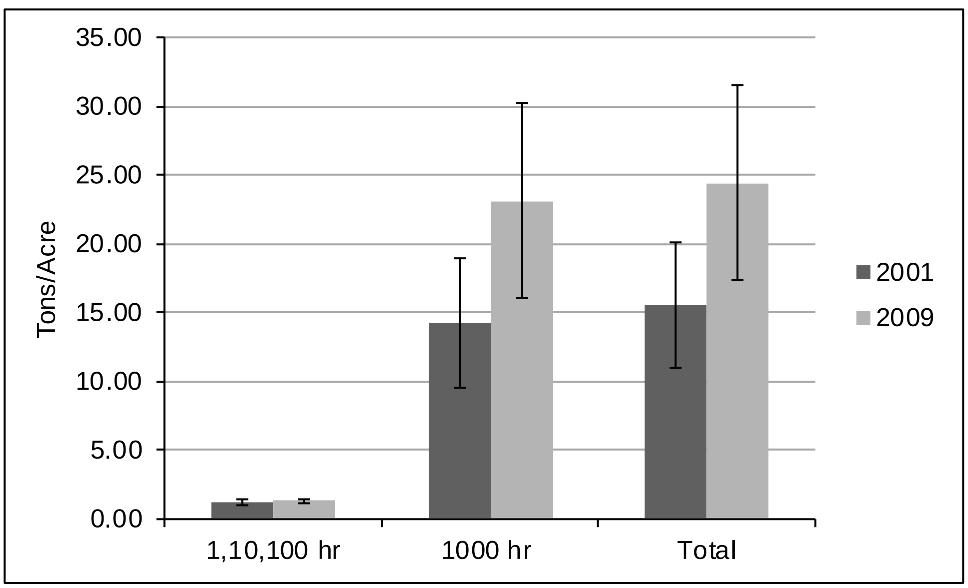


Fig. 14. Downed Woody Debris on Thin/Burn Plots in 2001 and 2009.

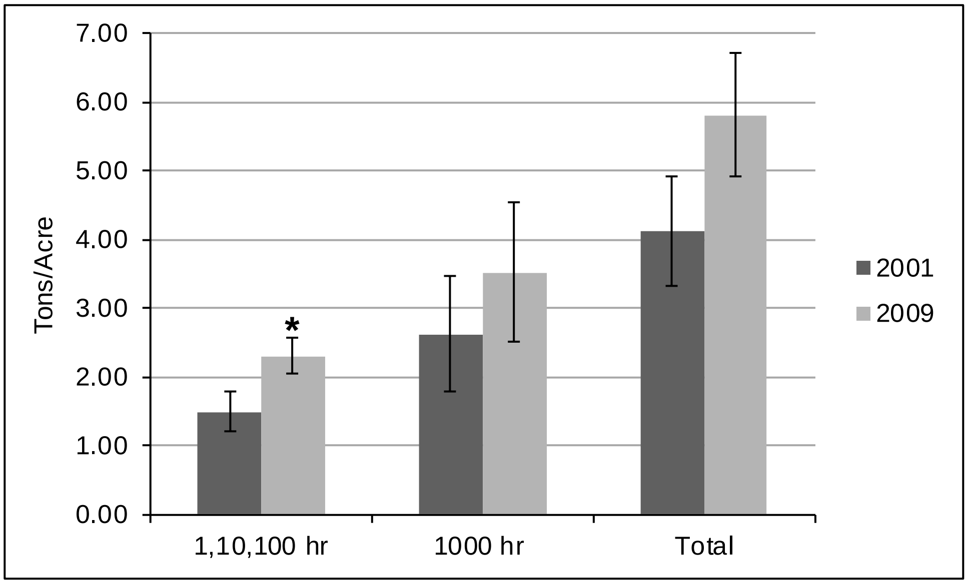


Fig. 15. Downed Woody Debris on Control Plots in 2001 and 2009 (asterisk indicates difference between 2001 and 2009 value at 0.05 level).

CHAPTER 5

Discussion

Overstory Growth and Yield Response

The growth and yield data for these primarily young-growth giant sequoia mixed conifer stands show extremely high values, especially for the control stands. The average growth for 1989 - 2009 was 9,731 cubic-feet per acre with a (PAI) of 487 cubic-feet per acre per year, and the 2009 yield was 24,881 cubic-feet per acre for the control plots. The average growth for 1989 - 2009 was 63,354 board-feet per acre with PAI of 3,168 board-feet per acre per year and 2009 yield of 144,490 board-feet per acre. A growth study from MHDSF of a primary young-growth giant sequoia 86 year old stand presented in Forestry Note no. 113 demonstrates the ability of high growth and yield. Its results showed a total volume yield of 26,080 cubic-feet per acre with greatest PAI of 541cubic-feet/acre/year during a three year period of the study and 147,002 board-feet per acre with a greatest PAI of 3,012 board-feet/acre/year during a one year period of the study (Dulitz and Medina, 2000). Our study averaged a 2009 yield for control plots of 24,881 cubic-feet per acre and 144,490 board-feet per acre and PAI of 562 cubic-feet per acre per year (1994 - 2001) and 511 cubic-feet per acre per year (2001 - 2009) and 3,685 board-feet per acre per year (1994 - 2001) and 3,403 board-feet per acre per year (2001 - 2009). Most giant sequoia/ mixed conifer forests stabilize at 400 square feet basal area

(BA) per acre shown from inventory plots on Whitaker Forest, yet stands of primary young growth giant sequoia stands are able to hold high levels of growing stock. The 500 - 600 square feet per acre (BA) for the control plots at the beginning of this study could not be achieved by other species before stagnation of growth (Gasser, 1992).

The overall cubic-foot volume growth per acre for the 20 year period of 1989 - 2009 was significantly different ($p = 0.0140$) between the two treatments and the control. The pairwise comparison showed that the treatments were significantly different than the control yet not significantly different from each other. Our study showed combining prescribed burning with thinning produced no significant effect on cubic-foot volume growth. A ponderosa pine/Douglas-Fir stand manipulation study showed no significant difference in quadratic mean diameter between thin only and thin and burn treatments, yet there was significant difference when compared to the control (Fiedler et al., 2010). Our study's control plots have greater trees per acre, BA, PAI, and volume growth and yield compared to the treatments plots still after 20 years. A thinning/ stocking study of coast redwood showed 17 years after treatment that the growth of the different spaced thinned stands had transferred to the residual trees in that there was no significant difference between the control (no cut) in respect to cubic-foot per acre volume yield, PAI and BA (Lindquist, 2004). A ponderosa pine thinning study suggested that cubic-foot volume yield decreased linearly as spacing increased and board-foot volume yield varied as spacing increased (Cochran and Barrett, 1999). The ability of giant sequoia to continue in volume growth even with high levels of growing stock perhaps explains the greater total volume in our study's control plots compared to treatment plots even after 20 years. Yet, the percent of post-treatment volume growth between 1989 and 2009 is greater for the treatments then the control. The treatment plots grew back approximately 106% of the post-treatment 1989 cubic-feet volume and the control approximately 65% of the 1989 cubic-feet volume. The thinning aspect of treatments provide more growing space allowing greater average 20 year volume growth per tree, 60 - 68 cubic-feet per tree, compared to 23 cubic-feet per tree of the control. The management objective will determine whether the result is large trees with low stand volume or small trees with high stand volume (Peracca and O'Hara, 2008).

The giant sequoia growth trend shows the PAI between years 6 and 12 after treatment greater than the PAI of the first five years after treatment for both treatment and control plots (Figure 4). A coast redwood stocking study similarly showed the PAI between years 6 and 17 greater than the PAI of the first five years after thinning treatments for both treatment and uncut (control) plots (Lindquist, 2004). This increase for the treatment plots in this study is perhaps due to a delayed release response after the thinning treatment. Another possible reason for the increase of both treatment and control plots in this study is a below average winter precipitation the five years following the treatment and then an above average winter precipitation from years 6 to 12 after the treatment (York et al., 2010). The PAI between years 12 and 20 of this study tell a different story.

The last eight years, 2001 – 2009, of this study shows a decrease in PAI of 51 cubic-feet per acre per year on the control plots (Figure 4). The control cubic-feet mortality per acre per year increased from 25.3 to 41.1 during the last eight years due to competition within the stand. Study by Stohlgren (1993) found that dead sequoia trees with diameter less than 6.5 in (16.6 cm) had significantly greater crowding index in relation to overlapped root system and mean number of live neighbor trees compared to live trees of similar diameter. The treatment plots are starting to level off in growth for the last eight years of study; thus, the culmination of PAI is being prolonged due to the thinning.

Understory Plant Response

There are 26 different plants represented in this study with 23 species, ferns (Bracken and Lady Ferns lumped together), graminoids (grasses, sedges and rushes lumped together), and unidentified forbs (lumped together); other studies within the giant sequoia mixed conifer forest type have found many of the same plants (Biswell, 1966; Roy and Vankat, 1999; Vankat, 1982; Vankat and Major, 1978; Wayman and North, 2007). The treatments, whether thin or thin and burn, had positive effects upon many species when looking at frequency, density, and abundance. Earlier understory plant studies of Biswell (1966) and Wayman and North (2007) found that *R. roezlii* has been shown to have greater frequency in burn or thin and burn plots and our study shows similar results with actually the thin only plots having the greatest values for frequency, density, and abundance. Some species in this study such as *Lotus crassifolius* were only found on thin and burn plots and a study at Teakettle Experimental Forest found similar results; thin and burn treatments were preferred (Wayman and North, 2007).

Shrub species such as *Arctostaphylos patula* and *Ceanothus cordulatus*, *C. integerrimus,* and *Prunus emarginata* within the giant sequoia mixed-conifer forest have decreased, probably due to lack of fire needed for seed germination (Biswell et al., 1966; Vankat and Major, 1978). This study showed that the above species were only found in the treatment plots with the thin and burn plots having the greatest frequency and density, reinforcing the importance of disturbance, especially fire (Tables 24 and 25). The disturbance caused by the treatments in relation to the shrubs shows an almost doubling in frequency from 1989 to 2009 (Figure 6) and a significant increase in density and abundance from 1989 to 2009 on the treatment plots (Figure 16 and Table 27).

The trees' density for treatment thin and burn was significantly greater than thin only and control which is similar to this study's and Roller's (2001) regeneration results. White fir density trees per acre were the highest among the tree species across all treatments and higher for thin and burn treatment compared to thin only and control. A study in southern Sierra Nevada showed similar results with white fir having the highest density among tree species (height: ≤ 5 feet) across treatments and higher density where treatment included burning (Meyer and Safford, 2011). This study shows that after combining all treatments, the rank from greatest to least density is: white fir, incense-cedar, black oak, sugar pine and giant sequoia. Sugar pine had lowest density on thin only plots, preferring thin and burn or control for both understory and regeneration studies. Giant sequoia density was low across all the treatments. Study at Giant Sequoia National Monument showed giant sequoia seedling density was significantly greater for high- and moderate-severity fire compared to control and not significantly different between low-severity fire compared to control (Meyer and Safford, 2011). This study's prescribed fire severity was not high enough to establish sufficient amounts of giant sequoia seedlings on thin and burn plots due to low seed release from closed cones since fire intensity was relatively low.

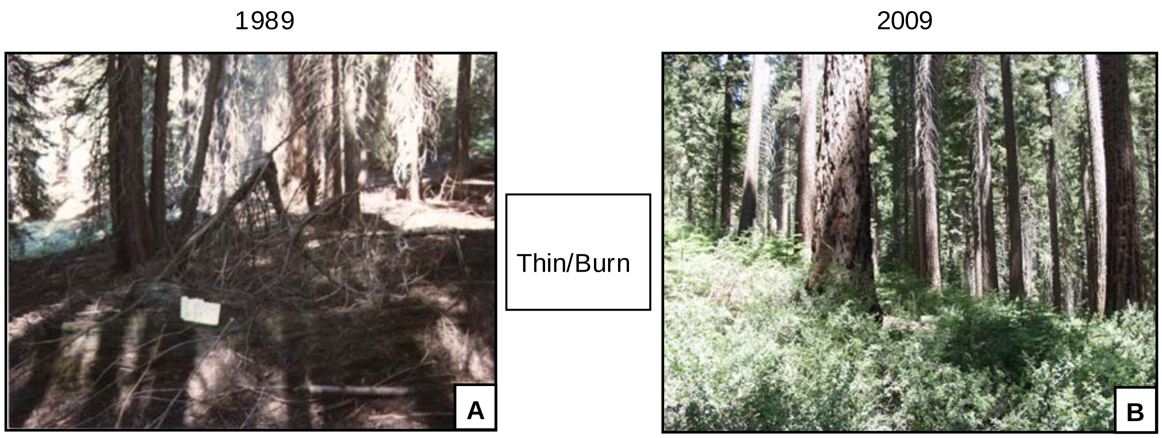


Fig. 16. Change in Shrub Abundance (percent cover) and Density (stems per acre) on the same Thin and Burn Plot comparing 1989 (A) and 2009 (B) at Frasier Mill Stand.

Twenty years after initial treatment, control plots lagged behind the treatment plots of thin only and thin and burn when comparing average species richness, species evenness using the Berger-Parker index, and species diversity using Simpson index values. Battles et al. (2001) study showed management regimes that include thinning such as plantation, shelterwood, group selection, and single-tree had greater average species richness and Simpson index values compared to reserve/control, with plantation and shelterwood values significantly greater than reserve/control. Study at Teakettle Experimental Forest showed the burn and understory thin treatment produced significantly greater species richness than the control, burn only, understory thin only, and overstory thin only treatments (Wayman and North, 2007). The variability due to environmental conditions within the sites is great enough to influence the treatment effect causing no significant difference between treatment plots and control plots. The stands were shown to have varying species richness, Berger-Parker index values, and Simpson index values (Table 29), so a PCA was done to determine which environmental conditions were most influential.

Understory plant diversity was shown to be most influenced by environmental conditions with those of elevation and slope being the most influential. The diversity indices' values for species richness and Simpson index decreased as elevation values increased (Figures 7 and 9), showing results similar to a woody species study at Sequoia National Park in white fir forest vegetation type containing *S. giganteum* within similar elevation range (Vankat, 1982). A study in the Siskiyou Mountains, Oregon showed that as elevation increased from 5,000 feet (1,524 m) to 6,500 feet (1,981 m) the number of species decreased (Whittaker, 1960). Another study in Arizona's Santa Catalina Mountains documented that as elevation increased the species richness decreased (Whittaker, 1965; Whittaker and Niering, 1965).

Regeneration/ Seedlings Response

This study was not set up as a regeneration study yet in 2001 it was determined to assess the effects of the treatments on natural regeneration. The number of seedlings per acre for the 20 year period of 1989 - 2009 was significantly different ($p = 0.010$) between the thin and burn treatment compared to the control and thin only treatment. These results are similar to Roller's (2001) 12 year period of 1989 - 2001 with significant difference ($p = 0.005$) of seedlings per acre between thin and burn treatment compared to control and thin only treatment. This study and Roller (2001) both show control and thin only not significantly different from each other. Early growth plots at MHDSF showed reproduction after five years in descending order with white fir, sugar pine, incense-cedar, ponderosa pine and giant sequoia (Beechel, 1960). The 2001 and 2009 conifer seedling species composition is similar in descending order with white fir, incense-cedar, sugar pine, giant sequoia and ponderosa pine. Both 2001 and 2009 measurements showed white fir seedlings with over 85% of the regeneration having 3,927 out of a total 4,589 mixed conifer and hardwood seedlings in 2001 and 6,280 out of a total 7,245 mixed conifer and hardwood seedlings in 2009 (Roller, 2004). A seedlings study done within the mixed conifer forest at Challenge Experimental Forest showed white fir with approximately 1,000 seedlings per acre in 9-meter openings out of a total of about 4,300 mixed conifer seedlings. Sugar pine, ponderosa, and giant sequoia seedlings - all shade intolerant trees, were less than 5% of total mixed conifer seedlings for this study. The ponderosa pine seedlings at the Challenge Experimental Forest study showed a significant height increase with 27-meter openings, suggesting small openings and thinning the stand is not enough for a shade intolerant species such as ponderosa pine to maintain adequate growth (McDonald and Abbott, 1994; McDonald and Reynolds, 1999). A study done at Blodgett Experimental Forest found that canopy gaps/openings above 0.3 to 0.5 ha best facilitated seedling height growth and height in general also increased as distance from edge increased (York et al., 2004; York and Battles, 2008). A regeneration study at MHDSF with openings ranging from approximately 15 to 61 meters in diameter found that all canopy openings had low giant sequoia seedling density with no significant difference between opening sizes, yet the smallest openings had the least amount of seedlings (Stephens et al., 1999). A study at Whitaker's Forest Research Station showed no influence of gap size which ranged from 1/8 to 1 acre on seedling survival (York, 2010). The treatment of thinning the stand in this study yielded low giant sequoia seedling density showing that thinning do not facilitate high seedling density or good regeneration. The prescribed fire severity was too low for adequate seed dispersal and establishment of giant sequoia seedlings. Study at Giant Sequoia National Monument found that giant sequoia seedling density was significantly greater for high- and moderate-severity fire compared to control and not significantly different between low-severity fire compared to control (Meyer and Safford, 2011).

Downed Woody Debris Response

Due to the incomplete nature of the 1989 pre-treatment data, only the 2001 and 2009 data, 12 and 20 years after treatment, could be examined. The rate of accumulation could be determined since the values of two separate time periods were known. A 1997 fuel study by Weise et al. (1997) at Mountain Home Demonstration State Forest showed a control plot with comparable trees per acre and majority giant sequoia composition having an average fuel loading of 3.0 tons per acre for total downed woody debris. The annual accumulation trend rate for total downed woody debris for this study's control plots using 2001 and 2009 data was 0.211 tons per acre per year. This results in a 12 year, 1997 to 2009, accumulation of 2.53 tons per acre with a predicted fuel load of 5.53 tons per acre in 2009, which is close to our study's 2009 control fuel load of 5.81 tons per acre. These rates were determined to be reasonable values for young-growth giant sequoia control stands at Mountain Home Demonstration State Forest.

Parson's 1978 study at Kings Canyon National Park determined that seven years after a prescribed burn, the surface (1, 10, 100 hr.) fuels levels were 86% of pre-burned levels. This study at Mountain Home Demonstration State Forest indicates that 12 years after treatment, surface (1, 10, 100 hr.) fuels levels show no significant difference between control and thin and burn plots, which have returned to pre-treatment levels. Fuels levels on thin only plots were significantly greater than control and thin and burn plots since they had not been reduced by fire (Table 33). Twenty years after treatment the dynamics of the surface (1, 10, 100 hr.) fuels levels have changed with the thin only and control plots significantly greater than the thin and burn plots but not different from each other (Table 33 and Figure 12). This increase in fine surface (1, 10, 100 hr.) fuels levels for control plots between 2001 and 2009 was significant (Table 33 and Figure 15) due to increased mortality caused by suppression initiating fuel build-up when dead materials fall to the forest floor (Parson, 1978; USDA, 2010).

Litter levels seven years after a prescribed burn were only 45% of unburned levels for a Kings Canyon National Park study and another study within the Sequoia Kings Canyon National Parks exhibited 50% of unburned levels ten years after treatment (Keifer et al., 2006; Parson, 1978). This study showed that after 12 years, the litter levels for thin and burn plots were not significantly different than control plots, showing a return to pre-treatment levels; after 20 years the plots had the same statistical outcome with the litter values even closer together.

Coarse woody debris average levels after thin only treatment were higher than after thin and burn treatment for a mixed-conifer forest study at Teakettle Experiment Forest, yet due to variability they were not significantly different (Innes et al., 2006). This study found that the 2001 and 2009 thin only 1,000 hr. fuels levels were higher than thin and burn 1,000 hr. fuels levels, yet because of variability they were not significantly different (Table 33). The 2001 and 2009 1,000 hr. fuels levels for thin only and thin and burn plots were higher than control plots by between 11 to 27 tons per acre (Table 33). This may be caused by large remnant giant sequoia logs within the treatment plots long before the study was established.

Variability when calculating total tons per acre for downed woody fuels may account for the following inconsistencies. 2009 calculations determined no significant differences between any of the treatments. 2001 calculations, however, showed a significant difference between thin only (26.67 tons per acre) and control (4.12 tons per acre) plots, but no significant difference between thin and burn (15.54 tons per acre) and control (4.12 tons per acre) plots (Table 33).

CHAPTER 6

Recommendations

Future Research

Research involving growth and yield will need to continue if giant sequoia is ever to become a viable commercial timber species in the future. The rapid growth of young giant sequoia is known but the specific thinning prescriptions in relation to trees per acre and basal area for maximum wood production need to be researched. This study has shown that young growth giant sequoia stands are capable of heavy stocking levels before growth starts to decline. Studies have been done on the favorable wood properties of young growth giant sequoia and research needs to continue, especially related to the production of decay resistant heartwood (Piirto, 1986). Growth and yield studies involving giant sequoia plantations are being done at University of California, Berkeley's Blodgett Experimental Forest in Eldorado County, California. Sierra Pacific Industries of California has giant sequoia planted in 460 plantations from 3 to 57 years in age. Giant sequoia wood is incorporated with incense-cedar wood at fencing material plant. A study at 136 plantations evaluating giant sequoia growth compared to native conifers was potentially completed fall 2010, presently no published results. This needs to be a long-term study to further the understanding of giant sequoia's commercial potential both outside and within its natural range.

Mountain Home Demonstration State Forest

This understory plant study was able to identify 32 separate plants with 27 to species level and 5 to genus level (Appendix D). All species present within plots were not identified. This caused an underestimating of species richness across all treatments due to the unknown amount of species within the unidentified forbs and graminoids growth form category. It is recommended that the next time an understory plant diversity study is done that a botanist is hired to aid in plant identification. The study's results showed that average species richness for treatments was greater than control but not significantly greater due to variability. The site conditions of elevation and slope had the strongest effect upon this variability. It is recommended that research plots are located within areas of similar slope and elevation values to control for variability.

CHAPTER 7

Conclusion

This study is one of the few, if only, involving stand manipulation of natural young-growth giant sequoia stands and needs to be remeasured perhaps every 10 years. When Martin and Gasser first initiated this study in 1989 an objective was a continued measurement and observation of these stands. Long-term status has been secured with the 20 year remeasurement of the original plots to observe the effects of thinning and prescribed fire on overstory growth and yield, understory plant growth and diversity, fuel load, and tree regeneration.

The overstory growth and yield study has shown that even 20 years after management strategies there is a significant difference between treatments and control. The ability of giant sequoia to continue the increase of volume growth even with high levels of growing stock perhaps explains the greater total volume in control plots compared to treatment plots even after 20 years. The dense control stands have more volume growth than the treatment stands yet the post-treatment percent volume growth over 20 years is greater in the treatment stands. The last eight years of this study show the PAI of the control stands starting to decrease while the treatment stands PAI are starting to level off. When will the treatment plots PAI intersect with the control plots PAI?

All young-growth giant sequoia stands are not alike for there are differences in species richness and evenness using Berger-Parker Index and homogeneity using Simpson Index due to environmental conditions related to stand location. The variability due to site conditions was a strong enough influence to null the treatment effects. The diversity was driven by the environmental conditions elevation and slope; as these values increased the diversity indices values decreased. Management strategies such as stand manipulation within these young-growth giant sequoia stands did not negatively affect diversity. When observing functional groups and/or species there are positive effects related to frequency, density, and abundance, shrubs preferred treatment plots having significantly more stems per acre and percent cover after 20 years.

The regeneration study showed that the thin and burn treatment had significantly greater seedlings per acre compared to thin only and control. The next cohort within these stands will be majority white fir which had the highest seedlings per acre count across all management strategies. Giant sequoia did not have adequate regeneration. Study results found that successful giant sequoia regeneration requires large enough multiple canopy openings distributed throughout the stand to provide adequate sunlight, and a high- to moderate-severity fire that burns off the litter layer to expose mineral soil and opens cones to produce a large seed source.

Stand manipulation treatments such as thinning, and thinning and burning effect downed woody debris and litter within young-growth giant sequoia stands even 20 years after treatment. The thin and burn plots had significantly reduced surface (1, 10, 100 hr.) fuels and litter tons per acre compared to thin only and control treatments. The Kings Canyon National Park study found that seven years after prescribed burn the total fuel level including litter/duff and downed woody debris of 45.0 tons per acre was a sufficient level to support intense fire (Parson, 1978). This study's total fuel levels including litter and downed woody debris after 20 years for the treatments thin only and thin/burn are 59.05 and 44.89 tons per acre. These levels would be adequate to support a prescribed fire intense enough to provide Mountain Home Demonstration Forest's objectives of reducing fuel load to provide seedbed for seeds released from heat opened giant sequoia cones (CDF, 2010). The treatments removed those ladder fuels in the lower 55 feet (16.8 m) of the stand, minimizing the potential of a crown fire while some control plots have 50% of the trees made up of these ladder fuels, increasing the potential of a crown fire (Kilgore and Sando, 1975).

The results provided by this study will hopefully yield insight into the management of giant sequoia into the future. When this study began it was mentioned at the 1992 symposium, Giant Sequoias: Their Place in the Ecosystem and Society; perhaps it will be mentioned at a future symposium; "Do behold the King in his glory, King Sequoia! Behold! Behold! seems all I can say" (Muir, 1870).

References

Afanasijev, D. 1951. Establishment of fast-growing stands (abstract). Sum. List. 75(12):387-392.

Anderson, R.S. 1994. Paleohistory of giant sequoia grove: The record from log meadow, Sequoia National Park. Gen. Tech. Rep. PSW-151 USDA Forest Service, Pacific Southwest Research Station. Albany, CA.

Anderson, R.S. and S.J. Smith. 1994. Paleoclimate interpretation of meadow sediment and pollen stratigraphies from California. Geology. 22(9):723-726.

Antipova, V.I. 1952. Cultivation of Sequoia in Yalta forest district (abstract). Lesn. Hoz. 5(6):79.

Aubert, J. 1996. Figure 55.2. 1434. In: Sierra Nevada Ecosystem Project, Final report to Congress, vol. II, Assessments and scientific basis for management options, Ch 55, Davis: University of California, Centers for Water and Wildland Resources.

Axelrod, D.I. 1959. Late cenozoic evolution of the sierra bigtree forest. Society for the Study of Evolution. 13(1):9-23.

Basey, H.E. and J.M. Basey. 1998. Basey's Sierra Nevada Journal. 1st ed. The Robin Works, Groveland, CA.

Bates, T.R. 1998. Response of young growth giant sequoia to management strategies. University of California, Berkeley. Master's Thesis.

Battles, J.J., A.J. Shlisky, R.H. Barrett, R.C. Heald and B.H. Allen-Diaz. 2001. The effects of forest management on plant species diversity in a Sierran conifer forest. Forest Ecology and Management. 146:211-222.

Beechel, K. 1960. Growth plots on Mountain Home State Forest. California Forestry Note No. 1. California Department of Forestry and Fire Protection. Sacramento, California.

Benson, N.J. 1986. Management of giant sequoia on Mountain Home Demonstration State Forest. Proceedings of the workshop on management of giant sequoia, May 24-25, 1985, Reedley, California. Gen. Tech. Rep. PSW-95 USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. Berkeley, CA.

Berger W.H. and F.L. Parker. 1970. Diversity of planktonic foraminifera in deep-sea sediments. Science 168(3937):1345-1347.

Biswell, H.H., H. Buchanan and R.P. Gibbens. 1966. Ecology of the vegetation of a second-growth sequoia forest. Ecology. 47(4):630-634.

Bonev, I. 1966. *Sequoia gigantea* abroad and in Bulgaria (abstract). Gorsko Stopanstvo. 22(1):15-19.

Brown, J.K. 1974. Handbook for inventorying downed woody material. USDA Forest Service General Technical Report, INT-16. Intermountain Forest and Range Experiment Station, Ogden, UT.

California Department of Forestry and Fire Protection (CDF), The Natural Resources Agency. 2010. Mountain Home Demonstration State Forest, Management Plan. California Southern Region. Tulare County California. Revised by James Kral.

Cochran, P.H. and J.W. Barrett. 1999. Thirty-five-year growth of ponderosa pine saplings in response to thinning and understory removal. Research Paper. PNW-RP-512. Portland, OR: Department of Agriculture, Forest Service, Pacific Northwest Research Station.

Cole, K.L. 1983. Late Pleistocene vegetation of Kings Canyon, Sierra Nevada, California (abstract). Quaternary Research. 19:117-129.

Commonwealth Agriculture Bureaux. 1949-1950. Forestry the World Over, USSR. Forestry Abstracts. 11(4):588-593.

Davis, O.K. 1999a. Pollen analysis of a late-glacial and Holocene sediment core from Mono Lake, Mono County, California. Quaternary Research. 52:243-249.

Davis, O.K. 1999b. Pollen analysis of Tulare Lake, California: Great Basin-like vegetation in central California during the full-glacial and early Holocene. Review of Palaeobotany and Palynology. 107(3/4):249-257.

DeLeon, D. 1952. Insects associated with *Sequoia sempervirens* and *Sequoia gigantea* in California. The Pan-Pacific Entomologist. 23(2):75-92.

Dulitz, D.J. and J.M. Medina. 2000. Growth of young giant sequoia stands on Mountain Home Demonstration State Forest. California Forestry Note No. 113. California Department of Forestry and Fire Protection. Sacramento, CA.

Fiedler, C.E., K.L. Metlen and E.K. Dobson. 2010. Restoration treatment effects on stand structure, tree growth, and fire hazard in a Ponderosa Pine/Douglas-Fir forest in Montana. Forest Science. 56(1):18-31.

Flint, W.D. 2002. To find the biggest tree. Three Rivers, CA: Sequoia Natural History Association.

Fontaine, J. 1986. Recommendations from the Sierra Club for managing giant sequoia. Proceedings of the workshop on management of giant sequoia, May 24-25, 1985, Reedley, California. Gen. Tech. Rep. PSW-95 USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. Berkeley, CA.

Gasser, D.P. 1992. Young growth management of giant sequoia. Proceedings of the Symposium on Giant Sequoia: Their Place in the Ecosystem and Society. Visalia, California. USDA Forest Service, PSW-GTR-151. 1994.

Halpern, C.B. and T.A. Spies. 1995. Plant species diversity in natural and managed forests of the Pacific Northwest. Ecological Applications. 5(4):913-934

Harrison, W. 1986. Management of giant sequoia at Calaveras Big Trees State Park. Proceedings of the workshop on management of giant sequoia, May 24-25, 1985, Reedley, California. Gen. Tech. Rep. PSW-95 USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. Berkeley, CA.

Hartesveldt, R.J., H.T. Harvey, H.S. Shellhammer, and R.E. Stecker. 1975. The giant sequoia of the Sierra Nevada. U.S. Department of the Interior, National Park Service, Washington, DC.

Heald, R.C. 1986. Management of giant sequoia at Blodgett Forest Research Station. Proceedings of the workshop on management of giant sequoia, May 24-25, 1985, Reedley, California. Gen. Tech. Rep. PSW-95 USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. Berkeley, CA.

Heald, R.C. and T.M. Barrett 1999. Effects of planting density on early growth of giant sequoia *(Sequoiadendron giganteum).* Western Journal of Applied Forestry 14:65-72.

Hickman, J.C. (ed.). 1993. The Jepson manual: Higher plants of California. University of California Press, Berkeley and Los Angeles, California.

Holubčík, M. 1960. Raising exotics in Czechoslovak stands (abstract). Lesn. Căs. 6(1):64-75.

Huisinga, K.D., D.C. Laughlin, P.Z. Fulé, J.D. Springer, and C.M. McGlone. 2005. Effects of an intense prescribed fire on understory vegetation in a mixed conifer forest. Journal of the Torrey Botanical Society. 132(4):590-601.

Innes, J.C., M.P. North and N. Williamson. 2006. Effect of thinning and prescribed fire restoration treatments on woody debris and snag dynamics in a sierra old-growth, mixed conifer forest. Canadian Journal of Forest Research 36:3183-3193.

Jaroslavcev, G.D. 1963. *Sequoia gigantea* in plantations in the Crimea (abstract). Lesn. Ž., Arhangelʹsk. 6(1):43-45.

Kayacık, H., B. Aytuğ, F. Yaltırık, İ. Şanlı, A. Efe, Ü. Akkemik, and M. İnan. 1995 (publ.1999) (abstract). *Sequoiadendron giganteum* trees lived near Istanbul in late Tertiary. İstanbul Üniversitesi Orman Fakültesi Dergisi. Seri A**,** 45(1):15-22.

Keifer, M. 1998. Fuel load and tree density changes following prescribed fire in the giant sequoia-mixed conifer forest: the first 14 years of fire monitoring. Proceedings of the Tall Timbers Fire Ecology Conference 20:306-309.

Keifer, M., J.W. van Wagtendonk and M. Buhler. 2006. Long-term surface fuel accumulation in burned and unburned mixed-conifer forests of the central and southern Sierra Nevada, CA (USA). Fire Ecology 2(1):53-72.

Kilgore, B.M. 1973. Impact of prescribed burning on a sequoia-mixed conifer forest. Proceedings of the Tall Timbers Fire Ecology Conference 12:345-375.

Kilgore, B.M and R.W. Sando. 1975. Crown-fire potential in sequoia forest after prescribed burning. Forest Science 21(1):83-87.

Kilgore, B.M. and D. Taylor. 1979. Fire history of a sequoia-mixed conifer forest. Ecology 60(1):129-142.

Knapp, E.E., D.W. Schwilk, J.M. Kane, and J.E. Kelley. 2007. Role of burning season on initial understory vegetation response to prescribed fire in a mixed conifer forest. Canadian Journal of Forest Research. 37(1):11-22.

Knigge, W. 1994. Giant sequoia (*Sequoiadendron giganteum* (Lindl.) Buchholz) in Europe. Gen. Tech. Rep. PSW-151 USDA Forest Service, Pacific Southwest Research Station. Albany, CA.

Krebs, C.J. 1999. Ecological methodology. 2nd ed. Benjamin/Cummings. Menlo Park, California. 620 pp.

Leisz, D.R. 1992. Remarks for the Giant Sequoia Symposium. Proceedings of the Symposium on Giant Sequoia: Their Place in the Ecosystem and Society. Visalia, California. USDA Forest Service, PSW-GTR-151. 1994.

Lewis, C.E., B.F. Swindel and G.W. Tanner. 1988. Species diversity and diversity profiles: Concept, measurement and application to timber and range management. Journal of Range Management. 41(6):466-469.

Lindley, J. (Ed.). 1853, December 24. The Gardeners' Chronicle and Agricultural Gazette, 52, 819-820.

Lindquist, J.L. 2004. Precommercial stocking control of Coast Redwood a seventeen-year status report (1981-1998). California Forestry Report No. 2. California Department of Forestry and Fire Protection, Sacramento, CA.

Magurran, A.E. 1988. Ecological diversity and its measurement. Princeton University Press, Princeton, NJ.

Martin R.E. and D.P. Gasser. 1989. Response to management strategies in giant sequoia forests, research proposal. California Department of Forestry and Fire Protection, Sacramento, CA. Unpublished document.

May R.M. 1975. Patterns of species abundances and diversity. In: Cody M.L., Diamond J.M. (eds.). Ecology and Evolution of Communities. Belknap Press of Harvard University Press, Cambridge, MA. pp 81-120.

McDonald, P.M. and C.S. Abbott. 1994. Seedfall, regeneration, and seedling development in small group-selection openings. USDA Forest Service Pacific Southwest Research Station. Research Paper. PSW-RP-220.

McDonald, P.M. and P.E. Reynolds. 1999. Plant community development after 28 years in small group-selection openings. USDA Forest Service Pacific Southwest Research Station. Research Paper. PSW-RP-241.

McIntosh, R.P. 1967. An index of diversity and the relation of certain concepts to diversity. Ecology. 48(3):392-404.

Meyer M.D. and H.D. Safford. 2011. Giant Sequoia regeneration in groves exposed to wildfire and retention harvest. Fire Ecology. 7(2):2-16.

Molotkov, P.I. 1958. *Sequoia gigantea* in Transcaucasia (abstract) Lesn. Hoz. 11(12):74.

Muir, J. 1870. Letter from [John Muir] to [Jeanne C.] Carr, [1870 Fall]. John Muir Correspondence. Holt-Atherton Special Collections. University of the Pacific.

Muir, J. 1876. On the post-glacial history of *Sequoia gigantea.* Proc. Amer. Assoc. Adv. Sci., 25:242-253.

Muller-Stoll, H. 1947. The durability of wood of trees and shrubs of the Tertiary period (abstract). Senckenbergiana, Frankfurt a.M. 28(1/3):67-94.

North, M., J. Chen, G. Smith, L. Krakowiak, and J. Franklin. 1996. Initial response of understory plant diversity and overstory tree diameter growth to a green tree retention harvest. Northwest Science. 70(1):24-35.

North, M., J. Innes and H. Zald. 2007. Comparison of thinning and prescribed fire restoration treatments to Sierran mixed-conifer historic conditions. Canadian Journal of Forest Research 37(2):331-342.

Nyland, R.D. 2002. Silviculture concepts and applications. 2nd ed. Waveland Press, Inc., Long Grove, IL.

Parson, D.J. 1978. Fire and fuel accumulation in a giant sequoia forest. Journal of Forestry 76(2):104-105.

Parsons, D.J. and H.T. Nichols. 1986. Management of giant sequoia in the national parks of the Sierra Nevada, California. Proceedings of the workshop on management of giant sequoia, May 24-25, 1985, Reedley, California. Gen. Tech. Rep. PSW-95 USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. Berkeley, CA.

Peracca, G.G. and K.L. O’Hara. 2008. Effects of growing space on growth for 20-year-old giant sequoia, ponderosa pine, and Douglas-fir in the Sierra Nevada. Western Journal of Applied Forestry 23:156-165.

Piirto, D.D. 1986. Wood of giant sequoia: Properties and unique characteristics. Proceedings of the workshop on management of giant sequoia, May 24-25, 1985, Reedley, California. Gen. Tech. Rep. PSW-95 USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. Berkeley, CA.

Piirto, D. and R. Rogers. 2002. An ecological basis for managing giant sequoia ecosystems. Environmental Management 30:110-128.

Piirto, D. and R. Rogers. 1999. An ecological foundation for management of national forest giant sequoia ecosystems. USDA Forest Service Pacific Southwest Region, R5-EM-TP-005.

Piirto, D., R. Rogers and M.C. Bethke. 1997. Communicating the role of science in managing giant sequoia groves. Reprinted from: Communicating the Role of Silviculture in Managing the National Forests, Proceedings of the National Silviculture Workshop. General Technical Report #238. Northeastern Forest Experimental Station. USDA Forest Service.

Pillsbury, N.H., M.J. De Lasaux and D. Dulitz. 1991. Young-growth sierra redwood volume equations for Mountain Home Demonstration State Forest. California Forestry Note No. 103. California Department of Forestry and Fire Protection. Sacramento, CA.

Pillsbury, N.H. and J.P. Joseph. 1990. Volume equations for young growth softwood species at Mountain Home Demonstration State Forest. Natural Resources Management Department, California Polytechnic State University, San Luis Obispo, California.

Radler, F. 1956. Trials with *Sequoia gigantea* in Lower Rhine region (abstract). Hoz-Zbl. 82(6):55-56.

Rannert, H. 1955. On the stem form and volume of *Sequoia gigantea* (abstract). Zbl. Ges. Forstw. 74(1):19-26.

Rigg, C.M. 2001. Orchestrating ecosystem management: Challenges and lessons from Sequoia National Forest. Conservation Biology 15:78-90.

Roberts, M.R. and F.S. Gilliam. 1995. Patterns and mechanisms of plant diversity in forested ecosystems: Implications for forest management. Ecological Applications 5(4):969-977.

Rogers, R.R. 1986. Management of giant sequoia in the national forests of the Sierra Nevada, California. Proceedings of the workshop on management of giant sequoia, May 24-25, 1985, Reedley, California. Gen. Tech. Rep. PSW-95 USDA Forest Service, Pacific Southwest Forest and Range Experiment Station. Berkeley, CA.

Roller, G. 2001. A twelve-year remeasurement of growth response of young growth giant sequoia trees to silvicultural manipulation. California Polytechnic State University, San Luis Obispo. Senior Project.

Roller, G. 2004. Young growth giant sequoia response to management strategies at Mountain Home State Forest. Master's thesis. California Polytechnic State University, San Luis Obispo, CA.

Roy, D.G. and J.L. Vankat. 1999. Reversal of human-induced vegetation changes in Sequoia National Park, California. Canadian Journal of Forest Research 29(4):399-412.

Rundel, P.W. 1972a. Habitat restriction in giant sequoia: The environmental control of grove boundaries. American Midland Naturalist 87(1):81-99.

Rundel, P.W. 1972b. An annotated list of the groves of Sequoiadendron giganteum in the Sierra Nevada –Part 1. Madroño. 21(5):319-328.

Schubert, G.H. 1957. Silvicultural characteristics of giant sequoia. Technical Paper #20. California Forest and Range Experimental Station, Berkeley California. USDA Forest Service.

Shellhammer, H.S. and T.H. Shellhammer. 2006. Giant sequoia *(Sequoiadendron giganteum* [taxodiaceae]) seedling survival and growth in the first four decades following managed fires. Madroño 53:342-350.

Shevock, J.R. 1996. Status of rare and endangered plants. In: Sierra Nevada Ecosystem Project: Final Report to Congress, Vol. II. Centers for Water and Wildland Resources, University of California, Davis, pp. 691-707.

Simpson, E.H. 1949. Measurement of diversity. Nature 163:688.

Spoljaric, Z. 1952. Anatomic and pollen-analytic investigations on some lignites from northern Croatia (abstract). Jugaslavenska Akademija Znanosti I Umjetnosti, Zagreb. p 98.

Stephens, S.L., D.J. Dulitz, and R.E. Martin. 1999. Giant sequoia regeneration in group selection openings in the southern Sierra Nevada. Forest Ecology and Management 120:89-95.

Stephenson, N.L. 1999. Reference conditions for giant sequoia forest restoration: Structure, process, and precision. Ecological Applications 9:1253-1265.

Stephenson, S.L., D.L. Parsons, and T.W. Swetnam. 1991. Restoring natural fire to the sequoia-mixed conifer forest should intense fire play a role? Proceedings of the 18th Tall Timbers Fire Ecology Conference, May 18-21, 1989: High Intensity Fire in Wildlands: Management Challenges and Options. pp.321-337.

Stoddard, C.H. and G.M. Stoddard. 1987. Essentials of forestry practice. 4th ed. John Wiley & Sons, Inc., New York.

Stohlgren, T.J., 1993. Intra-specific competition (crowding) of giant sequoias *(Sequoiadendron giganteum).* Forestry Ecology and Management. 59(1-2):127-148.

Swetnam, T.W., C.H. Baisan, A.C. Caprio, P.M. Brown, R. Touchan, R.S. Anderson and D.J. Hallett. 2009. Multi-millennial fire history of the Giant Forest, Sequoia National Park, California, USA. Fire Ecology 5(3):120-150.

Tweed, W. 1992. Public perceptions of giant sequoia over time. Proceedings of the Symposium on Giant Sequoia: Their Place in the Ecosystem and Society. Visalia, California. USDA Forest Service, PSW-GTR-151. 1994.

USDA Forest Service. 1990. Sequoia National Forest Mediated Settlement Agreement. Unpublished administrative document, Porterville, CA.

USDA Forest Service. 2010. Giant sequoia national monument draft environmental impact statement (DEIS), volume 1, chapter 3. Sequoia National Forest, Porterville, CA.

Vankat, J.L. 1982. A gradient perspective on the vegetation of Sequoia National Park, California. Madroño. 29:200-214.

Vankat, J.L. and J. Major. Vegetation changes in Sequoia National Park, California. Journal of Biogeography. 5:377-402.

van Wagtendonk, J.W., J.M. Benedict and W.M. Sydoriak. 1996. Physical properties of woody fuel particles of Sierra Nevada conifers. International Journal of Wildland Fire. 6(3):117-123.

van Wagtendonk, J.W., J.M. Benedict and W.M. Sydoriak. 1998. Fuel bed characteristics of Sierra Nevada conifers. Western Journal of Applied Forestry. 13(3):73-84.

Wayman, R.B. and M. North. 2007. Initial response of a mixed-conifer understory plant community to burning and thinning restoration treatments. Forest Ecology and Management. 239:32-44.

Weise, D.R.; A. Gelobter, S.M. Haase and S.S. Sackett. 1997. Photo series for quantifying fuels and assessing fire risk in giant sequoia groves. General Technical Report #163. Pacific Southwest Research Station. USDA Forest Service.

Whittaker, R.H. 1960. Vegetation of the Siskiyou Mountains, Oregon and California. Ecological Monographs. 30(3):279-338.

Whittaker, R.H. 1965. Dominance and diversity in land plant communities. Science. 147(3655):250-260.

Whittaker, R.H. and W.A. Niering. 1965. Vegetation of the Santa Catalina Mountains, Arizona: A gradient analysis of the south slope. Ecology. 46(4):429-452.

Willard, D. 1994. The natural giant sequoia *(Sequoiadendron giganteum)* groves of the Sierra Nevada, California - an updated annotated list. General Technical Report #151. Pacific Southwest Research Station. USDA Forest Service.

Wilson, L.R. and R.M. Webster. 1946. Plant microfossils from a Fort Union coal of Montana (abstract). American Journal of Botany. 33(4):271-278.

York, R.A. 2010. Update on giant sequoia research and management at UC Center for Forestry Properties. Meeting: Long term management of giant sequoia in California in light of potential climate change and fire risk. Sacramento, California.

York, R.A. and J.J. Battles. 2008. Growth response of mature trees versus seedlings to gaps associated with group selection management in the Sierra Nevada, California. Western Journal of Applied Forestry. 23(2):94-98.

York, R.A., J.J. Battles, A.K. Eschtruth, and F.G. Schurr. 2011. Giant sequoia (*Sequoiadendron giganteum*) regeneration in experimental canopy gaps. Restoration Ecology. 19(1):14-23.

York, R.A., J.J. Battles, and R.C. Heald. 2003. Edge effects in mixed conifer group selection openings: Tree height response to resource gradients. Forest Ecology and Management 179:107-121.

York, R.A., D. Fuchs, J.J. Battles and S.L. Stephens. 2010. Radial growth responses to gap creation in large, old *Sequoiadendron giganteum.* Applied Vegetation Science. 13(4):498-509.

York, R.A., R.C. Heald, J.J. Battles, and J.D. York. 2004. Group selection management in conifer forests: Relationships between opening size and tree growth. Canadian Journal of Forestry Res. 34:630-641.

Zippi, P. 2003. Diversity calculator 4.0 PAZ Software, Garland, TX.

Appendices

APPENDIX A

Overstory Data

MHDSF Young-Growth Giant Sequoia Management Strategies Study

2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow	Treatment: Thinned	Measured By:	1989 Bates, Masser
		Measured By:	1994 Ganz
Block: A	Plot # : 1	Measured By:	2001 Roller, Rueter
		Measured By:	2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
16	GS	38.2	160.0	41.0	174.0	43.9	173.1	47.7	172.8
17	GS	28.7	145.0	33.6	167.0	38.2	168.9	42.3	170.8
18	GS	26.9	111.0	29.0	122.0	31.9	115.8	35.1	129.8
19	GS	52.3	160.0	56.0	168.0	59.9	180.9	64.7	177.8
20	GS	30.6	172.0	33.4	183.0	38.3	189.2	44.1	181.2
AVG.		35.3	149.6	38.6	162.8	42.4	165.6	46.8	166.5

2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
16	GS	2.8	14.0	2.9	-0.9	5.7	13.1	6.7	-1.2	3.8	-0.3	9.5	12.8
17	GS	4.9	22.0	4.6	1.9	9.5	23.9	8.7	3.8	4.1	1.9	13.6	25.8
18	GS	2.1	11.0	2.9	-6.2	5.0	4.8	6.1	7.8	3.2	14.0	8.2	18.8
19	GS	3.7	8.0	3.9	12.9	7.6	20.9	8.7	9.8	4.8	-3.1	12.4	17.8
20	GS	2.8	11.0	4.9	6.2	7.7	17.2	10.7	-1.8	5.8	-8.0	13.5	9.2
AVG.		3.3	13.2	3.8	2.8	7.1	16.0	8.2	3.7	4.3	0.9	11.4	16.9

Tree 18 Broken Top in 2001

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow	Treatment: Thinned	Measured By:	1990 Rodgers, Eagen
		Measured By:	1994 Ganz
Block: A	Plot # : 2	Measured By:	2001 Roller, Rueter
		Measured By:	2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
58	GS	32.0	159.0	34.5	161.0	36.7	165.3	41.1	183.1
59	GS	37.8	156.0	40.9	176.0	41.6	181.4	46.5	184.4
60	GS	27.9	130.0	29.8	137.0	34.6	138.6	39.7	162.4
61	GS	41.4	173.0	43.9	188.0	48.4	186.6	53.4	188.2
62	WF	***	***	***	***	2.4	13.0	4.9	23.6
63	WF	***	***	***	***	***	***	1.7	10.1
64	WF	***	***	***	***	***	***	1.0	7.7
65	WF	***	***	***	***	***	***	1.1	7.8
AVG.		34.8	154.5	37.3	165.5	32.7	137.0	23.7	95.9

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
58	GS	2.5	2.0	2.2	4.3	4.7	6.3	6.6	22.1	4.4	17.8	9.1	24.1
59	GS	3.1	20.0	0.7	5.4	3.8	25.4	5.6	8.4	4.9	3.0	8.7	28.4
60	GS	1.9	7.0	4.8	1.6	6.7	8.6	9.9	25.4	5.1	23.8	11.8	32.4
61	GS	2.5	15.0	4.5	-1.4	7.0	13.6	9.5	0.2	5.0	1.6	12.0	15.2
62	WF	***	***	***	***	***	***	***	***	2.5	10.6	***	***
63	WF	***	***	***	***	***	***	***	***	***	***	***	***
64	WF	***	***	***	***	***	***	***	***	***	***	***	***
65	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		2.5	11.0	3.1	2.5	5.6	13.5	7.9	14.0	4.4	11.4	10.4	25.0

Tree	62	Ingrowth in 2001
Trees	63,64,65	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow | Treatment: Thinned/Burned | Measured By: 1989 Bates, Masser
Measured By: 1994 Ganz
Block: B | Plot # : 1 | Measured By: 2001 Roller, Rueter
Measured By: 2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
9	SP	23.5	143.0	24.6	154.0	27.3	156.8	29.7	150.4
10	GS	12.5	80.0	13.5	88.0	16.1	99.1	19.5	106.0
11	GS	25.0	134.0	26.0	139.0	29.8	149.4	34.5	154.7
12	GS	40.1	169.0	41.7	186.0	45.8	199.7	50.4	202.0
13	GS	33.8	150.0	36.1	167.0	40.4	172.0	44.1	181.4
14	GS	33.2	148.0	37.0	161.0	38.2	180.9	41.5	174.9
15	GS	40.2	140.0	42.7	147.0	45.5	152.4	48.4	171.2
16	WF	***	***	***	***	***	***	2.1	11.7
17	WF	***	***	***	***	***	***	2.0	12.3
18	IC	***	***	***	***	***	***	1.1	9.5
AVG.		29.8	137.7	31.7	148.9	34.7	158.6	27.3	117.4

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
9	SP	1.1	11.0	2.7	2.8	3.8	13.8	5.1	-3.6	2.4	-6.4	6.2	7.4
10	GS	1.0	8.0	2.6	11.1	3.6	19.1	6.0	18.0	3.4	6.9	7.0	26.0
11	GS	1.0	5.0	3.8	10.4	4.8	15.4	8.5	15.7	4.7	5.3	9.5	20.7
12	GS	1.6	17.0	4.1	13.7	5.7	30.7	8.7	16.0	4.6	2.3	10.3	33.0
13	GS	2.3	17.0	4.3	5.0	6.6	22.0	8.0	14.4	3.7	9.4	10.3	31.4
14	GS	3.8	13.0	1.2	19.9	5.0	32.9	4.5	13.9	3.3	-6.0	8.3	26.9
15	GS	2.5	7.0	2.8	5.4	5.3	12.4	5.7	24.2	2.9	18.8	8.2	31.2
16	WF	***	***	***	***	***	***	***	***	***	***	***	***
17	WF	***	***	***	***	***	***	***	***	***	***	***	***
18	IC	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		1.9	11.1	3.1	9.8	5.0	20.9	6.6	14.1	3.6	4.3	8.5	25.2

Tree 13 Diameter measured 4in above dbh due to stems growing together in 2009
Tree 14 Diameter measured 6in above dbh due to stems growing together in 2009
Tree 16,17,18 Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow	Treatment: Thinned/Burned	Measured By: 1990	Rodgers, Eagen
		Measured By: 1994	Ganz
Block: B	Plot # : 2	Measured By: 2001	Roller, Rueter
		Measured By: 2009	Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
47	GS	31.4	160.0	33.8	177.0	38.3	179.0	42.7	183.7
48	GS	46.1	161.0	45.1	179.0	48.5	191.3	52.6	183.3
49	WF	6.6	24.0	7.9	34.0	10.0	40.7	11.3	52.7
50	GS	32.7	140.0	36.2	154.0	38.8	160.3	43.3	163.9
51	GS	49.4	147.0	51.1	172.0	54.2	171.1	59.3	174.2
52	GS	24.0	107.0	24.0	120.0	25.4	123.3	28.9	136.2
53	WF	19.7	68.0	20.0	79.0	20.5	90.5	21.3	116.4
54	GS	43.3	139.0	44.7	152.0	48.5	153.4	53.0	181.3
55	GS	29.4	154.0	30.9	168.0	33.7	168.7	35.9	170.5
56	WF	1.0	16.0	3.6	21.0	3.6	16.3	5.2	25.7
57	WF	3.0	6.0	***	***	5.6	26.3	7.9	36.6
58	WF	***	***	***	***	1.1	6.8	2.1	12.3
59	WF	***	***	***	***	***	***	1.6	7.3
AVG.		26.1	102.0	29.7	125.6	27.4	110.6	28.1	111.1

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
47	GS	2.4	17.0	4.5	2.0	6.9	19.0	8.9	6.7	4.4	4.7	11.3	23.7
48	GS	-1.0	18.0	3.4	12.3	2.4	30.3	7.5	4.3	4.1	-8.0	6.5	22.3
49	WF	1.3	10.0	2.1	6.7	3.4	16.7	3.4	18.7	1.3	12.0	4.7	28.7
50	GS	3.5	14.0	2.6	6.3	6.1	20.3	7.1	9.9	4.5	3.6	10.6	23.9
51	GS	1.7	25.0	3.1	-0.9	4.8	24.1	8.2	2.2	5.1	3.1	9.9	27.2
52	GS	0.0	13.0	1.4	3.3	1.4	16.3	4.9	16.2	3.5	12.9	4.9	29.2
53	WF	0.3	11.0	0.5	11.5	0.8	22.5	1.3	37.4	0.8	25.9	1.6	48.4
54	GS	1.4	13.0	3.8	1.4	5.2	14.4	8.3	29.3	4.5	27.9	9.7	42.3
55	GS	1.5	14.0	2.8	0.7	4.3	14.7	5.0	2.5	2.2	1.8	6.5	16.5
56	WF	2.6	5.0	0.0	-4.7	2.6	0.3	1.6	4.7	1.6	9.4	4.2	9.7
57	WF	***	***	***	***	2.6	20.3	***	***	2.3	10.3	4.9	30.6
58	WF	***	***	***	***	***	***	***	***	1.0	5.5	***	***
59	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		1.4	14.0	2.4	3.9	3.7	18.1	5.6	13.2	2.9	9.1	6.8	27.5

Tree 57 Dead in 1994
Tree 57 Is Alive in 2001
Tree 58 Ingrowth in 2001
Tree 59 Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Bogus Meadow   Treatment: Control   Measured By: 1989 Bates, Scott, Masser
Measured By: 1994 Ganz & CDF
Block: C   Plot # : 1   Measured By: 2001 Roller, Rueter
Measured By: 2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
37	GS	25.1	124.0	26.5	135.0	39.5	149.8	32.7	156.6
38	WF	11.1	58.0	***	***	***	***	***	***
39	GS	4.1	27.0	4.1	28.0	***	***	***	***
40	GS	6.2	25.0	6.2	28.0	6.2	29.1	6.3	27.1
41	GS	21.2	117.0	22.3	116.0	23.8	119.1	25.5	141.8
42	WF	8.0	58.0	8.0	73.0	8.2	47.1	***	***
43	GS	17.7	84.0	17.6	98.0	18.0	91.0	18.0	89.5
44	GS	21.9	118.0	22.9	130.0	25.4	145.7	27.8	152.1
45	GS	10.0	65.0	9.9	67.0	9.9	70.5	9.8	62.3
46	GS	24.0	112.0	25.2	103.0	27.0	126.3	29.0	146.8
47	GS	9.5	27.0	9.5	49.0	9.6	50.2	9.6	52.6
48	GS	1.9	8.0	***	***	***	***	***	***
49	GS	17.9	112.0	19.2	115.0	21.6	138.8	24.4	146.9
50	WF	6.5	45.0	6.3	44.0	6.5	49.4	6.8	50.6
51	GS	19.1	121.0	20.3	118.0	23.2	126.9	25.0	144.4
52	WF	9.9	72.0	10.0	76.0	***	***	***	***
53	WF	4.3	36.0	4.4	40.0	4.4	38.9	***	***
54	GS	14.0	73.0	14.7	75.0	15.4	84.7	16.2	87.6
55	WF	10.5	80.0	10.5	74.0	10.7	81.8	11.1	87.8
56	GS	27.5	115.0	29.6	124.0	32.4	142.3	45.6	152.4
57	WF	4.2	31.0	4.1	31.0	***	***	***	***
58	GS	5.9	21.0	6.1	24.0	6.5	24.2	7.0	25.3
59	GS	26.4	118.0	27.7	116.0	30.3	130.4	33.2	142.5
60	GS	6.5	26.0	6.5	28.0	6.5	28.1	6.5	27.8
61	GS	6.0	22.0	6.0	21.0	6.0	23.9	6.0	24.2
62	GS	2.7	12.0	2.7	10.0	2.7	11.2	2.6	***
63	GS	15.4	94.0	16.0	93.0	17.2	86.8	18.3	89.6
64	GS	14.3	36.0	14.6	41.0	15.1	37.9	15.0	42.5
65	WF	4.2	19.0	5.0	22.0	6.3	31.9	7.4	38.2
66	GS	7.5	38.0	8.0	38.0	8.6	40.3	8.9	43.7
67	GS	12.1	50.0	12.4	55.0	13.2	51.0	13.8	54.3
68	GS	6.6	32.0	6.5	34.0	6.4	33.5	6.4	33.5
69	GS	13.1	72.0	13.4	91.0	13.7	76.1	14.3	80.8
70	GS	9.4	82.0	9.5	75.0	9.9	83.8	10.0	96.1
71	GS	17.2	72.0	17.9	75.0	18.9	89.7	20.1	100.5
72	WF	5.0	32.0	5.1	39.0	5.5	38.5	5.6	40.2
73	SP	11.5	63.0	11.9	70.0	13.0	79.9	14.4	71.6
74	GS	11.6	45.0	12.1	53.0	12.4	46.8	12.4	46.9
75	WF	18.0	67.0	18.6	65.0	20.0	85.4	20.9	97.9
76	GS	12.7	70.0	12.9	81.0	13.7	80.9	14.3	81.5
77	WF	46.9	164.0	47.2	152.0	48.4	187.3	49.1	182.4
78	SP	6.8	38.0	***	***	***	***	***	***

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Bogus Meadow	Treatment: Control	Measured By:	1989 Bates, Scott, Masser
		Measured By:	1994 Ganz & CDF
Block: C	Plot # : 1	Measured By:	2001 Roller, Rueter
		Measured By:	2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
79	GS	6.6	36.0	6.6	35.0	6.6	37.9	6.6	34.6
80	GS	6.2	21.0	6.2	19.0	6.3	22.4	6.3	22.7
81	GS	8.5	42.0	8.8	42.0	8.9	45.2	8.8	45.1
82	GS	2.9	12.0	2.8	11.0	2.7	13.2	2.7	13.0
83	WF	***	***	***	***	***	***	4.5	19.3
84	WF	***	***	***	***	***	***	2.2	13.4
85	GS	***	***	***	***	***	***	22.3	***
AVG.		12.1	60.7	12.9	65.4	14.5	71.9	15.3	76.1

Trees	38,48,78	Dead in 1994
Trees	39,52,78	Dead/Down in 2001
Trees	38, 57	Dead/Standing in 2001
Trees	42,45,64	Broken Top in 2001
Tree	71	Forked top-height at highest fork in 2001, 2009
Trees	74,79	Deformed/Bowed Tops in 2001
Tree	37	A tree fell into plot ripping bark off and decreasing dbh in 2009
Tree	83	Tree in plot 37.8ft from plot center and tagged, no data in 1994 or 2001.
Trees	38,42,53,57	Dead/Down in 2009
Tree	62	Dead/Standing in 2009
Tree	85	Dead/Standing in 2009, no data in 1989, 1994 or 2001.
Trees	40,43,47,60,68,74,81	Deformed top in 2009
Trees	45,73,77	Broken top in 2009
Tree	82	Dead top in 2009
Tree	79	Deformed/Bowed in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow — Treatment: Control — Measured By: 1989 Bates, Scott, Masser
Measured By: 1994 Ganz & CDF
Block: C — Plot # : 1 — Measured By: 2001 Roller, Rueter
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
37	GS	1.4	11.0	13.0	14.8	14.4	25.8	6.2	21.6	-6.8	6.8	7.6	32.6
38	WF	***	***	***	***	***	***	***	***	***	***	***	***
39	GS	0.0	1.0	***	***	***	***	***	***	***	***	***	***
40	GS	0.0	3.0	0.0	1.1	0.0	4.1	0.1	-0.9	0.1	-2.0	0.1	2.1
41	GS	1.1	-1.0	1.5	3.1	2.6	2.1	3.2	25.8	1.7	22.7	4.3	24.8
42	WF	0.0	15.0	0.2	-25.9	0.2	-10.9	***	***	***	***	***	***
43	GS	-0.1	14.0	0.4	-7.0	0.3	7.0	0.4	-8.5	0.0	-1.5	0.3	5.5
44	GS	1.0	12.0	2.5	15.7	3.5	27.7	4.9	22.1	2.4	6.4	5.9	34.1
45	GS	-0.1	2.0	0.0	3.5	-0.1	5.5	-0.1	-4.7	-0.1	-8.2	-0.2	-2.7
46	GS	1.2	-9.0	1.8	23.3	3.0	14.3	3.8	43.8	2.0	20.5	5.0	34.8
47	GS	0.0	22.0	0.1	1.2	0.1	23.2	0.1	3.6	0.0	2.4	0.1	25.6
48	GS	***	***	***	***	***	***	***	***	***	***	***	***
49	GS	1.3	3.0	2.4	23.8	3.7	26.8	5.2	31.9	2.8	8.1	6.5	34.9
50	WF	-0.2	-1.0	0.2	5.4	0.0	4.4	0.5	6.6	0.3	1.2	0.3	5.6
51	GS	1.2	-3.0	2.9	8.9	4.1	5.9	4.7	26.4	1.8	17.5	5.9	23.4
52	WF	0.1	4.0	***	***	***	***	***	***	***	***	***	***
53	WF	0.1	4.0	0.0	-1.1	0.1	2.9	***	***	***	***	***	***
54	GS	0.7	2.0	0.7	9.7	1.4	11.7	1.5	12.6	0.8	2.9	2.2	14.6
55	WF	0.0	-6.0	0.2	7.8	0.2	1.8	0.6	13.8	0.4	6.0	0.6	7.8
56	GS	2.1	9.0	2.8	18.3	4.9	27.3	16.0	28.4	13.2	10.1	18.1	37.4
57	WF	-0.1	0.0	***	***	***	***	***	***	***	***	***	***
58	GS	0.2	3.0	0.4	0.2	0.6	3.2	0.9	1.3	0.5	1.1	1.1	4.3
59	GS	1.3	-2.0	2.6	14.4	3.9	12.4	5.5	26.5	2.9	12.1	6.8	24.5
60	GS	0.0	2.0	0.0	0.1	0.0	2.1	0.0	-0.2	0.0	-0.3	0.0	1.8
61	GS	0.0	-1.0	0.0	2.9	0.0	1.9	0.0	3.2	0.0	0.3	0.0	2.2
62	GS	0.0	-2.0	0.0	1.2	0.0	-0.8	-0.1	***	-0.1	***	-0.1	***
63	GS	0.6	-1.0	1.2	-6.2	1.8	-7.2	2.3	-3.4	1.1	2.8	2.9	-4.4
64	GS	0.3	5.0	0.5	-3.1	0.8	1.9	0.4	1.5	-0.1	4.6	0.7	6.5
65	WF	0.8	3.0	1.3	9.9	2.1	12.9	2.4	16.2	1.1	6.3	3.2	19.2
66	GS	0.5	0.0	0.6	2.3	1.1	2.3	0.9	5.7	0.3	3.4	1.4	5.7
67	GS	0.3	5.0	0.8	-4.0	1.1	1.0	1.4	-0.7	0.6	3.3	1.7	4.3
68	GS	-0.1	2.0	-0.1	-0.5	-0.2	1.5	-0.1	-0.5	0.0	0.0	-0.2	1.5
69	GS	0.3	19.0	0.3	-14.9	0.6	4.1	0.9	-10.2	0.6	4.7	1.2	8.8
70	GS	0.1	-7.0	0.4	8.8	0.5	1.8	0.5	21.1	0.1	12.3	0.6	14.1
71	GS	0.7	3.0	1.0	14.7	1.7	17.7	2.2	25.5	1.2	10.8	2.9	28.5
72	WF	0.1	7.0	0.4	-0.5	0.5	6.5	0.5	1.2	0.1	1.7	0.6	8.2
73	SP	0.4	7.0	1.1	9.9	1.5	16.9	2.5	1.6	1.4	-8.3	2.9	8.6
74	GS	0.5	8.0	0.3	-6.2	0.8	1.8	0.3	-6.1	0.0	0.1	0.8	1.9
75	WF	0.6	-2.0	1.4	20.4	2.0	18.4	2.3	32.9	0.9	12.5	2.9	30.9
76	GS	0.2	11.0	0.8	-0.1	1.0	10.9	1.4	0.5	0.6	0.6	1.6	11.5
77	WF	0.3	-12.0	1.2	35.3	1.5	23.3	1.9	30.4	0.7	-4.9	2.2	18.4
78	SP	***	***	***	***	***	***	***	***	***	***	***	***

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow   Treatment: Control   Measured By: 1989 Bates, Scott, Masser
Measured By: 1994 Ganz & CDF
Block: C   Plot # : 1   Measured By: 2001 Roller, Rueter
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
79	GS	0.0	-1.0	0.0	2.9	0.0	1.9	0.0	-0.4	0.0	-3.3	0.0	-1.4
80	GS	0.0	-2.0	0.1	3.4	0.1	1.4	0.1	3.7	0.0	0.3	0.1	1.7
81	GS	0.3	0.0	0.1	3.2	0.4	3.2	0.0	3.1	-0.1	-0.1	0.3	3.1
82	GS	-0.1	-1.0	-0.1	2.2	-0.2	1.2	-0.1	2.0	0.0	-0.2	-0.2	1.0
83	WF	***	***	***	***	***	***	***	***	***	***	***	***
84	WF	***	***	***	***	***	***	***	***	***	***	***	***
85	GS	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		0.4	2.9	1.1	5.0	1.5	8.0	1.9	10.2	0.8	4.1	2.4	13.0

Trees	38,48,78	Dead in 1994
Trees	39,52,78	Dead/Down in 2001
Trees	38, 57	Dead/Standing in 2001
Trees	42,45,64	Broken Top in 2001
Tree	71	Forked top-height at highest fork in 2001, 2009
Trees	74,79	Deformed/Bowed Tops in 2001
Tree	37	A tree fell into plot ripping bark off and decreasing dbh in 2009
Tree	83	Tree in plot 37.8ft from plot center and tagged, no data in 1994 or 2001.
Trees	38,42,53,57	Dead/Down in 2009
Tree	62	Dead/Standing in 2009
Tree	85	Dead/Standing in 2009, no data in 1989, 1994 or 2001.
Trees	40,43,47,60,68,74,81	Deformed top in 2009
Trees	45,73,77	Broken top in 2009
Tree	82	Dead top in 2009
Tree	79	Deformed/Bowed in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow | Treatment: Control | Measured By: 1990 Bates, Scott, Masser, Johannis
Measured By: 1994 Ganz & CDF
Block: C | Plot # : 2 | Measured By: 2001 Roller, Rueter
Measured By: 2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	36.2	127.0	38.0	130.0	41.3	152.3	44.5	168.2
2	WF	2.2	12.0	2.4	12.0	2.7	12.7	2.7	13.0
3	GS	2.9	14.0	***	***	***	***	***	***
5	WF	7.2	41.0	7.2	41.0	7.5	44.6	7.7	44.9
6	GS	4.7	13.0	4.7	25.0	4.8	18.6	4.8	19.2
7	WF	3.9	19.0	4.2	20.0	4.4	23.2	4.6	26.0
8	GS	25.1	123.0	27.0	128.0	30.1	133.7	32.8	149.1
9	GS	7.7	30.0	7.7	31.0	7.8	34.9	7.6	30.9
10	GS	17.3	95.0	18.0	95.0	19.1	107.8	20.0	111.8
11	WF	2.5	14.0	2.8	16.0	3.2	15.8	3.4	16.1
12	GS	20.3	97.0	21.7	103.0	23.9	119.1	26.0	132.3
13	WF	1.8	12.0	1.9	12.0	2.3	14.8	2.4	15.3
14	GS	12.4	53.0	12.8	53.0	13.8	61.4	14.7	59.5
15	WF	7.6	46.0	8.2	47.0	9.1	52.7	10.5	53.2
16	WF	28.0	134.0	28.0	138.0	28.6	139.3	28.4	***
17	GS	7.0	38.0	7.0	41.0	7.3	40.1	7.7	38.4
18	GS	8.2	28.0	8.2	28.0	8.3	27.1	8.4	30.4
19	GS	5.1	13.0	5.3	14.0	5.7	17.5	6.0	18.7
20	GS	3.3	12.0	3.7	12.0	4.2	12.3	4.7	14.6
21	GS	6.3	25.0	6.6	27.0	6.5	33.4	7.0	37.3
22	GS	25.3	112.0	27.1	115.0	30.6	136.5	34.0	150.6
23	GS	23.3	108.0	24.5	111.0	25.7	132.1	28.0	144.7
24	GS	12.9	103.0	13.1	107.0	13.3	109.9	13.3	110.6
25	GS	9.9	52.0	9.9	52.0	10.1	52.4	10.2	53.5
26	GS	29.1	131.0	30.9	133.0	33.6	142.2	36.3	163.7
27	GS	19.6	98.0	19.6	102.0	22.2	115.9	24.2	131.0
28	GS	23.6	127.0	24.5	127.0	26.4	152.1	28.2	153.7
29	GS	6.4	34.0	6.5	34.0	6.5	33.5	6.5	33.5
30	GS	10.4	73.0	10.5	75.0	10.5	72.5	10.6	75.6
31	GS	18.1	77.0	18.3	86.0	18.6	87.6	18.9	90.3
32	GS	5.7	24.0	5.7	24.0	5.8	26.0	5.7	26.2
33	GS	29.5	103.0	31.0	104.0	33.2	119.5	34.7	144.7
34	GS	33.7	123.0	34.8	126.0	37.2	138.6	39.9	153.8
35	GS	13.6	45.0	***	***	***	***	13.1	***
36	GS	36.8	116.0	38.4	119.0	40.8	148.0	43.4	160.9
37	WF	***	***	***	***	1.1	8.1	2.3	12.2
38	IC	***	***	***	***	***	***	9.5	***
39	WF	***	***	***	***	***	***	1.4	8.7
40	WF	***	***	***	***	***	***	1.3	8.7
41	WF	***	***	***	***	***	***	1.4	8.4
42	WF	***	***	***	***	***	***	1.5	7.9
AVG.		14.5	64.9	15.5	69.3	16.1	74.6	15.2	70.7

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow	Treatment: Control	Measured By:	1990	Bates, Scott, Masser, Johannis
		Measured By:	1994	Ganz & CDF
Block: C	Plot # : 2	Measured By:	2001	Roller, Rueter
		Measured By:	2009	Soderlund, Ricchiazzi

Tree	3	Dead/Down in 1994
Tree	35	Dead/Standing in 1994
Trees	18	Broken top in 2001
Tree	15	Swelling in bole,DBH taken at tag just above swelling in 2001,2009
Tree	37	Ingrowth in 2001
Trees	9,14,17,25,29,41	Deformed top in 2009
Tree	16	Dead/Standing in 2009
Tree	31	Broken top in 2009
Tree	38	Dead/Standing in 2009, no data for 1989, 1994 or 2001.
Trees	39 - 42	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow Treatment: Control Measured By: 1990 Bates, Scott, Masser, Johannis
Measured By: 1994 Ganz & CDF
Block: C Plot # : 2 Measured By: 2001 Roller, Rueter
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	1.8	3.0	3.3	22.3	5.1	25.3	6.5	38.2	3.2	15.9	8.3	41.2
2	WF	0.2	0.0	0.3	0.7	0.5	0.7	0.3	1.0	0.0	0.3	0.5	1.0
3	GS	***	***	***	***	***	***	***	***	***	***	***	***
5	WF	0.0	0.0	0.3	3.6	0.3	3.6	0.5	3.9	0.2	0.3	0.5	3.9
6	GS	0.0	12.0	0.1	-6.4	0.1	5.6	0.1	-5.8	0.0	0.6	0.1	6.2
7	WF	0.3	1.0	0.2	3.2	0.5	4.2	0.4	6.0	0.2	2.8	0.7	7.0
8	GS	1.9	5.0	3.1	5.7	5.0	10.7	5.8	21.1	2.7	15.4	7.7	26.1
9	GS	0.0	1.0	0.1	3.9	0.1	4.9	-0.1	-0.1	-0.2	-4.0	-0.1	0.9
10	GS	0.7	0.0	1.1	12.8	1.8	12.8	2.0	16.8	0.9	4.0	2.7	16.8
11	WF	0.3	2.0	0.4	-0.2	0.7	1.8	0.6	0.1	0.2	0.3	0.9	2.1
12	GS	1.4	6.0	2.2	16.1	3.6	22.1	4.3	29.3	2.1	13.2	5.7	35.3
13	WF	0.1	0.0	0.4	2.8	0.5	2.8	0.5	3.3	0.1	0.5	0.6	3.3
14	GS	0.4	0.0	1.0	8.4	1.4	8.4	1.9	6.5	0.9	-1.9	2.3	6.5
15	WF	0.6	1.0	0.9	5.7	1.5	6.7	2.3	6.2	1.4	0.5	2.9	7.2
16	WF	0.0	4.0	0.6	1.3	0.6	5.3	0.4	***	-0.2	***	0.4	***
17	GS	0.0	3.0	0.3	-0.9	0.3	2.1	0.7	-2.6	0.4	-1.7	0.7	0.4
18	GS	0.0	0.0	0.1	-0.9	0.1	-0.9	0.2	2.4	0.1	3.3	0.2	2.4
19	GS	0.2	1.0	0.4	3.5	0.6	4.5	0.7	4.7	0.3	1.2	0.9	5.7
20	GS	0.4	0.0	0.5	0.3	0.9	0.3	1.0	2.6	0.5	2.3	1.4	2.6
21	GS	0.3	2.0	-0.1	6.4	0.2	8.4	0.4	10.3	0.5	3.9	0.7	12.3
22	GS	1.8	3.0	3.5	21.5	5.3	24.5	6.9	35.6	3.4	14.1	8.7	38.6
23	GS	1.2	3.0	1.2	21.1	2.4	24.1	3.5	33.7	2.3	12.6	4.7	36.7
24	GS	0.2	4.0	0.2	2.9	0.4	6.9	0.2	3.6	0.0	0.7	0.4	7.6
25	GS	0.0	0.0	0.2	0.4	0.2	0.4	0.3	1.5	0.1	1.1	0.3	1.5
26	GS	1.8	2.0	2.7	9.2	4.5	11.2	5.4	30.7	2.7	21.5	7.2	32.7
27	GS	0.0	4.0	2.6	13.9	2.6	17.9	4.6	29.0	2.0	15.1	4.6	33.0
28	GS	0.9	0.0	1.9	25.1	2.8	25.1	3.7	26.7	1.8	1.6	4.6	26.7
29	GS	0.1	0.0	0.0	-0.5	0.1	-0.5	0.0	-0.5	0.0	0.0	0.1	-0.5
30	GS	0.1	2.0	0.0	-2.5	0.1	-0.5	0.1	0.6	0.1	3.1	0.2	2.6
31	GS	0.2	9.0	0.3	1.6	0.5	10.6	0.6	4.3	0.3	2.7	0.8	13.3
32	GS	0.0	0.0	0.1	2.0	0.1	2.0	0.0	2.2	-0.1	0.2	0.0	2.2
33	GS	1.5	1.0	2.2	15.5	3.7	16.5	3.7	40.7	1.5	25.2	5.2	41.7
34	GS	1.1	3.0	2.4	12.6	3.5	15.6	5.1	27.8	2.7	15.2	6.2	30.8
35	GS	***	***	***	***	***	***	***	***	***	***	***	***
36	GS	1.6	3.0	2.4	29.0	4.0	32.0	5.0	41.9	2.6	12.9	6.6	44.9
37	WF	***	***	***	***	***	***	***	***	1.2	4.1	***	***
38	IC	***	***	***	***	***	***	***	***	***	***	***	***
39	WF	***	***	***	***	***	***	***	***	***	***	***	***
40	WF	***	***	***	***	***	***	***	***	***	***	***	***
41	WF	***	***	***	***	***	***	***	***	***	***	***	***
42	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		0.6	2.3	1.1	7.3	1.6	9.5	2.0	13.2	1.0	5.7	2.6	15.4

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Bogus Meadow	Treatment: Control	Measured By:	1990	Bates, Scott, Masser, Johannis
		Measured By:	1994	Ganz & CDF
Block: C	Plot # : 2	Measured By:	2001	Roller, Rueter
		Measured By:	2009	Soderlund, Ricchiazzi

Tree	3	Dead/Down in 1994
Tree	35	Dead/Standing in 1994
Trees	18	Broken top in 2001
Tree	15	Swelling in bole,DBH taken at tag just above swelling in 2001,2009
Trees	9,14,17,25,29,41	Deformed top in 2009
Tree	16	Dead/Standing in 2009
Tree	31	Broken top in 2009
Tree	38	Dead/Standing in 2009, no data for 1989, 1994 or 2001.
Trees	39 - 42	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill	Treatment: Thinned	Measured By:	1990 Joe, Domingo, Mary
		Measured By:	1994 Ganz
Block: A	Plot # : 1	Measured By:	2001 Roller, McLoed
		Measured By:	2009 Soderlund, Ricchiazzi

		1990 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
24	GS	11.8	82.0	12.7	88.0	14.8	100.8	16.7	109.4
25	GS	16.0	91.0	17.6	95.0	20.2	122.3	22.5	134.4
26	GS	20.8	115.0	21.8	128.0	23.3	128.3	24.9	138.5
27	GS	23.9	132.0	25.0	134.0	27.3	148.6	29.7	148.7
28	GS	22.7	125.0	23.8	125.0	25.9	143.5	28.2	153.2
29	GS	13.7	88.0	14.1	90.0	15.6	94.3	16.8	102.0
30	GS	21.7	106.0	23.0	110.0	25.6	115.7	28.3	124.4
31	GS	21.6	119.0	23.0	122.0	25.3	131.9	27.6	144.8
AVG.		19.0	107.3	20.1	111.5	22.3	123.2	24.3	131.9

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1990-1994		Change 1994-2001		Change 1990-2001		Change 1994-2009		Change 2001-2009		Change 1990-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
24	GS	0.9	6.0	2.1	12.8	3.0	18.8	4.0	21.4	1.9	8.6	4.9	27.4
25	GS	1.6	4.0	2.6	27.3	4.2	31.3	4.9	39.4	2.3	12.1	6.5	43.4
26	GS	1.0	13.0	1.5	0.3	2.5	13.3	3.1	10.5	1.6	10.2	4.1	23.5
27	GS	1.1	2.0	2.3	14.6	3.4	16.6	4.7	14.7	2.4	0.1	5.8	16.7
28	GS	1.1	0.0	2.1	18.5	3.2	18.5	4.4	28.2	2.3	9.7	5.5	28.2
29	GS	0.4	2.0	1.5	4.3	1.9	6.3	2.7	12.0	1.2	7.7	3.1	14.0
30	GS	1.3	4.0	2.6	5.7	3.9	9.7	5.3	14.4	2.7	8.7	6.6	18.4
31	GS	1.4	3.0	2.3	9.9	3.7	12.9	4.6	22.8	2.3	12.9	6.0	25.8
AVG.		1.1	4.3	2.1	11.7	3.2	15.9	4.2	20.4	2.1	8.8	5.3	24.7

Tree 27 Deformed Top in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill | Treatment: Thinned/Burned | Measured By: 1990 Joe, Domingo, Mary
Measured By: 1994 Ganz
Block: A | Plot # : 2 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Ricchiazzi

		1990 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
17	GS	11.9	100.0	12.2	102.0	35.3	151.6	39.1	161.8
18	GS	***	***	***	***	***	***	***	***
19	GS	20.7	105.0	21.5	127.0	24.5	130.6	26.8	140.0
20	GS	34.5	145.0	35.8	154.0	39.4	158.7	42.3	166.4
21	GS	32.0	140.0	33.0	143.0	38.1	148.0	43.0	155.7
22	GS	35.7	141.0	36.9	158.0	40.3	159.3	44.0	166.2
23	GS	29.4	140.0	31.8	156.0	***	***	***	***
24	GS	***	***	***	***	22.4	125.0	24.9	132.1
25	GS	***	***	***	***	9.4	69.5	9.8	70.4
26	GS	***	***	***	***	***	***	7.6	***
AVG.		27.4	128.5	28.5	140.0	29.9	134.7	29.7	141.8

2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

		Change 1990-1994		Change 1994-2001		Change 1990-2001		Change 1994-2009		Change 2001-2009		Change 1990-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
17	GS	0.3	2.0	23.1	49.6	23.4	51.6	26.9	59.8	3.8	10.2	27.2	61.8
18	GS	***	***	***	***	***	***	***	***	***	***	***	***
19	GS	0.8	22.0	3.0	3.6	3.8	25.6	5.3	13.0	2.3	9.4	6.1	35.0
20	GS	1.3	9.0	3.6	4.7	4.9	13.7	6.5	12.4	2.9	7.7	7.8	21.4
21	GS	1.0	3.0	5.1	5.0	6.1	8.0	10.0	12.7	4.9	7.7	11.0	15.7
22	GS	1.2	17.0	3.4	1.3	4.6	18.3	7.1	8.2	3.7	6.9	8.3	25.2
23	GS	2.4	16.0	***	***	***	***	***	***	***	***	***	***
24	GS	***	***	***	***	***	***	***	***	2.5	7.1	***	***
25	GS	***	***	***	***	***	***	***	***	0.4	0.9	***	***
26	GS	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		1.17	11.50	7.64	12.84	8.56	23.44	11.16	21.22	2.93	7.13	12.08	31.82

Tree	18	Dead 1994. No plot center stake. Reestablished as close as possible. Tree #18 is dead/down in 2001
Tree	23	There was no tree alive or dead in plot that was the size reported in 1994 that could have been #23. Missing in 2001,2009
Tree	24	With the new plot center another tree was added to become a new tree #24 in 2001
Tree	25	Not previously measured in 1989 or 1994
Tree	26	Dead/Standing in 2009, not previously measured in 1994 or 2001.

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill | Treatment: Thinned | Measured By: 1990 Joe, Sandy, Mary
Measured By: 1994 Ganz
Block: B | Plot # : 1 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Ricchiazzi

		1990 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	23.8	110.0	24.6	112.0	27.0	122.9	29.3	128.2
2	GS	29.4	129.0	30.4	132.0	33.8	129.7	34.6	142.8
3	GS	46.3	159.0	47.6	164.0	51.2	168.2	52.3	178.0
4	GS	29.5	119.0	30.4	128.0	33.3	136.7	35.6	147.7
5	GS	32.4	132.0	33.8	141.0	37.3	152.5	40.8	163.5
6	GS	27.1	132.0	28.3	134.0	31.0	148.3	33.7	161.9
7	GS	26.0	124.0	27.1	130.0	29.8	135.9	32.4	143.4
8	GS	30.6	127.0	32.7	135.0	36.2	140.4	37.8	149.0
AVG.		30.6	129.0	31.9	134.5	35.0	141.8	37.1	151.8

2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	0.8	2.0	2.4	10.9	3.2	12.9	4.7	16.2	2.3	5.3	5.5	18.2
2	GS	1.0	3.0	3.4	-2.3	4.4	0.7	4.2	10.8	0.8	13.1	5.2	13.8
3	GS	1.3	5.0	3.6	4.2	4.9	9.2	4.7	14.0	1.1	9.8	6.0	19.0
4	GS	0.9	9.0	2.9	8.7	3.8	17.7	5.2	19.7	2.3	11.0	6.1	28.7
5	GS	1.4	9.0	3.5	11.5	4.9	20.5	7.0	22.5	3.5	11.0	8.4	31.5
6	GS	1.2	2.0	2.7	14.3	3.9	16.3	5.4	27.9	2.7	13.6	6.6	29.9
7	GS	1.1	6.0	2.7	5.9	3.8	11.9	5.3	13.4	2.6	7.5	6.4	19.4
8	GS	2.1	8.0	3.5	5.4	5.6	13.4	5.1	14.0	1.6	8.6	7.2	22.0
AVG.		1.2	5.5	3.1	7.3	4.3	12.8	5.2	17.3	2.1	10.0	6.4	22.8

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill | Treatment: Thinned/Burned | Measured By: 1990 Joe, Sandy, Mary
Measured By: 1994 Ganz
Block: B | Plot # : 2 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Ricchiazzi

		1990 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
9	GS	23.5	112.0	25.1	119.0	27.5	119.6	29.5	129.1
10	GS	31.8	115.0	32.4	120.0	33.8	124.2	35.3	125.5
11	GS	22.5	120.0	23.1	127.0	25.8	129.5	28.2	142.5
12	GS	24.1	124.0	25.2	130.0	27.4	132.0	29.6	146.1
13	GS	35.4	133.0	36.1	138.0	38.7	139.6	40.9	151.1
14	GS	14.6	100.0	15.6	101.0	17.3	103.4	18.6	107.5
15	GS	***	***	***	***	29.1	126.1	31.8	140.7
16	GS	25.5	120.0	26.7	129.0	27.3	137.0	29.7	157.5
17	GS	***	***	***	***	14.6	66.8	17.1	80.9
18	GS	***	***	***	***	35.7	128.9	35.8	137.3
AVG.		25.3	117.7	26.3	123.4	27.7	120.7	29.7	131.8

2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
9	GS	1.6	7.0	2.4	0.6	4.0	7.6	4.4	10.1	2.0	9.5	6.0	17.1
10	GS	0.6	5.0	1.4	4.2	2.0	9.2	2.9	5.5	1.5	1.3	3.5	10.5
11	GS	0.6	7.0	2.7	2.5	3.3	9.5	5.1	15.5	2.4	13.0	5.7	22.5
12	GS	1.1	6.0	2.2	2.0	3.3	8.0	4.4	16.1	2.2	14.1	5.5	22.1
13	GS	0.7	5.0	2.6	1.6	3.3	6.6	4.8	13.1	2.2	11.5	5.5	18.1
14	GS	1.0	1.0	1.7	2.4	2.7	3.4	3.0	6.5	1.3	4.1	4.0	7.5
15	GS	***	***	***	***	***	***	***	***	2.7	14.6	***	***
16	GS	1.2	9.0	0.6	8.0	1.8	17.0	3.0	28.5	2.4	20.5	4.2	37.5
17	GS	***	***	***	***	***	***	***	***	2.5	14.1	***	***
18	GS	***	***	***	***	***	***	***	***	0.1	8.4	***	***
AVG.		1.0	5.7	1.9	3.0	2.9	8.8	3.9	13.6	1.9	11.1	4.9	19.3

Tree	15	Missing in 1989,1994
Tree	12	Previously measured but is out of plot at 43.5 feet from plot center.
Tree	17,18	Not previously measured but clearly in plot and added to data.
Tree	10	Deformed Top in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill | Treatment: Control | Measured By: 1990 Joe, Domingo, Mary
Measured By: 1994 Ganz
Block: C | Plot # : 1 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	WF	1.5	8.0	1.9	9.0	2.2	10.8	2.5	12.3
2	WF	32.4	144.0	32.4	145.0	36.0	149.4	37.6	165.6
3	WF	7.8	42.0	8.3	43.0	8.8	44.4	9.2	48.8
4	WF	3.1	15.0	3.3	16.0	***	***	***	***
69	GS	32.5	134.0	33.4	162.0	34.2	151.9	35.9	165.5
70	GS	14.6	80.0	14.9	80.0	14.9	82.5	14.8	79.8
71	GS	32.2	149.0	32.9	150.0	34.5	155.2	36.5	181.0
72	GS	19.7	81.0	20.0	82.0	20.7	80.8	21.0	88.1
73	WF	3.5	15.0	3.9	17.0	4.3	20.7	4.6	23.0
74	WF	5.8	25.0	6.0	26.0	6.2	38.3	6.4	42.7
75	GS	33.0	149.0	33.6	152.0	35.2	156.4	36.7	173.3
76	GS	***	***	***	***	23.9	***	23.3	***
77	GS	46.4	158.0	47.5	159.0	48.3	173.8	51.9	190.8
78	GS	***	***	***	***	24.5	***	25.0	***
79	GS	19.2	103.0	19.8	116.0	20.3	115.0	20.8	117.3
80	GS	7.1	47.0	7.1	51.0	7.1	53.5	7.0	***
81	GS	***	***	***	***	7.3	***	7.1	***
82	GS	***	***	***	***	***	***	5.2	***
83	GS	***	***	***	***	***	***	8.4	***
84	GS	***	***	***	***	***	***	***	***
85	GS	17.0	120.0	17.2	129.0	17.8	123.5	17.8	131.3
86	GS	9.9	33.0	10.1	33.0	9.7	36.0	9.4	***
87	GS	14.5	58.0	14.5	58.0	14.7	59.3	15.0	67.2
88	GS	17.3	148.0	18.1	151.0	18.4	140.6	19.4	137.6
89	GS	15.6	66.0	15.8	72.0	15.7	58.3	15.5	70.5
90	WF	5.8	40.0	6.0	40.0	6.3	46.2	6.6	48.5
91	WF	3.7	18.0	3.9	19.0	***	***	***	***
92	WF	4.8	32.0	5.8	32.0	***	***	***	***
93	WF	4.9	34.0	5.3	36.0	6.1	40.2	6.1	40.9
94	WF	5.1	25.0	5.5	27.0	5.6	26.0	5.5	***
95	GS	***	***	33.5	40.0	33.8	45.0	33.8	88.0
96	WF	5.6	35.0	6.1	36.0	6.2	37.5	6.5	39.7
97	WF	2.1	9.0	2.1	9.0	***	***	***	***
98	WF	3.5	10.0	3.6	10.0	3.7	12.1	4.2	12.9
99	GS	52.5	165.0	54.1	175.0	56.8	182.8	60.0	191.5
100	WF	12.7	64.0	13.5	69.0	14.2	76.9	14.7	83.3
102	GS	***	***	***	***	***	***	28.5	176.2
103	GS	***	***	***	***	***	***	8.5	***
AVG.		15.0	69.2	16.0	71.5	18.5	81.4	18.3	99.0

Trees 76,78,81,82,83,84 Dead in 1994, no values. Roller 2004 thesis has values for 1994: #81-DBH 7.4; #82-DBH 5.6; #83-DBH 8.8; #84-DBH 25.7
Tree 95 Broken top in 1994, no values. Roller 2004 thesis has values for 1994: #95-DBH 33.5,Ht 40.0
Trees 76,78,81 Dead/Standing in 2001

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill	Treatment: Control	Measured By:	1990	Joe, Domingo, Mary
		Measured By:	1994	Ganz
Block: C	Plot # : 1	Measured By:	2001	Roller, McLoed
		Measured By:	2009	Soderlund, Ricchiazzi

Trees	4,91,92,97	Dead/missing in 2001
Trees	94,98	Deformed/broken top in 2001
Tree	89	Forked top-height taken at highest fork in 2001,2009
Trees	80,82,83,86,94	Dead/Standing in 2009
Tree	84	Dead/Missing in 2009
Trees	72,73	Deformed top in 2009
Tree	70	Deformed/ broken top in 2009
Tree	85	2 trees or 1 tree? If 2 trees - # 85 dbh 17.8 and if 1 tree dbh 37.7
Trees	88,89	Bark growing together so diameter measured 2in above dbh in 2009
Tree	103	Dead/Standing in 2009, no data in 1989, 1994 or 2001
Tree	102	New tree #102 in 2009, no data in 1989, 1994 or 2001
		tree is behind #85 at 34.2ft from plot center

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill | Treatment: Control | Measured By: 1990 Joe, Domingo, Mary
Measured By: 1994 Ganz
Block: C | Plot # : 1 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	WF	0.4	1.0	0.3	1.8	0.7	2.8	0.6	3.3	0.3	1.5	1.0	4.3
2	WF	0.0	1.0	3.6	4.4	3.6	5.4	5.2	20.6	1.6	16.2	5.2	21.6
3	WF	0.5	1.0	0.5	1.4	1.0	2.4	0.9	5.8	0.4	4.4	1.4	6.8
4	WF	0.2	1.0	***	***	***	***	***	***	***	***	***	***
69	GS	0.9	28.0	0.8	-10.1	1.7	17.9	2.5	3.5	1.7	13.6	3.4	31.5
70	GS	0.3	0.0	0.0	2.5	0.3	2.5	-0.1	-0.2	-0.1	-2.7	0.2	-0.2
71	GS	0.7	1.0	1.6	5.2	2.3	6.2	3.6	31.0	2.0	25.8	4.3	32.0
72	GS	0.3	1.0	0.7	-1.2	1.0	-0.2	1.0	6.1	0.3	7.3	1.3	7.1
73	WF	0.4	2.0	0.4	3.7	0.8	5.7	0.7	6.0	0.3	2.3	1.1	8.0
74	WF	0.2	1.0	0.2	12.3	0.4	13.3	0.4	16.7	0.2	4.4	0.6	17.7
75	GS	0.6	3.0	1.6	4.4	2.2	7.4	3.1	21.3	1.5	16.9	3.7	24.3
76	GS	***	***	***	***	***	***	***	***	-0.6	***	***	***
77	GS	1.1	1.0	0.8	14.8	1.9	15.8	4.4	31.8	3.6	17.0	5.5	32.8
78	GS	***	***	***	***	***	***	***	***	0.5	***	***	***
79	GS	0.6	13.0	0.5	-1.0	1.1	12.0	1.0	1.3	0.5	2.3	1.6	14.3
80	GS	0.0	4.0	0.0	2.5	0.0	6.5	-0.1	***	-0.1	***	-0.1	***
81	GS	***	***	***	***	***	***	***	***	-0.2	***	***	***
82	GS	***	***	***	***	***	***	***	***	***	***	***	***
83	GS	***	***	***	***	***	***	***	***	***	***	***	***
84	GS	***	***	***	***	***	***	***	***	***	***	***	***
85	GS	0.2	9.0	0.6	-5.5	0.8	3.5	0.6	2.3	0.0	7.8	0.8	11.3
86	GS	0.2	0.0	-0.4	3.0	-0.2	3.0	-0.7	***	-0.3	***	-0.5	***
87	GS	0.0	0.0	0.2	1.3	0.2	1.3	0.5	9.2	0.3	7.9	0.5	9.2
88	GS	0.8	3.0	0.3	-10.4	1.1	-7.4	1.3	-13.4	1.0	-3.0	2.1	-10.4
89	GS	0.2	6.0	-0.1	-13.7	0.1	-7.7	-0.3	-1.5	-0.2	12.2	-0.1	4.5
90	WF	0.2	0.0	0.3	6.2	0.5	6.2	0.6	8.5	0.3	2.3	0.8	8.5
91	WF	0.2	1.0	***	***	***	***	***	***	***	***	***	***
92	WF	1.0	0.0	***	***	***	***	***	***	***	***	***	***
93	WF	0.4	2.0	0.8	4.2	1.2	6.2	0.8	4.9	0.0	0.7	1.2	6.9
94	WF	0.4	2.0	0.1	-1.0	0.5	1.0	0.0	***	-0.1	***	0.4	***
95	GS	***	***	0.3	5.0	***	***	0.3	48.0	0.0	43.0	***	***
96	WF	0.5	1.0	0.1	1.5	0.6	2.5	0.4	3.7	0.3	2.2	0.9	4.7
97	WF	0.0	0.0	***	***	***	***	***	***	***	***	***	***
98	WF	0.1	0.0	0.1	2.1	0.2	2.1	0.6	2.9	0.5	0.8	0.7	2.9
99	GS	1.6	10.0	2.7	7.8	4.3	17.8	5.9	16.5	3.2	8.7	7.5	26.5
100	WF	0.8	5.0	0.7	7.9	1.5	12.9	1.2	14.3	0.5	6.4	2.0	19.3
102	GS	***	***	***	***	***	***	***	***	***	***	***	***
103	GS	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		0.4	3.3	0.6	1.9	1.1	5.6	1.3	10.5	0.6	8.6	1.8	12.9

Trees 76,78,81,82,83,84 Dead in 1994, no values. Roller 2004 thesis has values for 1994: #81-DBH 7.4; #82-DBH 5.6; #83-DBH 8.8; #84-DBH 25.7

Tree 95 Broken top in 1994

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill	Treatment: Control	Measured By:	1990 Joe, Domingo, Mary
		Measured By:	1994 Ganz
Block: C	Plot # : 1	Measured By:	2001 Roller, McLoed
		Measured By:	2009 Soderlund, Ricchiazzi

Trees	76,78,81	Dead/Standing in 2001
Trees	4,91,92,97	Dead/missing in 2001
Trees	94,98	Deformed/broken top in 2001
Tree	89	Forked top-height taken at highest fork in 2001,2009
Trees	80,82,83,86,94	Dead/Standing in 2009
Tree	84	Dead/Missing in 2009
Trees	72,73	Deformed top in 2009
Tree	70	Deformed/ broken top in 2009
Tree	85	2 trees or 1 tree? If 2 trees - # 85 dbh 17.8 and if 1 tree dbh 37.7
Trees	88,89	Bark growing together so diameter measured 2in above dbh in 2009
Tree	103	Dead/Standing in 2009, no data in 1989, 1994 or 2001
Tree	102	New tree #102 in 2009, no data in 1989, 1994 or 2001
		tree is behind #85 at 34.2ft from plot center

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill	Treatment: Control	Measured By:	1989 Bates, Masser, Johannis
		Measured By:	1994 ???
Block: C	Plot # : 2	Measured By:	2001 Roller, McLoed
		Measured By:	2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	WF	2.1	8.0	2.5	10.0	3.0	13.6	3.6	15.9
2	WF	2.5	10.0	2.6	11.0	2.6	15.5	3.0	15.1
3	GS	29.0	141.0	30.2	144.0	31.5	150.5	33.8	165.8
4	WF	3.8	12.0	3.9	13.0	3.9	15.9	4.0	17.3
5	GS	21.7	140.0	22.4	142.0	23.3	148.9	23.9	155.3
6	GS	32.3	123.0	33.1	126.0	34.6	139.2	36.2	148.5
7	GS	25.1	119.0	26.2	122.0	27.4	127.0	28.3	138.0
8	GS	34.9	133.0	35.5	146.0	38.1	141.8	39.2	153.7
9	WF	7.5	24.0	7.7	31.0	8.0	26.7	8.1	27.2
10	GS	14.7	63.0	15.3	66.0	15.8	63.2	16.3	66.9
11	GS	13.4	41.0	13.9	41.0	14.6	42.6	15.4	69.4
12	WF	4.9	15.0	6.1	16.0	7.0	17.1	7.4	19.0
13	GS	9.7	82.0	9.7	82.0	9.8	74.5	9.7	81.3
14	GS	14.2	94.0	14.4	104.0	14.8	93.1	14.8	106.0
15	GS	8.7	63.0	9.0	65.0	9.1	60.4	9.3	65.1
16	GS	16.1	84.0	16.8	87.0	17.2	84.0	16.7	92.3
17	GS	8.3	64.0	8.4	65.0	8.6	59.9	8.5	67.4
18	GS	15.2	75.0	15.4	80.0	15.8	73.0	15.6	77.9
19	GS	19.0	60.0	19.0	64.0	19.5	58.8	19.2	61.8
20	GS	8.1	62.0	8.1	62.0	8.1	78.2	7.8	69.8
21	GS	7.9	29.0	8.0	59.0	8.0	29.8	7.8	29.1
22	GS	5.0	21.0	5.1	24.0	5.1	21.8	5.0	21.6
23	GS	12.3	70.0	12.3	76.0	12.4	75.1	12.2	65.2
24	GS	25.8	122.0	26.9	125.0	28.1	136.7	29.9	145.9
25	GS	32.3	118.0	33.7	121.0	35.5	142.2	38.1	155.5
26	GS	11.3	46.0	11.7	48.0	12.0	51.7	11.9	55.8
27	GS	5.8	34.0	5.8	38.0	5.9	31.5	5.7	***
28	GS	20.7	109.0	21.8	128.0	23.3	143.3	24.6	150.8
29	GS	11.6	60.0	12.0	64.0	12.2	59.4	12.6	64.2
30	GS	3.6	18.0	3.6	18.0	3.6	18.7	3.6	18.9
31	GS	10.8	60.0	11.1	79.0	11.4	60.8	11.3	67.0
32	GS	7.1	38.0	7.1	48.0	7.2	45.7	7.0	42.3
33	GS	9.4	39.0	9.5	40.0	9.5	47.2	9.3	42.9
34	GS	20.5	105.0	21.8	108.0	22.4	128.9	23.4	140.3
35	WF	2.8	13.0	3.1	14.0	3.3	17.2	4.6	17.7
36	GS	***	***	***	***	9.4	35.4	9.3	37.5
37	GS	25.1	104.0	26.6	106.0	28.7	120.6	29.9	136.9
38	GS	5.7	27.0	5.8	27.0	6.0	32.2	5.8	28.7
39	GS	7.6	32.0	8.0	33.0	8.3	35.3	8.5	35.2
40	GS	22.5	114.0	23.4	117.0	25.0	157.9	26.6	163.7
41	GS	37.6	147.0	38.9	149.0	42.2	162.4	43.7	175.0
42	GS	1.8	6.0	1.9	7.0	2.0	9.1	2.0	7.9
43	GS	24.4	121.0	25.3	124.0	26.1	142.9	26.5	156.0
44	GS	12.1	46.0	12.6	48.0	13.1	48.9	13.3	49.9

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill	Treatment: Control	Measured By:	1989 Bates, Masser, Johannis
		Measured By:	1994 ???
Block: C	Plot # : 2	Measured By:	2001 Roller, McLoed
		Measured By:	2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
45	WF	1.0	7.0	2.0	9.0	2.1	11.6	3.7	12.8
46	GS	17.7	128.0	18.2	135.0	18.8	141.1	19.5	153.5
47	GS	11.1	70.0	11.2	78.0	12.4	83.3	11.4	76.2
48	GS	4.5	14.0	4.5	15.0	4.5	13.7	4.5	13.9
49	GS	37.1	136.0	37.3	139.0	40.0	151.1	42.0	170.8
50	GS	25.9	143.0	26.7	147.0	28.2	154.4	28.8	148.6
51	GS	20.6	122.0	20.9	126.0	21.2	133.9	21.1	133.4
52	GS	***	***	***	***	***	***	***	***
53	GS	33.6	140.0	34.4	143.0	36.0	174.6	37.6	181.2
54	GS	25.9	143.0	26.5	158.0	27.3	154.4	27.6	158.5
55	GS	17.5	146.0	17.6	147.0	17.6	134.5	17.4	127.8
56	GS	12.1	60.0	12.1	66.0	12.5	70.0	12.3	57.2
57	GS	33.1	160.0	34.2	161.0	36.1	176.5	36.7	186.7
58	GS	9.6	76.0	9.9	78.0	9.7	92.0	9.5	88.7
59	GS	30.5	149.0	31.5	168.0	33.0	192.1	34.3	173.4
60	GS	15.1	104.0	15.5	117.0	16.5	119.9	15.6	107.6
61	GS	***	***	***	***	***	***	***	***
62	GS	30.4	134.0	31.3	137.0	32.5	157.5	34.1	164.6
63	GS	17.0	68.0	17.0	68.0	17.3	69.6	17.1	***
64	GS	12.0	62.0	12.1	63.0	12.0	63.6	11.9	65.2
65	GS	32.9	145.0	33.3	147.0	34.1	160.0	35.9	164.1
66	GS	34.1	150.0	35.2	158.0	36.7	173.3	38.3	175.2
67	GS	***	***	***	***	***	***	***	***
68	GS	***	***	***	***	***	***	***	***
69	WF	***	***	***	***	1.4	8.7	2.0	11.4
70	WF	***	***	***	***	1.1	7.0	2.7	8.8
71	WF	***	***	***	***	1.0	9.1	1.4	10.8
72	WF	***	***	***	***	***	***	1.6	10.1
73	GS	***	***	***	***	***	***	2.7	***
74	GS	***	***	***	***	***	***	1.9	***
AVG.		16.5	80.1	16.9	84.7	16.8	84.9	16.6	88.2

Trees	36,52,61,67,68	Dead in 1994
Trees	9,10,18,21,36,42,48,63	Broken top in 2001
Tree	19,22,32	Bowed/Deformed in 2001
Tree	36	Is Alive/broken top in 2001
Tree	54	Forked Top in 2001
Tree	69,70,71	Ingrowth in 2001
Trees	9,16,20,50,51,64	Broken top in 2009
Trees	27,63	Dead/Standing in 2009
Trees	18,23,33,47,55,58,59,60	Deformed top in 2009
Tree	48	Dead top in 2009
Tree	56	Broken/Dead top in 2009
Tree	72	Ingrowth in 2009
Trees	73,74	Dead/Standing in 2009, not recorded in 1994 or 2001 data

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill | Treatment: Control | Measured By: 1989 Bates, Masser, Johannis
Measured By: 1994 ???
Block: C | Plot # : 2 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	WF	0.4	2.0	0.5	3.6	0.9	5.6	1.1	5.9	0.6	2.3	1.5	7.9
2	WF	0.1	1.0	0.0	4.5	0.1	5.5	0.4	4.1	0.4	-0.4	0.5	5.1
3	GS	1.2	3.0	1.3	6.5	2.5	9.5	3.6	21.8	2.3	15.3	4.8	24.8
4	WF	0.1	1.0	0.0	2.9	0.1	3.9	0.1	4.3	0.1	1.4	0.2	5.3
5	GS	0.7	2.0	0.9	6.9	1.6	8.9	1.5	13.3	0.6	6.4	2.2	15.3
6	GS	0.8	3.0	1.5	13.2	2.3	16.2	3.1	22.5	1.6	9.3	3.9	25.5
7	GS	1.1	3.0	1.2	5.0	2.3	8.0	2.1	16.0	0.9	11.0	3.2	19.0
8	GS	0.6	13.0	2.6	-4.2	3.2	8.8	3.7	7.7	1.1	11.9	4.3	20.7
9	WF	0.2	7.0	0.3	-4.3	0.5	2.7	0.4	-3.8	0.1	0.5	0.6	3.2
10	GS	0.6	3.0	0.5	-2.8	1.1	0.2	1.0	0.9	0.5	3.7	1.6	3.9
11	GS	0.5	0.0	0.7	1.6	1.2	1.6	1.5	28.4	0.8	26.8	2.0	28.4
12	WF	1.2	1.0	0.9	1.1	2.1	2.1	1.3	3.0	0.4	1.9	2.5	4.0
13	GS	0.0	0.0	0.1	-7.5	0.1	-7.5	0.0	-0.7	-0.1	6.8	0.0	-0.7
14	GS	0.2	10.0	0.4	-10.9	0.6	-0.9	0.4	2.0	0.0	12.9	0.6	12.0
15	GS	0.3	2.0	0.1	-4.6	0.4	-2.6	0.3	0.1	0.2	4.7	0.6	2.1
16	GS	0.7	3.0	0.4	-3.0	1.1	0.0	-0.1	5.3	-0.5	8.3	0.6	8.3
17	GS	0.1	1.0	0.2	-5.1	0.3	-4.1	0.1	2.4	-0.1	7.5	0.2	3.4
18	GS	0.2	5.0	0.4	-7.0	0.6	-2.0	0.2	-2.1	-0.2	4.9	0.4	2.9
19	GS	0.0	4.0	0.5	-5.2	0.5	-1.2	0.2	-2.2	-0.3	3.0	0.2	1.8
20	GS	0.0	0.0	0.0	16.2	0.0	16.2	-0.3	7.8	-0.3	-8.4	-0.3	7.8
21	GS	0.1	30.0	0.0	-29.2	0.1	0.8	-0.2	-29.9	-0.2	-0.7	-0.1	0.1
22	GS	0.1	3.0	0.0	-2.2	0.1	0.8	-0.1	-2.4	-0.1	-0.2	0.0	0.6
23	GS	0.0	6.0	0.1	-0.9	0.1	5.1	-0.1	-10.8	-0.2	-9.9	-0.1	-4.8
24	GS	1.1	3.0	1.2	11.7	2.3	14.7	3.0	20.9	1.8	9.2	4.1	23.9
25	GS	1.4	3.0	1.8	21.2	3.2	24.2	4.4	34.5	2.6	13.3	5.8	37.5
26	GS	0.4	2.0	0.3	3.7	0.7	5.7	0.2	7.8	-0.1	4.1	0.6	9.8
27	GS	0.0	4.0	0.1	-6.5	0.1	-2.5	-0.1	***	-0.2	***	-0.1	***
28	GS	1.1	19.0	1.5	15.3	2.6	34.3	2.8	22.8	1.3	7.5	3.9	41.8
29	GS	0.4	4.0	0.2	-4.6	0.6	-0.6	0.6	0.2	0.4	4.8	1.0	4.2
30	GS	0.0	0.0	0.0	0.7	0.0	0.7	0.0	0.9	0.0	0.2	0.0	0.9
31	GS	0.3	19.0	0.3	-18.2	0.6	0.8	0.2	-12.0	-0.1	6.2	0.5	7.0
32	GS	0.0	10.0	0.1	-2.3	0.1	7.7	-0.1	-5.7	-0.2	-3.4	-0.1	4.3
33	GS	0.1	1.0	0.0	7.2	0.1	8.2	-0.2	2.9	-0.2	-4.3	-0.1	3.9
34	GS	1.3	3.0	0.6	20.9	1.9	23.9	1.6	32.3	1.0	11.4	2.9	35.3
35	WF	0.3	1.0	0.2	3.2	0.5	4.2	1.5	3.7	1.3	0.5	1.8	4.7
36	GS	***	***	***	***	***	***	***	***	-0.1	2.1	***	***
37	GS	1.5	2.0	2.1	14.6	3.6	16.6	3.3	30.9	1.2	16.3	4.8	32.9
38	GS	0.1	0.0	0.2	5.2	0.3	5.2	0.0	1.7	-0.2	-3.5	0.1	1.7
39	GS	0.4	1.0	0.3	2.3	0.7	3.3	0.5	2.2	0.2	-0.1	0.9	3.2
40	GS	0.9	3.0	1.6	40.9	2.5	43.9	3.2	46.7	1.6	5.8	4.1	49.7
41	GS	1.3	2.0	3.3	13.4	4.6	15.4	4.8	26.0	1.5	12.6	6.1	28.0
42	GS	0.1	1.0	0.1	2.1	0.2	3.1	0.1	0.9	0.0	-1.2	0.2	1.9
43	GS	0.9	3.0	0.8	18.9	1.7	21.9	1.2	32.0	0.4	13.1	2.1	35.0
44	GS	0.5	2.0	0.5	0.9	1.0	2.9	0.7	1.9	0.2	1.0	1.2	3.9

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Frasier Mill　　Treatment: Control　　Measured By: 1989 Bates, Masser, Johannis
Measured By: 1994 ???
Block: C　　Plot # : 2　　Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
45	WF	1.0	2.0	0.1	2.6	1.1	4.6	1.7	3.8	1.6	1.2	2.7	5.8
46	GS	0.5	7.0	0.6	6.1	1.1	13.1	1.3	18.5	0.7	12.4	1.8	25.5
47	GS	0.1	8.0	1.2	5.3	1.3	13.3	0.2	-1.8	-1.0	-7.1	0.3	6.2
48	GS	0.0	1.0	0.0	-1.3	0.0	-0.3	0.0	-1.1	0.0	0.2	0.0	-0.1
49	GS	0.2	3.0	2.7	12.1	2.9	15.1	4.7	31.8	2.0	19.7	4.9	34.8
50	GS	0.8	4.0	1.5	7.4	2.3	11.4	2.1	1.6	0.6	-5.8	2.9	5.6
51	GS	0.3	4.0	0.3	7.9	0.6	11.9	0.2	7.4	-0.1	-0.5	0.5	11.4
52	GS	***	***	***	***	***	***	***	***	***	***	***	***
53	GS	0.8	3.0	1.6	31.6	2.4	34.6	3.2	38.2	1.6	6.6	4.0	41.2
54	GS	0.6	15.0	0.8	-3.6	1.4	11.4	1.1	0.5	0.3	4.1	1.7	15.5
55	GS	0.1	1.0	0.0	-12.5	0.1	-11.5	-0.2	-19.2	-0.2	-6.7	-0.1	-18.2
56	GS	0.0	6.0	0.4	4.0	0.4	10.0	0.2	-8.8	-0.2	-12.8	0.2	-2.8
57	GS	1.1	1.0	1.9	15.5	3.0	16.5	2.5	25.7	0.6	10.2	3.6	26.7
58	GS	0.3	2.0	-0.2	14.0	0.1	16.0	-0.4	10.7	-0.2	-3.3	-0.1	12.7
59	GS	1.0	19.0	1.5	24.1	2.5	43.1	2.8	5.4	1.3	-18.7	3.8	24.4
60	GS	0.4	13.0	1.0	2.9	1.4	15.9	0.1	-9.4	-0.9	-12.3	0.5	3.6
61	GS	***	***	***	***	***	***	***	***	***	***	***	***
62	GS	0.9	3.0	1.2	20.5	2.1	23.5	2.8	27.6	1.6	7.1	3.7	30.6
63	GS	0.0	0.0	0.3	1.6	0.3	1.6	0.1	***	-0.2	***	0.1	***
64	GS	0.1	1.0	-0.1	0.6	0.0	1.6	-0.2	2.2	-0.1	1.6	-0.1	3.2
65	GS	0.4	2.0	0.8	13.0	1.2	15.0	2.6	17.1	1.8	4.1	3.0	19.1
66	GS	1.1	8.0	1.5	15.3	2.6	23.3	3.1	17.2	1.6	1.9	4.2	25.2
67	GS	***	***	***	***	***	***	***	***	***	***	***	***
68	GS	***	***	***	***	***	***	***	***	***	***	***	***
69	WF	***	***	***	***	***	***	***	***	0.6	2.7	***	***
70	WF	***	***	***	***	***	***	***	***	1.6	1.8	***	***
71	WF	***	***	***	***	***	***	***	***	0.4	1.7	***	***
72	WF	***	***	***	***	***	***	***	***	***	***	***	***
73	GS	***	***	***	***	***	***	***	***	***	***	***	***
74	GS	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		0.5	4.6	0.7	4.6	1.2	9.2	1.2	8.4	0.5	3.4	1.7	13.1

Trees	36,52,61,67,68	Dead in 1994
Trees	9,10,18,21,36,42,48,63	Broken top in 2001
Tree	19,22,32	Bowed/Deformed in 2001
Tree	36	Is Alive/broken top in 2001
Tree	54	Forked Top in 2001
Tree	69,70,71	Ingrowth in 2001
Trees	9,16,20,50,51,64	Broken top in 2009
Trees	27,63	Dead/Standing in 2009
Trees	18,23,33,47,55,58,59,60	Deformed top in 2009
Tree	48	Dead top in 2009
Tree	56	Broken/Dead top in 2009
Tree	72	Ingrowth in 2009
Trees	73,74	Dead/Standing in 2009, not recorded in 1994 or 2001 data

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Headquarters	Treatment: Thinned	Measured By:	1989 ???
		Measured By:	1994 Ganz
Block: A	Plot # : 1	Measured By:	2001 Roller, Kong
		Measured By:	2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
11	GS	33.7	112.0	37.5	126.0	41.8	136.8	50.5	145.5
12	GS	24.4	103.0	27.0	115.0	33.1	128.8	39.1	145.2
13	GS	25.3	103.0	28.6	119.0	33.3	133.6	39.0	139.6
14	IC	3.3	14.0	3.8	15.0	4.5	18.6	5.2	22.2
15	GS	24.4	98.0	26.8	112.0	30.4	116.1	33.7	130.4
16	IC	0.3	5.0	0.9	8.0	2.5	13.0	3.9	22.6
17	GS	0.8	8.0	1.3	8.0	1.7	10.9	2.4	15.4
18	GS	23.4	113.0	26.9	123.0	30.1	141.2	35.2	156.3
19	IC	***	***	***	***	1.5	9.1	2.5	13.7
20	IC	***	***	***	***	1.3	9.1	2.4	14.2
21	WF	***	***	***	***	1.8	11.4	4.1	16.5
22	GS	***	***	***	***	29.7	149.0	35.1	144.8
23	IC	***	***	***	***	***	***	2.9	15.3
24	WF	***	***	***	***	***	***	1.3	9.0
25	WF	***	***	***	***	***	***	1.4	10.2
26	WF	***	***	***	***	***	***	2.1	11.9
27	WF	***	***	***	***	***	***	1.4	8.8
28	WF	***	***	***	***	***	***	2.4	13.4
AVG.		17.0	69.5	19.1	78.3	17.6	73.1	14.7	57.5

Trees	19,20,21	Ingrowth in 2001
Tree	22	Not previously measured in 1989 or 1994. Measured in 2001
Trees	23,24,25,26,27,28	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Headquarters | Treatment: Thinned | Measured By: 1989 ???
Measured By: 1994 Ganz
Block: A | Plot # : 1 | Measured By: 2001 Roller, Kong
Measured By: 2009 Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
11	GS	3.8	14.0	4.3	10.8	8.1	24.8	13.0	19.5	8.7	8.7	16.8	33.5
12	GS	2.6	12.0	6.1	13.8	8.7	25.8	12.1	30.2	6.0	16.4	14.7	42.2
13	GS	3.3	16.0	4.7	14.6	8.0	30.6	10.4	20.6	5.7	6.0	13.7	36.6
14	IC	0.5	1.0	0.7	3.6	1.2	4.6	1.4	7.2	0.7	3.6	1.9	8.2
15	GS	2.4	14.0	3.6	4.1	6.0	18.1	6.9	18.4	3.3	14.3	9.3	32.4
16	IC	0.6	3.0	1.6	5.0	2.2	8.0	3.0	14.6	1.4	9.6	3.6	17.6
17	GS	0.5	0.0	0.4	2.9	0.9	2.9	1.1	7.4	0.7	4.5	1.6	7.4
18	GS	3.5	10.0	3.2	18.2	6.7	28.2	8.3	33.3	5.1	15.1	11.8	43.3
19	IC	***	***	***	***	***	***	***	***	1.0	4.6	***	***
20	IC	***	***	***	***	***	***	***	***	1.1	5.1	***	***
21	WF	***	***	***	***	***	***	***	***	2.3	5.1	***	***
22	GS	***	***	***	***	***	***	***	***	5.4	-4.2	***	***
23	IC	***	***	***	***	***	***	***	***	***	***	***	***
24	WF	***	***	***	***	***	***	***	***	***	***	***	***
25	WF	***	***	***	***	***	***	***	***	***	***	***	***
26	WF	***	***	***	***	***	***	***	***	***	***	***	***
27	WF	***	***	***	***	***	***	***	***	***	***	***	***
28	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		2.2	8.8	3.1	9.1	5.2	17.9	7.0	18.9	3.5	7.4	9.2	27.7

Trees	19,20,21	Ingrowth in 2001
Tree	22	Not previously measured in 1989 or 1994. Measured in 2001
Trees	23,24,25,26,27,28	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Headquarters	Treatment: Thinned/Burned	Measured By:	1989	???
		Measured By:	1994	Ganz
Block: B	Plot # : 1	Measured By:	2001	Roller, Kong
		Measured By:	2009	Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	14.2	67.0	15.4	85.0	18.8	96.6	21.2	109.7
2	GS	16.5	82.0	17.0	94.0	17.2	86.3	19.9	90.7
3	GS	14.8	73.0	16.3	89.0	19.9	90.9	23.7	107.5
4	GS	25.7	93.0	27.2	105.0	30.2	111.6	34.5	125.5
5	GS	15.5	84.0	16.8	97.0	18.9	104.9	21.5	119.3
6	GS	19.0	92.0	20.5	109.0	23.1	113.9	26.3	130.6
7	GS	25.4	97.0	27.4	116.0	30.0	116.6	34.1	133.7
8	GS	19.4	88.0	20.3	96.0	22.7	105.9	27.2	124.5
9	GS	21.5	112.0	23.7	120.0	27.6	122.7	33.1	139.5
10	GS	27.1	99.0	29.7	111.0	33.7	116.8	41.1	131.5
AVG.		19.9	88.7	21.4	102.2	24.2	106.6	28.3	121.3

2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	1.2	18.0	3.4	11.6	4.6	29.6	5.8	24.7	2.4	13.1	7.0	42.7
2	GS	0.5	12.0	0.2	-7.7	0.7	4.3	2.9	-3.3	2.7	4.4	3.4	8.7
3	GS	1.5	16.0	3.6	1.9	5.1	17.9	7.4	18.5	3.8	16.6	8.9	34.5
4	GS	1.5	12.0	3.0	6.6	4.5	18.6	7.3	20.5	4.3	13.9	8.8	32.5
5	GS	1.3	13.0	2.1	7.9	3.4	20.9	4.7	22.3	2.6	14.4	6.0	35.3
6	GS	1.5	17.0	2.6	4.9	4.1	21.9	5.8	21.6	3.2	16.7	7.3	38.6
7	GS	2.0	19.0	2.6	0.6	4.6	19.6	6.7	17.7	4.1	17.1	8.7	36.7
8	GS	0.9	8.0	2.4	9.9	3.3	17.9	6.9	28.5	4.5	18.6	7.8	36.5
9	GS	2.2	8.0	3.9	2.7	6.1	10.7	9.4	19.5	5.5	16.8	11.6	27.5
10	GS	2.6	12.0	4.0	5.8	6.6	17.8	11.4	20.5	7.4	14.7	14.0	32.5
AVG.		1.5	13.5	2.8	4.4	4.3	17.9	6.8	19.1	4.1	14.6	8.4	32.6

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Headquarters | Treatment: Control | Measured By: 1989 ???
Measured By: 1994 Ganz
Block: C | Plot # : 1 | Measured By: 2001 Roller, Kong
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
35	GS	20.0	99.0	21.8	116.0	23.4	122.9	27.4	133.8
36	GS	20.0	100.0	21.1	113.0	22.5	113.9	25.4	125.4
65	GS	20.0	90.0	20.7	105.0	21.5	102.0	23.0	120.2
66	GS	12.7	97.0	13.4	99.0	13.9	112.5	15.1	126.5
67	GS	21.6	102.0	23.0	111.0	24.5	114.3	27.5	129.0
68	GS	17.1	94.0	18.1	110.0	19.0	119.9	20.6	132.4
69	GS	4.4	22.0	4.5	18.0	4.5	24.4	4.4	24.0
70	GS	13.0	77.0	13.5	79.0	13.6	82.4	14.2	79.3
71	GS	6.0	35.0	6.4	36.0	6.4	39.1	6.6	38.8
72	GS	12.9	74.0	13.9	83.0	14.8	93.9	17.6	122.5
73	GS	7.2	18.0	7.6	19.0	7.5	19.3	7.6	22.3
74	GS	13.8	80.0	15.3	94.0	17.3	121.0	19.4	126.3
75	IC	18.8	69.0	19.1	78.0	19.5	87.0	20.2	88.6
76	GS	9.7	68.0	10.4	75.0	10.6	88.0	11.7	90.7
77	SP	13.2	103.0	***	***	***	***	***	***
78	GS	19.8	102.0	21.2	111.0	23.1	122.0	26.6	137.8
79	GS	9.6	65.0	10.0	67.0	10.3	***	10.3	***
80	GS	24.3	100.0	26.2	108.0	27.2	132.2	29.7	139.6
81	GS	7.4	36.0	7.8	39.0	7.8	36.6	7.9	36.4
82	GS	11.2	87.0	11.6	94.0	11.5	***	11.5	***
83	GS	28.5	107.0	30.8	119.0	34.1	138.8	37.9	150.4
84	IC	0.6	7.0	0.6	7.0	1.4	9.5	1.7	10.0
85	GS	28.9	90.0	30.8	101.0	33.5	123.1	36.6	132.7
86	GS	27.1	106.0	29.0	119.0	30.9	135.0	34.3	150.5
87	IC	8.0	32.0	8.7	36.0	9.0	31.7	9.4	37.6
88	GS	4.5	20.0	4.8	18.0	4.6	18.5	4.6	20.8
89	GS	3.0	18.0	3.1	17.0	3.0	12.0	3.1	15.1
90	GS	5.2	12.0	5.3	13.0	5.1	12.3	5.1	20.9
91	GS	12.8	60.0	13.4	65.0	13.6	69.8	13.6	67.7
92	GS	8.1	33.0	8.4	38.0	8.4	34.5	8.4	37.5
93	GS	31.4	102.0	33.3	114.0	34.0	120.3	39.3	144.5
94	GS	26.5	105.0	27.8	118.0	29.6	136.7	33.5	142.3
95	GS	25.3	108.0	26.9	123.0	27.2	129.7	31.1	138.8
96	GS	11.1	63.0	11.4	69.0	11.3	62.1	11.6	62.6
97	IC	22.0	74.0	22.3	81.0	22.5	82.0	24.3	98.6
98	SP	12.7	85.0	***	***	***	***	***	***
99	GS	3.9	22.0	4.1	22.0	4.1	23.2	4.1	22.2
100	GS	3.1	15.0	3.3	15.0	3.3	16.6	***	***
101	GS	***	***	***	***	12.4	48.2	13.4	49.2
102	WF	***	***	***	***	***	***	1.2	8.6
103	WF	***	***	***	***	***	***	1.9	11.1
AVG.		14.4	67.8	15.3	73.1	15.9	78.2	16.9	83.2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Headquarters	Treatment: Control	Measured By:	1989	???
		Measured By:	1994	Ganz
Block: C	Plot # : 1	Measured By:	2001	Roller, Kong
		Measured By:	2009	Soderlund, Estrada

Tree	77	Dead in 1994
Tree	98	Dead/Standing in 1994
Trees	79, 82	Dead/Standing in 2001
Trees	89, 90	Damaged/Deformed in 2001
Trees	102, 103	Ingrowth in 2009
Trees	98, 100	Dead/Missing in 2009
Tree	90	Deformed/Bowed in 2009
Trees	69,70,99	Deformed Top in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Headquarters | Treatment: Control | Measured By: 1989 ???
Measured By: 1994 Ganz
Block: C | Plot # : 1 | Measured By: 2001 Roller, Kong
Measured By: 2009 Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
35	GS	1.8	17.0	1.6	6.9	3.4	23.9	5.6	17.8	4.0	10.9	7.4	34.8
36	GS	1.1	13.0	1.4	0.9	2.5	13.9	4.3	12.4	2.9	11.5	5.4	25.4
65	GS	0.7	15.0	0.8	-3.0	1.5	12.0	2.3	15.2	1.5	18.2	3.0	30.2
66	GS	0.7	2.0	0.5	13.5	1.2	15.5	1.7	27.5	1.2	14.0	2.4	29.5
67	GS	1.4	9.0	1.5	3.3	2.9	12.3	4.5	18.0	3.0	14.7	5.9	27.0
68	GS	1.0	16.0	0.9	9.9	1.9	25.9	2.5	22.4	1.6	12.5	3.5	38.4
69	GS	0.1	-4.0	0.0	6.4	0.1	2.4	-0.1	6.0	-0.1	-0.4	0.0	2.0
70	GS	0.5	2.0	0.1	3.4	0.6	5.4	0.7	0.3	0.6	-3.1	1.2	2.3
71	GS	0.4	1.0	0.0	3.1	0.4	4.1	0.2	2.8	0.2	-0.3	0.6	3.8
72	GS	1.0	9.0	0.9	10.9	1.9	19.9	3.7	39.5	2.8	28.6	4.7	48.5
73	GS	0.4	1.0	-0.1	0.3	0.3	1.3	0.0	3.3	0.1	3.0	0.4	4.3
74	GS	1.5	14.0	2.0	27.0	3.5	41.0	4.1	32.3	2.1	5.3	5.6	46.3
75	IC	0.3	9.0	0.4	9.0	0.7	18.0	1.1	10.6	0.7	1.6	1.4	19.6
76	GS	0.7	7.0	0.2	13.0	0.9	20.0	1.3	15.7	1.1	2.7	2.0	22.7
77	SP	***	***	***	***	***	***	***	***	***	***	***	***
78	GS	1.4	9.0	1.9	11.0	3.3	20.0	5.4	26.8	3.5	15.8	6.8	35.8
79	GS	0.4	2.0	***	***	***	***	***	***	***	***	***	***
80	GS	1.9	8.0	1.0	24.2	2.9	32.2	3.5	31.6	2.5	7.4	5.4	39.6
81	GS	0.4	3.0	0.0	-2.4	0.4	0.6	0.1	-2.6	0.1	-0.2	0.5	0.4
82	GS	0.4	7.0	***	***	***	***	***	***	***	***	***	***
83	GS	2.3	12.0	3.3	19.8	5.6	31.8	7.1	31.4	3.8	11.6	9.4	43.4
84	IC	0.0	0.0	0.8	2.5	0.8	2.5	1.1	3.0	0.3	0.5	1.1	3.0
85	GS	1.9	11.0	2.7	22.1	4.6	33.1	5.8	31.7	3.1	9.6	7.7	42.7
86	GS	1.9	13.0	1.9	16.0	3.8	29.0	5.3	31.5	3.4	15.5	7.2	44.5
87	IC	0.7	4.0	0.3	-4.3	1.0	-0.3	0.7	1.6	0.4	5.9	1.4	5.6
88	GS	0.3	-2.0	-0.2	0.5	0.1	-1.5	-0.2	2.8	0.0	2.3	0.1	0.8
89	GS	0.1	-1.0	-0.1	-5.0	0.0	-6.0	0.0	-1.9	0.1	3.1	0.1	-2.9
90	GS	0.1	1.0	-0.2	-0.7	-0.1	0.3	-0.2	7.9	0.0	8.6	-0.1	8.9
91	GS	0.6	5.0	0.2	4.8	0.8	9.8	0.2	2.7	0.0	-2.1	0.8	7.7
92	GS	0.3	5.0	0.0	-3.5	0.3	1.5	0.0	-0.5	0.0	3.0	0.3	4.5
93	GS	1.9	12.0	0.7	6.3	2.6	18.3	6.0	30.5	5.3	24.2	7.9	42.5
94	GS	1.3	13.0	1.8	18.7	3.1	31.7	5.7	24.3	3.9	5.6	7.0	37.3
95	GS	1.6	15.0	0.3	6.7	1.9	21.7	4.2	15.8	3.9	9.1	5.8	30.8
96	GS	0.3	6.0	-0.1	-6.9	0.2	-0.9	0.2	-6.4	0.3	0.5	0.5	-0.4
97	IC	0.3	7.0	0.2	1.0	0.5	8.0	2.0	17.6	1.8	16.6	2.3	24.6
98	SP	***	***	***	***	***	***	***	***	***	***	***	***
99	GS	0.2	0.0	0.0	1.2	0.2	1.2	0.0	0.2	0.0	-1.0	0.2	0.2
100	GS	0.2	0.0	0.0	1.6	0.2	1.6	***	***	***	***	***	***
101	GS	***	***	***	***	***	***	***	***	1.0	1.0	***	***
102	WF	***	***	***	***	***	***	***	***	***	***	***	***
103	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		0.8	6.7	0.7	6.4	1.6	13.2	2.4	14.3	1.6	7.5	3.3	21.3

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Headquarters	Treatment: Control	Measured By:	1989	???
		Measured By:	1994	Ganz
Block: C	Plot # : 1	Measured By:	2001	Roller, Kong
		Measured By:	2009	Soderlund, Estrada

Tree	77	Dead in 1994
Tree	98	Dead/Standing in 1994
Trees	79, 82	Dead/Standing in 2001
Trees	89, 90	Damaged/Deformed in 2001
Trees	102, 103	Ingrowth in 2009
Trees	98, 100	Missing in 2009
Tree	90	Deformed/Bowed in 2009
Trees	69,70,99	Deformed Top in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Indian Bath   Treatment: Thinned   Measured By: 1989 Rodgers, Johannis
Measured By: 1994 Ganz
Block: A   Plot # : 1   Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
19	GS	19.7	92.0	20.8	96.0	22.8	105.2	25.0	117.1
20	GS	18.2	91.0	20.5	95.0	23.3	103.6	25.9	115.4
21	GS	13.7	81.0	14.7	80.0	15.2	96.8	16.5	109.4
22	GS	15.1	84.0	16.4	88.0	18.8	107.3	20.6	115.5
23	GS	19.0	100.0	20.4	102.0	21.5	101.7	23.5	115.4
24	GS	12.7	79.0	13.5	83.0	14.6	84.8	15.6	96.9
25	GS	18.9	92.0	20.4	91.0	22.8	100.6	24.9	110.5
26	GS	11.1	69.0	11.6	71.0	12.3	85.9	13.1	92.1
27	GS	19.0	87.0	19.5	90.0	21.3	103.5	22.9	112.8
28	GS	9.9	67.0	10.8	69.0	10.9	44.7	10.4	***
29	GS	20.3	96.0	21.7	98.0	23.5	116.9	26.3	126.1
30	GS	16.6	81.0	18.2	84.0	20.6	99.4	22.8	110.4
31	GS	8.5	68.0	9.3	68.0	***	***	***	***
32	GS	9.0	60.0	9.7	61.0	11.0	70.9	11.9	94.3
33	GS	15.9	71.0	17.3	73.0	19.6	89.8	22.0	101.7
34	GS	11.5	70.0	12.2	74.0	13.8	83.4	15.1	96.9
35	GS	14.3	89.0	15.7	84.0	17.2	97.8	18.7	110.0
36	GS	14.4	84.0	15.9	80.0	18.0	100.5	20.4	112.8
37	GS	8.2	58.0	9.1	63.0	10.1	72.1	10.8	79.5
38	GS	10.7	85.0	11.6	82.0	13.3	97.7	14.9	103.9
39	GS	14.2	85.0	15.5	82.0	17.2	86.4	18.8	99.2
40	GS	8.3	75.0	9.0	70.0	8.9	***	8.8	***
41	GS	12.9	76.0	13.8	75.0	15.4	92.7	16.7	101.5
42	GS	10.0	69.0	10.9	68.0	12.0	85.5	13.5	92.7
43	GS	***	***	***	***	11.2	60.9	11.4	68.2
44	GS	***	***	***	***	12.5	91.9	13.4	100.6
AVG.		13.8	79.5	14.9	80.3	16.3	90.8	17.8	103.6

Tree	28	Broken Top in 2001
Tree	31	Dead/Down in 2001
Tree	40	Dead/Standing in 2001
Tree	43	Deformed Top, Tagged tree but not counted in 1989,1994 data. Measured - 2001,2009 Roller 2004 thesis has value for 1994: #43-DBH 10.8,Ht 56
Tree	44	Tagged tree but not counted in 1989 or 1994 data. Measured in 2001, 2009
Tree	28	Dead/Standing in 2009
Tree	18	1989: DBH 10.8,Ht 82. Excluded from 1994 study for unknown reason, and excluded from 2001 and 2009 studies for consistency.

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Indian Bath	Treatment: Thinned	Measured By:	1989 Rodgers, Johannis
		Measured By:	1994 Ganz
Block: A	Plot # : 1	Measured By:	2001 Roller, Arrowsmith
		Measured By:	2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
19	GS	1.1	4.0	2.0	9.2	3.1	13.2	4.2	21.1	2.2	11.9	5.3	25.1
20	GS	2.3	4.0	2.8	8.6	5.1	12.6	5.4	20.4	2.6	11.8	7.7	24.4
21	GS	1.0	-1.0	0.5	16.8	1.5	15.8	1.8	29.4	1.3	12.6	2.8	28.4
22	GS	1.3	4.0	2.4	19.3	3.7	23.3	4.2	27.5	1.8	8.2	5.5	31.5
23	GS	1.4	2.0	1.1	-0.3	2.5	1.7	3.1	13.4	2.0	13.7	4.5	15.4
24	GS	0.8	4.0	1.1	1.8	1.9	5.8	2.1	13.9	1.0	12.1	2.9	17.9
25	GS	1.5	-1.0	2.4	9.6	3.9	8.6	4.5	19.5	2.1	9.9	6.0	18.5
26	GS	0.5	2.0	0.7	14.9	1.2	16.9	1.5	21.1	0.8	6.2	2.0	23.1
27	GS	0.5	3.0	1.8	13.5	2.3	16.5	3.4	22.8	1.6	9.3	3.9	25.8
28	GS	0.9	2.0	0.1	-24.3	1.0	-22.3	-0.4	***	-0.5	***	0.5	***
29	GS	1.4	2.0	1.8	18.9	3.2	20.9	4.6	28.1	2.8	9.2	6.0	30.1
30	GS	1.6	3.0	2.4	15.4	4.0	18.4	4.6	26.4	2.2	11.0	6.2	29.4
31	GS	0.8	0.0	***	***	***	***	***	***	***	***	***	***
32	GS	0.7	1.0	1.3	9.9	2.0	10.9	2.2	33.3	0.9	23.4	2.9	34.3
33	GS	1.4	2.0	2.3	16.8	3.7	18.8	4.7	28.7	2.4	11.9	6.1	30.7
34	GS	0.7	4.0	1.6	9.4	2.3	13.4	2.9	22.9	1.3	13.5	3.6	26.9
35	GS	1.4	-5.0	1.5	13.8	2.9	8.8	3.0	26.0	1.5	12.2	4.4	21.0
36	GS	1.5	-4.0	2.1	20.5	3.6	16.5	4.5	32.8	2.4	12.3	6.0	28.8
37	GS	0.9	5.0	1.0	9.1	1.9	14.1	1.7	16.5	0.7	7.4	2.6	21.5
38	GS	0.9	-3.0	1.7	15.7	2.6	12.7	3.3	21.9	1.6	6.2	4.2	18.9
39	GS	1.3	-3.0	1.7	4.4	3.0	1.4	3.3	17.2	1.6	12.8	4.6	14.2
40	GS	0.7	-5.0	-0.1	***	0.6	***	-0.2	***	-0.1	***	0.5	***
41	GS	0.9	-1.0	1.6	17.7	2.5	16.7	2.9	26.5	1.3	8.8	3.8	25.5
42	GS	0.9	-1.0	1.1	17.5	2.0	16.5	2.6	24.7	1.5	7.2	3.5	23.7
43	GS	***	***	***	***	***	***	***	***	0.2	7.3	***	***
44	GS	***	***	***	***	***	***	***	***	0.9	8.7	***	***
AVG.		1.1	0.8	1.5	10.8	2.6	11.9	3.0	23.5	1.4	10.8	4.2	24.5

Tree	28	Broken Top in 2001
Tree	31	Dead/Down in 2001
Tree	40	Dead/Standing in 2001
Tree	43	Deformed Top, Tagged tree but not counted in 1989,1994 data. Measured - 2001,2009 Roller 2004 thesis has value for 1994: #43-DBH 10.8,Ht 56
Tree	44	Tagged tree but not counted in 1989 or 1994 data. Measured in 2001, 2009
Tree	28	Dead/Standing in 2009
Tree	18	1989: DBH 10.8,Ht 82. Excluded from 1994 study for unknown reason, and excluded from 2001 and 2009 studies for consistency.

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37 ft. (12m) Plot)

Stand: Indian Bath	Treatment: Thinned/Burned	Measured By:	1989	Rodgers, Johannis
		Measured By:	1994	Ganz
Block: A	Plot # : 2	Measured By:	2001	Roller, Arrowsmith
		Measured By:	2009	Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
55	GS	21.4	90.0	22.5	96.0	23.9	112.9	26.1	124.4
56	GS	18.6	102.0	18.7	106.0	20.3	116.6	21.9	130.5
57	GS	22.3	103.0	23.4	110.0	26.0	110.7	28.3	124.1
58	GS	17.9	94.0	18.5	101.0	20.5	106.7	22.7	121.3
59	GS	14.9	80.0	15.4	86.0	16.6	88.5	18.0	101.7
60	GS	12.0	79.0	12.5	78.0	14.0	90.7	15.8	102.7
61	GS	7.3	39.0	7.4	46.0	7.6	45.0	7.8	46.0
62	GS	8.1	52.0	8.8	51.0	10.0	54.9	10.2	60.8
63	GS	13.5	81.0	14.4	81.0	15.6	94.3	17.0	105.6
64	GS	13.5	82.0	14.3	85.0	16.0	95.1	17.4	102.4
65	GS	11.4	75.0	12.4	79.0	13.8	90.2	15.1	98.3
66	GS	18.0	89.0	18.8	84.0	20.5	104.5	22.3	108.9
67	GS	15.8	87.0	16.7	91.0	19.1	110.6	21.1	121.1
68	GS	9.3	68.0	9.9	69.0	10.2	80.7	10.5	86.7
69	GS	17.8	87.0	18.8	94.0	20.3	106.4	22.2	114.2
70	GS	12.5	82.0	13.3	85.0	14.5	95.9	15.7	108.8
71	GS	11.7	71.0	12.4	78.0	13.5	96.3	14.5	108.5
72	GS	15.5	97.0	16.3	101.0	17.4	114.8	18.5	121.6
73	GS	15.1	94.0	16.2	97.0	17.7	111.6	19.4	123.7
74	GS	21.8	105.0	23.0	115.0	25.2	129.0	27.2	138.3
75	GS	12.6	90.0	13.5	93.0	15.8	112.6	16.2	121.7
AVG.		14.8	83.2	15.6	87.0	17.1	98.5	18.5	108.2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37 ft. (12m) Plot)

Stand: Indian Bath | Treatment: Thinned/Burned | Measured By: 1989 Rodgers, Johannis
Measured By: 1994 Ganz
Block: A | Plot # : 2 | Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
55	GS	1.1	6.0	1.4	16.9	2.5	22.9	3.6	28.4	2.2	11.5	4.7	34.4
56	GS	0.1	4.0	1.6	10.6	1.7	14.6	3.2	24.5	1.6	13.9	3.3	28.5
57	GS	1.1	7.0	2.6	0.7	3.7	7.7	4.9	14.1	2.3	13.4	6.0	21.1
58	GS	0.6	7.0	2.0	5.7	2.6	12.7	4.2	20.3	2.2	14.6	4.8	27.3
59	GS	0.5	6.0	1.2	2.5	1.7	8.5	2.6	15.7	1.4	13.2	3.1	21.7
60	GS	0.5	-1.0	1.5	12.7	2.0	11.7	3.3	24.7	1.8	12.0	3.8	23.7
61	GS	0.1	7.0	0.2	-1.0	0.3	6.0	0.4	0.0	0.2	1.0	0.5	7.0
62	GS	0.7	-1.0	1.2	3.9	1.9	2.9	1.4	9.8	0.2	5.9	2.1	8.8
63	GS	0.9	0.0	1.2	13.3	2.1	13.3	2.6	24.6	1.4	11.3	3.5	24.6
64	GS	0.8	3.0	1.7	10.1	2.5	13.1	3.1	17.4	1.4	7.3	3.9	20.4
65	GS	1.0	4.0	1.4	11.2	2.4	15.2	2.7	19.3	1.3	8.1	3.7	23.3
66	GS	0.8	-5.0	1.7	20.5	2.5	15.5	3.5	24.9	1.8	4.4	4.3	19.9
67	GS	0.9	4.0	2.4	19.6	3.3	23.6	4.4	30.1	2.0	10.5	5.3	34.1
68	GS	0.6	1.0	0.3	11.7	0.9	12.7	0.6	17.7	0.3	6.0	1.2	18.7
69	GS	1.0	7.0	1.5	12.4	2.5	19.4	3.4	20.2	1.9	7.8	4.4	27.2
70	GS	0.8	3.0	1.2	10.9	2.0	13.9	2.4	23.8	1.2	12.9	3.2	26.8
71	GS	0.7	7.0	1.1	18.3	1.8	25.3	2.1	30.5	1.0	12.2	2.8	37.5
72	GS	0.8	4.0	1.1	13.8	1.9	17.8	2.2	20.6	1.1	6.8	3.0	24.6
73	GS	1.1	3.0	1.5	14.6	2.6	17.6	3.2	26.7	1.7	12.1	4.3	29.7
74	GS	1.2	10.0	2.2	14.0	3.4	24.0	4.2	23.3	2.0	9.3	5.4	33.3
75	GS	0.9	3.0	2.3	19.6	3.2	22.6	2.7	28.7	0.4	9.1	3.6	31.7
AVG.		0.8	3.8	1.5	11.5	2.3	15.3	2.9	21.2	1.4	9.7	3.7	25.0

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Indian Bath — Treatment: Thinned — Measured By: 1989 Rodgers, Johannis
Measured By: 1994 Ganz
Block: B — Plot # : 1 — Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
43	GS	24.7	95.0	26.2	96.0	28.5	106.8	30.8	123.1
44	GS	24.3	92.0	25.5	93.0	27.8	109.7	29.9	116.8
45	GS	17.4	66.0	18.1	72.0	20.1	83.1	22.4	95.5
46	GS	20.7	82.0	21.9	83.0	23.2	94.8	27.9	100.2
47	GS	21.2	90.0	22.9	91.0	25.0	107.7	27.2	112.7
48	GS	10.5	39.0	12.1	43.0	13.3	56.1	15.3	70.9
49	GS	22.5	89.0	24.2	96.0	27.1	107.8	29.7	119.5
50	GS	17.7	79.0	18.7	88.0	21.1	103.7	23.7	109.0
51	GS	24.1	91.0	25.7	97.0	28.0	109.1	30.5	116.3
52	GS	8.2	47.0	8.7	48.0	9.5	62.9	10.4	63.2
53	GS	16.9	82.0	17.7	87.0	16.8	84.3	17.5	92.3
54	GS	15.4	78.0	16.1	79.0	19.0	93.3	20.2	101.3
55	GS	***	***	***	***	24.4	106.0	26.5	112.8
56	GS	***	***	***	***	9.2	37.6	9.8	39.2
57	GS	***	***	***	***	19.4	90.3	21.4	97.9
58	GS	***	***	***	***	2.7	7.8	2.2	***
AVG.		18.6	77.5	19.8	81.1	19.7	85.1	21.6	98.0

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
43	GS	1.5	1.0	2.3	10.8	3.8	11.8	4.6	27.1	2.3	16.3	6.1	28.1
44	GS	1.2	1.0	2.3	16.7	3.5	17.7	4.4	23.8	2.1	7.1	5.6	24.8
45	GS	0.7	6.0	2.0	11.1	2.7	17.1	4.3	23.5	2.3	12.4	5.0	29.5
46	GS	1.2	1.0	1.3	11.8	2.5	12.8	6.0	17.2	4.7	5.4	7.2	18.2
47	GS	1.7	1.0	2.1	16.7	3.8	17.7	4.3	21.7	2.2	5.0	6.0	22.7
48	GS	1.6	4.0	1.2	13.1	2.8	17.1	3.2	27.9	2.0	14.8	4.8	31.9
49	GS	1.7	7.0	2.9	11.8	4.6	18.8	5.5	23.5	2.6	11.7	7.2	30.5
50	GS	1.0	9.0	2.4	15.7	3.4	24.7	5.0	21.0	2.6	5.3	6.0	30.0
51	GS	1.6	6.0	2.3	12.1	3.9	18.1	4.8	19.3	2.5	7.2	6.4	25.3
52	GS	0.5	1.0	0.8	14.9	1.3	15.9	1.7	15.2	0.9	0.3	2.2	16.2
53	GS	0.8	5.0	-0.9	-2.7	-0.1	2.3	-0.2	5.3	0.7	8.0	0.6	10.3
54	GS	0.7	1.0	2.9	14.3	3.6	15.3	4.1	22.3	1.2	8.0	4.8	23.3
55	GS	***	***	***	***	***	***	***	***	2.1	6.8	***	***
56	GS	***	***	***	***	***	***	***	***	0.6	1.6	***	***
57	GS	***	***	***	***	***	***	***	***	2.0	7.6	***	***
58	GS	***	***	***	***	***	***	***	***	-0.5	***	***	***
AVG.		1.2	3.6	1.8	12.2	3.0	15.8	4.0	20.7	1.9	7.8	5.2	24.2

Trees 55,56,57 Tagged trees but not counted in 1989 or 1994 data. Measured in 2001,2009. Roller 2004 thesis has values for 1994: #55-DBH 22.5,Ht 93; #56-DBH 8.5,Ht 37; #57-DBH 17.9,Ht 80

Tree 58 Ingrowth in 2001; Dead/Standing in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39.37ft. (12m) Plot)

Stand: Indian Bath	Treatment: Thinned/Burned	Measured By:	1989 Bates, Maddson
		Measured By:	1994 Ganz
Block: B	Plot # : 2	Measured By:	2001 Roller, Arrowsmith
		Measured By:	2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
19	GS	8.1	56.0	8.6	68.0	8.9	73.4	9.3	74.6
20	GS	12.4	78.0	13.0	82.0	14.4	90.6	15.8	101.3
21	GS	8.0	49.0	8.4	59.0	8.2	***	8.0	***
22	GS	20.8	93.0	22.3	96.0	24.6	107.5	26.9	118.7
23	GS	16.7	93.0	16.9	97.0	17.9	95.2	19.5	106.3
24	GS	11.6	77.0	11.8	80.0	12.6	91.9	13.5	101.9
25	GS	13.2	71.0	13.5	75.0	14.2	81.5	15.1	95.0
26	GS	7.8	55.0	8.0	57.0	8.4	70.9	8.9	79.9
27	GS	11.7	78.0	11.8	85.0	12.9	93.8	14.0	103.7
28	GS	12.8	78.0	13.2	86.0	14.3	85.6	15.0	92.9
29	GS	12.2	83.0	12.2	88.0	13.3	94.4	14.6	107.3
30	GS	7.0	62.0	7.8	69.0	***	***	***	***
31	GS	10.2	71.0	10.7	75.0	11.7	80.2	12.7	87.8
32	GS	7.2	53.0	7.6	58.0	8.3	67.7	8.8	74.7
33	GS	8.8	58.0	9.4	64.0	10.2	72.1	10.8	78.1
34	SP	29.3	100.0	31.3	107.0	33.7	117.1	36.6	124.2
35	GS	11.0	64.0	11.6	69.0	12.5	89.0	13.7	95.8
36	GS	8.2	59.0	8.9	64.0	9.8	80.5	10.5	87.8
37	GS	10.0	71.0	11.0	72.0	12.3	89.2	13.5	99.8
38	WF	11.5	71.0	12.6	74.0	14.3	84.5	15.4	89.8
39	GS	10.0	72.0	11.0	74.0	12.1	88.2	12.9	96.4
40	GS	9.8	62.0	11.0	67.0	12.1	82.1	12.9	90.6
41	GS	10.3	64.0	11.0	69.0	12.0	82.7	13.1	93.5
42	GS	9.5	73.0	10.2	77.0	11.6	89.4	12.9	100.1
43	GS	9.8	76.0	10.6	79.0	11.9	91.0	13.0	101.8
44	GS	9.4	73.0	10.3	83.0	11.5	86.7	12.4	96.8
45	WF	21.0	84.0	22.3	89.0	23.5	93.4	24.5	98.0
46	GS	16.9	86.0	18.6	92.0	20.3	102.8	21.8	112.1
AVG.		12.0	71.8	12.7	77.0	14.0	87.7	15.0	96.5

Tree 21 Dead/Standing in 2001
Tree 30 Dead/Down in 2001

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39.37ft. (12m) Plot)

Stand: Indian Bath Treatment: Thinned/Burned

Block: B Plot # : 2

Measured By: 1989 Bates, Maddson
Measured By: 1994 Ganz
Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
19	GS	0.5	12.0	0.3	5.4	0.8	17.4	0.7	6.6	0.4	1.2	1.2	18.6
20	GS	0.6	4.0	1.4	8.6	2.0	12.6	2.8	19.3	1.4	10.7	3.4	23.3
21	GS	0.4	10.0	-0.2	***	0.2	***	-0.4	***	-0.2	***	0.0	***
22	GS	1.5	3.0	2.3	11.5	3.8	14.5	4.6	22.7	2.3	11.2	6.1	25.7
23	GS	0.2	4.0	1.0	-1.8	1.2	2.2	2.6	9.3	1.6	11.1	2.8	13.3
24	GS	0.2	3.0	0.8	11.9	1.0	14.9	1.7	21.9	0.9	10.0	1.9	24.9
25	GS	0.3	4.0	0.7	6.5	1.0	10.5	1.6	20.0	0.9	13.5	1.9	24.0
26	GS	0.2	2.0	0.4	13.9	0.6	15.9	0.9	22.9	0.5	9.0	1.1	24.9
27	GS	0.1	7.0	1.1	8.8	1.2	15.8	2.2	18.7	1.1	9.9	2.3	25.7
28	GS	0.4	8.0	1.1	-0.4	1.5	7.6	1.8	6.9	0.7	7.3	2.2	14.9
29	GS	0.0	5.0	1.1	6.4	1.1	11.4	2.4	19.3	1.3	12.9	2.4	24.3
30	GS	0.8	7.0	***	***	***	***	***	***	***	***	***	***
31	GS	0.5	4.0	1.0	5.2	1.5	9.2	2.0	12.8	1.0	7.6	2.5	16.8
32	GS	0.4	5.0	0.7	9.7	1.1	14.7	1.2	16.7	0.5	7.0	1.6	21.7
33	GS	0.6	6.0	0.8	8.1	1.4	14.1	1.4	14.1	0.6	6.0	2.0	20.1
34	SP	2.0	7.0	2.4	10.1	4.4	17.1	5.3	17.2	2.9	7.1	7.3	24.2
35	GS	0.6	5.0	0.9	20.0	1.5	25.0	2.1	26.8	1.2	6.8	2.7	31.8
36	GS	0.7	5.0	0.9	16.5	1.6	21.5	1.6	23.8	0.7	7.3	2.3	28.8
37	GS	1.0	1.0	1.3	17.2	2.3	18.2	2.5	27.8	1.2	10.6	3.5	28.8
38	WF	1.1	3.0	1.7	10.5	2.8	13.5	2.8	15.8	1.1	5.3	3.9	18.8
39	GS	1.0	2.0	1.1	14.2	2.1	16.2	1.9	22.4	0.8	8.2	2.9	24.4
40	GS	1.2	5.0	1.1	15.1	2.3	20.1	1.9	23.6	0.8	8.5	3.1	28.6
41	GS	0.7	5.0	1.0	13.7	1.7	18.7	2.1	24.5	1.1	10.8	2.8	29.5
42	GS	0.7	4.0	1.4	12.4	2.1	16.4	2.7	23.1	1.3	10.7	3.4	27.1
43	GS	0.8	3.0	1.3	12.0	2.1	15.0	2.4	22.8	1.1	10.8	3.2	25.8
44	GS	0.9	10.0	1.2	3.7	2.1	13.7	2.1	13.8	0.9	10.1	3.0	23.8
45	WF	1.3	5.0	1.2	4.4	2.5	9.4	2.2	9.0	1.0	4.6	3.5	14.0
46	GS	1.7	6.0	1.7	10.8	3.4	16.8	3.2	20.1	1.5	9.3	4.9	26.1
AVG.		0.7	5.2	1.1	9.8	1.8	14.7	2.2	18.5	1.1	8.8	2.9	23.5

Tree 21 Dead/Standing in 2001
Tree 30 Dead/Down in 2001

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Indian Bath | Treatment: Control | Measured By: 1989 Bates, Maddson
Measured By: 1994 Gasser, Ganz, Bothof
Block: C | Plot # : 1 | Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
4	IC	11.1	43.0	11.2	43.0	11.6	47.8	11.5	47.7
5	IC	10.5	32.0	10.5	31.0	10.8	36.2	10.4	34.3
6	IC	12.1	48.0	12.4	48.0	12.9	59.2	13.2	54.3
7	WF	13.9	74.0	15.2	77.0	17.9	91.7	19.4	95.3
8	IC	5.5	18.0	5.5	19.0	5.7	20.6	5.7	***
9	IC	6.4	30.0	6.7	30.0	7.1	34.6	7.2	36.6
10	GS	23.5	89.0	24.2	88.0	25.9	108.8	27.8	111.1
11	IC	2.6	10.0	2.8	9.0	3.0	12.6	3.2	13.7
12	GS	6.5	32.0	6.7	32.0	6.9	33.7	7.3	33.3
13	GS	10.8	64.0	10.2	67.0	10.7	71.4	11.1	74.9
14	GS	31.8	112.0	32.5	109.0	35.1	120.1	36.8	130.9
15	SP	19.2	66.0	19.7	60.0	21.2	76.4	22.9	84.9
16	IC	3.4	13.0	3.5	10.0	3.5	14.3	3.4	15.3
17	IC	6.2	23.0	6.3	22.0	6.4	26.1	6.4	26.6
18	GS	21.1	83.0	21.7	86.0	22.4	105.7	23.8	109.9
19	GS	9.6	60.0	9.8	60.0	10.3	70.5	10.5	64.3
20	GS	10.6	58.0	10.7	60.0	11.0	62.8	11.1	65.7
21	IC	2.3	11.0	2.1	10.0	***	***	***	***
22	IC	1.4	8.0	***	***	1.9	***	1.8	***
23	IC	1.5	8.0	***	***	***	***	***	***
24	GS	5.6	13.0	***	***	5.5	***	5.3	***
25	IC	3.9	15.0	4.0	11.0	3.8	***	3.8	***
26	GS	29.0	104.0	29.7	102.0	31.8	115.5	33.3	119.6
27	IC	3.7	14.0	***	***	3.8	***	3.8	***
28	GS	27.0	94.0	27.8	101.0	30.2	111.6	32.0	119.6
29	GS	24.7	107.0	25.2	106.0	27.6	121.9	29.4	128.4
30	IC	6.3	41.0	6.3	25.0	6.3	35.1	6.2	***
31	IC	4.2	15.0	4.2	18.0	3.8	***	3.8	***
32	IC	5.5	25.0	5.4	34.0	5.5	28.5	5.5	29.1
33	GS	15.5	89.0	16.0	91.0	17.3	107.8	18.6	110.3
34	GS	9.7	36.0	9.7	37.0	9.7	44.6	9.6	42.4
35	IC	7.1	26.0	7.2	28.0	8.6	32.8	7.4	31.6
36	IC	2.0	8.0	2.0	7.0	2.0	9.7	1.9	***
37	IC	7.7	29.0	7.7	33.0	7.9	36.0	8.0	33.4
38	GS	15.2	92.0	15.7	98.0	17.2	107.7	18.7	111.6
39	IC	5.7	21.0	5.7	20.0	5.6	21.0	5.4	***
40	GS	14.3	86.0	14.3	95.0	15.0	105.2	15.3	107.9
41	IC	3.3	14.0	3.3	12.0	***	***	***	***
42	GS	13.7	80.0	14.1	96.0	15.3	94.0	16.2	100.6
43	GS	16.6	96.0	17.1	100.0	18.5	95.0	19.4	107.1
44	IC	3.1	15.0	3.2	11.0	***	***	***	***
45	GS	5.1	22.0	5.2	19.0	5.2	21.2	5.1	22.1
46	IC	1.6	7.0	***	***	***	***	***	***
47	GS	2.9	12.0	2.8	12.0	***	***	***	***

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Indian Bath | Treatment: Control | Measured By: 1989 Bates, Maddson
Measured By: 1994 Gasser, Ganz, Bothof
Block: C | Plot # : 1 | Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
48	IC	5.1	24.0	5.1	22.0	5.5	24.6	5.4	24.2
49	IC	2.8	12.0	2.8	10.0	2.9	15.5	3.0	13.2
50	IC	6.4	23.0	6.4	24.0	6.7	25.2	6.8	25.4
51	IC	8.4	29.0	8.7	29.0	9.5	35.6	9.8	38.0
52	GS	2.6	8.0	2.6	9.0	3.7	9.8	***	***
53	GS	14.6	76.0	14.9	78.0	15.5	88.6	15.5	65.0
54	GS	11.6	77.0	12.0	79.0	12.5	70.7	12.5	73.5
55	GS	6.2	21.0	6.4	20.0	6.5	22.5	6.5	23.5
56	GS	18.8	90.0	19.6	89.0	22.1	98.0	24.2	111.8
57	GS	15.0	80.0	15.4	79.0	16.6	98.7	17.9	101.5
58	GS	8.0	40.0	8.0	41.0	8.0	43.9	7.9	41.6
59	GS	14.8	87.0	15.3	86.0	16.6	103.8	17.6	109.5
60	IC	3.9	19.0	3.8	20.0	***	***	***	***
61	IC	1.7	8.0	1.5	8.0	***	***	***	***
62	GS	6.4	27.0	6.6	27.0	6.8	31.8	6.9	32.2
63	GS	12.7	71.0	13.0	68.0	13.6	82.0	13.8	90.2
64	GS	7.0	21.0	7.1	21.0	7.2	23.1	7.1	22.7
65	GS	11.6	72.0	12.0	72.0	13.4	80.4	12.7	85.2
66	GS	19.0	91.0	19.6	99.0	21.4	110.3	22.6	118.1
67	WF	4.8	28.0	4.9	26.0	4.8	27.7	4.8	***
68	IC	4.0	12.0	4.0	13.0	3.8	13.6	***	***
69	IC	4.8	17.0	4.8	16.0	4.9	19.8	4.8	20.2
70	IC	6.7	18.0	6.8	21.0	6.6	25.1	6.5	***
71	WF	***	***	***	***	20.3	101.3	22.1	103.9
72	GS	26.2	59.0	26.7	98.0	28.4	103.0	29.8	116.2
73	IC	5.1	18.0	5.1	18.0	5.0	24.7	4.9	***
74	IC	8.5	33.0	8.5	34.0	8.5	40.0	8.3	***
75	IC	9.7	38.0	9.8	39.0	10.2	44.9	10.1	42.6
76	WF	9.1	57.0	9.4	58.0	9.8	65.1	9.9	68.4
77	WF	4.1	18.0	4.1	11.0	4.2	17.2	4.1	***
78	GS	25.6	100.0	26.3	102.0	28.3	115.7	29.5	122.0
79	WF	10.4	58.0	10.7	63.0	11.1	44.8	11.2	49.8
80	GS	26.1	102.0	27.6	104.0	30.0	116.7	31.5	125.5
81	SP	18.0	64.0	18.5	73.0	20.0	81.0	20.3	76.2
82	IC	2.4	11.0	2.2	13.0	2.1	***	2.0	***
83	IC	4.8	16.0	4.6	18.0	4.3	***	4.3	***
84	IC	4.8	18.0	4.7	18.0	4.7	20.4	4.7	17.6
85	IC	4.5	14.0	2.1	12.0	1.9	21.0	1.8	***
86	IC	2.1	12.0	4.5	14.0	4.5	20.4	4.3	***
87	IC	***	***	***	***	***	***	5.8	***
AVG.		9.8	42.8	10.4	46.1	11.6	58.0	12.1	68.7

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Indian Bath	Treatment: Control	Measured By:	1989	Bates, Maddson
		Measured By:	1994	Gasser, Ganz, Bothof
Block: C	Plot # : 1	Measured By:	2001	Roller, Arrowsmith
		Measured By:	2009	Soderlund, Ricchiazzi

Trees	22,23,24,46	Dead in 1994. 22,24 - Dead/Standing and 23,46 - Dead/Down.
Tree	71	Missing in 1989
Trees	21,23,41,44,47,60,61	Dead/Down in 2001
Trees	22,24,25,27,31,82,83	Dead/Standing in 2001
Tree	27	Tagged but no data in 1994. Measured in 2001
Tree	35	Is out of plot at 40.9 feet from plot center in 2001
Tree	46	Dead/Missing in 2001,2009
Tree	49	Deformed/Bowed-height taken at dominant leader in 2001. Leaning in 2009.
Trees	54,79,81	Broken Top in 2001
Tree	71	Was tagged but there is no data in 1989 or 1994. Forked Top in 2001.
Trees	4,5,6,9,12,19,37,34,48,64,75,84	Deformed Top in 2009
Trees	8,30,36,39,67,70,73,74,77,85,86	Dead/Standing in 2009
Trees	52,68	Dead/Down in 2009
Trees	53,81	Broken Top in 2009
Tree	81	Dead Top in 2009
Tree	87	Dead/Standing in 2009, no data in 1989, 1994 or 2001

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Indian Bath   Treatment: Control   Measured By: 1989 Bates, Maddson
Measured By: 1994 Gasser, Ganz, Bothof
Block: C   Plot # : 1   Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
4	IC	0.1	0.0	0.4	4.8	0.5	4.8	0.3	4.7	-0.1	-0.1	0.4	4.7
5	IC	0.0	-1.0	0.3	5.2	0.3	4.2	-0.1	3.3	-0.4	-1.9	-0.1	2.3
6	IC	0.3	0.0	0.5	11.2	0.8	11.2	0.8	6.3	0.3	-4.9	1.1	6.3
7	WF	1.3	3.0	2.7	14.7	4.0	17.7	4.2	18.3	1.5	3.6	5.5	21.3
8	IC	0.0	1.0	0.2	1.6	0.2	2.6	0.2	***	0.0	***	0.2	***
9	IC	0.3	0.0	0.4	4.6	0.7	4.6	0.5	6.6	0.1	2.0	0.8	6.6
10	GS	0.7	-1.0	1.7	20.8	2.4	19.8	3.6	23.1	1.9	2.3	4.3	22.1
11	IC	0.2	-1.0	0.2	3.6	0.4	2.6	0.4	4.7	0.2	1.1	0.6	3.7
12	GS	0.2	0.0	0.2	1.7	0.4	1.7	0.6	1.3	0.4	-0.4	0.8	1.3
13	GS	-0.6	3.0	0.5	4.4	-0.1	7.4	0.9	7.9	0.4	3.5	0.3	10.9
14	GS	0.7	-3.0	2.6	11.1	3.3	8.1	4.3	21.9	1.7	10.8	5.0	18.9
15	SP	0.5	-6.0	1.5	16.4	2.0	10.4	3.2	24.9	1.7	8.5	3.7	18.9
16	IC	0.1	-3.0	0.0	4.3	0.1	1.3	-0.1	5.3	-0.1	1.0	0.0	2.3
17	IC	0.1	-1.0	0.1	4.1	0.2	3.1	0.1	4.6	0.0	0.5	0.2	3.6
18	GS	0.6	3.0	0.7	19.7	1.3	22.7	2.1	23.9	1.4	4.2	2.7	26.9
19	GS	0.2	0.0	0.5	10.5	0.7	10.5	0.7	4.3	0.2	-6.2	0.9	4.3
20	GS	0.1	2.0	0.3	2.8	0.4	4.8	0.4	5.7	0.1	2.9	0.5	7.7
21	IC	-0.2	-1.0	***	***	***	***	***	***	***	***	***	***
22	IC	***	***	***	***	***	***	***	***	-0.1	***	0.4	***
23	IC	***	***	***	***	***	***	***	***	***	***	***	***
24	GS	***	***	***	***	***	***	***	***	-0.2	***	-0.3	***
25	IC	0.1	-4.0	-0.2	***	-0.1	***	-0.2	***	0.0	***	-0.1	***
26	GS	0.7	-2.0	2.1	13.5	2.8	11.5	3.6	17.6	1.5	4.1	4.3	15.6
27	IC	***	***	***	***	***	***	***	***	0.0	***	0.1	***
28	GS	0.8	7.0	2.4	10.6	3.2	17.6	4.2	18.6	1.8	8.0	5.0	25.6
29	GS	0.5	-1.0	2.4	15.9	2.9	14.9	4.2	22.4	1.8	6.5	4.7	21.4
30	IC	0.0	-16.0	0.0	10.1	0.0	-5.9	-0.1	***	-0.1	***	-0.1	***
31	IC	0.0	3.0	-0.4	***	-0.4	***	-0.4	***	0.0	***	-0.4	***
32	IC	-0.1	9.0	0.1	-5.5	0.0	3.5	0.1	-4.9	0.0	0.6	0.0	4.1
33	GS	0.5	2.0	1.3	16.8	1.8	18.8	2.6	19.3	1.3	2.5	3.1	21.3
34	GS	0.0	1.0	0.0	7.6	0.0	8.6	-0.1	5.4	-0.1	-2.2	-0.1	6.4
35	IC	0.1	2.0	1.4	4.8	1.5	6.8	0.2	3.6	-1.2	-1.2	0.3	5.6
36	IC	0.0	-1.0	0.0	2.7	0.0	1.7	-0.1	***	-0.1	***	-0.1	***
37	IC	0.0	4.0	0.2	3.0	0.2	7.0	0.3	0.4	0.1	-2.6	0.3	4.4
38	GS	0.5	6.0	1.5	9.7	2.0	15.7	3.0	13.6	1.5	3.9	3.5	19.6
39	IC	0.0	-1.0	-0.1	1.0	-0.1	0.0	-0.3	***	-0.2	***	-0.3	***
40	GS	0.0	9.0	0.7	10.2	0.7	19.2	1.0	12.9	0.3	2.7	1.0	21.9
41	IC	0.0	-2.0	***	***	***	***	***	***	***	***	***	***
42	GS	0.4	16.0	1.2	-2.0	1.6	14.0	2.1	4.6	0.9	6.6	2.5	20.6
43	GS	0.5	4.0	1.4	-5.0	1.9	-1.0	2.3	7.1	0.9	12.1	2.8	11.1
44	IC	0.1	-4.0	***	***	***	***	***	***	***	***	***	***
45	GS	0.1	-3.0	0.0	2.2	0.1	-0.8	-0.1	3.1	-0.1	0.9	0.0	0.1
46	IC	***	***	***	***	***	***	***	***	***	***	***	***

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Indian Bath | Treatment: Control | Measured By: 1989 Bates, Maddson
Measured By: 1994 Gasser, Ganz, Bothof
Block: C | Plot # : 1 | Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
47	GS	-0.1	0.0	***	***	***	***	***	***	***	***	***	***
48	IC	0.0	-2.0	0.4	2.6	0.4	0.6	0.3	2.2	-0.1	-0.4	0.3	0.2
49	IC	0.0	-2.0	0.1	5.5	0.1	3.5	0.2	3.2	0.1	-2.3	0.2	1.2
50	IC	0.0	1.0	0.3	1.2	0.3	2.2	0.4	1.4	0.1	0.2	0.4	2.4
51	IC	0.3	0.0	0.8	6.6	1.1	6.6	1.1	9.0	0.3	2.4	1.4	9.0
52	GS	0.0	1.0	1.1	0.8	1.1	1.8	***	***	***	***	***	***
53	GS	0.3	2.0	0.6	10.6	0.9	12.6	0.6	-13.0	0.0	-23.6	0.9	-11.0
54	GS	0.4	2.0	0.5	-8.3	0.9	-6.3	0.5	-5.5	0.0	2.8	0.9	-3.5
55	GS	0.2	-1.0	0.1	2.5	0.3	1.5	0.1	3.5	0.0	1.0	0.3	2.5
56	GS	0.8	-1.0	2.5	9.0	3.3	8.0	4.6	22.8	2.1	13.8	5.4	21.8
57	GS	0.4	-1.0	1.2	19.7	1.6	18.7	2.5	22.5	1.3	2.8	2.9	21.5
58	GS	0.0	1.0	0.0	2.9	0.0	3.9	-0.1	0.6	-0.1	-2.3	-0.1	1.6
59	GS	0.5	-1.0	1.3	17.8	1.8	16.8	2.3	23.5	1.0	5.7	2.8	22.5
60	IC	-0.1	1.0	***	***	***	***	***	***	***	***	***	***
61	IC	-0.2	0.0	***	***	***	***	***	***	***	***	***	***
62	GS	0.2	0.0	0.2	4.8	0.4	4.8	0.3	5.2	0.1	0.4	0.5	5.2
63	GS	0.3	-3.0	0.6	14.0	0.9	11.0	0.8	22.2	0.2	8.2	1.1	19.2
64	GS	0.1	0.0	0.1	2.1	0.2	2.1	0.0	1.7	-0.1	-0.4	0.1	1.7
65	GS	0.4	0.0	1.4	8.4	1.8	8.4	0.7	13.2	-0.7	4.8	1.1	13.2
66	GS	0.6	8.0	1.8	11.3	2.4	19.3	3.0	19.1	1.2	7.8	3.6	27.1
67	WF	0.1	-2.0	-0.1	1.7	0.0	-0.3	-0.1	***	0.0	***	0.0	***
68	IC	0.0	1.0	-0.2	0.6	-0.2	1.6	***	***	***	***	***	***
69	IC	0.0	-1.0	0.1	3.8	0.1	2.8	0.0	4.2	-0.1	0.4	0.0	3.2
70	IC	0.1	3.0	-0.2	4.1	-0.1	7.1	-0.3	***	-0.1	***	-0.2	***
71	WF	***	***	***	***	***	***	***	***	1.8	2.6	***	***
72	GS	0.5	39.0	1.7	5.0	2.2	44.0	3.1	18.2	1.4	13.2	3.6	57.2
73	IC	0.0	0.0	-0.1	6.7	-0.1	6.7	-0.2	***	-0.1	***	-0.2	***
74	IC	0.0	1.0	0.0	6.0	0.0	7.0	-0.2	***	-0.2	***	-0.2	***
75	IC	0.1	1.0	0.4	5.9	0.5	6.9	0.3	3.6	-0.1	-2.3	0.4	4.6
76	WF	0.3	1.0	0.4	7.1	0.7	8.1	0.5	10.4	0.1	3.3	0.8	11.4
77	WF	0.0	-7.0	0.1	6.2	0.1	-0.8	0.0	***	-0.1	***	0.0	***
78	GS	0.7	2.0	2.0	13.7	2.7	15.7	3.2	20.0	1.2	6.3	3.9	22.0
79	WF	0.3	5.0	0.4	-18.2	0.7	-13.2	0.5	-13.2	0.1	5.0	0.8	-8.2
80	GS	1.5	2.0	2.4	12.7	3.9	14.7	3.9	21.5	1.5	8.8	5.4	23.5
81	SP	0.5	9.0	1.5	8.0	2.0	17.0	1.8	3.2	0.3	-4.8	2.3	12.2
82	IC	-0.2	2.0	-0.1	***	-0.3	***	-0.2	***	-0.1	***	-0.4	***
83	IC	-0.2	2.0	-0.3	***	-0.5	***	-0.3	***	0.0	***	-0.5	***
84	IC	-0.1	0.0	0.0	2.4	-0.1	2.4	0.0	-0.4	0.0	-2.8	-0.1	-0.4
85	IC	-2.4	-2.0	-0.2	9.0	-2.6	7.0	-0.3	***	-0.1	***	-2.7	***
86	IC	2.4	2.0	0.0	6.4	2.4	8.4	-0.2	***	-0.2	***	2.2	***
87	IC	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		0.2	1.1	0.7	6.4	0.9	7.8	1.1	9.1	0.4	2.2	1.3	11.1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Indian Bath	Treatment: Control	Measured By:	1989	Bates, Maddson
		Measured By:	1994	Gasser, Ganz, Bothof
Block: C	Plot # : 1	Measured By:	2001	Roller, Arrowsmith
		Measured By:	2009	Soderlund, Ricchiazzi

Trees	22,23,24,46	Dead in 1994. 22,24 - Dead/Standing and 23,46 - Dead/Down.
Tree	71	Missing in 1989
Trees	21,23,41,44,47,60,61	Dead/Down in 2001
Trees	22,24,25,27,31,82,83	Dead/Standing in 2001
Tree	27	Tagged but no data in 1989 or 1994. Measured in 2001
Tree	35	Is out of plot at 40.9 feet from plot center in 2001
Tree	46	Dead/Missing in 2001,2009
Tree	49	Deformed/Bowed-height taken at dominant leader in 2001. Leaning in 2009.
Trees	54,79,81	Broken Top in 2001
Tree	71	Was tagged but there is no data in 1989 or 1994. Forked Top in 2001.
Trees	4,5,6,9,12,19,37,34,48,64,75,84	Deformed Top in 2009
Trees	8,30,36,39,67,70,73,74,77,85,86	Dead/Standing in 2009
Trees	52,68	Dead/Down in 2009
Trees	53,81	Broken Top in 2009
Tree	81	Dead Top in 2009
Tree	87	Dead/Standing in 2009, no data in 1994 or 2001

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Indian Bath	Treatment: Control	Measured By:	1989 Scott, Eagan
		Measured By:	1994 Gasser, Ganz, Bothof
Block: C	Plot # : 2	Measured By:	2001 Roller, Arrowsmith
		Measured By:	2009 Soderlund, Ricchiazzi

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
37	IC	2.2	11.0	2.4	11.0	2.5	14.0	2.7	14.0
38	GS	34.2	134.0	35.4	142.0	37.6	156.2	39.7	161.8
39	WF	10.2	53.0	10.6	57.0	11.2	65.4	11.7	68.7
40	IC	1.0	7.0	1.2	8.0	1.4	8.7	1.4	9.1
41	GS	32.5	118.0	33.1	130.0	34.9	141.7	36.5	153.2
42	GS	30.1	113.0	30.0	115.0	31.5	120.1	32.7	138.2
43	GS	9.1	42.0	9.1	39.0	9.3	41.6	9.4	40.1
44	IC	0.9	8.0	1.1	8.0	1.3	9.6	1.4	13.5
45	GS	9.0	47.0	9.1	47.0	9.3	48.8	9.3	50.2
46	GS	19.6	114.0	20.1	115.0	21.8	129.0	23.2	140.1
47	GS	27.5	118.0	28.2	119.0	30.1	128.7	31.8	139.5
48	GS	10.9	113.0	11.0	76.0	11.0	79.6	11.0	74.4
49	GS	32.5	114.0	33.5	112.0	35.5	129.1	37.6	136.5
50	GS	13.5	88.0	13.6	92.0	14.2	107.5	14.3	107.7
51	GS	27.7	115.0	28.4	118.0	30.7	124.8	32.3	135.9
52	GS	8.8	41.0	9.0	41.0	9.4	37.1	9.4	38.7
53	GS	18.3	80.0	18.8	105.0	19.9	109.1	20.4	116.9
54	GS	23.3	105.0	23.8	111.0	25.6	124.7	27.4	133.0
55	GS	7.5	23.0	7.6	23.0	7.8	23.2	7.6	24.7
56	GS	20.7	103.0	21.3	109.0	23.1	124.9	24.4	133.2
57	GS	8.8	48.0	9.0	45.0	9.3	57.3	9.3	52.5
58	GS	1.9	7.0	2.0	8.0	2.0	8.6	2.1	8.1
59	GS	26.3	99.0	26.8	103.0	28.6	118.7	29.8	127.1
60	GS	36.0	127.0	36.4	127.0	38.6	139.5	40.7	150.5
61	GS	3.8	10.0	3.9	10.0	3.8	13.9	3.9	13.5
62	SP	15.5	77.0	15.8	80.0	16.7	97.5	17.1	92.5
63	GS	26.3	128.0	31.1	131.0	31.9	155.1	33.6	155.4
64	WF	5.7	27.0	5.9	28.0	6.3	32.2	6.6	32.6
65	WF	1.4	9.0	1.5	9.0	1.5	10.1	***	***
66	GS	31.1	119.0	31.6	121.0	32.8	129.8	34.0	135.3
67	GS	24.1	125.0	25.3	124.0	27.2	140.8	29.1	146.0
68	WF	5.9	27.0	6.3	29.0	7.0	36.6	7.3	37.7
AVG.		16.4	73.4	17.0	74.8	17.9	83.2	19.3	89.7

Trees	45,52	Broken Top in 2001
Tree	64	Is out of plot at 39.9 ft from plot center in 2001
Tree	57,62	Broken Top in 2009
Trees	43,45,48,58,61	Deformed Top in 2009
Tree	61	Dead Top in 2009
Tree	65	Dead/Down in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Indian Bath | Treatment: Control | Measured By: 1989 Scott, Eagan
Measured By: 1994 Gasser, Ganz, Bothof
Block: C | Plot # : 2 | Measured By: 2001 Roller, Arrowsmith
Measured By: 2009 Soderlund, Ricchiazzi

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
37	IC	0.2	0.0	0.1	3.0	0.3	3.0	0.3	3.0	0.2	0.0	0.5	3.0
38	GS	1.2	8.0	2.2	14.2	3.4	22.2	4.3	19.8	2.1	5.6	5.5	27.8
39	WF	0.4	4.0	0.6	8.4	1.0	12.4	1.1	11.7	0.5	3.3	1.5	15.7
40	IC	0.2	1.0	0.2	0.7	0.4	1.7	0.2	1.1	0.0	0.4	0.4	2.1
41	GS	0.6	12.0	1.8	11.7	2.4	23.7	3.4	23.2	1.6	11.5	4.0	35.2
42	GS	-0.1	2.0	1.5	5.1	1.4	7.1	2.7	23.2	1.2	18.1	2.6	25.2
43	GS	0.0	-3.0	0.2	2.6	0.2	-0.4	0.3	1.1	0.1	-1.5	0.3	-1.9
44	IC	0.2	0.0	0.2	1.6	0.4	1.6	0.3	5.5	0.1	3.9	0.5	5.5
45	GS	0.1	0.0	0.2	1.8	0.3	1.8	0.2	3.2	0.0	1.4	0.3	3.2
46	GS	0.5	1.0	1.7	14.0	2.2	15.0	3.1	25.1	1.4	11.1	3.6	26.1
47	GS	0.7	1.0	1.9	9.7	2.6	10.7	3.6	20.5	1.7	10.8	4.3	21.5
48	GS	0.1	-37.0	0.0	3.6	0.1	-33.4	0.0	-1.6	0.0	-5.2	0.1	-38.6
49	GS	1.0	-2.0	2.0	17.1	3.0	15.1	4.1	24.5	2.1	7.4	5.1	22.5
50	GS	0.1	4.0	0.6	15.5	0.7	19.5	0.7	15.7	0.1	0.2	0.8	19.7
51	GS	0.7	3.0	2.3	6.8	3.0	9.8	3.9	17.9	1.6	11.1	4.6	20.9
52	GS	0.2	0.0	0.4	-3.9	0.6	-3.9	0.4	-2.3	0.0	1.6	0.6	-2.3
53	GS	0.5	25.0	1.1	4.1	1.6	29.1	1.6	11.9	0.5	7.8	2.1	36.9
54	GS	0.5	6.0	1.8	13.7	2.3	19.7	3.6	22.0	1.8	8.3	4.1	28.0
55	GS	0.1	0.0	0.2	0.2	0.3	0.2	0.0	1.7	-0.2	1.5	0.1	1.7
56	GS	0.6	6.0	1.8	15.9	2.4	21.9	3.1	24.2	1.3	8.3	3.7	30.2
57	GS	0.2	-3.0	0.3	12.3	0.5	9.3	0.3	7.5	0.0	-4.8	0.5	4.5
58	GS	0.1	1.0	0.0	0.6	0.1	1.6	0.1	0.1	0.1	-0.5	0.2	1.1
59	GS	0.5	4.0	1.8	15.7	2.3	19.7	3.0	24.1	1.2	8.4	3.5	28.1
60	GS	0.4	0.0	2.2	12.5	2.6	12.5	4.3	23.5	2.1	11.0	4.7	23.5
61	GS	0.1	0.0	-0.1	3.9	0.0	3.9	0.0	3.5	0.1	-0.4	0.1	3.5
62	SP	0.3	3.0	0.9	17.5	1.2	20.5	1.3	12.5	0.4	-5.0	1.6	15.5
63	GS	4.8	3.0	0.8	24.1	5.6	27.1	2.5	24.4	1.7	0.3	7.3	27.4
64	WF	0.2	1.0	0.4	4.2	0.6	5.2	0.7	4.6	0.3	0.4	0.9	5.6
65	WF	0.1	0.0	0.0	1.1	0.1	1.1	***	***	***	***	***	***
66	GS	0.5	2.0	1.2	8.8	1.7	10.8	2.4	14.3	1.2	5.5	2.9	16.3
67	GS	1.2	-1.0	1.9	16.8	3.1	15.8	3.8	22.0	1.9	5.2	5.0	21.0
68	WF	0.4	2.0	0.7	7.6	1.1	9.6	1.0	8.7	0.3	1.1	1.4	10.7
AVG.		0.5	1.3	1.0	8.5	1.5	9.8	1.8	12.8	0.8	4.1	2.3	14.2

Trees	45,52	Broken Top in 2001
Tree	64	Is out of plot at 39.9 ft from plot center in 2001
Tree	57,62	Broken Top in 2009
Trees	43,45,48,58,61	Deformed Top in 2009
Tree	61	Dead Top in 2009
Tree	65	Dead/Down in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah	Treatment: Thinned	Measured By:	1989	Bates, Maddson
		Measured By:	1994	Ganz
Block: A	Plot # : 1	Measured By:	2001	Roller, Kong
		Measured By:	2009	Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	17.6	75.0	23.0	81.0	23.7	98.0	28.4	104.9
2	GS	12.5	60.0	15.2	69.0	18.2	82.2	21.6	93.2
3	GS	7.5	35.0	9.9	41.0	12.9	54.9	15.7	66.4
4	GS	***	***	***	***	***	***	***	***
5	GS	14.0	64.0	15.0	71.0	16.9	79.2	19.1	90.3
6	GS	28.9	84.0	32.0	95.0	36.3	103.9	39.8	115.3
7	GS	23.7	83.0	26.3	92.0	29.0	103.8	34.4	115.6
8	IC	26.2	59.0	28.2	75.0	30.4	84.3	32.9	94.4
9	WF	***	***	***	***	1.1	6.1	2.2	10.5
10	WF	***	***	***	***	***	***	2.3	10.6
11	WF	***	***	***	***	***	***	2.1	9.6
12	BO	***	***	***	***	***	***	1.8	12.0
13	BO	***	***	***	***	***	***	1.7	12.9
14	WF	***	***	***	***	***	***	2.3	13.9
15	WF	***	***	***	***	***	***	2.8	13.1
16	WF	***	***	***	***	***	***	1.8	9.7
17	WF	***	***	***	***	***	***	1.9	8.5
AVG.		18.6	65.7	21.4	74.9	21.1	76.6	13.2	48.8

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	5.4	6.0	0.7	17.0	6.1	23.0	5.4	23.9	4.7	6.9	10.8	29.9
2	GS	2.7	9.0	3.0	13.2	5.7	22.2	6.4	24.2	3.4	11.0	9.1	33.2
3	GS	2.4	6.0	3.0	13.9	5.4	19.9	5.8	25.4	2.8	11.5	8.2	31.4
4	GS	***	***	***	***	***	***	***	***	***	***	***	***
5	GS	1.0	7.0	1.9	8.2	2.9	15.2	4.1	19.3	2.2	11.1	5.1	26.3
6	GS	3.1	11.0	4.3	8.9	7.4	19.9	7.8	20.3	3.5	11.4	10.9	31.3
7	GS	2.6	9.0	2.7	11.8	5.3	20.8	8.1	23.6	5.4	11.8	10.7	32.6
8	IC	2.0	16.0	2.2	9.3	4.2	25.3	4.7	19.4	2.5	10.1	6.7	35.4
9	WF	***	***	***	***	***	***	***	***	1.1	4.4	***	***
10	WF	***	***	***	***	***	***	***	***	***	***	***	***
11	WF	***	***	***	***	***	***	***	***	***	***	***	***
12	BO	***	***	***	***	***	***	***	***	***	***	***	***
13	BO	***	***	***	***	***	***	***	***	***	***	***	***
14	WF	***	***	***	***	***	***	***	***	***	***	***	***
15	WF	***	***	***	***	***	***	***	***	***	***	***	***
16	WF	***	***	***	***	***	***	***	***	***	***	***	***
17	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		2.7	9.1	2.5	11.8	5.3	20.9	6.0	22.3	3.2	9.8	8.8	31.4

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah	Treatment: Thinned	Measured By:	1989	Bates, Maddson
		Measured By:	1994	Ganz
Block: A	Plot # : 1	Measured By:	2001	Roller, Kong
		Measured By:	2009	Soderlund, Estrada

Tree	4	Missing in 1994, no tree or data in 1989
Tree	9	Ingrowth in 2001
Tree	3	Previously measured but is out of plot at 41.0 ft from plot center in 2001
Trees	10-17.	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah   Treatment: Thinned   Measured By: 1989 Bishop, Johannis
Measured By: 1994 Ganz
Block: A   Plot # : 2   Measured By: 2001 Roller, Kong
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
78	GS	21.2	84.0	23.7	93.0	27.3	110.7	31.3	121.1
79	GS	17.4	69.0	20.4	66.0	23.4	94.1	29.2	106.0
80	IC	0.9	7.0	1.0	7.0	2.1	8.8	3.3	13.8
81	GS	21.4	74.0	22.6	76.0	25.4	95.4	29.3	106.1
82	GS	0.8	6.0	1.2	7.0	1.4	7.1	2.1	8.7
83	GS	16.9	71.0	19.0	73.0	21.3	89.2	24.1	103.0
84	IC	1.6	10.0	2.1	11.0	3.3	13.0	3.7	14.7
85	GS	14.5	62.0	16.0	68.0	18.3	78.8	20.8	93.5
86	GS	13.0	60.0	14.3	64.0	15.7	76.5	17.3	87.8
87	GS	15.9	51.0	17.8	54.0	20.0	67.1	22.5	76.9
88	GS	14.3	59.0	16.2	66.0	17.9	77.4	20.4	87.9
89	GS	19.2	74.0	21.0	81.0	24.2	96.6	27.7	107.5
90*	PP	14.0	52.0	***	***	***	***	***	***
90	WF	***	***	***	***	1.3	10.0	1.5	10.4
91	IC	***	***	***	***	1.0	7.3	2.6	11.5
92	WF	***	***	***	***	1.1	7.3	2.1	9.7
93	IC	***	***	***	***	1.2	7.6	2.5	12.5
94	PP	***	***	***	***	1.4	8.3	3.2	13.8
95	WF	***	***	***	***	2.6	13.0	4.8	22.1
96	IC	***	***	***	***	1.6	7.6	2.1	8.8
97	WF	***	***	***	***	2.6	11.4	4.5	18.4
98	GS	***	***	***	***	1.1	6.9	2.1	10.5
99	WF	***	***	***	***	***	***	2.1	11.2
100	WF	***	***	***	***	***	***	1.1	8.0
101	WF	***	***	***	***	***	***	2.6	14.7
102	WF	***	***	***	***	***	***	1.5	10.2
103	IC	***	***	***	***	***	***	1.3	7.3
104	BO	***	***	***	***	***	***	1.1	11.8
105	IC	***	***	***	***	***	***	1.0	7.4
106	IC	***	***	***	***	***	***	1.2	8.5
107	BO	***	***	***	***	***	***	1.1	11.5
108	WF	***	***	***	***	***	***	2.2	11.9
109	WF	***	***	***	***	***	***	2.0	11.5
110	WF	***	***	***	***	***	***	2.1	11.1
111	WF	***	***	***	***	***	***	1.4	8.2
112	WF	***	***	***	***	***	***	1.0	7.7
AVG.		13.2	52.2	14.6	55.5	10.2	42.6	8.0	33.9

Tree	84	Previously measured but is out of plot at 42.9 ft from plot center in 2001
Tree	90*	Dead in 1994
Trees	90-98	Ingrowth in 2001
Trees	99-112	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Thinned | Measured By: 1989 Bishop, Johannis
Measured By: 1994 Ganz
Block: A | Plot # : 2 | Measured By: 2001 Roller, Kong
Measured By: 2009 Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
78	GS	2.5	9.0	3.6	17.7	6.1	26.7	7.6	28.1	4.0	10.4	10.1	37.1
79	GS	3.0	-3.0	3.0	28.1	6.0	25.1	8.8	40.0	5.8	11.9	11.8	37.0
80	IC	0.1	0.0	1.1	1.8	1.2	1.8	2.3	6.8	1.2	5.0	2.4	6.8
81	GS	1.2	2.0	2.8	19.4	4.0	21.4	6.7	30.1	3.9	10.7	7.9	32.1
82	GS	0.4	1.0	0.2	0.1	0.6	1.1	0.9	1.7	0.7	1.6	1.3	2.7
83	GS	2.1	2.0	2.3	16.2	4.4	18.2	5.1	30.0	2.8	13.8	7.2	32.0
84	IC	0.5	1.0	1.2	2.0	1.7	3.0	1.6	3.7	0.4	1.7	2.1	4.7
85	GS	1.5	6.0	2.3	10.8	3.8	16.8	4.8	25.5	2.5	14.7	6.3	31.5
86	GS	1.3	4.0	1.4	12.5	2.7	16.5	3.0	23.8	1.6	11.3	4.3	27.8
87	GS	1.9	3.0	2.2	13.1	4.1	16.1	4.7	22.9	2.5	9.8	6.6	25.9
88	GS	1.9	7.0	1.7	11.4	3.6	18.4	4.2	21.9	2.5	10.5	6.1	28.9
89	GS	1.8	7.0	3.2	15.6	5.0	22.6	6.7	26.5	3.5	10.9	8.5	33.5
90*	PP	***	***	***	***	***	***	***	***	***	***	***	***
90	WF	***	***	***	***	***	***	***	***	0.2	0.4	***	***
91	IC	***	***	***	***	***	***	***	***	1.6	4.2	***	***
92	WF	***	***	***	***	***	***	***	***	1.0	2.4	***	***
93	IC	***	***	***	***	***	***	***	***	1.3	4.9	***	***
94	PP	***	***	***	***	***	***	***	***	1.8	5.5	***	***
95	WF	***	***	***	***	***	***	***	***	2.2	9.1	***	***
96	IC	***	***	***	***	***	***	***	***	0.5	1.2	***	***
97	WF	***	***	***	***	***	***	***	***	1.9	7.0	***	***
98	GS	***	***	***	***	***	***	***	***	1.0	3.6	***	***
99	WF	***	***	***	***	***	***	***	***	***	***	***	***
100	WF	***	***	***	***	***	***	***	***	***	***	***	***
101	WF	***	***	***	***	***	***	***	***	***	***	***	***
102	WF	***	***	***	***	***	***	***	***	***	***	***	***
103	IC	***	***	***	***	***	***	***	***	***	***	***	***
104	BO	***	***	***	***	***	***	***	***	***	***	***	***
105	IC	***	***	***	***	***	***	***	***	***	***	***	***
106	IC	***	***	***	***	***	***	***	***	***	***	***	***
107	BO	***	***	***	***	***	***	***	***	***	***	***	***
108	WF	***	***	***	***	***	***	***	***	***	***	***	***
109	WF	***	***	***	***	***	***	***	***	***	***	***	***
110	WF	***	***	***	***	***	***	***	***	***	***	***	***
111	WF	***	***	***	***	***	***	***	***	***	***	***	***
112	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		1.5	3.3	2.1	12.4	3.6	15.6	4.7	21.8	2.0	7.2	6.2	25.0

Tree 84 Previously measured but is out of plot at 42.9 ft from plot center in 2001
Tree 90* Dead in 1994
Trees 90-98 Ingrowth in 2001
Trees 99-112 Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Thinned | Measured By: 1989 Bishop, Johannis
Measured By: 1994 Ganz
Block: A | Plot # : 3 | Measured By: 2001 Roller, Kong
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
88	IC	17.9	67.0	19.6	72.0	20.9	71.8	23.1	78.6
89	GS	26.9	91.0	29.0	93.0	31.5	107.4	37.0	120.2
90	GS	14.5	74.0	17.1	77.0	20.4	96.8	24.5	108.8
91	GS	11.7	51.0	13.9	54.0	16.3	69.9	19.6	81.5
92	GS	11.7	30.0	13.0	33.0	15.3	44.2	17.4	57.4
93	GS	19.9	96.0	22.0	98.0	25.6	106.5	29.7	120.9
94	IC	8.1	37.0	9.2	40.0	11.1	48.2	13.0	57.5
95	WF	***	***	***	***	1.5	9.0	3.0	12.5
96	WF	***	***	***	***	1.9	11.8	3.0	15.6
97	WF	***	***	***	***	1.6	11.3	2.8	15.7
98	WF	***	***	***	***	2.0	10.8	4.1	17.8
99	WF	***	***	***	***	***	***	1.9	9.8
100	IC	***	***	***	***	***	***	1.1	7.4
101	WF	***	***	***	***	***	***	1.5	8.5
102	WF	***	***	***	***	***	***	1.5	9.9
103	WF	***	***	***	***	***	***	2.0	11.4
104	WF	***	***	***	***	***	***	2.0	8.6
105	IC	***	***	***	***	***	***	2.4	13.7
AVG.		15.8	63.7	17.7	66.7	13.5	53.4	10.5	42.0

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
88	IC	1.7	5.0	1.3	-0.2	3.0	4.8	3.5	6.6	2.2	6.8	5.2	11.6
89	GS	2.1	2.0	2.5	14.4	4.6	16.4	8.0	27.2	5.5	12.8	10.1	29.2
90	GS	2.6	3.0	3.3	19.8	5.9	22.8	7.4	31.8	4.1	12.0	10.0	34.8
91	GS	2.2	3.0	2.4	15.9	4.6	18.9	5.7	27.5	3.3	11.6	7.9	30.5
92	GS	1.3	3.0	2.3	11.2	3.6	14.2	4.4	24.4	2.1	13.2	5.7	27.4
93	GS	2.1	2.0	3.6	8.5	5.7	10.5	7.7	22.9	4.1	14.4	9.8	24.9
94	IC	1.1	3.0	1.9	8.2	3.0	11.2	3.8	17.5	1.9	9.3	4.9	20.5
95	WF	***	***	***	***	***	***	***	***	1.5	3.5	***	***
96	WF	***	***	***	***	***	***	***	***	1.1	3.8	***	***
97	WF	***	***	***	***	***	***	***	***	1.2	4.4	***	***
98	WF	***	***	***	***	***	***	***	***	2.1	7.0	***	***
99	WF	***	***	***	***	***	***	***	***	***	***	***	***
100	IC	***	***	***	***	***	***	***	***	***	***	***	***
101	WF	***	***	***	***	***	***	***	***	***	***	***	***
102	WF	***	***	***	***	***	***	***	***	***	***	***	***
103	WF	***	***	***	***	***	***	***	***	***	***	***	***
104	WF	***	***	***	***	***	***	***	***	***	***	***	***
105	IC	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		1.9	3.0	2.5	11.1	4.3	14.1	5.8	22.6	2.6	9.0	7.7	25.6

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah	Treatment: Thinned	Measured By:	1989	Bishop, Johannis
		Measured By:	1994	Ganz
Block: A	Plot # : 3	Measured By:	2001	Roller, Kong
		Measured By:	2009	Soderlund, Estrada

Trees	95-98	Ingrowth in 2001
Trees	99-105	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Thinned | Measured By: 1989 Scoot, Vickeral
Measured By: 1994 Ganz
Block: A | Plot # : 4 | Measured By: 2001 Roller, Kong
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
91	GS	23.4	89.0	26.2	92.0	30.0	106.0	35.0	120.5
92	GS	18.9	67.0	20.3	74.0	22.5	89.8	26.5	101.3
93	GS	17.7	68.0	19.5	74.0	23.5	82.5	26.9	96.3
94	GS	20.7	72.0	24.0	80.0	26.4	93.0	30.1	103.2
95	IC	9.8	37.0	10.8	39.0	13.1	52.8	14.9	64.2
96	GS	27.1	86.0	30.9	93.0	33.6	113.9	40.4	126.8
97	GS	25.1	75.0	27.8	83.0	31.2	96.4	36.7	111.8
98	WF	***	***	***	***	3.0	14.8	5.6	25.6
99	WF	***	***	***	***	3.7	13.6	5.9	16.4
100	GS	***	***	***	***	1.1	7.0	1.7	9.7
101	WF	***	***	***	***	4.9	20.8	7.4	28.4
102	IC	***	***	***	***	***	***	1.6	10.2
103	IC	***	***	***	***	***	***	2.0	9.9
104	IC	***	***	***	***	***	***	1.0	8.1
105	IC	***	***	***	***	***	***	1.7	10.7
106	GS	***	***	***	***	***	***	1.7	8.7
107	IC	***	***	***	***	***	***	1.3	9.9
108	IC	***	***	***	***	***	***	1.5	8.5
109	IC	***	***	***	***	***	***	1.7	10.2
110	WF	***	***	***	***	***	***	1.1	6.4
AVG.		20.4	70.6	22.8	76.4	17.5	62.8	12.2	44.3

Trees 98-101 Ingrowth in 2001
Trees 102-110 Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Methuselah	Treatment: Thinned	Measured By:	1989 Scoot, Vickeral
		Measured By:	1994 Ganz
Block: A	Plot # : 4	Measured By:	2001 Roller, Kong
		Measured By:	2009 Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
91	GS	2.8	3.0	3.8	14.0	6.6	17.0	8.8	28.5	5.0	14.5	11.6	31.5
92	GS	1.4	7.0	2.2	15.8	3.6	22.8	6.2	27.3	4.0	11.5	7.6	34.3
93	GS	1.8	6.0	4.0	8.5	5.8	14.5	7.4	22.3	3.4	13.8	9.2	28.3
94	GS	3.3	8.0	2.4	13.0	5.7	21.0	6.1	23.2	3.7	10.2	9.4	31.2
95	IC	1.0	2.0	2.3	13.8	3.3	15.8	4.1	25.2	1.8	11.4	5.1	27.2
96	GS	3.8	7.0	2.7	20.9	6.5	27.9	9.5	33.8	6.8	12.9	13.3	40.8
97	GS	2.7	8.0	3.4	13.4	6.1	21.4	8.9	28.8	5.5	15.4	11.6	36.8
98	WF	***	***	***	***	***	***	***	***	2.6	10.8	***	***
99	WF	***	***	***	***	***	***	***	***	2.2	2.8	***	***
100	GS	***	***	***	***	***	***	***	***	0.6	2.7	***	***
101	WF	***	***	***	***	***	***	***	***	2.5	7.6	***	***
102	IC	***	***	***	***	***	***	***	***	***	***	***	***
103	IC	***	***	***	***	***	***	***	***	***	***	***	***
104	IC	***	***	***	***	***	***	***	***	***	***	***	***
105	IC	***	***	***	***	***	***	***	***	***	***	***	***
106	GS	***	***	***	***	***	***	***	***	***	***	***	***
107	IC	***	***	***	***	***	***	***	***	***	***	***	***
108	IC	***	***	***	***	***	***	***	***	***	***	***	***
109	IC	***	***	***	***	***	***	***	***	***	***	***	***
110	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		2.4	5.9	3.0	14.2	5.4	20.1	7.3	27.0	3.5	10.3	9.7	32.9

Trees 98-101 Ingrowth in 2001
Trees 102-110 Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Thinned/Burned | Measured By: 1989 ???
Measured By: 1994 Ganz
Block: B | Plot # : 1 | Measured By: 2001 Roller, McLeod
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
11	GS	16.8	65.0	19.6	83.0	23.4	102.7	27.3	117.4
12	GS	27.4	98.0	30.9	102.0	35.7	118.5	39.7	132.4
13	PP	13.0	52.0	***	***	***	***	***	***
14	GS	15.1	47.0	16.1	52.0	18.8	64.6	21.1	79.3
15	GS	21.7	68.0	23.9	92.0	28.5	105.1	31.1	118.0
16	GS	18.0	67.0	19.3	68.0	22.7	80.2	25.6	102.6
17	GS	28.8	108.0	31.2	111.0	32.3	122.9	35.1	135.3
AVG.		20.1	72.1	23.5	84.7	26.9	99.0	30.0	114.2

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
11	GS	2.8	18.0	3.8	19.7	6.6	37.7	7.7	34.4	3.9	14.7	10.5	52.4
12	GS	3.5	4.0	4.8	16.5	8.3	20.5	8.8	30.4	4.0	13.9	12.3	34.4
13	PP	***	***	***	***	***	***	***	***	***	***	***	***
14	GS	1.0	5.0	2.7	12.6	3.7	17.6	5.0	27.3	2.3	14.7	6.0	32.3
15	GS	2.2	24.0	4.6	13.1	6.8	37.1	7.2	26.0	2.6	12.9	9.4	50.0
16	GS	1.3	1.0	3.4	12.2	4.7	13.2	6.3	34.6	2.9	22.4	7.6	35.6
17	GS	2.4	3.0	1.1	11.9	3.5	14.9	3.9	24.3	2.8	12.4	6.3	27.3
AVG.		2.2	9.2	3.4	14.3	5.6	23.5	6.5	29.5	3.1	15.2	8.7	38.7

Tree 13 Dead/Missing in 1994

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah	Treatment: Thinned/Burned	Measured By:	1989 Rodgers, Johannis
		Measured By:	1994 Ganz
Block: B	Plot # : 2	Measured By:	2001 Roller, McLeod
		Measured By:	2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	14.7	63.0	16.0	67.0	19.1	82.5	21.9	91.3
2	IC	2.2	11.0	***	***	***	***	***	***
3	GS	26.1	81.0	27.9	94.0	31.9	111.4	35.4	119.8
4	WF	2.9	12.0	***	***	***	***	***	***
5	GS	21.3	70.0	22.1	79.0	26.2	96.8	29.9	104.5
6	IC	17.3	28.0	***	***	***	***	***	***
7	GS	20.6	90.0	22.6	96.0	26.4	112.7	29.0	123.0
8	GS	24.6	80.0	27.0	85.0	31.9	100.2	35.7	112.7
9	GS	16.9	58.0	19.3	69.0	22.8	78.5	25.8	93.3
10	GS	10.0	65.0	11.1	66.0	13.5	79.7	15.1	88.6
AVG.		15.7	55.8	20.9	79.4	24.5	94.5	27.5	104.7

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	1.3	4.0	3.1	15.5	4.4	19.5	5.9	24.3	2.8	8.8	7.2	28.3
2	IC	***	***	***	***	***	***	***	***	***	***	***	***
3	GS	1.8	13.0	4.0	17.4	5.8	30.4	7.5	25.8	3.5	8.4	9.3	38.8
4	WF	***	***	***	***	***	***	***	***	***	***	***	***
5	GS	0.8	9.0	4.1	17.8	4.9	26.8	7.8	25.5	3.7	7.7	8.6	34.5
6	IC	***	***	***	***	***	***	***	***	***	***	***	***
7	GS	2.0	6.0	3.8	16.7	5.8	22.7	6.4	27.0	2.6	10.3	8.4	33.0
8	GS	2.4	5.0	4.9	15.2	7.3	20.2	8.7	27.7	3.8	12.5	11.1	32.7
9	GS	2.4	11.0	3.5	9.5	5.9	20.5	6.5	24.3	3.0	14.8	8.9	35.3
10	GS	1.1	1.0	2.4	13.7	3.5	14.7	4.0	22.6	1.6	8.9	5.1	23.6
AVG.		1.7	7.0	3.7	15.1	5.4	22.1	6.7	25.3	3.0	10.2	8.4	32.3

Trees	2,4,6	Dead in 1994
Trees	2,4	Dead/Down in 2001
Tree	6	Dead/Missing in 2001
Tree	6	Dead/Down in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Thinned/Burned | Measured By: 1989 Rodgers, Johannis
Measured By: 1994 Ganz
Block: B | Plot # : 3 | Measured By: 2001 Roller, McLeod
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
65	GS	16.6	73	19.9	80.0	24.8	94.8	28.5	105.4
66	GS	22.1	78	23.8	88.0	27.4	103.2	30.2	118.6
67	GS	12.1	52	12.9	56.0	15.0	71.9	16.8	79.1
68	GS	20	72	21.6	80.0	24.5	95.3	27.2	104.4
69	GS	17.6	73	18.6	77.0	20.5	84.8	23.8	96.8
70	GS	22	71	22.7	75.0	25.0	86.3	27.1	99.7
71	GS	21.9	80	22.2	86.0	24.6	96.4	27.6	110.6
72	GS	5.3	29	6.2	32.0	***	***	***	***
73	WF	***	***	***	***	***	***	1.0	7.6
74	WF	***	***	***	***	***	***	1.1	7.6
75	WF	***	***	***	***	***	***	1.8	9.4
76	WF	***	***	***	***	***	***	1.7	9.3
AVG.		17.2	66.0	18.5	71.8	23.1	90.4	17.0	68.0

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
65	GS	3.3	7.0	4.9	14.8	8.2	21.8	8.6	25.4	3.7	10.6	11.9	32.4
66	GS	1.7	10.0	3.6	15.2	5.3	25.2	6.4	30.6	2.8	15.4	8.1	40.6
67	GS	0.8	4.0	2.1	15.9	2.9	19.9	3.9	23.1	1.8	7.2	4.7	27.1
68	GS	1.6	8.0	2.9	15.3	4.5	23.3	5.6	24.4	2.7	9.1	7.2	32.4
69	GS	1.0	4.0	1.9	7.8	2.9	11.8	5.2	19.8	3.3	12.0	6.2	23.8
70	GS	0.7	4.0	2.3	11.3	3.0	15.3	4.4	24.7	2.1	13.4	5.1	28.7
71	GS	0.3	6.0	2.4	10.4	2.7	16.4	5.4	24.6	3.0	14.2	5.7	30.6
72	GS	0.9	3.0	***	***	***	***	***	***	***	***	***	***
73	WF	***	***	***	***	***	***	***	***	***	***	***	***
74	WF	***	***	***	***	***	***	***	***	***	***	***	***
75	WF	***	***	***	***	***	***	***	***	***	***	***	***
76	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		1.3	5.8	2.9	13.0	4.2	19.1	5.6	24.7	2.8	11.7	7.0	30.8

Tree 72 Dead/Missing in 2001
Trees 73-76 Ingrowth

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Thinned/Burned | Measured By: 1989 Scott, Gasser, Johannis
Measured By: 1994 Ganz
Block: B | Plot # : 4 | Measured By: 2001 Roller, McLeod
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
69	GS	11.0	57.0	12.8	68.0	15.5	78.1	17.4	87.9
70	GS	17.1	74.0	19.2	81.0	22.0	92.1	25.5	101.0
71	SP	12.1	63.0	14.0	72.0	17.3	86.4	20.6	100.9
72	GS	4.3	25.0	5.8	28.0	7.5	32.8	9.0	41.4
73	GS	13.0	59.0	15.0	72.0	17.8	81.4	20.3	89.1
74	GS	13.3	64.0	16.8	71.0	21.6	87.6	24.9	95.4
75	GS	11.0	53.0	12.4	69.0	15.3	70.8	18.1	80.8
76	GS	19.1	79.0	19.6	90.0	24.5	102.3	28.8	112.5
77	GS	18.4	75.0	20.5	82.0	23.8	98.8	27.2	108.2
AVG.		13.3	61.0	15.1	70.3	18.4	81.1	21.3	90.8

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1989-2009		Change 1994-2009		Change 2001-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
69	GS	1.8	11.0	2.7	10.1	4.5	21.1	6.4	30.9	4.6	19.9	1.9	9.8
70	GS	2.1	7.0	2.8	11.1	4.9	18.1	8.4	27.0	6.3	20.0	3.5	8.9
71	SP	1.9	9.0	3.3	14.4	5.2	23.4	8.5	37.9	6.6	28.9	3.3	14.5
72	GS	1.5	3.0	1.7	4.8	3.2	7.8	4.7	16.4	3.2	13.4	1.5	8.6
73	GS	2.0	13.0	2.8	9.4	4.8	22.4	7.3	30.1	5.3	17.1	2.5	7.7
74	GS	3.5	7.0	4.8	16.6	8.3	23.6	11.6	31.4	8.1	24.4	3.3	7.8
75	GS	1.4	16.0	2.9	1.8	4.3	17.8	7.1	27.8	5.7	11.8	2.8	10.0
76	GS	0.5	11.0	4.9	12.3	5.4	23.3	9.7	33.5	9.2	22.5	4.3	10.2
77	GS	2.1	7.0	3.3	16.8	5.4	23.8	8.8	33.2	6.7	26.2	3.4	9.4
AVG.		1.9	9.3	3.2	10.8	5.1	20.1	8.1	29.8	6.2	20.5	2.9	9.7

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Control | Measured By: 1989 Bates, Maddson
Measured By: 1994 Ganz
Block: C | Plot # : 2 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	20.4	81.0	21.9	88.0	24.2	100.7	27.0	112.5
2	IC	20.0	32.0	21.0	59.0	21.5	69.9	22.2	67.1
3	IC	2.4	43.0	2.8	14.0	3.4	14.3	4.0	16.2
4	IC	3.1	20.0	4.2	15.0	3.9	13.8	4.2	15.5
5	GS	5.4	58.0	5.8	37.0	6.4	37.8	6.8	36.6
6	GS	29.8	87.0	31.6	101.0	35.7	104.1	38.8	117.8
7	IC	2.0	6.0	2.0	13.0	2.3	12.4	2.6	14.0
8	IC	31.0	67.0	31.7	70.0	32.6	76.6	33.3	82.7
9	IC	11.1	24.0	12.0	52.0	13.4	49.1	14.8	55.3
10	IC	4.2	11.0	5.3	28.0	5.4	21.2	5.9	21.5
11	IC	10.8	30.0	12.0	49.0	13.4	55.3	14.9	62.6
12	IC	7.5	17.0	8.5	28.0	9.7	37.3	11.0	43.2
13	IC	15.5	44.0	16.1	61.0	16.9	52.6	17.6	54.6
14	IC	11.0	39.0	12.6	47.0	14.3	52.3	16.1	62.3
15	GS	18.8	79.0	21.5	88.0	23.6	99.8	26.8	111.0
16	IC	7.3	28.0	7.8	40.0	8.1	41.9	8.3	39.6
17	GS	8.5	34.0	9.3	45.0	10.3	47.5	11.1	49.3
18	IC	6.1	31.0	6.6	37.0	7.0	42.1	7.2	47.1
19	IC	10.8	42.0	11.8	52.0	12.7	54.5	13.8	56.6
20	IC	0.7	6.0	1.0	9.0	1.2	9.1	1.3	9.4
21	IC	0.7	7.0	1.3	10.0	2.0	10.1	2.4	10.7
22	IC	18.3	46.0	19.4	49.0	20.7	58.1	22.1	60.4
23	IC	5.4	24.0	6.0	27.0	6.5	26.9	6.9	27.9
24	IC	5.3	37.0	6.0	30.0	6.2	28.2	6.6	26.8
25	IC	1.2	8.0	1.4	9.0	1.4	8.3	1.6	8.5
26	GS	25.0	94.0	26.5	97.0	28.8	113.5	31.9	115.4
27	IC	0.6	7.0	0.8	9.0	1.1	8.2	1.2	7.4
28	GS	21.7	79.0	23.9	83.0	26.4	101.5	29.1	102.7
29	GS	16.8	78.0	18.2	80.0	19.9	97.3	21.8	103.5
30	GS	1.5	9.0	1.8	9.0	2.0	9.1	2.1	9.9
31	GS	19.3	74.0	21.0	85.0	23.0	89.4	25.5	100.8
32	IC	0.8	6.0	1.2	8.0	1.7	10.1	2.3	12.9
33	IC	0.7	5.0	1.0	7.0	1.5	7.9	2.0	9.8
34	GS	21.4	80.0	23.3	84.0	24.7	96.7	26.5	104.4
AVG.		10.7	39.2	11.7	44.7	12.7	48.8	13.8	52.2

Tree 13 Severely deformed, original bole missing, height was measured at side branch which is now the dominant leader in 2001, 2009

Trees 6,8 1989 dbh values too low, #6 - 6 and #8 - 9 using Bates 2004 values

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Methuselah	Treatment: Control	Measured By:	1989	Bates, Maddson
		Measured By:	1994	Ganz
Block: C	Plot # : 2	Measured By:	2001	Roller, McLoed
		Measured By:	2009	Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	GS	1.5	7.0	2.3	12.7	3.8	19.7	5.1	24.5	2.8	11.8	6.6	31.5
2	IC	1.0	27.0	0.5	10.9	1.5	37.9	1.2	8.1	0.7	-2.8	2.2	35.1
3	IC	0.4	-29.0	0.6	0.3	1.0	-28.7	1.2	2.2	0.6	1.9	1.6	-26.8
4	IC	1.1	-5.0	-0.3	-1.2	0.8	-6.2	0.0	0.5	0.3	1.7	1.1	-4.5
5	GS	0.4	-21.0	0.6	0.8	1.0	-20.2	1.0	-0.4	0.4	-1.2	1.4	-21.4
6	GS	1.8	14.0	4.1	3.1	5.9	17.1	7.2	16.8	3.1	13.7	9.0	30.8
7	IC	0.0	7.0	0.3	-0.6	0.3	6.4	0.6	1.0	0.3	1.6	0.6	8.0
8	IC	0.7	3.0	0.9	6.6	1.6	9.6	1.6	12.7	0.7	6.1	2.3	15.7
9	IC	0.9	28.0	1.4	-2.9	2.3	25.1	2.8	3.3	1.4	6.2	3.7	31.3
10	IC	1.1	17.0	0.1	-6.8	1.2	10.2	0.6	-6.5	0.5	0.3	1.7	10.5
11	IC	1.2	19.0	1.4	6.3	2.6	25.3	2.9	13.6	1.5	7.3	4.1	32.6
12	IC	1.0	11.0	1.2	9.3	2.2	20.3	2.5	15.2	1.3	5.9	3.5	26.2
13	IC	0.6	17.0	0.8	-8.4	1.4	8.6	1.5	-6.4	0.7	2.0	2.1	10.6
14	IC	1.6	8.0	1.7	5.3	3.3	13.3	3.5	15.3	1.8	10.0	5.1	23.3
15	GS	2.7	9.0	2.1	11.8	4.8	20.8	5.3	23.0	3.2	11.2	8.0	32.0
16	IC	0.5	12.0	0.3	1.9	0.8	13.9	0.5	-0.4	0.2	-2.3	1.0	11.6
17	GS	0.8	11.0	1.0	2.5	1.8	13.5	1.8	4.3	0.8	1.8	2.6	15.3
18	IC	0.5	6.0	0.4	5.1	0.9	11.1	0.6	10.1	0.2	5.0	1.1	16.1
19	IC	1.0	10.0	0.9	2.5	1.9	12.5	2.0	4.6	1.1	2.1	3.0	14.6
20	IC	0.3	3.0	0.2	0.1	0.5	3.1	0.3	0.4	0.1	0.3	0.6	3.4
21	IC	0.6	3.0	0.7	0.1	1.3	3.1	1.1	0.7	0.4	0.6	1.7	3.7
22	IC	1.1	3.0	1.3	9.1	2.4	12.1	2.7	11.4	1.4	2.3	3.8	14.4
23	IC	0.6	3.0	0.5	-0.1	1.1	2.9	0.9	0.9	0.4	1.0	1.5	3.9
24	IC	0.7	-7.0	0.2	-1.8	0.9	-8.8	0.6	-3.2	0.4	-1.4	1.3	-10.2
25	IC	0.2	1.0	0.0	-0.7	0.2	0.3	0.2	-0.5	0.2	0.2	0.4	0.5
26	GS	1.5	3.0	2.3	16.5	3.8	19.5	5.4	18.4	3.1	1.9	6.9	21.4
27	IC	0.2	2.0	0.3	-0.8	0.5	1.2	0.4	-1.6	0.1	-0.8	0.6	0.4
28	GS	2.2	4.0	2.5	18.5	4.7	22.5	5.2	19.7	2.7	1.2	7.4	23.7
29	GS	1.4	2.0	1.7	17.3	3.1	19.3	3.6	23.5	1.9	6.2	5.0	25.5
30	GS	0.3	0.0	0.2	0.1	0.5	0.1	0.3	0.9	0.1	0.8	0.6	0.9
31	GS	1.7	11.0	2.0	4.4	3.7	15.4	4.5	15.8	2.5	11.4	6.2	26.8
32	IC	0.4	2.0	0.5	2.1	0.9	4.1	1.1	4.9	0.6	2.8	1.5	6.9
33	IC	0.3	2.0	0.5	0.9	0.8	2.9	1.0	2.8	0.5	1.9	1.3	4.8
34	GS	1.9	4.0	1.4	12.7	3.3	16.7	3.2	20.4	1.8	7.7	5.1	24.4
AVG.		0.9	5.5	1.0	4.0	2.0	9.5	2.1	7.5	1.1	3.5	3.1	13.0

Tree	13	Severely deformed, original bole missing, height was measured at side branch which is now the dominant leader in 2001, 2009
Trees	6,8	1989 values too low, #6 - 6 and #8 - 9 using Roller Thesis values

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Control | Measured By: 1989 Bates, Maddson
Measured By: 1994 Ganz
Block: C | Plot # : 3 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
32	GS	12.0	53.0	13.3	65.0	15.5	74.5	17.5	91.2
33	GS	12.0	60.0	13.3	62.0	15.2	82.3	17.1	89.1
34	GS	15.4	65.0	16.7	75.0	18.4	90.5	20.8	95.3
35	WF	25.3	95.0	26.1	98.0	27.2	109.2	29.7	112.5
36	GS	11.5	56.0	11.9	63.0	12.4	77.4	13.0	85.8
37	GS	14.4	56.0	15.5	62.0	15.8	85.4	18.7	101.7
38	GS	24.2	81.0	25.7	91.0	26.4	94.8	30.4	107.0
39	GS	13.2	71.0	14.0	74.0	14.5	92.3	16.4	94.5
40	GS	11.2	70.0	12.0	75.0	13.0	87.1	14.2	93.3
41	GS	11.3	61.0	12.0	65.0	12.6	78.6	13.7	86.3
42	GS	10.7	76.0	11.4	79.0	11.7	85.0	12.5	97.5
43	GS	15.9	86.0	17.1	89.0	18.0	87.7	19.8	103.7
44	GS	12.8	69.0	13.6	73.0	14.6	89.8	15.4	95.3
45	GS	11.8	72.0	12.5	77.0	13.2	90.8	13.9	93.0
46	GS	11.0	82.0	11.5	67.0	12.0	83.7	12.5	90.8
47	GS	14.4	74.0	15.5	77.0	17.0	97.2	18.7	98.3
48	GS	14.3	71.0	15.6	76.0	16.4	90.0	17.7	101.1
49	GS	13.4	59.0	14.2	73.0	15.7	79.2	16.9	87.6
50	GS	13.6	67.0	14.8	75.0	15.8	96.3	17.7	91.7
51	GS	15.0	71.0	16.0	73.0	18.2	92.6	19.7	98.8
52	GS	10.0	48.0	11.4	58.0	12.0	65.9	12.9	79.2
53	GS	10.3	51.0	11.3	52.0	12.6	65.7	13.9	78.6
54	GS	16.1	81.0	17.5	85.0	19.7	92.4	21.7	114.7
55	GS	15.5	67.0	16.8	76.0	18.0	87.4	19.5	99.1
56	GS	16.7	68.0	18.0	72.0	20.0	84.6	21.6	96.7
57	GS	14.8	69.0	15.7	74.0	17.4	86.7	19.0	98.2
58	GS	9.5	60.0	9.9	66.0	10.7	78.7	11.1	85.9
59	GS	11.7	47.0	12.7	61.0	13.9	73.3	15.1	80.6
60	GS	12.5	68.0	13.9	74.0	15.5	86.3	17.2	99.5
61	GS	22.0	75.0	23.4	80.0	25.8	93.8	28.1	102.3
62	GS	14.1	72.0	15.5	75.0	17.2	89.3	18.6	98.5
63	GS	11.8	65.0	13.1	71.0	14.7	77.0	16.1	93.2
64	GS	11.4	64.0	12.4	72.0	14.2	74.4	16.1	89.8
65	IC	***	***	***	***	1.3	8.9	2.4	11.8
66	WF	***	***	***	***	2.0	12.4	2.4	12.3
67	IC	***	***	***	***	2.2	11.6	2.7	14.7
68	WF	***	***	***	***	4.1	15.1	5.3	16.7
69	IC	***	***	***	***	3.0	11.2	3.1	13.3
70	IC	***	***	***	***	1.6	9.9	2.1	11.1
71	WF	***	***	***	***	4.4	23.9	5.5	31.7
72	IC	***	***	***	***	1.0	7.8	1.4	9.9
AVG.		13.9	67.6	15.0	72.9	13.5	71.2	14.9	79.3

Trees 65-72 Ingrowth in 2001

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Control | Measured By: 1989 Bates, Maddson
Measured By: 1994 Ganz
Block: C | Plot # : 3 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
32	GS	1.3	12.0	2.2	9.5	3.5	21.5	4.2	26.2	2.0	16.7	5.5	38.2
33	GS	1.3	2.0	1.9	20.3	3.2	22.3	3.8	27.1	1.9	6.8	5.1	29.1
34	GS	1.3	10.0	1.7	15.5	3.0	25.5	4.1	20.3	2.4	4.8	5.4	30.3
35	WF	0.8	3.0	1.1	11.2	1.9	14.2	3.6	14.5	2.5	3.3	4.4	17.5
36	GS	0.4	7.0	0.5	14.4	0.9	21.4	1.1	22.8	0.6	8.4	1.5	29.8
37	GS	1.1	6.0	0.3	23.4	1.4	29.4	3.2	39.7	2.9	16.3	4.3	45.7
38	GS	1.5	10.0	0.7	3.8	2.2	13.8	4.7	16.0	4.0	12.2	6.2	26.0
39	GS	0.8	3.0	0.5	18.3	1.3	21.3	2.4	20.5	1.9	2.2	3.2	23.5
40	GS	0.8	5.0	1.0	12.1	1.8	17.1	2.2	18.3	1.2	6.2	3.0	23.3
41	GS	0.7	4.0	0.6	13.6	1.3	17.6	1.7	21.3	1.1	7.7	2.4	25.3
42	GS	0.7	3.0	0.3	6.0	1.0	9.0	1.1	18.5	0.8	12.5	1.8	21.5
43	GS	1.2	3.0	0.9	-1.3	2.1	1.7	2.7	14.7	1.8	16.0	3.9	17.7
44	GS	0.8	4.0	1.0	16.8	1.8	20.8	1.8	22.3	0.8	5.5	2.6	26.3
45	GS	0.7	5.0	0.7	13.8	1.4	18.8	1.4	16.0	0.7	2.2	2.1	21.0
46	GS	0.5	-15.0	0.5	16.7	1.0	1.7	1.0	23.8	0.5	7.1	1.5	8.8
47	GS	1.1	3.0	1.5	20.2	2.6	23.2	3.2	21.3	1.7	1.1	4.3	24.3
48	GS	1.3	5.0	0.8	14.0	2.1	19.0	2.1	25.1	1.3	11.1	3.4	30.1
49	GS	0.8	14.0	1.5	6.2	2.3	20.2	2.7	14.6	1.2	8.4	3.5	28.6
50	GS	1.2	8.0	1.0	21.3	2.2	29.3	2.9	16.7	1.9	-4.6	4.1	24.7
51	GS	1.0	2.0	2.2	19.6	3.2	21.6	3.7	25.8	1.5	6.2	4.7	27.8
52	GS	1.4	10.0	0.6	7.9	2.0	17.9	1.5	21.2	0.9	13.3	2.9	31.2
53	GS	1.0	1.0	1.3	13.7	2.3	14.7	2.6	26.6	1.3	12.9	3.6	27.6
54	GS	1.4	4.0	2.2	7.4	3.6	11.4	4.2	29.7	2.0	22.3	5.6	33.7
55	GS	1.3	9.0	1.2	11.4	2.5	20.4	2.7	23.1	1.5	11.7	4.0	32.1
56	GS	1.3	4.0	2.0	12.6	3.3	16.6	3.6	24.7	1.6	12.1	4.9	28.7
57	GS	0.9	5.0	1.7	12.7	2.6	17.7	3.3	24.2	1.6	11.5	4.2	29.2
58	GS	0.4	6.0	0.8	12.7	1.2	18.7	1.2	19.9	0.4	7.2	1.6	25.9
59	GS	1.0	14.0	1.2	12.3	2.2	26.3	2.4	19.6	1.2	7.3	3.4	33.6
60	GS	1.4	6.0	1.6	12.3	3.0	18.3	3.3	25.5	1.7	13.2	4.7	31.5
61	GS	1.4	5.0	2.4	13.8	3.8	18.8	4.7	22.3	2.3	8.5	6.1	27.3
62	GS	1.4	3.0	1.7	14.3	3.1	17.3	3.1	23.5	1.4	9.2	4.5	26.5
63	GS	1.3	6.0	1.6	6.0	2.9	12.0	3.0	22.2	1.4	16.2	4.3	28.2
64	GS	1.0	8.0	1.8	2.4	2.8	10.4	3.7	17.8	1.9	15.4	4.7	25.8
65	IC	***	***	***	***	***	***	***	***	1.1	2.9	***	***
66	WF	***	***	***	***	***	***	***	***	0.4	-0.1	***	***
67	IC	***	***	***	***	***	***	***	***	0.5	3.1	***	***
68	WF	***	***	***	***	***	***	***	***	1.2	1.6	***	***
69	IC	***	***	***	***	***	***	***	***	0.1	2.1	***	***
70	IC	***	***	***	***	***	***	***	***	0.5	1.2	***	***
71	WF	***	***	***	***	***	***	***	***	1.1	7.8	***	***
72	IC	***	***	***	***	***	***	***	***	0.4	2.1	***	***
AVG.		1.0	5.3	1.2	12.6	2.3	17.9	2.8	22.0	1.4	8.1	3.9	27.3

Trees 65-72 Ingrowth in 2001

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Control | Measured By: 1989 Bates, Maddson
Measured By: 1994 Ganz
Block: C | Plot # : 4 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	PP	15.4	75.0	16.7	83.0	18.9	93.5	20.9	108.6
2	GS	10.8	50.0	11.7	70.0	12.8	73.3	13.8	84.6
3	GS	6.7	28.0	7.3	33.0	7.6	37.5	7.6	35.0
4	GS	15.0	76.0	16.0	78.0	18.0	103.4	19.8	99.2
5	GS	15.4	70.0	16.9	72.0	18.1	91.5	20.3	95.7
6	GS	5.9	48.0	6.3	53.0	6.6	50.3	6.8	49.8
7	GS	6.2	25.0	6.8	27.0	7.1	28.9	7.2	29.2
8	GS	12.6	69.0	13.5	74.0	14.5	78.9	16.0	88.3
9	GS	13.4	76.0	14.5	81.0	15.8	93.5	17.2	99.4
10	GS	8.8	48.0	9.5	46.0	10.2	65.3	10.5	70.6
11	GS	11.9	51.0	13.2	55.0	14.9	74.8	16.5	79.1
12	WF	22.6	85.0	23.4	92.0	24.5	99.9	26.0	105.4
13	GS	19.4	73.0	20.9	72.0	23.1	90.9	25.7	97.4
14	GS	7.2	51.0	8.0	56.0	8.8	69.0	9.9	71.4
15	GS	9.3	61.0	10.2	64.0	10.5	81.8	11.0	89.6
16	GS	6.2	36.0	6.7	37.0	7.0	43.6	7.1	43.5
17	GS	12.6	65.0	13.9	71.0	15.7	85.1	17.6	92.4
18	GS	11.7	58.0	12.9	65.0	14.4	75.2	15.7	88.8
19	GS	11.4	47.0	12.3	52.0	13.5	65.0	14.7	78.4
20	GS	8.9	53.0	9.6	57.0	10.8	73.8	11.7	71.5
21	GS	7.9	31.0	8.5	31.0	9.1	26.7	10.1	54.4
22	GS	13.9	50.0	15.3	68.0	17.8	83.9	20.3	95.7
23	GS	10.2	52.0	11.6	63.0	12.9	70.5	13.9	83.6
24	GS	13.0	61.0	13.6	66.0	15.4	76.9	16.5	92.4
25	GS	12.7	62.0	13.4	65.0	14.1	74.9	14.8	88.6
26	GS	18.4	70.0	19.9	87.0	22.1	89.1	25.0	97.7
27	GS	9.5	57.0	10.4	64.0	11.1	75.0	11.9	84.4
28	GS	16.5	62.0	17.3	71.0	18.9	78.0	20.9	92.3
29	GS	15.7	68.0	16.9	76.0	19.0	85.6	20.7	95.2
30	GS	8.7	32.0	9.3	41.0	9.7	40.6	10.2	46.6
31	GS	15.6	77.0	17.0	79.0	18.9	93.2	20.9	102.6
32	WF	***	***	***	***	2.2	11.9	2.4	13.4
33	WF	***	***	***	***	4.3	22.8	4.9	26.4
34	WF	***	***	***	***	3.3	16.1	4.8	18.4
35	WF	***	***	***	***	2.3	12.0	3.1	13.6
36	WF	***	***	***	***	1.2	8.7	2.0	11.3
37	WF	***	***	***	***	1.7	10.1	2.8	14.2
38	WF	***	***	***	***	***	***	1.2	8.2
39	WF	***	***	***	***	***	***	1.3	6.9
40	WF	***	***	***	***	***	***	1.1	6.9
41	SP	***	***	***	***	***	***	1.2	8.2
42	IC	***	***	***	***	***	***	1.2	7.6
43	SP	***	***	***	***	***	***	1.2	9.3
44	WF	***	***	***	***	***	***	1.4	8.1
45	WF	***	***	***	***	***	***	1.0	7.1
46	WF	***	***	***	***	***	***	1.1	7.9
AVG.		12.0	57.0	13.0	62.9	12.3	63.5	11.1	58.2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah	Treatment: Control	Measured By:	1989	Bates, Maddson
		Measured By:	1994	Ganz
Block: C	Plot # : 4	Measured By:	2001	Roller, McLoed
		Measured By:	2009	Soderlund, Estrada

Trees	32-37	Ingrowth in 2001
Trees	21	Forked Top in 2001
Trees	38-46	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah | Treatment: Control | Measured By: 1989 Bates, Maddson
Measured By: 1994 Ganz
Block: C | Plot # : 4 | Measured By: 2001 Roller, McLoed
Measured By: 2009 Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	PP	1.3	8.0	2.2	10.5	3.5	18.5	4.2	25.6	2.0	15.1	5.5	33.6
2	GS	0.9	20.0	1.1	3.3	2.0	23.3	2.1	14.6	1.0	11.3	3.0	34.6
3	GS	0.6	5.0	0.3	4.5	0.9	9.5	0.3	2.0	0.0	-2.5	0.9	7.0
4	GS	1.0	2.0	2.0	25.4	3.0	27.4	3.8	21.2	1.8	-4.2	4.8	23.2
5	GS	1.5	2.0	1.2	19.5	2.7	21.5	3.4	23.7	2.2	4.2	4.9	25.7
6	GS	0.4	5.0	0.3	-2.7	0.7	2.3	0.5	-3.2	0.2	-0.5	0.9	1.8
7	GS	0.6	2.0	0.3	1.9	0.9	3.9	0.4	2.2	0.1	0.3	1.0	4.2
8	GS	0.9	5.0	1.0	4.9	1.9	9.9	2.5	14.3	1.5	9.4	3.4	19.3
9	GS	1.1	5.0	1.3	12.5	2.4	17.5	2.7	18.4	1.4	5.9	3.8	23.4
10	GS	0.7	-2.0	0.7	19.3	1.4	17.3	1.0	24.6	0.3	5.3	1.7	22.6
11	GS	1.3	4.0	1.7	19.8	3.0	23.8	3.3	24.1	1.6	4.3	4.6	28.1
12	WF	0.8	7.0	1.1	7.9	1.9	14.9	2.6	13.4	1.5	5.5	3.4	20.4
13	GS	1.5	-1.0	2.2	18.9	3.7	17.9	4.8	25.4	2.6	6.5	6.3	24.4
14	GS	0.8	5.0	0.8	13.0	1.6	18.0	1.9	15.4	1.1	2.4	2.7	20.4
15	GS	0.9	3.0	0.3	17.8	1.2	20.8	0.8	25.6	0.5	7.8	1.7	28.6
16	GS	0.5	1.0	0.3	6.6	0.8	7.6	0.4	6.5	0.1	-0.1	0.9	7.5
17	GS	1.3	6.0	1.8	14.1	3.1	20.1	3.7	21.4	1.9	7.3	5.0	27.4
18	GS	1.2	7.0	1.5	10.2	2.7	17.2	2.8	23.8	1.3	13.6	4.0	30.8
19	GS	0.9	5.0	1.2	13.0	2.1	18.0	2.4	26.4	1.2	13.4	3.3	31.4
20	GS	0.7	4.0	1.2	16.8	1.9	20.8	2.1	14.5	0.9	-2.3	2.8	18.5
21	GS	0.6	0.0	0.6	-4.3	1.2	-4.3	1.6	23.4	1.0	27.7	2.2	23.4
22	GS	1.4	18.0	2.5	15.9	3.9	33.9	5.0	27.7	2.5	11.8	6.4	45.7
23	GS	1.4	11.0	1.3	7.5	2.7	18.5	2.3	20.6	1.0	13.1	3.7	31.6
24	GS	0.6	5.0	1.8	10.9	2.4	15.9	2.9	26.4	1.1	15.5	3.5	31.4
25	GS	0.7	3.0	0.7	9.9	1.4	12.9	1.4	23.6	0.7	13.7	2.1	26.6
26	GS	1.5	17.0	2.2	2.1	3.7	19.1	5.1	10.7	2.9	8.6	6.6	27.7
27	GS	0.9	7.0	0.7	11.0	1.6	18.0	1.5	20.4	0.8	9.4	2.4	27.4
28	GS	0.8	9.0	1.6	7.0	2.4	16.0	3.6	21.3	2.0	14.3	4.4	30.3
29	GS	1.2	8.0	2.1	9.6	3.3	17.6	3.8	19.2	1.7	9.6	5.0	27.2
30	GS	0.6	9.0	0.4	-0.4	1.0	8.6	0.9	5.6	0.5	6.0	1.5	14.6
31	GS	1.4	2.0	1.9	14.2	3.3	16.2	3.9	23.6	2.0	9.4	5.3	25.6
32	WF	***	***	***	***	***	***	***	***	0.2	1.5	***	***
33	WF	***	***	***	***	***	***	***	***	0.6	3.6	***	***
34	WF	***	***	***	***	***	***	***	***	1.5	2.3	***	***
35	WF	***	***	***	***	***	***	***	***	0.8	1.6	***	***
36	WF	***	***	***	***	***	***	***	***	0.8	2.6	***	***
37	WF	***	***	***	***	***	***	***	***	1.1	4.1	***	***
38	WF	***	***	***	***	***	***	***	***	***	***	***	***
39	WF	***	***	***	***	***	***	***	***	***	***	***	***
40	WF	***	***	***	***	***	***	***	***	***	***	***	***
41	SP	***	***	***	***	***	***	***	***	***	***	***	***
42	IC	***	***	***	***	***	***	***	***	***	***	***	***
43	SP	***	***	***	***	***	***	***	***	***	***	***	***
44	WF	***	***	***	***	***	***	***	***	***	***	***	***
45	WF	***	***	***	***	***	***	***	***	***	***	***	***
46	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		1.0	5.9	1.2	10.3	2.2	16.2	2.5	18.1	1.2	7.0	3.5	24.0

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Methuselah	Treatment: Control	Measured By:	1989	Bates, Maddson
		Measured By:	1994	Ganz
Block: C	Plot # : 4	Measured By:	2001	Roller, McLoed
		Measured By:	2009	Soderlund, Estrada

Trees	32-37	Ingrowth in 2001
Trees	21	Forked Top in 2001
Trees	38-46	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Tub Flats	Treatment: Thinned	Measured By:	1989 Rodgers, Johannis, Eagan
		Measured By:	1994 Gasser, Ganz
Block: A	Plot #: 1	Measured By:	2001 Roller, Reuter
		Measured By:	2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
62	GS	14.1	81.0	15.7	82.0	18.8	92.6	21.9	108.2
63	GS	20.9	76.0	22.6	78.0	25.6	90.1	29.0	105.3
64	GS	13.1	61.0	13.9	59.0	16.4	66.9	18.3	79.1
65	GS	12.0	51.0	12.4	49.0	13.2	52.2	14.0	68.5
66	GS	10.3	44.0	11.2	45.0	12.9	53.8	14.4	68.5
67	GS	8.3	41.0	9.1	42.0	10.2	47.7	11.5	60.3
68	GS	7.1	50.0	7.4	58.0	8.1	57.7	9.0	69.2
69	GS	14.2	62.0	15.3	66.0	17.9	71.1	20.1	82.3
70	WF	10.8	61.0	11.3	66.0	13.8	73.7	15.4	83.7
71	GS	6.6	44.0	6.9	47.0	7.4	49.9	7.8	58.3
72	GS	9.8	50.0	10.3	59.0	11.4	57.5	12.8	68.7
73	GS	9.7	53.0	10.2	54.0	10.8	37.6	11.2	44.4
74	GS	12.4	59.0	13.0	70.0	14.4	71.8	16.1	83.1
75	GS	13.3	69.0	14.1	74.0	16.5	78.9	18.5	97.8
76	GS	18.4	92.0	20.7	97.0	24.8	102.3	28.5	117.3
77	GS	10.5	66.0	11.2	65.0	13.2	77.5	15.5	90.2
78	GS	10.5	64.0	11.3	66.0	13.7	79.9	15.8	94.8
79	WF	13.6	73.0	15.2	76.0	17.4	92.7	18.7	99.1
80	GS	***	***	***	***	6.1	19.5	6.5	23.1
94	WF	1.0	8.0	1.8	8.0	2.2	8.6	3.0	11.7
95	WF	***	***	***	***	***	***	1.4	7.0
96	WF	***	***	***	***	***	***	2.3	8.3
AVG.		11.4	58.2	12.3	61.1	13.7	64.1	14.2	69.5

Tree	80	Ingrowth in 2001
Tree	73	Broken Top in 2001
Trees	95,96	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Tub Flats	Treatment: Thinned	Measured By:	1989	Rodgers, Johannis, Eagan
		Measured By:	1994	Gasser, Ganz
Block: A	Plot #: 1	Measured By:	2001	Roller, Reuter
		Measured By:	2009	Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
62	GS	1.6	1.0	3.1	10.6	4.7	11.6	6.2	26.2	3.1	15.6	7.8	27.2
63	GS	1.7	2.0	3.0	12.1	4.7	14.1	6.4	27.3	3.4	15.2	8.1	29.3
64	GS	0.8	-2.0	2.5	7.9	3.3	5.9	4.4	20.1	1.9	12.2	5.2	18.1
65	GS	0.4	-2.0	0.8	3.2	1.2	1.2	1.6	19.5	0.8	16.3	2.0	17.5
66	GS	0.9	1.0	1.7	8.8	2.6	9.8	3.2	23.5	1.5	14.7	4.1	24.5
67	GS	0.8	1.0	1.1	5.7	1.9	6.7	2.4	18.3	1.3	12.6	3.2	19.3
68	GS	0.3	8.0	0.7	-0.3	1.0	7.7	1.6	11.2	0.9	11.5	1.9	19.2
69	GS	1.1	4.0	2.6	5.1	3.7	9.1	4.8	16.3	2.2	11.2	5.9	20.3
70	WF	0.5	5.0	2.5	7.7	3.0	12.7	4.1	17.7	1.6	10.0	4.6	22.7
71	GS	0.3	3.0	0.5	2.9	0.8	5.9	0.9	11.3	0.4	8.4	1.2	14.3
72	GS	0.5	9.0	1.1	-1.5	1.6	7.5	2.5	9.7	1.4	11.2	3.0	18.7
73	GS	0.5	1.0	0.6	-16.4	1.1	-15.4	1.0	-9.6	0.4	6.8	1.5	-8.6
74	GS	0.6	11.0	1.4	1.8	2.0	12.8	3.1	13.1	1.7	11.3	3.7	24.1
75	GS	0.8	5.0	2.4	4.9	3.2	9.9	4.4	23.8	2.0	18.9	5.2	28.8
76	GS	2.3	5.0	4.1	5.3	6.4	10.3	7.8	20.3	3.7	15.0	10.1	25.3
77	GS	0.7	-1.0	2.0	12.5	2.7	11.5	4.3	25.2	2.3	12.7	5.0	24.2
78	GS	0.8	2.0	2.4	13.9	3.2	15.9	4.5	28.8	2.1	14.9	5.3	30.8
79	WF	1.6	3.0	2.2	16.7	3.8	19.7	3.5	23.1	1.3	6.4	5.1	26.1
80	GS	***	***	***	***	***	***	***	***	0.4	3.6	***	***
94	WF	0.8	0.0	0.4	0.6	1.2	0.6	1.2	3.7	0.8	3.1	2.0	3.7
95	WF	***	***	***	***	***	***	***	***	***	***	***	***
96	WF	***	***	***	***	***	***	***	***	***	***	***	***
AVG.		0.9	2.9	1.8	5.3	2.7	8.3	3.6	17.3	1.7	11.6	4.5	20.3

Tree	80	Ingrowth in 2001
Tree	73	Broken Top in 2001
Trees	95,96	Ingrowth in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Tub Flats | Treatment: Thinned/Burned | Measured By: 1990 Rodgers, Johannis, Eagan
Measured By: 1994 Gasser, Ganz
Block: B | Plot #: 1 | Measured By: 2001 Roller, Reuter
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
80	WF	20.5	80.0	22.3	82.0	23.7	83.8	24.8	94.2
81	GS	11.8	55.0	11.8	57.0	13.2	69.6	16.2	86.1
82	WF	13.4	80.0	***	***	***	***	***	***
83	GS	13.0	79.0	13.4	80.0	16.6	89.2	19.2	99.4
84	GS	9.8	56.0	10.3	57.0	12.2	69.1	13.9	86.9
85	GS	11.1	64.0	12.0	67.0	14.2	75.4	16.7	85.4
86	WF	15.5	65.0	17.1	65.0	19.1	75.6	20.6	84.1
87	GS	14.8	72.0	15.9	78.0	19.3	82.4	22.4	103.1
88	GS	11.4	64.0	11.9	66.0	13.7	71.5	15.6	90.7
89	GS	10.6	55.0	11.1	53.0	12.8	67.8	15.2	83.5
90	GS	10.0	57.0	10.1	64.0	12.2	65.4	14.6	81.5
91	WF	19.6	86.0	20.8	87.0	22.5	94.7	23.8	104.4
92	GS	15.1	72.0	16.8	77.0	20.2	90.2	23.8	107.3
93	GS	15.9	78.0	18.2	85.0	21.1	90.4	23.4	107.3
AVG.		13.8	68.8	14.7	70.6	17.0	78.9	19.2	93.4

2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
80	WF	1.8	2.0	1.4	1.8	3.2	3.8	2.5	12.2	1.1	10.4	4.3	14.2
81	GS	0.0	2.0	1.4	12.6	1.4	14.6	4.4	29.1	3.0	16.5	4.4	31.1
82	WF	***	***	***	***	***	***	***	***	***	***	***	***
83	GS	0.4	1.0	3.2	9.2	3.6	10.2	5.8	19.4	2.6	10.2	6.2	20.4
84	GS	0.5	1.0	1.9	12.1	2.4	13.1	3.6	29.9	1.7	17.8	4.1	30.9
85	GS	0.9	3.0	2.2	8.4	3.1	11.4	4.7	18.4	2.5	10.0	5.6	21.4
86	WF	1.6	0.0	2.0	10.6	3.6	10.6	3.5	19.1	1.5	8.5	5.1	19.1
87	GS	1.1	6.0	3.4	4.4	4.5	10.4	6.5	25.1	3.1	20.7	7.6	31.1
88	GS	0.5	2.0	1.8	5.5	2.3	7.5	3.7	24.7	1.9	19.2	4.2	26.7
89	GS	0.5	-2.0	1.7	14.8	2.2	12.8	4.1	30.5	2.4	15.7	4.6	28.5
90	GS	0.1	7.0	2.1	1.4	2.2	8.4	4.5	17.5	2.4	16.1	4.6	24.5
91	WF	1.2	1.0	1.7	7.7	2.9	8.7	3.0	17.4	1.3	9.7	4.2	18.4
92	GS	1.7	5.0	3.4	13.2	5.1	18.2	7.0	30.3	3.6	17.1	8.7	35.3
93	GS	2.3	7.0	2.9	5.4	5.2	12.4	5.2	22.3	2.3	16.9	7.5	29.3
AVG.		1.0	2.7	2.2	8.2	3.2	10.9	4.5	22.8	2.3	14.5	5.5	25.5

Tree 82 Dead/Missing in 1994
Tree 86 Raptor nest in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Tub Flats | Treatment: Control | Measured By: 1990 Scott, Johannis
Measured By: 1994 Gasser, CDF
Block: C | Plot #: 1 | Measured By: 2001 Roller, Reuter
Measured By: 2009 Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	WF	11.3	49.0	12.2	56.0	13.6	70.6	15.1	85.9
2	WF	6.2	19.0	6.6	24.0	6.9	18.6	7.4	24.2
3	GS	15.1	73.0	15.7	71.0	17.9	81.0	19.5	93.6
4	GS	9.3	60.0	9.8	65.0	***	***	9.6	***
5	GS	14.5	69.0	16.0	72.0	17.9	88.0	20.1	95.7
6	GS	11.5	64.0	12.2	64.0	13.4	70.3	14.7	80.1
7	GS	10.5	58.0	10.7	61.0	11.1	65.9	11.4	72.7
8	GS	11.6	60.0	12.3	64.0	13.4	74.1	14.4	83.2
9	GS	1.6	8.0	1.5	7.0	1.6	7.7	2.7	8.3
10	GS	11.2	64.0	11.7	71.0	12.5	76.0	13.3	86.3
11	GS	16.3	83.0	17.0	90.0	18.6	91.5	20.6	108.3
12	WF	14.8	85.0	15.9	95.0	17.4	109.8	18.6	110.3
13	GS	14.2	75.0	15.2	77.0	17.4	89.5	19.2	98.1
14	WF	9.0	53.0	9.3	66.0	9.8	55.5	10.1	59.4
15	GS	16.3	71.0	17.0	72.0	18.7	82.7	20.8	96.8
16	GS	10.5	70.0	11.1	72.0	11.6	84.9	12.0	88.4
17	WF	15.3	77.0	16.5	84.0	18.4	90.9	20.2	100.8
18	WF	12.0	63.0	12.5	65.0	13.0	48.7	13.3	64.3
19	WF	23.5	103.0	24.3	105.0	***	***	***	***
20	GS	10.6	68.0	11.3	72.0	12.2	75.0	13.0	84.7
21	GS	14.3	83.0	15.3	94.0	16.9	104.7	18.4	97.2
22	GS	12.2	58.0	12.8	58.0	14.0	62.2	15.4	71.8
23	GS	19.4	77.0	20.2	76.0	22.1	92.0	23.9	103.2
24	GS	10.8	69.0	11.4	71.0	12.1	84.9	13.0	87.7
25	GS	12.3	71.0	12.9	76.0	14.2	83.6	15.1	89.6
26	GS	3.2	15.0	3.3	13.0	3.3	13.0	3.4	14.0
27	GS	5.4	19.0	5.1	22.0	5.2	21.5	5.2	21.6
28	GS	1.9	10.0	1.4	9.0	***	***	1.4	***
29	GS	12.9	64.0	13.4	59.0	14.1	79.6	14.7	83.1
30	GS	0.9	7.0	1.0	6.0	1.0	6.6	1.0	6.9
31	GS	11.2	69.0	11.5	67.0	12.5	75.9	13.4	79.8
32	GS	11.1	68.0	11.7	63.0	12.7	78.9	13.5	79.8
33	WF	3.4	19.0	3.6	17.0	4.1	18.8	4.5	21.2
34	GS	18.1	75.0	18.9	65.0	20.8	85.5	22.5	94.9
35	GS	12.0	67.0	12.4	76.0	13.2	76.0	14.0	81.3
36	GS	14.3	72.0	14.9	68.0	15.8	75.2	16.8	87.7
37	GS	4.4	25.0	4.5	24.0	4.6	21.9	4.7	20.5
38	GS	15.1	75.0	15.5	78.0	17.0	78.3	18.4	88.7
39	GS	10.7	65.0	10.9	71.0	11.3	70.5	11.6	76.8
40	GS	10.5	77.0	11.1	70.0	11.7	80.2	12.5	88.2
41	GS	5.6	36.0	5.5	35.0	5.5	35.4	5.6	34.4
42	GS	9.9	41.0	10.0	47.0	10.5	47.6	11.0	53.3
43	GS	8.6	48.0	9.1	56.0	9.7	65.3	10.5	72.4
44	GS	5.6	33.0	5.8	38.0	5.9	31.5	6.0	32.5

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Data (39ft. (12m) Plot)

Stand: Tub Flats	Treatment: Control	Measured By:	1990	Scott, Johannis
		Measured By:	1994	Gasser, CDF
Block: C	Plot #: 1	Measured By:	2001	Roller, Reuter
		Measured By:	2009	Soderlund, Estrada

		1989 Data		1994 Data		2001 Data		2009 Data	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height
45	GS	3.4	10.0	3.3	8.0	3.4	***	3.3	***
46	GS	10.9	67.0	11.4	78.0	12.4	82.9	13.4	86.5
47	GS	15.4	68.0	16.0	69.0	17.5	77.4	18.9	85.9
48	GS	15.4	72.0	15.8	74.0	17.3	79.8	18.8	92.3
49	GS	2.0	10.0	2.0	10.0	2.0	***	1.9	***
50	GS	8.0	26.0	8.0	26.0	8.5	28.5	8.7	26.3
51	GS	1.7	9.0	1.8	9.0	1.9	***	1.8	6.1
52	GS	10.2	61.0	10.6	67.0	11.4	69.7	12.3	80.8
53	GS	4.4	16.0	4.7	14.0	5.0	18.6	5.5	21.2
54	GS	3.7	15.0	3.9	12.0	4.0	15.2	4.2	15.3
55	GS	1.5	7.0	1.6	7.0	1.7	7.6	1.7	6.9
56	GS	11.5	65.0	12.1	77.0	12.8	70.5	13.7	77.9
57	GS	7.0	24.0	7.0	16.0	7.3	21.3	7.4	22.7
58	GS	7.9	41.0	8.4	46.0	9.0	48.0	9.6	56.5
59	GS	6.0	34.0	6.2	39.0	6.7	41.5	7.0	35.4
60	GS	2.3	8.0	2.3	8.0	2.4	8.4	2.4	8.0
61	GS	3.4	14.0	3.2	11.0	3.3	12.5	3.4	11.5
62	GS	4.6	19.0	4.8	21.0	4.9	24.6	5.0	22.5
63	GS	6.4	30.0	6.7	30.0	6.9	34.0	7.0	29.4
64	WF	2.6	12.0	3.0	13.0	3.4	17.9	3.8	19.9
AVG.		9.5	48.8	9.9	50.7	10.6	57.4	11.1	61.6

Trees	2,45,49,51	Deformed/Bowed in 2001,2009
Trees	4,28	Dead/Standing in 2001
Tree	18	Broken Top in 2001
Tree	19	Dead/Down in 2001
Trees	9,30,60	Dead top in 2009
Trees	45,49	Dead/Standing in 2009
Tree	21	Broken Top in 2009

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Overstory Summary Growth Data (39ft. (12m) Plot)

Stand: Tub Flats | Treatment: Control | Measured By: 1990 Scott, Johannis
Measured By: 1994 Gasser, CDF
Block: C | Plot #: 1 | Measured By: 2001 Roller, Reuter
Measured By: 2009 Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
1	WF	0.9	7.0	1.4	14.6	2.3	21.6	2.9	29.9	1.5	15.3	3.8	36.9
2	WF	0.4	5.0	0.3	-5.4	0.7	-0.4	0.8	0.2	0.5	5.6	1.2	5.2
3	GS	0.6	-2.0	2.2	10.0	2.8	8.0	3.8	22.6	1.6	12.6	4.4	20.6
4	GS	0.5	5.0	***	***	***	***	-0.2	***	***	***	0.3	***
5	GS	1.5	3.0	1.9	16.0	3.4	19.0	4.1	23.7	2.2	7.7	5.6	26.7
6	GS	0.7	0.0	1.2	6.3	1.9	6.3	2.5	16.1	1.3	9.8	3.2	16.1
7	GS	0.2	3.0	0.4	4.9	0.6	7.9	0.7	11.7	0.3	6.8	0.9	14.7
8	GS	0.7	4.0	1.1	10.1	1.8	14.1	2.1	19.2	1.0	9.1	2.8	23.2
9	GS	-0.1	-1.0	0.1	0.7	0.0	-0.3	1.2	1.3	1.1	0.6	1.1	0.3
10	GS	0.5	7.0	0.8	5.0	1.3	12.0	1.6	15.3	0.8	10.3	2.1	22.3
11	GS	0.7	7.0	1.6	1.5	2.3	8.5	3.6	18.3	2.0	16.8	4.3	25.3
12	WF	1.1	10.0	1.5	14.8	2.6	24.8	2.7	15.3	1.2	0.5	3.8	25.3
13	GS	1.0	2.0	2.2	12.5	3.2	14.5	4.0	21.1	1.8	8.6	5.0	23.1
14	WF	0.3	13.0	0.5	-10.5	0.8	2.5	0.8	-6.6	0.3	3.9	1.1	6.4
15	GS	0.7	1.0	1.7	10.7	2.4	11.7	3.8	24.8	2.1	14.1	4.5	25.8
16	GS	0.6	2.0	0.5	12.9	1.1	14.9	0.9	16.4	0.4	3.5	1.5	18.4
17	WF	1.2	7.0	1.9	6.9	3.1	13.9	3.7	16.8	1.8	9.9	4.9	23.8
18	WF	0.5	2.0	0.5	-16.3	1.0	-14.3	0.8	-0.7	0.3	15.6	1.3	1.3
19	WF	0.8	2.0	***	***	***	***	***	***	***	***	***	***
20	GS	0.7	4.0	0.9	3.0	1.6	7.0	1.7	12.7	0.8	9.7	2.4	16.7
21	GS	1.0	11.0	1.6	10.7	2.6	21.7	3.1	3.2	1.5	-7.5	4.1	14.2
22	GS	0.6	0.0	1.2	4.2	1.8	4.2	2.6	13.8	1.4	9.6	3.2	13.8
23	GS	0.8	-1.0	1.9	16.0	2.7	15.0	3.7	27.2	1.8	11.2	4.5	26.2
24	GS	0.6	2.0	0.7	13.9	1.3	15.9	1.6	16.7	0.9	2.8	2.2	18.7
25	GS	0.6	5.0	1.3	7.6	1.9	12.6	2.2	13.6	0.9	6.0	2.8	18.6
26	GS	0.1	-2.0	0.0	0.0	0.1	-2.0	0.1	1.0	0.1	1.0	0.2	-1.0
27	GS	-0.3	3.0	0.1	-0.5	-0.2	2.5	0.1	-0.4	0.0	0.1	-0.2	2.6
28	GS	-0.5	-1.0	***	***	***	***	0.0	***	***	***	-0.5	***
29	GS	0.5	-5.0	0.7	20.6	1.2	15.6	1.3	24.1	0.6	3.5	1.8	19.1
30	GS	0.1	-1.0	0.0	0.6	0.1	-0.4	0.0	0.9	0.0	0.3	0.1	-0.1
31	GS	0.3	-2.0	1.0	8.9	1.3	6.9	1.9	12.8	0.9	3.9	2.2	10.8
32	GS	0.6	-5.0	1.0	15.9	1.6	10.9	1.8	16.8	0.8	0.9	2.4	11.8
33	WF	0.2	-2.0	0.5	1.8	0.7	-0.2	0.9	4.2	0.4	2.4	1.1	2.2
34	GS	0.8	-10.0	1.9	20.5	2.7	10.5	3.6	29.9	1.7	9.4	4.4	19.9
35	GS	0.4	9.0	0.8	0.0	1.2	9.0	1.6	5.3	0.8	5.3	2.0	14.3
36	GS	0.6	-4.0	0.9	7.2	1.5	3.2	1.9	19.7	1.0	12.5	2.5	15.7
37	GS	0.1	-1.0	0.1	-2.1	0.2	-3.1	0.2	-3.5	0.1	-1.4	0.3	-4.5
38	GS	0.4	3.0	1.5	0.3	1.9	3.3	2.9	10.7	1.4	10.4	3.3	13.7
39	GS	0.2	6.0	0.4	-0.5	0.6	5.5	0.7	5.8	0.3	6.3	0.9	11.8
40	GS	0.6	-7.0	0.6	10.2	1.2	3.2	1.4	18.2	0.8	8.0	2.0	11.2
41	GS	-0.1	-1.0	0.0	0.4	-0.1	-0.6	0.1	-0.6	0.1	-1.0	0.0	-1.6
42	GS	0.1	6.0	0.5	0.6	0.6	6.6	1.0	6.3	0.5	5.7	1.1	12.3
43	GS	0.5	8.0	0.6	9.3	1.1	17.3	1.4	16.4	0.8	7.1	1.9	24.4
44	GS	0.2	5.0	0.1	-6.5	0.3	-1.5	0.2	-5.5	0.1	1.0	0.4	-0.5

Stand: Tub Flats | Treatment: Control | Measured By: 1990 Scott, Johannis
Measured By: 1994 Gasser, CDF
Block: C | Plot #: 1 | Measured By: 2001 Roller, Reuter
Measured By: 2009 Soderlund, Estrada

		Change 1989-1994		Change 1994-2001		Change 1989-2001		Change 1994-2009		Change 2001-2009		Change 1989-2009	
Tree #	Species	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height	DBH	Height
45	GS	-0.1	-2.0	0.1	***	0.0	***	0.0	***	-0.1	***	-0.1	***
46	GS	0.5	11.0	1.0	4.9	1.5	15.9	2.0	8.5	1.0	3.6	2.5	19.5
47	GS	0.6	1.0	1.5	8.4	2.1	9.4	2.9	16.9	1.4	8.5	3.5	17.9
48	GS	0.4	2.0	1.5	5.8	1.9	7.8	3.0	18.3	1.5	12.5	3.4	20.3
49	GS	0.0	0.0	0.0	***	0.0	***	-0.1	***	-0.1	***	-0.1	***
50	GS	0.0	0.0	0.5	2.5	0.5	2.5	0.7	0.3	0.2	-2.2	0.7	0.3
51	GS	0.1	0.0	0.1	***	0.2	***	0.0	-2.9	-0.1	***	0.1	-2.9
52	GS	0.4	6.0	0.8	2.7	1.2	8.7	1.7	13.8	0.9	11.1	2.1	19.8
53	GS	0.3	-2.0	0.3	4.6	0.6	2.6	0.8	7.2	0.5	2.6	1.1	5.2
54	GS	0.2	-3.0	0.1	3.2	0.3	0.2	0.3	3.3	0.2	0.1	0.5	0.3
55	GS	0.1	0.0	0.1	0.6	0.2	0.6	0.1	-0.1	0.0	-0.7	0.2	-0.1
56	GS	0.6	12.0	0.7	-6.5	1.3	5.5	1.6	0.9	0.9	7.4	2.2	12.9
57	GS	0.0	-8.0	0.3	5.3	0.3	-2.7	0.4	6.7	0.1	1.4	0.4	-1.3
58	GS	0.5	5.0	0.6	2.0	1.1	7.0	1.2	10.5	0.6	8.5	1.7	15.5
59	GS	0.2	5.0	0.5	2.5	0.7	7.5	0.8	-3.6	0.3	-6.1	1.0	1.4
60	GS	0.0	0.0	0.1	0.4	0.1	0.4	0.1	0.0	0.0	-0.4	0.1	0.0
61	GS	-0.2	-3.0	0.1	1.5	-0.1	-1.5	0.2	0.5	0.1	-1.0	0.0	-2.5
62	GS	0.2	2.0	0.1	3.6	0.3	5.6	0.2	1.5	0.1	-2.1	0.4	3.5
63	GS	0.3	0.0	0.2	4.0	0.5	4.0	0.3	-0.6	0.1	-4.6	0.6	-0.6
64	WF	0.4	1.0	0.4	4.9	0.8	5.9	0.8	6.9	0.4	2.0	1.2	7.9
AVG.		0.4	1.9	0.8	5.0	1.2	7.0	120.7	9.9	0.8	5.1	1.9	11.9

Trees	2,45,49,51	Deformed/Bowed in 2001,2009
Trees	4,28	Dead/Standing in 2001
Tree	18	Broken Top in 2001
Tree	19	Dead/Down in 2001
Trees	9,30,60	Dead top in 2009
Trees	45,49	Dead/Standing in 2009
Tree	21	Broken Top in 2009

APPENDIX B

DBH Distribution Graphs/Stand Tables

Located in Supplementary Files

APPENDIX C

Understory Data

BMA1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Bogus Meadow   Treatment: Thinned   Date: 9/1,2/09   Plot size: 2m² circular plot

Block: A   Plot # : 1   Crew: Soderlund, Ricchiazzi

# of each / % covered

Species	Ptaq/Atfi[1]	%	Rule	%	Riro	%	Adbi	%	Abco	%	Gatr	%	Lupo	%	Grass	%	Forbs[2]	%
1	12.0	30.0			2	1.0			1	0.5	4	0.5	30	3.0			1	0.5
2	14.0	25.0											20	4.0				
3	11.0	40.0			7	4.0							14	1.0			5	1.0
4	16.0	20.0			1	0.5			2	0.5	5	0.5	24	3.0			44	2.0
5	2.0	6.0							3	0.5	3	0.5	35	5.0				
6	6.0	5.0	3	3.0					5	1.0	50	2.0	13	3.0			91	6.0
7	36.0	14.0	19	10.0					1	3.0	270	25.0			1	0.5	260	15.0
8	8.0	15.0					2	0.5	2	0.5	120	10.0	10	6.0			54	3.0
9	10.0	20.0	6	2.0	1	0.5							5	0.5			30	1.0

Plot #	Duff	Litter
1	1	2
	0.5	1.5
2	2.5	1.5
	2	1
3	0.5	1.5
	1	1.5
4	3	1
	2	1
5	2	0.5
	1.5	1
6	2	1.5
	3	1.5
7	2	1.5
	2	1.5
8	3.5	1
	2.5	1.5
9	1	1.5
	1	1.5

1. 2001 - Roller identified ferns as Ptaq and 2009 Soderlund aggregated ferns into Ptaq and Atfi. Subplot #7 - Ptaq 4/8.0% and Atfi 32/6.0%.
2. 2009 - Soderlund aggregated Visp and Forbs. Subplot #7 - Visp 112/5.0% and Forbs 148/10%. Subplot #8 - Visp 25/1.0% and Forbs 29/2.0%.

BMA2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Bogus Meadow   Treatment: Thinned   Date: 9/3/09   Plot size: 2m² circular plot

Block: A   Plot # : 2   Crew: Soderlund

# of each / % covered

Species	Ptaq	%	Riro	%	Conu	%	Adbi	%	Abco	%	Gatr	%	Lupo	%	Grass	%	Forbs[1]	%
1	2	5.0			1	0.5			3	0.5	46	0.5	72	20.0			5	0.5
2	7	15.0							3	0.5	20	0.5	4	1.0			3	0.5
3	8	15.0					2	0.5			80	0.5	18	1.0	14	1.0	86	1.5
4	4	1.0	2	1.0			9	1.0			16	0.5	3	6.0	73	1.0	335	6.0
5	7	10.0					1	0.5			55	0.5	14	5.0	3	0.5	7	0.5
6	1	1.0	4	1.0			1	0.5			15	0.5	19	12.0			19	0.5
7	6	2.0	10	2.0					1	0.5	71	1.0	20	1.0			206	3.0
8	2	2.0	2	1.0							45	0.5	11	1.0			193	10.0
9	5	10.0	2	1.0					2	1.0	42	0.5			5	0.5	183	30.5

Plot #	Duff	Litter
1	3	1.5
	2.5	2
2	4	2.5
	5.5	1.5
3	2	1
	0	1
4	0	1
	2	1.5
5	1	0.5
	2	1.5
6	4	2
	3	2
7	0	1.5
	0.5	1
8	2.5	1.5
	3	1.5
9	0	0.5
	2	1

1. 2009 - Soderlund aggregated Irsp, Visp, and Forbs. Subplot #3 - Visp 70/1.0% and Forbs 16/0.5%. Subplot #4 - Visp 117/3% and Forbs 218/3.0%. Subplot 8# - Irsp 74/4.0% and Forbs 119/6%. Subplot #9 - Visp 9/0.5% and Forbs 174/30%.

BMB1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Bogus Meadow | Treatment: Thinned/Burned | Date: 8/28,31/09 | Plot size: 2m² circular plot

Block: B | Plot # : 1 | Crew: Soderlund, Bean, Hedge

# of each / % covered

Species	Ptaq/Atfi[1]	%	Rule	%	Riro	%	Adbi	%	Abco	%	Gatr	%	Lupo	%	Grass	%	Forbs[2]	%
1	15	15.0					2	0.5	6	1.0	5	0.5	12	3.0			9	1.0
2	8	35.0							2	0.5					34	6.0	297	25.0
3	6	30.0							1	0.5							322	69.5
4	5	20.0							3	15.0	48	2.0	1	0.5	47	2.0	307	26.0
5	23	35.0	3	10.0							30	1.0	1	1.0	3	0.5	228.0	20.0
6	11	20.0			14	5.0	1	0.5			12	1.0	21	3.0			17	1.0
7			3	10.0	3	2.0			1	0.5	38	2.0	2	2.0			43	3.0
8	5	25.0									5	0.5	2	0.5	59	5.0	298.0	21.0
9	6	30.0											15	12.0			4	0.5

Species	Case	%	Loam	%	Conu	%
1						
2	2	12.0				
3						
4						
5						
6			1	0.5		
7					1	25.0
8						
9						

Plot #	Duff	Litter
1	2	2
	2	2
2	3	2
	3.5	1.5
3	2.5	1
	1.5	3
4	3	2
	1	1.5
5	1	2
	2.5	2.5
6	2.5	1.5
	2	2
7	1	2
	2	2
8	2	1
	2	1
9	2	1
	1.5	1.5

1. 2001 - Roller identified ferns as Ptaq and 2009 Soderlund aggregated ferns into Ptaq and Atfi. Subplot #5 - Ptaq 6/20% and Atfi 17/15.0%.
2. 2009 - Soderlund aggregated Visp and forbs. Subplot #4 - Visp 178/6.0% and Forbs 129/20%. Subplot #5 - Visp 124/5.0% and Forbs 104/15.0%. Subplot #8 - Visp 139/6.0% and Forbs 159/15.0%. Subplot #9 - Visp 4/0.5% and Forbs 0/0.0%

BMB2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Bogus Meadow   Treatment: Thinned/Burned   Date: 9/1,2/09   Plot size: 2m² circular plot

Block: B   Plot # : 2   Crew: Soderlund,Ricchiazzi

# of each / % covered

Species	Ptaq	%	Rule	%	Riro	%	Rine	%	Abco	%	Gatr	%	Lupo	%	Grass	%	Forbs	%
1	10	35.0			2	2.0			1	2.0			4	6.0			50	10.0
2	4	20.0							3	3.0	6	0.5	15	12.0	5	1.0	14	2.0
3	6	15.0			4	0.5	3	5.0	15	40.0	18	0.5	16	1.0			24	1.0
4	4	8.0			3	2.0			3	5.0	127	2.0	14	1.0			55	2.0
5	2	4.0	12	6.0	16	4.0			9	15.0	46	0.5	2	1.0	1	0.5	47	2.0
6																		
7	26	25.0			2	0.5			1	1.0			6	1.0				
8	4	15.0							3	0.5	24	0.5					7	0.5
9	8	20.0			1	0.5			1	0.5	4	0.5	1	0.5			2	0.5

Plot #	Duff	Litter
1	0	2
	1	2.5
2	0.5	1
	0.5	1.5
3	1	1
	0.5	0.5
4	1.5	1
	5	2
5	0	1
	0	1.5
6	11	2
	0	1.5
7	1.5	1.5
	2	1
8	2.5	1
	3.5	2
9	3	1.5
	2	1.5

BMC1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Bogus Meadow | Treatment: Control | Date: 8/26/09 | Plot size: 2m² circular plot

Block: C | Plot # : 1 | Crew: Soderlund

# of each / % covered

Species	Ptaq	%	Riro	%	Pila	%	Conu	%	Adbi	%	Abco	%	Gatr	%	Grass	%	Forbs[1]	%
1	2	4.0							7	5.0			70	3.0			15	2.0
2									1	0.5			5	0.5			5	0.5
3	10	45.0	12	3.0					4	1.0	7	1.0	39	1.0	2	0.5	68	3.0
4	8	30.0									2	0.5	45	2.0			25	3.0
5	2	5.0	2	1.0					36	10.0			21	1.0			22	2.5
6									1	1.0	1	0.5	98	3.0			11	1.0
7	14	12.0							103	25.0			46	2.0			2	0.5
8	4	10.0	1	0.5					21	6.0			17	1.0			101	6.5
9	1	2.0			1	0.5	1	0.5	2	1.0			22	1.0				

Plot #	Duff	Litter
1	1.5	1.5
	1.5	1.5
2	1	1.5
	1.5	2
3	2.5	2
	2	1.5
4	3	3
	1.5	1.5
5	0.5	1
	3	1.5
6	2	1
	3	2
7	1.5	2
	1.5	1
8	2	2
	2	2
9	2	2
	3	2

1. 2009 - Soderlund aggregated Visp and Forbs. Subplot #5 - Visp 16/2.0% and Forbs 6/0.5%. Subplot #7 - Visp 2/0.5% and Forbs 0/0.0%. Subplot #8 - Visp 96/6.0% and Forbs5/0.5%.

BMC2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Bogus Meadow   Treatment: Control   Date: 8/27/09   Plot size: 2m² circular plot

Block: C   Plot # : 2   Crew: Soderlund

# of each / % covered

Species	Ptaq	%	Riro	%	Conu	%	Coco	%	Adbi	%	Abco	%	Gatr	%	Grass	%	Forbs[1]	%
1	9	25.0	6	3.0					108	12.0	1	0.5	31	1.0			86	6.0
2	3	2.0			1	0.5			103	15.0	7	0.5	4	0.5			35	3.5
3	1	2.0	1	0.5					12	6.0	2	0.5	21	1.0			23	5.0
4	21	30.0	1	0.5					69	30.0	6	15.0	24	1.0			30	5.0
5	2	12.0							4	2.0	1	0.5	12	1.0			8	1.0
6									91	15.0	5	1.0	32	1.0	2	0.5	188	20.0
7	4	12.0	2	1.0					9	1.0	1	0.5	6	0.5			3	0.5
8	5	12.0					2	3.0	6	3.0	1	1.0	1	0.5			3	1.0
9	4	15.0							3	3.0			31	1.0			31	2.0

Plot #	Duff	Litter
1	3	1.5
	4	1.5
2	1.5	1.5
	1.5	1.5
3	1	1.5
	2	2
4	6.5	1.5
	3	1.5
5	2	1
	2.5	1.5
6	2	2
	0.5	1
7	1.5	1
	1.5	1.5
8	3	2.5
	3	3
9	3	2
	4	2

1. 2009 - Soderlund aggregated Pypi, Visp and Forbs. Subplot #1 - Visp 77/5.0% and Forbs 9/1.0%. Subplot #2 - Visp 32/3.0% and Forbs 3/0.5%. Subplot #3 - Smra 2/1.0%, Pypi 3/1.0%, Visp 10/2.0% and Forbs 8/1.0%. Subplot # 6 - Visp 175/10.0% and Forbs 13/10%. Subplot #8 - Smra 1/0.5% and Forbs 2/0.5%.

FMA1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: FM | Treatment: Thinned | Date: 8/24/09 | Plot size: 2m² circular plot

Block: A | Plot # : 1 | Crew: Soderlund, Bean

# of each / % covered

Species	Ptaq	%	Riro	%			Ceco	%	Adbi	%	Abco	%	Gatr	%	Grass[1]	%	Forbs	%
1			6	6.0											11	1.0	72	10.0
2			2	2.0			1	2.0			5	4.0			27	2.0	52	6.0
3	2	20.0	1	1.0														
4	4	20.0	1	2.0											175	5.0		
5	9	15.0	4	3.0									2	0.5				
6																		
7	3	10.0							1	0.5					1	0.5	2	0.5
8	2	6.0											8	1.0				
9	10	25.0	3	0.5							1	0.5						

Plot #	Duff	Litter
1	1	1
	1	1
2	1.5	1
	1	2
3	1	1
	2	1
4	1.5	1.5
	2	1
5	3	1
	2	1.5
6	3	2
	3	2
7	3	2
	3	2
8	2.5	1
	2	2
9	3	2
	2	2

1. 2009 Soderlund aggregated Crsp and Grass. Subplot #1 - Crsp 7/0.5% and Grass 4/0.5%.

FMA2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: FM   Treatment: Thinned/Burned   Date: 8/24,25/09   Plot size: 2m² circular plot

Block: A   Plot # : 2   Crew: Soderlund, Bean

# of each / % covered

Species	Ptaq	%	Riro	%	Cepa	%	Ceco	%	Cade	%	Abco	%	Gatr	%	Grass[1]	%	Forbs	%
1	2	2.0									11	20.0	2	0.5	27	1.0		
2							6	20.0			1	2.0					2	1.0
3			2	3.0			15	25.0			11	20.0	7	0.5				
4			3	4.0			7	25.0			3	6.0	8	0.5	2	0.5	117	3.0
5			4	3.0	1	10.0					12	10.0					6	2.0
6									1	1.0	7	10.0	16	1.0			119	5.0
7			6	4.0					1	0.5	1	0.5			25	1.5	89	8.0
8					1	1.0	2	12.0	1	0.5	1	12.0					15	1.0
9							13	40.0			4	5.0	41	2.0				

Plot #	Duff	Litter
1	1	2
	2	2
2	0	2
	0.5	2
3	1.5	1
	3	1
4	1	2
	1.5	1.5
5	2	2
	1	1
6	0.5	1
	1	1
7	1	1
	1	1
8	0	0.5
	1	1
9	1	1
	2	1.5

Species	Adbi	%	Pila	%
1				
2				
3				
4				
5				
6			1	0.5
7				
8	1	1.0		
9				

1. 2009 Soderlund aggregated Crsp and Grass. Subplot #1 - Crsp 17/0.5% and Grass 10/0.5%. Subplot # 7 - Crsp 24/1.0% and Grass 1/0.5%.

FMB1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: FM | Treatment: Thinned | Date: 8/19/09 | Plot size: 2m² circular plot

Block: B | Plot # : 1 | Crew: Soderlund, Bean

# of each / % covered

Species	Ptaq	%	Riro	%	Cepa	%	Cade	%	Adbi	%	Abco	%	Gatr	%	Grass[1]	%	Forbs	%
1	3	25.0	17	5.0	2	8.0	1	0.5			1	0.5	1	0.5	29	2.0	133	10.0
2	1	5.0	14	12.0											32	2.0	156	10.0
3			3	12.0					1	0.5	1	0.5			14	1.0	10	1.0
4			6	6.0							1	1.0	4	0.5	10	1.0	19	1.0
5									2	3.0					1	0.5	19	1.0
6															41	2.0	10	1.0
7	25	40.0																
8	10	20.0	5	5.0													43	2.0
9	6	20.0									1	0.5	12	2.0			6	0.5

Plot #	Duff	Litter
1	1.5	2
	1	2
2	1	1.5
	1.5	1.5
3	0.5	1.5
	0	1
4	1.5	1
	2	1.5
5	2	1
	2	1
6	2	2
	4	2
7	3	2
	3	2
8	2	1
	1.5	1
9	2	2
	3	2

1. 2009 Soderlund aggregated Crsp and Grass. Subplot #1 - Crsp 3/0.5% and Grass 26/1.5%.

FMB2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: FM | Treatment: Thinned/Burned | Date: 8/20/09 | Plot size: 2m² circular plot

Block: B | Plot # : 2 | Crew: Soderlund, Bean

# of each / % covered

Species	Ptaq	%	Riro	%	Ceco	%	Cade	%	Adbi	%	Abco	%	Gatr	%	Grass[1]	%	Forbs	%
1	4	12.0	2	2.0							4	10.0			35	2.0	78	5.0
2											6	2.0			46	2.0	4	1.0
3					13	13.0	1	0.5	1	0.5	4	45.0					22	3.0
4					20	25.0					5	8.0			2	0.5	1	0.5
5					3	8.0					1	10.0						
6			1	2.0	4	5.0					10	20.0	5	1.0			12	2.0
7			5	4.0	31	45.0					12	25.0	4	0.5			12	2.0
8					12	40.0					6	4.0						
9	1	3.0			2	15.0									101	3.0	8	1.0

Plot #	Duff	Litter
1	0	1
	0.5	1.5
2	1	1
	1	2
3	0.5	2
	1	1.5
4	1.5	1.5
	1	2
5	1	1.5
	1	0.5
6	0	0.5
	1	1
7	0	2.5
	0	1.5
8	1	2
	1.5	2.5
9	1	1
	1	2

Species	Arpa	%
1		
2		
3	5	1.0
4		
5		
6		
7		
8		
9		

1. 2009 Soderlund aggregated Crsp and Grass. Subplot #1 - Crsp 30/1.5% and Grass 5/0.5%. Subplot # 9 - Crsp 27/1.0% and Grass 74/2.0%.

FMC1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: FM | Treatment: Control | Date: 8/21/09 | Plot size: 2m² circular plot

Block: C | Plot # : 1 | Crew: Soderlund

# of each / % covered

Species	Ptaq	%							Adbi	%	Abco	%	Gatr	%	Grass	%	Forbs[1]	%
1													1	0.5				
2											1	0.5	7	0.5			1	0.5
3	1	2.0									1	0.5	6	1.0				
4											2	0.5	40	3.0				
5													1	0.5				
6																		
7													2	0.5			4	1.0
8									18	5.0			16	1.0			183	11.0
9													3	0.5			2	1.0

Plot #	Duff	Litter
1	3.5	1.5
	2	2
2	2	1.5
	1.5	2
3	2.5	1.5
	3	2
4	0.5	1
	0.5	2
5	2	1.5
	1.5	1.5
6	2	1.5
	4	1.5
7	2.5	2
	1.5	1.5
8	2	1.5
	1	0.5
9	4	2.5
	3	1.5

1. 2009 Soderlund aggregated Eqsp, Visp and Forbs. Subplot #7 - Visp 2/0.5% and Forbs 2/0.5%. Subplot # 8 - Visp 179/10.0% and Forbs 4/1.0%. Subplot # 9 - Eqsp 2/1.0% and Forbs 0/0.0%.

FMC2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: FM | Treatment: Control | Date: 8/19,20/09 | Plot size: 2m² circular plot

Block: C | Plot # : 2 | Crew: Soderlund, Bean

# of each / % covered

Species	Ptaq	%	Riro	%			Coco	%					Gatr	%	Grass	%	Forbs[1]	%
1																		
2																	1	0.5
3	1	2.0											8	0.5				
4													2	0.5				
5																		
6																		
7	8	25.0																
8	3	10.0																
9	5	10.0	3	2.0			3	12.0										

Plot #	Duff	Litter
1	3	1.5
	3	2
2	3.5	1.5
	3	2
3	2	2
	2	2
4	3	2
	2	2
5	3	2
	2	2.5
6	2.5	1
	2.5	2.5
7	3	3
	1.5	1.5
8	3.5	1.5
	2.5	1.5
9	2	3
	2	2

1. 2009 Soderlund aggregated Smra and Forbs. Subplot #2 - Smra 1/0.5% and Forbs 0/0.0%.

HQA1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Headquarters | Treatment: Thinned | Date: 8/3/09 | Plot size: 2m² circular plot

Block: A | Plot # : 1 | Crew: Soderlund, Estrada

# of each / % covered

Species	Ptaq	%	Roca	%	Rine	%	Riro	%	Abco	%	Conu	%	Gatr	%	Grass	%	Forbs[1]	%
1			5	1.0			2	2.0	3	1.0			9	1.0			18	1.0
2			2	1.0	4	5.0			1	1.0	1	1.0	2	1.0			8	1.0
3	8	25.0					1	1.0	1	1.0			1	1.0	7	1.0	3	1.0
4	4	20.0	51	10.0			4	2.0							17	1.0	12	1.0
5	2	1.0	38	5.0	6	30.0							15	1.0			75	3.0
6							8	10.0					2	1.0			62	20.0
7	1	20.0	2	5.0			5	1.0	4	10.0			4	1.0	1	1.0	82	5.0
8	3	15.0					2	1.0	1	1.0			70	5.0	2	1.0	125	11.0
9	10	20.0							4	1.0					16	1.0	68	5.0

Species	Coco	%	Cein	%	Adbi	%
1	2	2	1	2.0		
2						
3						
4						
5						
6						
7					3	5.0
8					44	5.0
9						

Plot #	Duff	Litter
1	3.5	3
	2.5	2.5
2	0	1.5
	0	1.5
3	0	3.5
	1	2
4	2	2.5
	1	1.5
5	0	3.5
	0	3.5
6	3	4
	2	4
7	1.5	3.5
	2	3
8	2	2.5
	1.5	2
9	1	2
	1	1.5

1. 2009 Soderlund aggregated Visp and Forbs. Subplot #8 - Visp 22/1.0% and Forbs 103/10%.

HQB1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Headquarters | Treatment: Thinned/Burned | Date:8/4/09 | Plot size: 2m² circular plot

Block: B | Plot # : 1 | Crew: Soderlund, Estrada

# of each / % covered

Species	Ptaq	%	Lupo	%	Gatr	%	Riro	%	Quke	%	Abco	%	Adbi	%	Grass	%	Forbs	%
1	8	25.0	17	30.0			3	1.0			1	1.0			11	1.0	6	1.0
2	4	15.0	29	25.0	3	1.0					4	1.0			134	2.0	83	2.0
3	11	40.0	10	1.0	2	1.0			1	2.0	3	1.0					6	1.0
4	3	15.0	30	15.0			2	0.5			3	1.0			19	1.0	1	0.5
5	11	30.0	40	10.0	4	1.0	1	1.0			4	1.0			33	1.0	30	1.0
6	15	25.0	48	15.0														
7	8	40.0	57	5.0							5	1.0			1	1.0	16	1.0
8			8	6.0	12	6.0											34	2.0
9	4	20.0	6	2.0	8	1.0	1	1.0	1	1.0	3	1.0	1	1.0	79	2.0	22	1.0

Plot #	Duff	Litter
1	1.0	1.0
	0.5	1.0
2	0.5	2.0
	2.0	1.5
3	2.0	1.0
	2.5	1.5
4	0.0	2.5
	0.0	2.5
5	1.0	1.5
	1.0	1.5
6	1.0	2.0
	0.0	2.5
7	1.0	1.5
	4.0	2.5
8	8.0	3.0
	9.0	2.5
9	0.0	2.0
	0.5	2.0

HQC1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Headquarters Treatment: Control Date: 7/31 & 8/3/09 Plot size: 2m² circular plot

Block: C Plot # : 1 Crew: Soderlund,Ricchiazzi, Estrada

# of each / % covered

Species	Ptaq	%	Quke	%	Riro	%	Rine	%	Conu	%	Abco	%	Gatr	%	Grass	%	Forbs[1]	%
1							7	15.0			4	1.0	78	3.0			92	6.0
2					1	1.0					1	1.0	23	1.0			137	61.0
3											1	1.0	5	1.0			7	2.0
4											1	1.0	76	1.0			3	1.0
5					1	1.0			3	1.0			13	1.0	10	1.0	190	16.0
6											3	1.0	15	1.0			377	20.0
7							2	15.0			2	0.5			5	0.5	282	16.0
8	2	1.0	1	1.0			3	1.0	3	1.0	1	1.0	6	1.0	9	1.0	40	3.0
9	5	12.0					6	20.0	2	1.0	8	3.0	60	2.0	1	0.5	13	1.0

Plot #	Duff	Litter
1	4	3
	4	2
2	3	2
	1.5	2
3	2.5	3
	6	1.5
4	0.5	2
	3	2
5	1	1
	0.5	2
6	5	2
	3	2
7	1	2
	1.5	2.5
8	0.5	1
	1	1.5
9	0	1.5
	0.5	2.5

Species	Abdi	%	Rupa	%	Cade	%
1						
2						
3						
4						
5	1	1.0				
6						
7						
8					2	1.0
9			18	20.0		

1. 2009 Soderlund aggregated Smra, Visp and Forbs. Subplot #1 - Visp 80/4.0% and Forbs 12/2.0. Subplot # 2 - Visp 10/1.0% and 127/60%. Subplot # 3 - Smra 1/1.0% and Forbs 6/1.0%. Subplot # 5 - 170/15% and Forbs 20/10.0%. Subplot # 6 - Visp 377/20% and Forbs 0/0.0%. Subplot # 7 - Visp 280/15.0% and Forbs 2/1.0%. Subplot # 8 - Visp 36/2.0% and Forbs 4/1.0%.

IBA1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: IB | Treatment: Thinned | Date: 8/14/09 | Plot size: 2m² circular plot

Block: A | Plot # : 1 | Crew: Soderlund, Estrada

# of each / % covered

Species							Abco	%							Grass	%	Forbs	%
1																		
2							2	0.5										
3																		
4							1	0.5										
5																		
6																		
7							2	0.5										
8																		
9							3	0.5										

Plot #	Duff	Litter
1	0.5	1.5
	1	1.5
2	0.5	1.5
	0.5	1
3	2	2
	1	2
4	2	2
	1	2
5	6	2
	5.5	2.5
6	2.5	2
	1	2.5
7	2	1.5
	0.5	1.5
8	3	1.5
	2	2
9	1.5	2
	2	2

IBA2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: IB | Treatment: Thinned/Burned | Date: 8/18/09 | Plot size: $2m^2$ circular plot

Block: A | Plot # : 2 | Crew: Soderlund, Bean

# of each / % covered

Species							Abco	%							Grass	%	Forbs	%
1							1	0.5										
2							2	0.5										
3							1	0.5										
4							2	0.5										
5																		
6																		
7																		
8																		
9							1	0.5										

Plot #	Duff	Litter
1	0	4
	2	3
2	1	1.5
	1	2
3	4	1
	2	3
4	1	2
	2	1
5	0	2
	1	1
6	1	2
	2	2
7	2	2
	1.5	2
8	1	2
	4	1
9	2	2
	2	2

IBB1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: IB   Treatment: Thinned   Date: 8/17/09   Plot size: 2m² circular plot

Block: B   Plot # : 1   Crew: Soderlund, Bean

# of each / % covered

Species							Abco	%	Riro	%					Grass	%	Forbs	%
1																		
2																		
3							1	10.0	1.0	0.5								
4																		
5							2	0.5										
6																		
7																		
8							1	0.5										
9																		

Plot #	Duff	Litter
1	2	2
	1	2
2	12	2
	0	1.5
3	0	2
	0	0.5
4	9	2
	3	2.5
5	2	1
	2.5	1
6	0	3
	2	2
7	5	2
	2	2
8	0.5	2.5
	0	0.5
9	6	2
	9	2.5

IBB2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: IB | Treatment: Thinned/ Burned | Date: 8/17/09 | Plot size: 2m² circular plot

Block: B | Plot # : 2 | Crew: Soderlund, Bean

# of each / % covered

Species	Riro	%					Abco	%							Grass	%	Forbs	%
1							1	0.5										
2							1	0.5									1	0.5
3							1	0.5									3	0.5
4							3	3.0										
5							2	2.0										
6							8	2.0										
7	4	2.0																
8							2	0.5									5	1.0
9							4	1.0										

Plot #	Duff	Litter
1	0	2
	2	1
2	2	1
	2	1
3	1.5	1.5
	1.5	1.5
4	0	2
	1	1.5
5	1	1
	1	1
6	2.5	1
	2	2
7	1	2
	1	2.5
8	1	1.5
	1	1.5
9	0	1.5
	3	1

1. 2009 Soderlund aggregated Pypi and Forbs. Subplot #8 - Pypi 5/1.0% and Forbs 0/0.0%.

IBC1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: IB | Treatment: Control | Date: 8/14/09 | Plot size: 2m² circular plot

Block: C | Plot # : 1 | Crew: Soderlund, Estrada

# of each / % covered

Species							Abco	%							Grass	%	Forbs	%
1																		
2							1	0.5										
3																		
4																		
5																		
6							1	15.0										
7																		
8							1	0.5										
9																		

Plot #	Duff	Litter
1	3	2.5
	2.5	2.5
2	2	2.5
	1.5	2.5
3	2	2
	2	1.5
4	0.5	1.5
	1	1.5
5	1	1
	1.5	1.5
6	1	1.5
	1	2
7	1.5	1.5
	2	1.5
8	2.5	2.5
	1.5	2
9	0	2.5
	0	2.5

IBC2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: IB Treatment: Control Date: 8/18/09 Plot size: 2m² circular plot

Block: C Plot # : 2 Crew: Soderlund, Bean

# of each / % covered

Species	Cade	%													Grass	%	Forbs	%
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9	1	10.0																

Plot #	Duff	Litter
1	3	3
	3	2.5
2	1	1
	1	1.5
3	7	3
	3	3
4	2.5	3.5
	3	2
5	3	1.5
	2.5	1.5
6	0	1
	0.5	2
7	3	2
	1.5	1.5
8	2	2
	3.5	2.5
9	2	3
	1.5	2

MEA1 MHDSF Young-Growth Giant Sequoia Management Strategies Study

2009 - Understory Raw Data

Stand: ME Treatment: Thinned Date:8/10/09 Plot size: 2m² circular plot

Block: A Plot # : 1 Crew: Soderlund, Hedge

# of each / % covered

Species	Chfo	%	Abco	%	Quke	%	Riro	%	Cade	%			Roca	%	Grass	%	Forbs[1]	%
1			1	0.5														
2	1	0.5	2	20.0	2	12.0	1	0.5	2	0.5			59	12.0			3	1.0
3													30	5.0			102	55.0
4			3	20.0	7	1.0	4	4.0	1	0.5			4	1.0			25	4.0
5									1	0.5			11	3.0				
6							6	4.0									1	0.5
7							1	2.0										
8			1	2.0	1	0.5	6	6.0									2	1.0
9			1	2.0			11	8.0									7	2.0

Plot #	Duff	Litter
1	0	2
	1	2
2	0.5	1.5
	0	2.5
3	0	1
	0	1.5
4	1	1
	1	1.5
5	0.5	2
	0	1
6	1	1.5
	0	1
7	0	2.5
	0.5	2.5
8	1	2
	1	2.5
9	0.5	1.5
	0.5	1

1. 2009 Soderlund aggregated Casp and Forbs. Subplot #3 - Casp 52/5.0% and Forbs 50/5.0%.

MEA2 MHDSF Young-Growth Giant Sequoia Management Strategies Study

2009 - Understory Raw Data

Stand: ME Treatment: Thinned Date:8/12/09 Plot size: 2m² circular plot

Block: A Plot # : 2 Crew: Soderlund, Hedge

# of each / % covered

Species	Chfo	%	Abco	%	Quke	%	Riro	%	Cade	%	Pila	%	Arpa	%	Grass	%	Forbs[1]	%
1	42	25.0	1	25.0			2	1.0							1	0.5	14	3.0
2																	30	6.5
3			1	0.5			2	1.0			1	2.0					22	3.0
4	18	10.0	1	0.5									1	25.0			14	2.5
5	16	5.0	1	45.0													36	5.5
6	28	10.0			1	8.0	1	1.0									54	5.0
7			1	10.0													45	7.0
8			3	12.0					3	20.0					2	0.5	45	8.5
9	96	25.0					1	0.5	1	0.5							3	1.0

Plot #	Duff	Litter
1	1	1.5
	1	1
2	0.5	1
	1	1
3	1.5	1
	1.5	1
4	1	1
	2	0.5
5	0.5	2.5
	1	1.5
6	2	2
	1.5	2
7	1.5	0.5
	0.5	1.5
8	0.5	1.5
	2	0.5
9	1	2
	0.5	2

1. 2009 Soderlund aggregated Casp and Forbs. Subplot #1 - Casp 14/3.0% and Forbs 0/0.0%. Subplot #2 - Casp 27/6.0% and Forbs 3/0.5%. Subplot # 3 - Casp 22/3.0% and Forbs 0/0.0%. Subplot # 4 - Casp 12/12.0% and Forbs 2/0.5%. Subplot # 5 - Casp 32/5.0% and 4/0.5% Subplot # 6 - Casp 45/4.0% and Forbs 9/1.0%. Subplots # 7 - 35/6.0% and Forbs 10/1.0%. Subplot # 8 - 43/8.0% and Forbs 2/0.5%. Subplot # 9 - Casp 3/1.0% and Forbs 0/0.0%.

MEA3

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: ME | Treatment: Thinned | Date:8/11/09 | Plot size: 2m² circular plot

Block: A | Plot # : 3 | Crew: Soderlund, Hedge

# of each / % covered

Species	Pila	%	Abco	%	Riro	%	Cade	%	Arpa	%	Coco	%	Cepa	%	Grass[1]	%	Forbs[2]	%
1			6	20.0													8	3.0
2																		
3																		
4			1	0.5	2	2.0	1	20.0			1	0.5						
5																		
6			2	6.0													23	2.0
7									2	10.0			3	25.0	2	0.5	32	6.0
8															12	1.0	12	4.0
9	2	1.0																

Plot #	Duff	Litter
1	1.5	1.5
	0.5	1.5
2	1	1
	2	1.5
3	3	1.5
	1	4
4	0.5	1.5
	1.5	2
5	1	0.5
	2.5	2
6	2	1.5
	2	2
7	0.5	0
	1	2
8	3	1.5
	1	1
9	2.5	1.5
	2	1

1. 2009 Soderlund aggregrated Crsp and Grass. Subplot # 8 - Crsp 12/1.0% and Grass 0/0.0%.
2. 2009 Soderlund aggregated Casp and Forbs. Subplot #1 - Casp 5/2.0% and Forbs 3/1.0%. Subplot # 6 - Casp 6/1.0% and Forbs 17/1.0%. Subplots # 7 - Casp 12/1.0% and Forbs 20/5.0%.

MEA4 MHDSF Young-Growth Giant Sequoia Management Strategies Study

2009 - Understory Raw Data

Stand: ME Treatment: Thinned Date:8/7/09 Plot size: 2m² circular plot

Block: A Plot # : 4 Crew: Soderlund, Estrada

# of each / % covered

Species	Chfo	%	Abco	%	Riro	%							Cepa	%	Grass[1]	%	Forbs[2]	%
1															62	1.0	17	1.5
2					5	2.0											18	1.5
3	142	60.0			7	12.0											6	2.0
4	39	12.0	1	0.5	21	6.0							1	5.0			14	1.0
5																		
6			1	0.5													1	0.5
7	86	30.0	3	0.5													13	1.0
8			1	0.5	12	5.0											79	13.0
9	147	75.0			1	2.0												

Plot #	Duff	Litter
1	1	0.5
	0.5	1
2	0	0.5
	0	0.5
3	1.5	3
	2	3.5
4	1.5	1.5
	1	1
5	1.5	1.5
	4	2
6	8	2.5
	9	4
7	2	1.5
	2	1.5
8	1.5	1.5
	1	1.5
9	2	1
	2	1.5

1. 2009 Soderlund aggregrated Crsp and Grass. Subplot # 1 - Crsp 62/1.0% and Grass 0/0.0%.
2. 2009 Soderlund aggregated Casp and Forbs. Subplot #1 - Casp 2/0.5% and Forbs 15/1.0 %. Subplot # 2 - Casp 17/1.0% and Forbs 1/0.5%. Subplots # 3 - Casp 6/2.0% and Forbs 0/0.0%. Subplot # 8 - Casp 7/1.0% and Forbs 72/12.0%.

MEB1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: ME — Treatment: Thinned/Burned — Date:8/5/09 — Plot size: 2m² circular plot

Block: B — Plot # : 1 — Crew: Soderlund, Estrada

# of each / % covered

Species	Pila	%	Rine	%	Roca	%	Conu	%	Prem	%	Loam	%	Abco	%	Grass[1]	%	Forbs[2]	%
1															323	4.0	28	2.0
2	4	3.0	3	2.0	26	2.0					12	15.0	2	10.0			19	2.0
3			10	1.0	11	1.0	4	40.0					2	1.0			105	2.0
4							6	75.0	2	1.0			4	1.0				
5			2	1.0	45	10.0			9	12.0			2	1.0			8	1.0
6			2	4.0					4	1.0					67	1.0	120	3.0
7	1	5.0	3	1.0					9	10.0	4	2.0	1	1.0			15	1.0
8			1	1.0					2	3.0			2	1.0			96	2.0
9									2	1.0			1	1.0			80	1.0

Plot #	Duff	Litter
1	0.5	1
	0.5	1.5
2	2	1.5
	1	2
3	4	2
	2	1
4	3	1.5
	2	2
5	2	2
	1	1
6	0.5	1
	0	0.5
7	1.5	1.5
	0.5	3
8	0.5	0.5
	0	0.5
9	0.5	1.5
	0.5	1

Species	Coco	%	Cade	%
1				
2			1	1.0
3				
4				
5			1	1.0
6				
7				
8	2	1.0		
9				

1. 2009 Soderlund aggregrated Crsp and Grass. Subplot # 1 - Crsp 319/3.5% and Grass 4/0.5%.
2. 2009 Soderlund aggregated Casp, Smra and Forbs. Subplot #1 - Smra 2/1.0% and Forbs 26/1.0 %. Subplot # 2 - Smra 3/1.0% and Forbs 16/1.0%. Subplots # 6 - Casp 1/1.0% and Forbs 119/2.0%.

MEB2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: ME | Treatment: Thinned/Burned | Date:8/4,5/09 | Plot size: 2m² circular plot

Block: B | Plot # : 2 | Crew: Soderlund, Estrada

\# of each / % covered

Species	Coco	%	Prem	%	Riro	%	Cade	%	Quke	%	Loam	%	Abco	%	Grass[1]	%	Forbs[2]	%
1					10	5.0	4	1.0					1	1.0			27	3.0
2	19	25.0			4	2.0	3	1.0					2	1.0	33	1.0	31	2.0
3							1	1.0					1	1.0	14	1.0	14	3.0
4			1	2.0							1	1.0	2	2.0			1	1.0
5																		
6									1	1.0			1	1.0	39	1.0	7	1.0
7			4	10.0	10	2.0					8	10.0					2	1.0
8			10	10.0					1	5.0	12	20.0					152	2.0
9											8	15.0						

Plot #	Duff	Litter
1	0.5	1.0
	0.5	1.0
2	0.5	0.5
	0.5	1.0
3	0.5	0.5
	1.0	0.5
4	1.0	0.5
	0.5	1.0
5	0.5	1.0
	1.5	1.0
6	0.5	2.0
	0.0	0.5
7	1.0	0.5
	1.0	0.5
8	0.5	1.0
	0.5	0.5
9	1.0	1.5
	0.5	1.5

Species	Cein	%	Roca	%
1				
2	2	1.0		
3			16	3.0
4				
5				
6				
7				
8				
9				

1. 2009 Soderlund aggregrated Crsp and Grass. Subplot # 3 - Crsp 11/0.5% and Grass 3/0.5%.
2. 2009 Soderlund aggregated Casp, Smra and Forbs. Subplot #1 - Smra 3/2.0% and Forbs 24/1.0%. Subplot # 2 - Casp 2/1.0% and Forbs 29/1.0%. Subplots # 3 - Casp 6/2.0% and Forbs 8/1.0%.

MEB3

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: ME | Treatment: Thinned/Burned | Date:8/5-6/09 | Plot size: 2m² circular plot

Block: B | Plot # : 3 | Crew: Soderlund, Estrada

# of each / % covered

Species	Roca	%	Riro	%	Cade	%	Cein	%	Abco	%					Grass	%	Forbs[1]	%
1			3	2.0					2	1.0							3	1.0
2	1	1.0			1	0.5	1	10.0									94	2.0
3	1	1.0	2	1.0	2	0.5											10	3.5
4					1	0.5	6	80.0	3	5.0					6	1.0	25	1.0
5			1	1.0			3	15.0									5	1.0
6	7	1.0	1	1.0					2	1.0							1	1.0
7																		
8																	204	31.0
9																	89	10.0

Plot #	Duff	Litter
1	0	0.5
	1	1
2	1.5	1
	1.5	1.5
3	0.5	1
	1	2
4	0	2
	0.5	2
5	1.5	1
	1	1
6	1.5	1
	0.5	1
7	1.5	1
	3	2
8	1.5	1.5
	1.5	1
9	1	1.5
	1.5	1.5

1. 2009 Soderlund aggregated Casp, Irsp, Smra and Forbs. Subplot #3 - Casp 8/3.0% and Forbs 2/0.5%. Subplot # 5 - Casp 5/1.0% and Forbs 0/0.0%. Subplots # 6 - Smra 1/1.0% and Forbs 0/0.0%. Subplot # 8 - Irsp 182/30% and Forbs 22/1.0%.

MEB4

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: ME   Treatment: Thinned/Burned   Date:8/6/09   Plot size: 2m² circular plot

Block: B   Plot # : 4   Crew: Soderlund, Estrada

# of each / % covered

Species	Chfo	%	Pila	%	Riro	%	Cade	%	Cein	%	Roca	%	Abco	%	Grass	%	Forbs[1]	%
1							1	2.0									18	2.0
2			1	2.0													39	6.0
3											4	2.0			1	0.5	49	3.5
4	4	1.0															59	5.0
5											19	2.0	1	2.0			97	4.0
6					2	1.0			4	90.0	1	1.0					40	3.0
7							2	1.0	4	80.0			4	1.0	13	1.0	38	7.0
8									1	10.0	3	2.0	9	1.0	10	1.0	77	17.0
9					3	1.0			2	80.0			2	2.0	8	1.0	95	4.0

Plot #	Duff	Litter
1	1.5	1
	1.5	0.5
2	1.5	1
	1	1.5
3	0.5	1
	0	0.5
4	0.5	1
	1	1
5	1.5	1
	1	0.5
6	1.5	0.5
	2	1
7	2	1
	1	0.5
8	1.5	0.5
	1.5	0.5
9	1	1.5
	1	1

Species	Arpa	%	Conu	%
1				
2				
3				
4				
5	2	10.0		
6				
7			1	0.5
8				
9				

1. 2009 Soderlund aggregated Casp, Irsp and Forbs. Subplot #1 - Casp 1/1.0% and Forbs 17/1.0%. Subplot # 2 - Casp 23/5.0% and Forbs 16/1.0%. Subplot # 3 - Irsp 1/0.5%, Casp 45/2.0% and Forbs 3/1.0%. Subplot # 4 - Casp 59/5.0% and Forbs 0/0.0%. Subplot # 5 - Irsp 75/2.0%, Casp 22/2.0% and Forbs 0/0.0%. Subplot # 6 - Irsp 3/1.0%, Casp 30/1.0% and Forbs 7/1.0%. Subplot # 7 - Casp 11/5.0% and Forbs 27/2.0%. Subplot # 8 - Irsp 4/1.0%, Casp 60/15% and Forbs 13/1.0%. Subplot # 9 - Casp 29/2.0% and Forbs 66/2.0%.

MEC2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: ME   Treatment: Control   Date:8/10-11/09   Plot size: 2m² circular plot

Block: C   Plot # : 2   Crew: Soderlund, Hedge

# of each / % covered

Species	Abco	%	Quke	%	Riro	%	Cade	%	Roca	%	Coco	%	Rupa	%	Grass	%	Forbs[1]	%
1	2	0.5	2	1.0	5	2.0											4	1.0
2			3	1.0									4	8.0				
3	6	0.5	1	20.0							3	0.5			1	0.5	4	2.5
4					4	6.0												
5					2	2.0			7	1.0								
6									17	5.0								
7									8	4.0								
8					4	5.0	1	4.0										
9	1	0.5			7	1.0												

Plot #	Duff	Litter
1	0	0.5
	0.5	2
2	3	6.5
	3.5	5
3	1	2.5
	1	2
4	2	2.5
	1.5	3
5	1.5	1
	1	2
6	1	2
	0.5	2
7	4	1.5
	1	2
8	2	1.5
	2.5	2
9	6.5	2
	2.5	2

1. 2009 Soderlund aggregated Casp, Smra and Forbs. Subplot #1 - Casp 1/0.5% and Forbs 3/0.5%. Subplot # 3 - Smra 2/2.0% and Forbs 2/0.5%.

MEC3

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: ME Treatment: Control Date:8/6-7/09 Plot size: 2m² circular plot

Block: C Plot # : 3 Crew: Soderlund, Estrada

# of each / % covered

Species	Chfo	%	Abco	%	Rine	%	Quke	%	Riro	%	Cade	%	Conu	%	Grass	%	Forbs[1]	%
1	40	25.0															89	3.0
2			6	0.5													3	1.0
3			3	0.5							1	0.5			45	1.0	3	1.0
4													2	1.0			51	2.0
5			2	0.5														
6	94	50.0	1	0.5					4	1.0	1	5.0					42	2.5
7													3	2.0			24	2.0
8					1	0.5	1	0.5							15	0.5	137	3.0
9			1	2.0					1	1.0							8	2.0

Plot #	Duff	Litter
1	0.5	1
	0.5	1
2	1.5	1
	1.5	1
3	1.5	1
	3.5	2
4	0.5	1.5
	0.5	1.5
5	2	1.5
	0	2
6	1	1.5
	1	1
7	1.5	1
	7	4.5
8	1.5	2
	0.5	2
9	2	1.5
	2	2

Species	Prem	%
1	1	0.5
2		
3		
4		
5		
6		
7		
8		
9		

1. 2009 Soderlund aggregated Casp and Forbs. Subplot #1 - Casp 72/2.0% and Forbs 17/1.0%. Subplot # 4 - Casp 21/1.0% and Forbs 30/1.0%. Subplot # 6 - Casp 3/0.5% and Forbs 39/2.0%. Subplot # 7 - Casp 2/1.0% and Forbs 22/1.0%. Subplot # 8 - Casp 25/2.0 and Forbs 112/1.0%.

MEC4

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: ME   Treatment: Control   Date:8/7/09   Plot size: 2m² circular plot

Block: C   Plot # : 4   Crew: Soderlund, Estrada

# of each / % covered

Species	Chfo	%	Abco	%	Quke	%	Riro	%	Cade	%	Pila	%	Roca	%	Grass	%	Forbs	%
1			7	25.0					3	15.0			28	3.0			11	2.0
2													1	0.5			15	2.0
3			1	0.5	2	1.0			2	6.0							87	7.0
4			3	0.5													31	3.0
5															36	0.5	6	1.0
6			3	25.0			1	0.5	1	0.5			7	2.0				
7	2	3.0			1	1.0							26	20.0	1	0.5	26	2.5
8			6	4.0					2	0.5	3	2.0			9	0.5	67	8.0
9			2	0.5			3	1.0			1	5.0					22	3.0

Plot #	Duff	Litter
1	2.5	1.5
	0.5	2
2	0.5	2.5
	0.5	1.5
3	0.5	1.5
	1	1.5
4	2.5	2
	2	3
5	1	1
	1.5	1
6	0.5	1.5
	1	2
7	0.5	1.5
	1	2
8	0	1.5
	0.5	1.5
9	0.5	2
	0.5	1.5

Species	Segi	%
1		
2		
3		
4		
5		
6		
7		
8		
9	1	3.0

1. 2009 Soderlund aggregated Casp and Forbs. Subplot #1 - Casp 11/2.0% and Forbs 0/0.0%. Subplot # 2 - Casp 15/2.0% and Forbs 0/0.0%. Subplot # 3 - Casp 9/2.0% and Forbs 78/5.0%. Subplot # 4 - Casp 31/3.0% and Forbs 0/0.0%. Subplot # 7 - Casp 23/2.0% and Forbs 3/0.5%. Subplot # 8 - Casp 44/6.0% and Forbs 23/2.0%. Subplot # 9 - Casp 5/1.0 and Forbs 17/2.0%.

TFA1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Tub Flats Treatment: Thinned Date: 8/12/09 Plot size: 2m² circular plot

Block: A Plot # : 1 Crew: Soderlund, Hedge

# of each / % covered

Species	Ptaq	%					Riro	%	Arpa	%	Abco	%			Grass	%	Forbs	%
1	8	25.0							1	1.0								
2	4	12.0																
3	8	20.0													6	1.0	1	0.5
4	3	2.0					10	4.0										
5	3	6.0									2	1.0					33	3.0
6																		
7	1	4.0									1	0.5						
8	4	6.0															4	0.5
9	1	2.0																

Plot #	Duff	Litter
1	1.5	1
	1	1
2	1	1.5
	1.5	2
3	1.5	1
	4	3
4	0	1
	0	1.5
5	0.5	1
	1	1.5
6	1	2
	2	1.5
7	1.5	1.5
	0.5	2
8	1	2
	2	3
9	0.5	1.5
	3	3

TFB1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Tub Flats | Treatment: Thinned/Burned | Date: 8/13/09 | Plot size: 2m² circular plot

Block: B | Plot # : 1 | Crew: Soderlund, Hedge

# of each / % covered

Species	Ptaq	%			Loam	%			Arpa	%	Abco	%	Ceco	%	Grass	%	Forbs	%
1	2	5.0																
2					1	0.5			2	10.0	10	20.0	3	3.0				
3											1	0.5						
4															1	0.5		
5																		
6	10	20.0									3	3.0						
7																	2	0.5
8																		
9																		

Plot #	Duff	Litter
1	1	1
	1	0.5
2	2	1
	1	1.5
3	1.5	1.5
	1.5	2
4	1.5	1
	2.5	2
5	1	1
	2	1.5
6	1.5	1
	2	2.5
7	2.5	2.5
	2	3.5
8	2	1.5
	2	1.5
9	0.5	1
	2	2

TFC1

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Understory Raw Data

Stand: Tub Flats | Treatment: Control | Date: 8/13/09 | Plot size: 2m² circular plot

Block: C | Plot # : 1 | Crew: Soderlund, Hedge

# of each / % covered

Species									Abco	%					Grass	%	Forbs	%
1									2	0.5							1	0.5
2																		
3																		
4																		
5																		
6									2	0.5								
7									1	0.5								
8																		
9																		

Plot #	Duff	Litter
1	1.5	1.5
	2.5	1
2	1.5	1
	4	2
3	1.5	2
	3	2
4	2.5	1
	2.5	1.5
5	2.5	2
	1.5	2
6	4	2
	1.5	2
7	0	0.5
	2	0
8	3	2.5
	4	3
9	2	1.5
	2	1.5

APPENDIX D

Understory Species List

Mountain Home Demonstration State Forest

List of Understory Tree and Shrub/Herbaceous Plant Species

2009

Code	Scientific Name	Common Name
	Trees	
Abco	*Abies concolor*	White Fir
Alrh	*Alnus rhombifolia*	White Alder
Cade	*Calocedrus decurrens*	Incense-cedar
Coco	*Corylus cornuta* var. *californica*	California Hazelnut
Conu	*Cornus nuttallii*	Western Dogwood
Pila	*Pinus lambertiana*	Sugar Pine
Quke	*Quercus kelloggii*	California Black Oak
Segi	*Sequoiadendron giganteum*	Giant Sequoia

Mountain Home Demonstration State Forest

List of Understory Tree and Shrub/Herbaceous Species

2009

Code	Scientific Name	Common Name
	Shrubs/ Herbaceous Plants	
Adbi	*Adenocaulon bicolor*	Trail Plant
Arpa	*Arctostaphylos patula*	Greenleaf Manzanita
Atfi	*Athyrum filix-femina* var *cyclosorum*	Lady Fern
Crsp	*Carex* sp.	Sedge
Case	*Chrysolepsis sempervirens*	Evergreen Chinquapin
Casp	*Castilleja* sp.	Paintbrush
Ceco	*Ceanothus cordulatus*	Mountain Whitethorn
Cein	*Ceanothus integerrimus*	Deer Brush
Cepa	*Ceanothus parviflorus*	Littleleaf Ceanothus
Chfo	*Chamaebatia foliosa*	Mountain Misery
Eqsp	*Equisetum* sp.	Horsetail
Gatr	*Galium trifidum*	Threepetal Bedstraw
Irsp	*Iris* sp.	Iris
Loam	*Lotus crassifolius*	Big Deervetch
Lupo	*Lupinus polyphyllus*	Big Leafed Lupine
Prem	*Prunus emarginata*	Bitter Cherry
Ptaq	*Pteridium aquilinum*	Bracken Fern
Pypi	*Pyrola picta*	Wintergreen

Rine	*Ribes nevadense*	Mountain Pink Currant
Riro	*Ribes roezlii*	Sierra Gooseberry
Roca	*Rosa californica*	California Wild Rose
Rule	*Rubus leucodermis*	Blackcap Raspberry
Rupa	*Rubus parviflorus*	Thimbleberry
Smra	*Smilacina racemosa*	False Solomon's Seal
Visp	*Viola* sp.	Violet

APPENDIX E

Downed Woody Debris Data

MHDSF Giant Sequoia Manipulation Study
2009 - Fuels Raw Data (4 Transects)

Stand: Bogus Meadow

Date: 8/26,27,28,31 & 9/1/09

Depth and 1000 hour fuel diameters in inches.

Crew: Soderlund, Hedge

Plot #	Transect Azimuth	0-2 m 1 Hour	0-2 m 10 Hour	0-3 m 100 Hour	0-10 m 1000 Hour Sound	0-10 m 1000 Hour Rotten	Litter Depth 3m	Litter Depth 10m
BM-A1	N	7	5	1	0	0	2.0	3.0
	E	5	3	2	0	0	1.0	1.0
	S	4	4	0	8	0	1.0	2.0
	W	7	10	1	0	0	1.5	2.5
BM-A2	N	7	5	2	0	5	2.0	3.0
	E	7	2	0	0	6	2.0	3.0
	S	3	3	0	0	8, 6	4.0	2.5
	W	6	4	1	0	0	3.0	3.0
BM-B1	N	1	2	0	9	7.5	2.0	1.0
	E	2	0	0	8	0	1.5	3.0
	S	3	1	0	0	29	2.0	2.0
	W	1	2	0	0	0	2.0	3.0
BM-B2	N	6	2	0	0	0	2.0	3.0
	E	2	6	1	0	0	2.0	2.0
	S	4	2	1	0	7	3.0	2.0
	W	8	1	0	0	0	0.5	1.5
BM-C1	N	2	0	0	7.5, 5	4.5	1.5	2.0
	E	19	13	0	0	0	2.0	1.5
	S	13	6	3	0	0	1.0	3.5
	W	7	4	1	0	4.5	3.0	2.5
BM-C2	N	13	7	1	0	0	2.5	2.0
	E	11	10	1	0	0	2.0	2.0
	S	15	4	0	0	0	2.5	2.0
	W	13	9	1	9	4.5	2.5	0.5

MHDSF Giant Sequoia Manipulation Study
2009 - Fuels Raw Data (4 Transects)

Stand: Frasier Mill

Date: 8/13,19,24,25/09

Depth and 1000 hour fuel diameters in inches.

Crew: Soderlund, Hedge, Bean

Plot #	Transect Azimuth	0-2 m 1 Hour	0-2 m 10 Hour	0-3 m 100 Hour	0-10 m 1000 Hour Sound	0-10 m 1000 Hour Rotten	Litter Depth 3m	Litter Depth 10m
FM-A1	N	8	2	0	0	7, 3.5, 5.5, 6	4.0	1.5
	E	11	11	2	0	7	2.0	2.0
	S	9	6	3	0	7, 7, 3.5	4.0	3.0
	W	9	10	2	0	4	2.0	2.0
FM-A2	N	9	2	2	0	0	2.5	3.0
	E	10	2	0	0	11.5, 5	0.5	2.0
	S	12	3	2	0	11, 9	1.0	2.0
	W	9	5	0	0	9, 9	3.0	2.0
FM-B1	N	5	4	2	0	6	2.0	2.5
	E	8	15	2	0	12	3.5	3.0
	S	10	3	0	0	0	3.0	1.0
	W	5	2	0	0	3	2.5	3.0
FM-B2	N	19	2	0	0	0	3.0	2.0
	E	32	5	0	0	13	2.0	1.0
	S	14	2	0	0	0	1.5	2.0
	W	8	1	0	0	0	2.0	3.0
FM-C1	N	15	11	0	0	0	1.5	2.0
	E	1	0	0	0	14	2.0	3.0
	S	9	8	0	0	0	2.0	3.0
	W	18	6	0	0	0	1.5	2.0
FM-C2	N	4	13	0	0	0	2.5	2.5
	E	8	10	0	0	0	3.0	3.0
	S	16	21	1	0	0	2.5	4.0
	W	6	17	0	0	0	4.5	6.5

MHDSF Giant Sequoia Manipulation Study
2009 - Fuels Raw Data (4 Transects)

Stand: Headquarters

Date: 7/31 & 8/3-4/09

Depth and 1000 hour fuel diameters in inches.

Crew:Soderlund, Ricchaizzi,Estrada

Plot #	Transect Azimuth	0-2 m 1 Hour	0-2 m 10 Hour	0-3 m 100 Hour	0-10 m 1000 Hour Sound	0-10 m 1000 Hour Rotten	Litter Depth 3m	Litter Depth 10m
HQ-A1	N	16	9	3	28.5	11	3.5	12.0
	E	4	6	0	11	0	1.5	2.0
	S	10	8	0	0	36	1.5	4.5
	W	8	9	1	0	9, 30, 5, 9	3.5	2.0
HQ-B1	N	0	1	1	0	9, 11.5	2	2.0
	E	0	0	0	0	0	1.5	2.0
	S	0	0	0	11	0	2	3.5
	W	0	1	1	0	40	2	2.0
HQ-C1	N	5	7	1	8	0	2	BG
	E	10	5	0	4	0	3.5	2.5
	S	13	4	0	8	0	3	2.5
	W	6	4	0	0	0	2	2.0

MHDSF Giant Sequoia Manipulation Study
2009 - Fuels Raw Data (4 Transects)

Stand: Indian Bath

Date: 8/14,17,18/09

Depth and 1000 hour fuel diameters in inches.

Crew: Soderlund, Estrada, Bean

Plot #	Transect Azimuth	0-2 m 1 Hour	0-2 m 10 Hour	0-3 m 100 Hour	0-10 m 1000 Hour Sound	0-10 m 1000 Hour Rotten	Litter Depth 3m	Litter Depth 10m
IB-A1	N	9	7	2	5.5, 7, 8	0	2.0	1.5
	E	2	2	0	5, 8, 10	34	3.0	1.0
	S	9	8	0	0	0	0.5	2.0
	W	4	1	0	6	9	2.0	1.5
IB-A2	N	5	5	0	0	4	2.5	3.0
	E	7	4	1	0	4	1.0	2.5
	S	4	1	1	14, 12	0	3.0	2.5
	W	5	3	0	0	12	2.0	2.5
IB-B1	N	16	8	0	0	0	4.0	3.0
	E	17	12	1	0	0	3.5	2.5
	S	19	9	0	0	0	1.5	2.0
	W	11	14	0	0	0	1.5	1.5
IB-B2	N	5	2	0	9, 4, 4	0	2.5	2.0
	E	10	3	0	6	0	1.5	2.0
	S	8	0	0	6, 9	0	2.0	0.5
	W	8	1	0	0	4	3.5	3.5
IB-C1	N	13	10	1	0	0	2.0	2.5
	E	13	12	0	0	0	1.5	2.0
	S	11	6	2	0	0	1.5	2.0
	W	16	10	1	0	0	2.5	1.5
IB-C2	N	12	4	1	0	0	2.0	2.5
	E	13	12	0	0	0	3.0	3.5
	S	12	9	0	0	0	2.0	4.0
	W	8	5	0	0	0	4.0	2.0

MHDSF Giant Sequoia Manipulation Study
2009 - Fuels Raw Data (4 Transects)

Stand: Methuselah

Date:8/4,5,6,10,11,12/09

Depth and 1000 hour fuel diameters in inches.

Crew:Soderlund, Estrada, Hedge

Plot #	Transect Azimuth	0-2 m 1 Hour	0-2 m 10 Hour	0-3 m 100 Hour	0-10 m 1000 Hour Sound	0-10 m 1000 Hour Rotten	Litter Depth 3m	Litter Depth 10m
ME-A1	N	13	3	0	0	0	1.5	2.5
	E	13	13	2	0	4	1.5	2.0
	S	9	7	1	0	0	1.5	2.0
	W	8	8	0	0	4.3, 3.8	2.5	3.0
ME-A2	N	4	1	0	0	4, 8	3.0	1.0
	E	5	4	0	0	0	3.0	2.0
	S	14	3	0	0	0	1.0	7.0
	W	11	2	0	0	0	2.0	2.5
ME-A3	N	6	6	0	0	0	1.0	2.0
	E	2	2	1	0	0	1.5	0.5
	S	12	10	1	0	17	2.0	3.0
	E	2	2	1	0	0	1.5	0.5
	W	2	1	0	0	0	1.0	0.5
ME-A4	N	4	3	0	0	0	5.0	1.0
	E	12	12	1	0	0	3.0	1.5
	S	8	3	0	0	0	2.0	1.5
	W	7	1	0	0	0	2.5	1.0
ME-B1	N	8	5	0	0	0	1.0	1.0
	E	19	8	0	0	0	1.5	1.5
	S	9	3	0	0	18	1.5	1.0
	W	9	2	0	0	0	1.0	2.0
ME-B2	N	11	6	0	7, 5	3.5	1.5	0.5
	E	16	9	0	14	0	2.0	1.5
	S	13	7	0	0	0	2.0	1.5
	W	12	8	0	0	4	2.0	2.5

MHDSF Giant Sequoia Manipulation Study
2009 - Fuels Raw Data (4 Transects)

Stand: Methuselah

Date:8/4,5,6,10,11,12/09

Depth and 1000 hour fuel diameters in inches.

Crew:Soderlund, Estrada, Hedge

Plot #	Transect Azimuth	0-2 m 1 Hour	0-2 m 10 Hour	0-3 m 100 Hour	0-10 m 1000 Hour Sound	0-10 m 1000 Hour Rotten	Litter Depth 3m	Litter Depth 10m
ME-B3	N	13	7	0	0	4, 5	1.5	2.0
	E	5	4	0	0	6	1.5	1.0
	S	21	6	1	0	0	1.5	1.5
	W	12	6	0	0	21	1.5	1.5
ME-B4	N	10	7	0	0	0	0.5	1.0
	E	8	10	1	0	0	0.5	0.5
	S	7	0	1	0	0	1.5	1.5
	W	6	4	0	0	0	1.5	1.0
ME-C2	N	14	4	0	0	5	4.5	2.0
	E	10	4	1	0	16	2.0	2.0
	S	23	6	0	0	5	3.0	2.0
	W	15	4	1	0	0	2.0	3.5
ME-C3	N	11	0	0	0	8	2.0	1.5
	E	5	1	0	0	0	1.5	2.0
	S	8	3	2	0	5	1.5	2.0
	W	8	1	0	0	0	2.0	1.5
ME-C4	N	17	3	0	0	7	1.5	2.0
	E	21	6	0	0	0	2.0	1.0
	S	31	12	0	0	0	1.5	1.5
	W	14	1	0	0	6	1.0	2.0

MHDSF Giant Sequoia Manipulation Study
2009 - Fuels Raw Data (4 Transects)

Stand: Tub Flats

Date: 8/12,13/09

Depth and 1000 hour fuel diameters in inches.

Crew: Soderlund, Hedge

Plot #	Transect Azimuth	0-2 m 1 Hour	0-2 m 10 Hour	0-3 m 100 Hour	0-10 m 1000 Hour Sound	0-10 m 1000 Hour Rotten	Litter Depth 3m	Litter Depth 10m
TF-A1	N	18	6	2	0	4	4.0	2.0
	E	9	2	1	0	61, 4	3.0	2.0
	S	6	0	0	20	0	2.5	2.0
	W	3	0	0	0	0	Rock	4.0
TF-B1	N	31	5	1	0	8	2.5	1.0
	E	24	5	0	0	4	2.0	4.5
	S	24	5	0	0	47, 9, 4	1.5	1.0
	W	33	6	0	0	5	BG	3.5
TF-C1	N	14	13	4	0	4	2.5	2.0
	E	12	6	1	0	0	2.0	3.0
	S	7	3	0	0	0	2.0	BG
	W	7	0	0	0	0	3.0	2.0

APPENDIX F

Regeneration Data

MHDSF Giant Sequoia Manipulation Study
2009 - Seedling Raw Data Set (19.7ft (6m) Plot)

Stand: Bogus Meadow   Crew: Soderlund, Hedge   Date: 8/26,31 & 9/1/09

BM-A1
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	32	0	0	0
1	6	0	0	0
2	9	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
47	0	0	0

BM-A2
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	10	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	1	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
11	0	0	0

BM-B1
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	23	0	0	0
1	2	0	0	0
2	2	0	0	0
3	3	0	0	0
4	4	1	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
34	1	0	0

BM-B2
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	23	0	0	0
1	66	1	0	0
2	117	0	0	0
3	29	0	0	0
4	7	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
242	1	0	0

BM-C1
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	54	0	0	1
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
54	0	0	1

BM-C2
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	60	0	1	1
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
60	0	1	1

MHDSF Giant Sequoia Manipulation Study
2009 - Regeneration Summary Data (19.7ft (6m) Plot)

Stand: Bogus Meadow   Crew: Soderlund, Hedge   Date: 8/26,27,28,31 & 9/1/09

BM-A1, BM-A2   Treatment - Thinned

	WF	IC	BO	SP	TOTAL
0	42	0	0	0	42
1	6	0	0	0	6
2	9	0	0	0	9
3	0	0	0	0	0
4	1	0	0	0	1
5	0	0	0	0	0
TOTAL	58	0	0	0	**58**

Ht. Class	
0	0 - 0.9 feet
1	1 -1.9 feet
2	2 - 2.9 feet
3	3 - 3.9 feet
4	4 - 4.9 feet
5	Over 5 feet

BM-B1, BM-B2   Treatment - Thinned/Burned

	WF	IC	BO	SP	TOTAL
0	46	0	0	0	46
1	68	1	0	0	69
2	119	0	0	0	119
3	32	0	0	0	32
4	11	1	0	0	12
5	0	0	0	0	0
TOTAL	276	2	0	0	**278**

BM-C1, BM-C2   Treatment - Control

	WF	IC	BO	SP	TOTAL
0	114	0	1	2	117
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
TOTAL	114	0	1	2	**117**

Total Number of Seedlings/ Height Class/ Entire Stand

	WF	IC	BO	SP
0	202	0	1	2
1	74	1	0	0
2	128	0	0	0
3	32	0	0	0
4	12	1	0	0
5	0	0	0	0

Total Number of Seedlings for Entire Stand

WF	IC	BO	SP
448	2	1	2

MHDSF Giant Sequoia Manipulation Study
2009 - Seedling Raw Data Set (19.7ft (6m) Plot)

Stand: Frasier Mill | Crew: Soderlund, Bean | Date: 8/19,20,21,24,25/09

FM-A1
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	GS
0	10	0	0	0	0
1	3	0	0	0	0
2	0	0	0	0	1
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP	GS
13	0	0	0	1

FM-B1
Totals/ 1 Foot Height Class

	WF	IC	SP
0	30	1	0
1	1	1	1
2	1	0	0
3	0	0	0
4	0	0	0
5	0	0	0

TOTALS/SPECIES

WF	IC	SP
32	2	1

FM-A2
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	GS
0	24	5	0	1	0
1	78	4	0	0	0
2	66	1	0	1	0
3	44	0	0	0	0
4	23	0	0	0	0
5	10	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP	GS
245	10	0	2	0

FM-B2
Totals/ 1 Foot Height Class

	WF	IC	SP
0	69	0	0
1	97	0	1
2	36	0	0
3	18	0	0
4	6	0	0
5	3	0	0

TOTALS/SPECIES

WF	IC	SP
229	0	1

FM-C1
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	GS
0	6	0	2	0	0
1	1	0	0	0	0
2	2	0	0	0	0
3	0	0	0	0	0
4	1	0	0	0	0
5	0	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP	GS
10	0	2	0	0

FM-C2
Totals/ 1 Foot Height Class

	WF	IC	SP
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0

TOTALS/SPECIES

WF	IC	SP
0	0	0

MHDSF Giant Sequoia Manipulation Study
2009 - Regeneration Summary Data (19.7ft (6m) Plot)

Stand: Frasier Mill   Crew: Soderlund, Bean   Date: 8/19,20,21,24,25/09

FM-A1, FM-B1   Treatment: Thinned

	WF	IC	BO	SP	GS	TOTAL
0	40	1	0	0	0	41
1	4	1	0	1	0	6
2	1	0	0	0	1	2
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
TOTAL	45	2	0	1	1	**49**

Ht. Class	
0	0 - 0.9 feet
1	1 - 1.9 feet
2	2 - 2.9 feet
3	3 - 3.9 feet
4	4 - 4.9 feet
5	Over 5 feet

FM-A2, FM-B2   Treatment: Thinned/ Burned

	WF	IC	BO	SP	GS	TOTAL
0	93	5	0	1	0	99
1	175	4	0	1	0	180
2	102	1	0	1	0	104
3	62	0	0	0	0	62
4	29	0	0	0	0	29
5	13	0	0	0	0	13
TOTAL	474	10	0	3	0	**487**

FM-C1, FM-C2   Treatment: Control

	WF	IC	BO	SP	GS	TOTAL
0	6	0	2	0	0	8
1	1	0	0	0	0	1
2	2	0	0	0	0	2
3	0	0	0	0	0	0
4	1	0	0	0	0	1
5	0	0	0	0	0	0
TOTAL	10	0	2	0	0	**12**

Total Number of Seedlings/ Height Class/ Entire Stand

	WF	IC	BO	SP	GS
0	139	6	2	1	0
1	180	5	0	2	0
2	105	1	0	1	1
3	62	0	0	0	0
4	30	0	0	0	0
5	13	0	0	0	0

Total Number of Seedlings for Entire Stand

WF	IC	BO	SP	GS
529	12	2	4	1

MHDSF Giant Sequoia Manipulation Study
2009 - Regeneration Raw Data Set and Summary (19.7ft (6m) Plot)

Stand: Headquarters   Crew: Soderlund, Estrada   Date: 8/3,4/09

HQ-A1   Treatment - Thinned   Totals/ 1 Foot Height Class

	WF	IC	BO	SP	TOTAL
0	34	6	1	0	41
1	6	0	0	0	6
2	2	0	0	0	2
3	0	0	0	0	0
4	1	0	0	0	1
5	0	0	0	0	0
TOTAL	43	6	1	0	**50**

Ht. Class	
0	0 - 0.9 feet
1	1 -1.9 feet
2	2 - 2.9 feet
3	3 - 3.9 feet
4	4 - 4.9 feet
5	Over 5 feet

HQ-B1   Treatment - Thinned/ Burned   Totals/ 1 Foot Height Class

	WF	IC	BO	SP	TOTAL
0	231	0	0	0	231
1	6	1	0	0	7
2	3	0	0	0	3
3	4	0	0	0	4
4	2	0	0	0	2
5	1	0	0	0	1
TOTAL	247	1	0	0	**248**

HQ-C1   Treatment - Control   Totals/ 1 Foot Height Class

	WF	IC	BO	SP	TOTAL
0	25	6	4	0	35
1	5	0	0	0	5
2	1	0	0	0	1
3	2	0	0	0	2
4	1	0	0	0	1
5	0	0	0	0	0
TOTAL	34	6	4	0	**44**

Total Number of Seedlings/ Height Class/ Entire Stand

	WF	IC	BO	SP
0	290	12	5	0
1	17	1	0	0
2	6	0	0	0
3	6	0	0	0
4	4	0	0	0
5	1	0	0	0

Total Number of Seedlings for Entire Stand

WF	IC	BO	SP
324	13	5	0

MHDSF Giant Sequoia Manipulation Study
2009 - Seedling Raw Data Set (19.7ft (6m) Plot)

Stand: Indian Bath | Crew: Soderlund, Estrada, Bean | Date: 8/14,17,18/09

IB-A1
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	7	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
7	0	0	0

IB-B1
Totals/ 1 Foot Height Class

	WF	BO	SP	GS
0	3	1	2	0
1	0	0	0	1
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	BO	SP	GS
3	1	2	1

IB-A2
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	28	0	1	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
28	0	1	0

IB-B2
Totals/ 1 Foot Height Class

	WF	BO	SP	GS
0	150	0	7	0
1	13	0	0	0
2	1	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	BO	SP	GS
164	0	7	0

IB-C1
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	13	0	1	0
1	1	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
14	0	1	0

IB-C2
Totals/ 1 Foot Height Class

	WF	BO	SP	GS
0	4	2	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	BO	SP	GS
4	2	0	0

MHDSF Giant Sequoia Manipulation Study
2009 - Regeneration Summary Data (19.7ft (6m) Plot)

Stand: Indian Bath   Crew: Soderlund, Estrada, Bean   Date: 8/14,17,18/09

IB-A-1, IB-B1

	WF	IC	BO	SP	GS	TOTAL
0	10	0	1	2	0	13
1	0	0	0	0	1	1
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
TOTAL	10	0	1	2	1	**14**

Ht. Class	
0	0 - 0.9 feet
1	1 - 1.9 feet
2	2 - 2.9 feet
3	3 - 3.9 feet
4	4 - 4.9 feet
5	Over 5 feet

IB-A2, IB-B2

	WF	IC	BO	SP	GS	TOTAL
0	178	0	1	7	0	186
1	13	0	0	0	0	13
2	1	0	0	0	0	1
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
TOTAL	192	0	1	7	0	**200**

IB-C1, IB-C2

	WF	IC	BO	SP	GS	TOTAL
0	17	0	3	0	0	20
1	1	0	0	0	0	1
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
TOTAL	18	0	3	0	0	**21**

Total Number of Seedlings/ Height Class/ Entire Stand

	WF	IC	BO	SP	GS
0	205	0	5	9	0
1	14	0	0	0	1
2	1	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0

Total Number of Seedlings for Entire Stand

WF	IC	BO	SP	GS
220	0	5	9	1

MHDSF Giant Sequoia Manipulation Study
2009 - Regeneration Raw Data Set (19.7ft (6m) Plot)

Stand: Methuselah — Crew: Soderlund, Estrada, Hedge — Date: 8/4,5,6,7,10,11,12/09

ME-A1
Totals/ 1 Foot Height Class

	WF	IC	BO	GS
0	37	14	18	0
1	6	3	2	0
2	1	1	0	0
3	2	1	0	0
4	0	0	1	0
5	1	1	1	0

TOTALS/SPECIES

WF	IC	BO	GS
47	20	22	0

ME-A2
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	GS
0	20	10	0	2	0
1	13	1	1	2	0
2	5	5	1	0	0
3	7	1	0	0	2
4	3	3	0	0	1
5	4	1	0	0	1

TOTALS/SPECIES

WF	IC	BO	SP	GS
52	21	2	4	4

ME-A3
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	PP
0	9	1	3	2	0
1	3	1	1	0	0
2	3	1	0	0	1
3	2	1	0	1	0
4	1	1	0	0	0
5	0	2	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP	PP
18	7	4	3	1

ME-A4
Totals/ 1 Foot Height Class

	WF	IC	BO	GS
0	25	0	5	0
1	2	1	0	0
2	2	1	0	0
3	1	0	0	0
4	1	1	0	1
5	0	2	0	0

TOTALS/SPECIES

WF	IC	BO	GS
31	5	5	1

ME-B1
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	18	6	1	2
1	16	0	0	3
2	2	0	1	1
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
36	6	2	6

ME-B2
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	GS
0	13	0	1	7	0
1	15	1	0	0	0
2	1	0	0	0	0
3	2	0	1	0	0
4	1	0	0	0	0
5	0	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP	GS
32	1	2	7	0

MHDSF Giant Sequoia Manipulation Study
2009 - Regeneration Raw Data Set (19.7ft (6m) Plot)

Stand: Methuselah Crew: Soderlund, Estrada, Hedge Date: 8/4,5,6,7,10,11,12/09

ME-B3
Totals/ 1 Foot Height Class

	WF	IC	BO	SP
0	15	4	2	5
1	9	0	1	2
2	3	0	0	0
3	2	0	0	0
4	1	0	0	0
5	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP
30	4	3	7

ME-B4
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	PP
0	40	7	1	4	0
1	11	1	0	2	0
2	2	0	0	0	0
3	0	0	0	0	1
4	1	0	0	0	0
5	0	0	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP	PP
54	8	1	6	1

ME-C2
Totals/ 1 Foot Height Class

	WF	IC	BO	GS
0	9	1	9	0
1	0	0	0	0
2	1	2	1	0
3	1	0	0	0
4	1	0	0	0
5	0	2	0	0

TOTALS/SPECIES

WF	IC	BO	GS
12	5	10	0

ME-C3
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	GS
0	70	3	15	8	0
1	1	4	0	2	0
2	0	3	0	1	0
3	0	3	0	1	0
4	0	0	0	0	0
5	0	1	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP	GS
71	14	15	12	0

ME-C4
Totals/ 1 Foot Height Class

	WF	IC	BO	SP	GS
0	88	16	7	5	0
1	6	10	2	5	0
2	2	4	0	1	0
3	2	0	0	2	0
4	3	0	0	0	0
5	2	1	0	0	0

TOTALS/SPECIES

WF	IC	BO	SP	GS
103	31	9	13	0

MHDSF Giant Sequoia Manipulation Study
2009 - Regeneration Summary Data (19.7ft (6m) Plot)

Stand: Methuselah   Crew: Soderlund, Estrada, Hedge   Date: 8/4,5,6,7,10,11,12/09

ME-A1, ME-A2, ME-A3, ME-A4   Treatment: Thinned

	WF	IC	BO	SP	GS	PP	TOTAL
0	91	25	26	4	0	0	146
1	24	6	4	2	0	0	36
2	11	8	1	0	0	1	21
3	12	3	0	1	2	0	18
4	5	5	1	0	2	0	13
5	5	6	1	0	1	0	13
TOTAL	148	53	33	7	5	1	**247**

Ht. Class	
0	0 - 0.9 feet
1	1 -1.9 feet
2	2 - 2.9 feet
3	3 - 3.9 feet
4	4 - 4.9 feet
5	Over 5 feet

ME-B1, ME-B2, ME-B3, ME-B4   Treatment: Thinned/ Burned

	WF	IC	BO	SP	GS	PP	TOTAL
0	86	17	5	18	0	0	126
1	51	2	1	7	0	0	61
2	8	0	1	1	0	0	10
3	4	0	1	0	0	1	6
4	3	0	0	0	0	0	3
5	0	0	0	0	0	0	0
TOTAL	152	19	8	26	0	1	**206**

ME-C2, ME-C3, ME-C4   Treatment: Control

	WF	IC	BO	SP	GS	TOTAL
0	167	20	31	13	0	231
1	7	14	2	7	0	30
2	3	9	1	2	0	15
3	3	3	0	3	0	9
4	4	0	0	0	0	4
5	2	4	0	0	0	6
TOTAL	186	50	34	25	0	**295**

Total Number of Seedlings/ Height Class/ Entire Stand

	WF	IC	BO	SP	GS	PP
0	344	62	62	35	0	0
1	82	22	7	16	0	0
2	22	17	3	3	0	1
3	19	6	1	4	2	1
4	12	5	1	0	2	0
5	7	10	1	0	1	0

Total Number of Seedlings for Entire Stand

WF	IC	BO	SP	GS	PP
486	122	75	58	5	2

MHDSF Young-Growth Giant Sequoia Management Strategies Study
2009 - Regeneration Raw Data Set and Summary (19.7ft (6m) Plot)

Stand: Tub Flats | Crew: Soderlund, Hedge | Date: 8/13/09

TF-A1 | Treatment - Thinned | Totals/ 1 Foot Height Class

	WF	IC	BO	SP	TOTAL
0	8	0	0	1	9
1	6	0	0	0	6
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
TOTAL	14	0	0	1	**15**

Ht. Class	
0	0 - 0.9 feet
1	1 -1.9 feet
2	2 - 2.9 feet
3	3 - 3.9 feet
4	4 - 4.9 feet
5	Over 5 feet

TF-B1 | Treatment - Thinned/ Burned | Totals/ 1 Foot Height Class

	WF	IC	BO	SP	TOTAL
0	77	0	0	1	78
1	6	0	0	0	6
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
TOTAL	83	0	0	1	**84**

TF-C1 | Treatment - Control | Totals/ 1 Foot Height Class

	WF	IC	BO	SP	TOTAL
0	33	0	0	2	35
1	0	0	0	0	0
2	1	0	0	0	1
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
TOTAL	34	0	0	2	**36**

Total Number of Seedlings/ Height Class/ Entire Stand

	WF	IC	BO	SP
0	118	0	0	4
1	12	0	0	0
2	1	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0

Total Number of Seedlings for Entire Stand

WF	IC	BO	SP
131	0	0	4

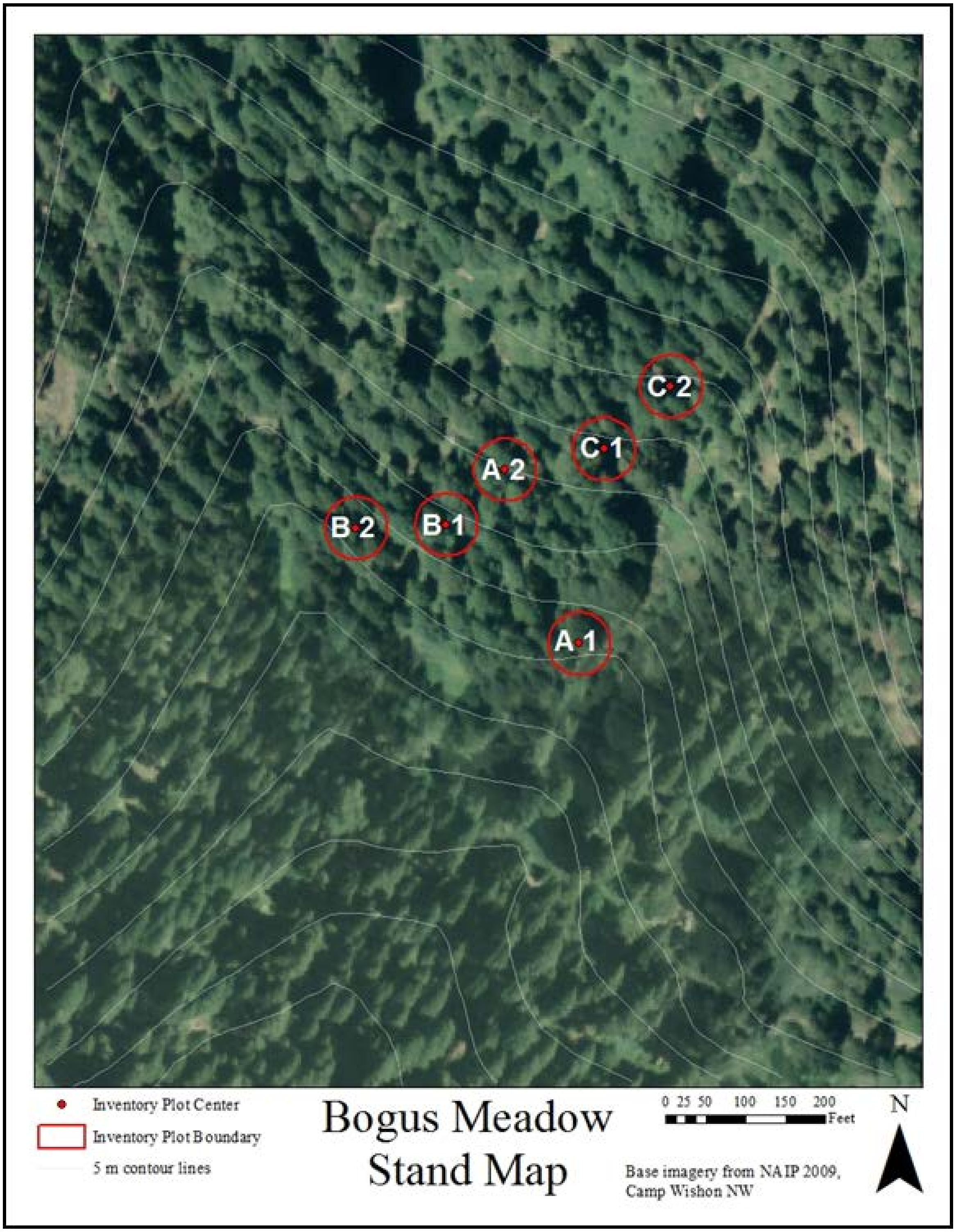
APPENDIX G

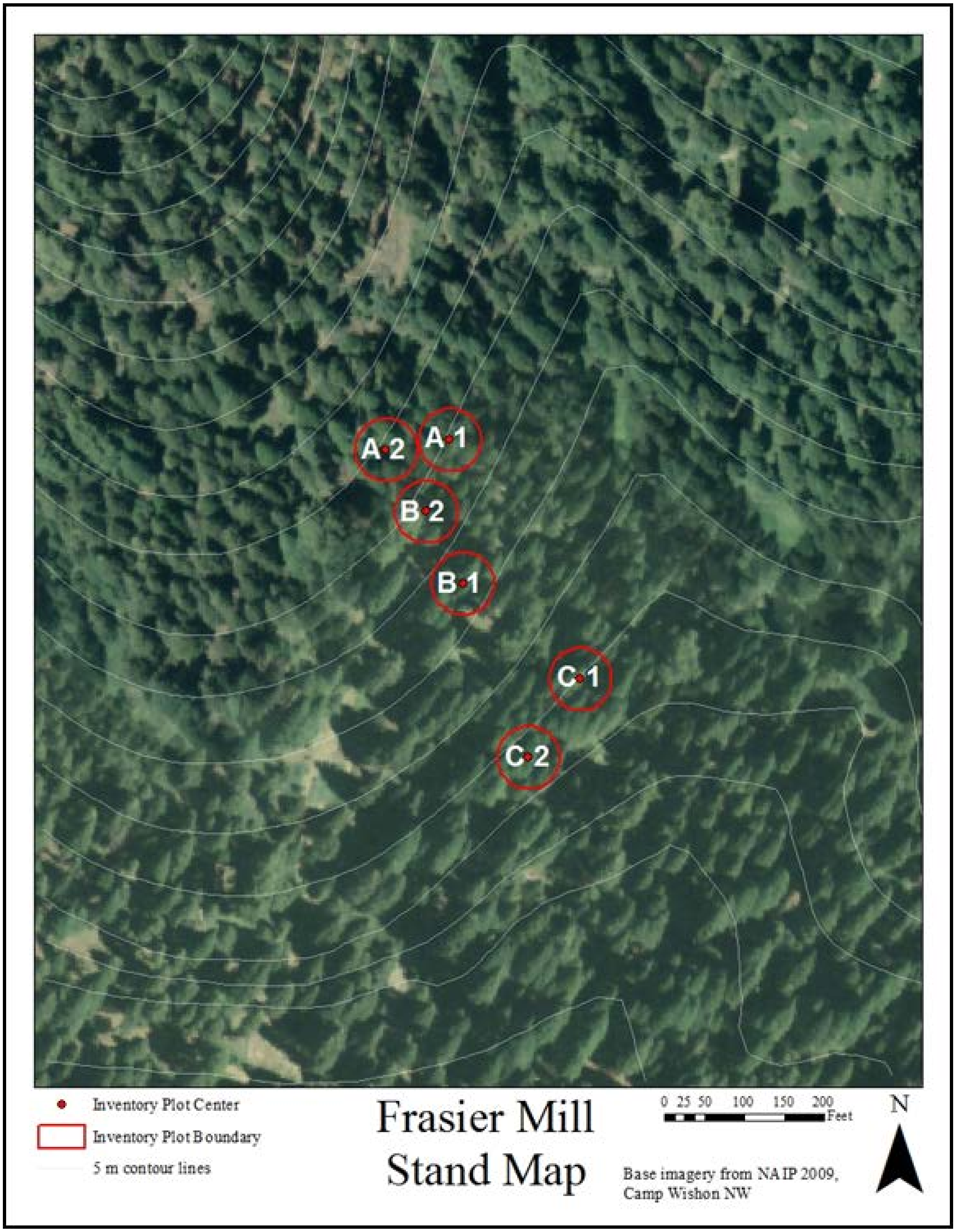
Regeneration TPA Graphs

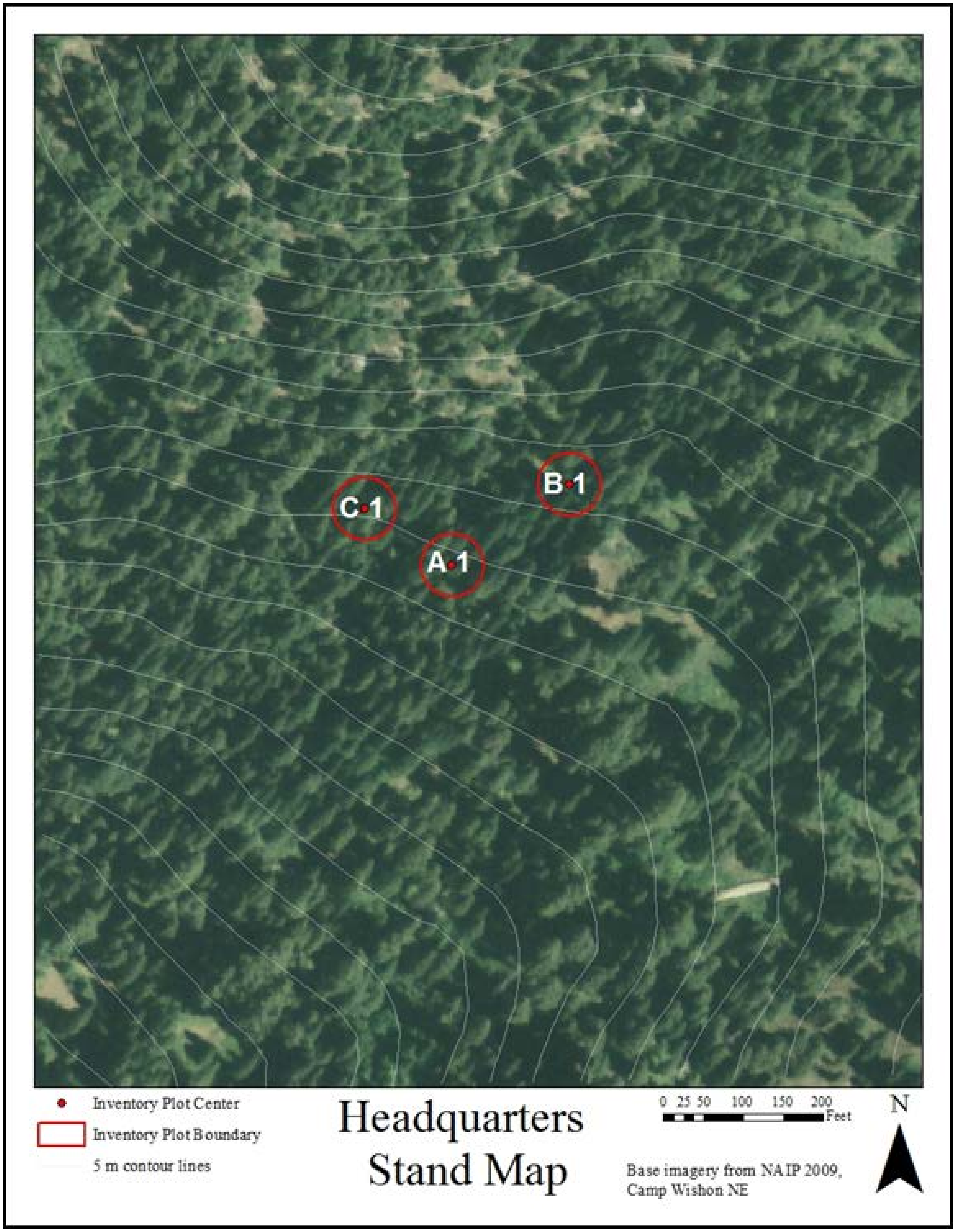
Located in Supplementary Files

APPENDIX H

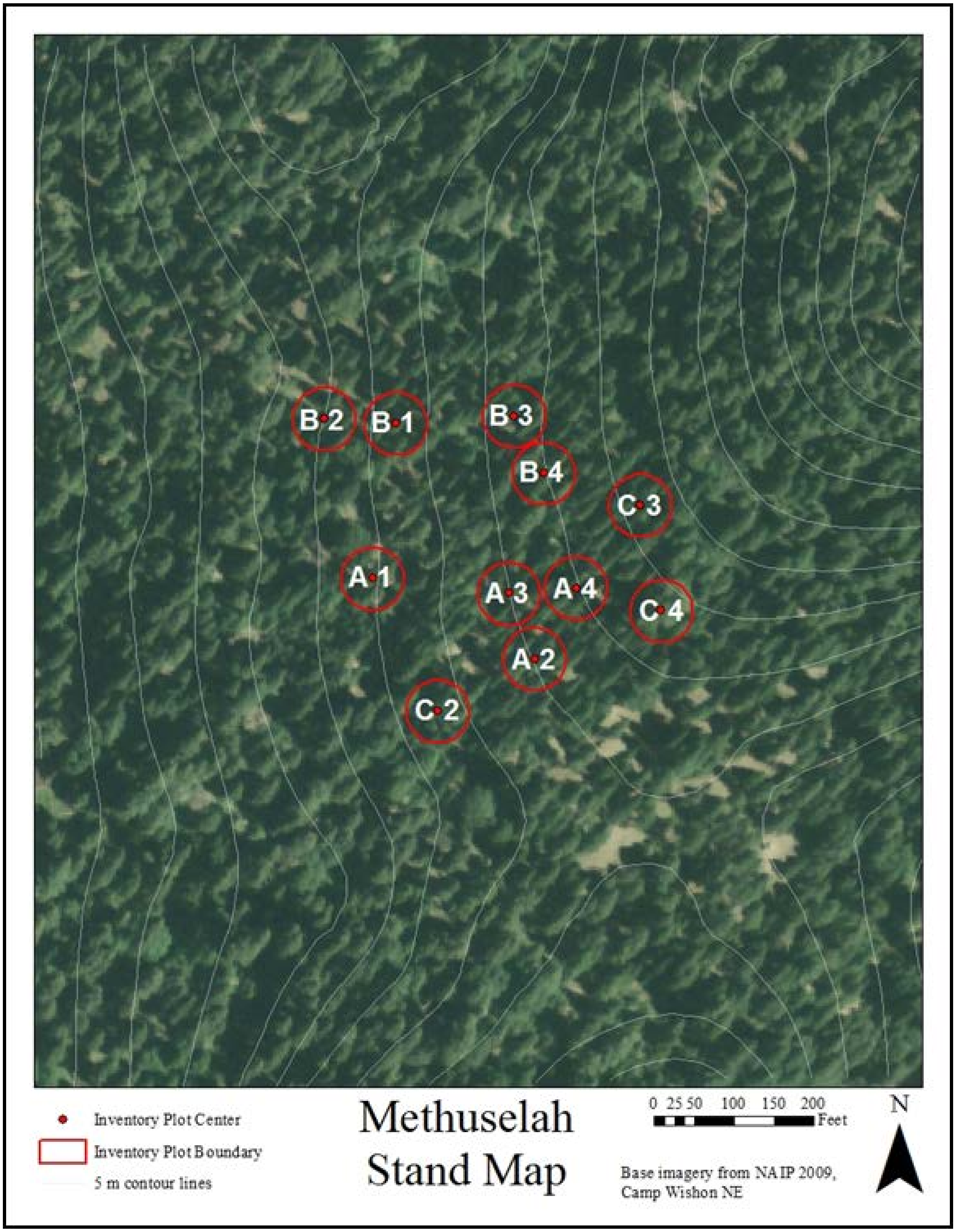
Plot Maps

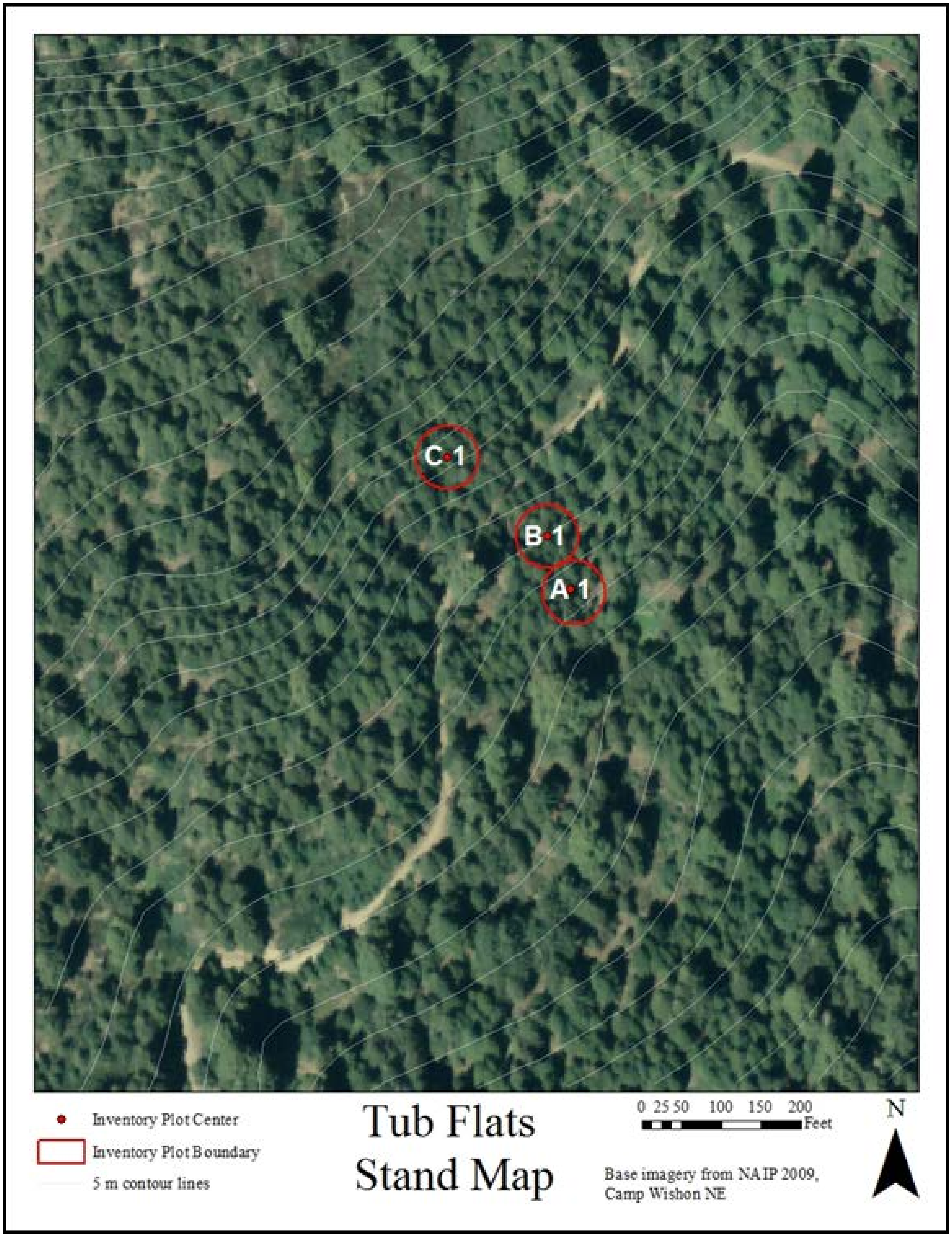

C 2
C 1
A 2
B 2
B 1
A 1
Inventory Plot Center
Inventory Plot Boundary
5 m contour lines
Bogus Meadow
Stand Map
0 25 50 100 150 200
Feet
N
Base imagery from NAIP 2009,
Camp Wishon NW


A 2
A 1
B 2
B 1
C 1
C 2
Inventory Plot Center
Inventory Plot Boundary
5 m contour lines
Frasier Mill
Stand Map
0 25 50 100 150 200
Feet
N
Base imagery from NAIP 2009,
Camp Wishon NW


C 1
B 1
A 1
Inventory Plot Center
Inventory Plot Boundary
5 m contour lines
Headquarters
Stand Map
0 25 50 100 150 200
Feet
N
Base imagery from NAIP 2009,
Camp Wishon NE


C 2
A 2
B 2
B 1
A 1
C 1
Inventory Plot Center
Inventory Plot Boundary
5 m contour lines
MHSDF boundary
Indian Bath
Stand Map
0 25 50 100 150 200
Feet
N
Base imagery from NAIP 2009,
Camp Wishon NW


B2
B1
B3
B4
C3
A1
A3
A4
C4
A2
C2
Inventory Plot Center
Inventory Plot Boundary
5 m contour lines
Methuselah
Stand Map
0 25 50 100 150 200
Feet
Base imagery from NAIP 2009,
Camp Wishon NE
N



C 1
B 1
A 1
Inventory Plot Center
Inventory Plot Boundary
5 m contour lines
Tub Flats
Stand Map
0 25 50 100 150 200
Feet
N
Base imagery from NAIP 2009,
Camp Wishon NE

APPENDIX I

Pre/Post Treatment Plot Pictures

Located in Supplementary Files

APPENDIX J

MHDSF Volume Equations

Mountain Home Demonstration State Forest

Volume Equations

		a	b	c
Giant Sequoia	CF	0.002438339	1.694874	1.098957
	BF	0.001682608	1.755956	1.490641
Ponderosa Pine	CF	0.0046019	1.764829	0.951568
	BF	0.0011752	2.139430	1.322741
Sugar Pine	CF	0.0127581	2.115143	0.485265
	BF	0.0042926	2.444471	0.833562
Incense Cedar	CF	0.0075869	1.750414	0.838679
	BF	0.0010465	1.935883	1.480513
White Fir	CF	0.0141475	1.790957	0.731500
	BF	0.0266830	1.765320	1.013663

Standard Volume Equation	V = a D^b H^c V = volume in cubic or board feet D = diameter at breast height outside bark H = total height in feet a, b, c = regression coefficients

APPENDIX K

Special Investigation of Observed Second-Growth Giant Sequoia Mortality

Special Investigation of Observed Second-Growth Giant Sequoia Mortality

Two young-growth giant sequoia trees suddenly died during the summer of 2009 and 2010. The first tree was within an inventory plot for the long-term young-growth giant sequoia study which is the topic of this thesis. The tree was green and healthy on 7/14/09, then on 8/4/09 the crown was 2/3 brown and by 9/2/09 the entire crown was brown and likely dead. On 10/29/09 Dr. Douglas Piirto and Joshua Soderlund collected insects found at the base of the dead giant sequoia tree. Dr. David Wood identified Tenebrionidae and Lygaediae spp., and it was determined that neither insect caused the tree's death. The second tree was located along a road and on 8/2/10 the crown was 1/3 brown and the bottom 6 feet (1.8 m) was wrapped in plastic to trap any emerging insects. On 8/24/10 the crown was 2/3 brown and the standing tree was investigated for insect colonization by Kim Camilli and Joshua Soderlund. Cal Fire felled the tree and cut the lower 6 feet (1.8 m) into one foot (0.3 m) log sections for further study. Sections were wrapped in plastic and then wire mesh and put in an office for rearing of insects. On 10/27/10 *Serropalpus substriatus* (Haldeman) was found in wire mesh. *Serropalpus* sp. specifically *Serropalpus barbatus* (Schall) has been recorded on coast redwood (*Sequoia sempervirens*) [D.Don] Engl.; it was collected as a larva that had bored into the sapwood of a recently dead tree (De Leon, 1952). Giant sequoia is potentially now a new record for S. substriatus after checking with nine separate entomology museums. On 8/13/11 the log sections were dissected and two distinct larvae were found, flat-headed and round-headed borers. Dr. Darren Polluck from Eastern New Mexico University identified them as cerambycid and buprestid from a picture provided by Kim Camilli.

All insects collected and identified are secondary and not primary invaders. Cause of death for these young-growth giant sequoias is still not known and further investigation is needed. A poster was presented at the 2011 California Forest Pest Council 60th Annual Meeting (Figure 17).

Fig. 17. Second-Growth Giant Sequoia Mortality Poster.