

SECTION III – PLAN ADDENDUM

PROPERTY DISCUSSION

Included in this section are the management considerations for the Ranch as well as the physical components of climate, geology, topography, soils, vegetation, stand conditions, watershed and stream conditions, harvest history and fire history per 14 CCR 1090.5. Each is described briefly below.

Mission

Swanton Pacific Ranch is a 3,282 acre educational and research facility that is managed by the College of Agriculture, Food and Environmental Sciences from the California Polytechnic University - San Luis Obispo. The Ranch was donated to Cal Poly following the death of Al Smith in 1993. Al was a Cal Poly graduate and founder of Orchard Supply Hardware. Al had specific goals in mind when donating the Ranch along with a significant endowment to Cal Poly: 1) After years living on the property and actively coordinating timber, crops, and livestock operations, he wanted to see the Ranch remain an operational Ranch for educational purposes and 2) he wanted to give Cal Poly students the chance to learn by working with active forest management and agricultural operations. Based on Al's conviction that real world experience is the best teacher, the NTMP approaches management of the Ranch timberlands on a pragmatic basis and assumes that there is great educational value in learning how to manage the timber resource productively, sustainably, and economically.

This plan delineates those areas where active forest management is economically viable, i.e., where timber is of sufficient size, quality and density, and where the site is both reasonably productive and accessible. To make the plan as useful as possible for management and to facilitate ongoing research, the plan area is divided up into management units. Timber volumes vary significantly from site to site. In general, the North Fork and South Fork Units are more productive than the varied Satellite Stands Unit. As stand and site conditions become more marginal, evaluation entails deciding whether the site warrants investment in stand improvement operations or if it is preferable to abandon active timber management altogether. Similarly, educational opportunities vary from a timber management orientation to broader study of ecological relationships and vegetation dynamics.

The Ranch mission is to provide Cal Poly students, faculty, staff and the public with a unique interdisciplinary environment in which to live and learn to foster the "learn by doing" philosophy. Swanton Pacific is a working ranch with diversified agriculture and forest resources, which are managed sustainably while maintaining the integrity of the Ranch. The implementation of this NTMP will provide interns/students with an opportunity to take part in responsible forestland management; thereby affording them an opportunity to cultivate real-world skills and perspective.

Research

Faculty and graduate students are actively pursuing research opportunities, utilizing the forest, range, and watershed resources within the Ranch. The development of this NTMP has included proposing high standards of environmental protection and land stewardship as well as taking into account the desired flexibility for continued implementation uneven-age management and

development of future research projects. Proposed research projects are reviewed by the Ranch Director to ensure their compatibility with the Ranch objectives. Many past research projects were reviewed during the development of this NTMP

LiDAR

One on-going research study that has aided development of this NTMP is the LiDAR (Light Detection and Ranging) technology. LiDAR is high-altitude laser altimetry that results in a very detailed digital terrain model with ground elevation points approaching one every square meter that are typically accurate to within a foot. LiDAR measures the returns of thousands of pulses of light per second emitted from a plane down through the forest canopy to the ground and returned back to the plane.

The research on the Ranch has compared LiDAR-generated stream channel features with on-the-ground surveys. For the initial study, six segments of stream channel in Little Creek were chosen and detailed ground-based cross section were surveyed for comparison to those cross-sectional profiles extracted from the LiDAR data. A new LiDAR study is investigating improvements in the technology as well as the ability to recognize and map other watershed features, such as roads. The potential applications using LiDAR imaging is tremendous, but often cost prohibitive for many resource management applications. Using LiDAR images, historic road alignments and even skid trails can be observed, allowing for more accurate map making. Topography and landscape level features are easily observed. The availability of LiDAR data aided in mapping of landscape features for the NTMP. Topographic mapping through LiDAR is more accurate than USGS 7.5 minute topographic maps and LiDAR aided in the identification and mapping of many features, such as unstable areas and skid trails, which were mapped for the NTMP based on LiDAR, along with aerial photo interpretation and ground-truthing. GIS manipulation of the LiDAR data can produce fine-scale graphics of the slope gradient and refined drainage area delineations. Maps showing the LiDAR-generated Digital Elevation Model were used extensively in NTMP preparation.

Water Quality Monitoring

A water quality monitoring study is currently underway on Little Creek and its tributaries. This study is contributing to the understanding of the local hydrology as well as the effects of modern forest management practices on water quality, namely suspended sediment export. In 1997, three monitoring stations equipped with rated section flumes were installed on Little Creek –on the North and South Forks just above the confluence, and on the lower Mainstem. In 2000, a fourth monitoring site without a flume was established as a control at the upper property boundary of the North Fork, above the proposed harvest area. The calibration phase will be complete following the 2007-08 rain year when stations will have gone through over 7 years of data collection. Water quality data collected over this period include flow, turbidity, and suspended sediment.

This research has several objectives using both paired and nested watershed study designs. The paired and nested analyses rely heavily on the statistical significance of the data established between stations during the 7 year calibration phase. According to results of the preharvest calibration for the Little Creek watershed analysis, “changes in storm event suspended sediment loads approximately 30% above background levels may be needed to detect change for the nested watershed

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design, while changes of approximately 90% may be needed to detect change in the paired watershed design.” This is according to the thesis by Michael Gaedeke entitled Pre-harvest Calibration of the Little Creek Watershed - a Paired and Nested Watershed Analysis.

In 2006 and 2007, five flumes were installed on Class II and III tributaries to the North Fork of Little Creek. The Class II and III flumes are intended to provide insight into the water quality effects coming from the higher order tributaries in the watershed. Each flume will provide suspended sediment and temperature data before and after single-tree selection harvesting. The locations of the original stations along with the tributary flumes are shown on the Water Resources Map at the end of Section II.

The three original Little Creek stations (North Fork confluence, South Fork confluence, lower Mainstem) contain a stilling well to measure the depth of the water mechanically and electronically to obtain the stage of streamflow throughout the storm event. The rectangular shape of the natural-bottom flumes provides a stable channel cross-section and allows for the electronic measurements of stage and stilling well, which are then converted to flow discharge using a rating curve developed for each site. The more-recent Upper North Fork station is a natural channel station, but includes much of the same hydrologic and water quality sampling instrumentation.

An automated pump sampler records instream turbidity and water temperature readings every minute as well as pumping the one-hour storm samples into bottles for lab analysis. During the summer months, 90° sharp-crested V-notch weirs are installed for more accurate low-flow measurements and a HOBO datalogger is installed instream to measure summer temperatures.

Data that is collected from these stations is analyzed and stored at the Water Quality Lab by hydrology graduate students and project assistants. The lab contains a turbidimeter to measure turbidity, and gravimetric analysis is used to determine suspended sediment concentration (SSC) from water samples collected at one-hour intervals from the monitoring stations during storm events. This data is then entered into a computer database for each of the monitoring stations so that a statistical analysis can be performed to determine correlations between the different stations. Ultimately, this will allow for post-harvesting comparisons to evaluate the effectiveness of management practices in protecting water quality.

Land

The lands of Swanton Pacific Ranch have a complex interweaving of environmental and land use influences. The Ranch is comprised of a diverse landscape overlooking the Pacific Ocean, 15 miles north of Santa Cruz. The elevation ranges from sea level at the estuary to around 1,200 feet on the ridge north of Little Creek. The Ranch is located in portions of Sections 8, 9, 16, 17 and Rancho Agua Puerca y las Trancas, Township 10 South, Range 3 West. The Ranch is roughly 3282 acres, managed by Cal Poly Corporation. Of these 3282 acres, an 80 acre in-holding owned by the heirs of Al Smith is located near the confluence of the North and South Forks of Little Creek. Cal Poly Corporation has timber rights but not ownership rights to this parcel. Refer to Section I, Items 2 and 4 where Steve Spafford, Susan Spafford England, and Stuart Spafford are listed as timberland owners of record and plan submitters for parcel 057-121-10. Cal Poly Corporation has assumed all plan submitter responsibilities and all timberland

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owner responsibilities including erosion control maintenance for all activities related to the NTMP. See Section V for the letter relieving the Spaffords of plan submitter and timberland owner responsibilities as well as the document ascribing timber rights of parcel 057-121-10 to Cal Poly Corporation.

Forestlands consist of approximately 1,308 acres, 1000 acres conifer dominated, 300 acres with hardwood. The forests have great variability and diversity throughout the Ranch. The dominant timber type is coast redwood and Douglas-fir, with more redwood in the drainages and areas with natural surface water, interspersed with more fir and Monterey pine approaching the ridges. Each of the coniferous species occurs in pure or nearly pure stands, as well as mixed together in stands of varied composition. The oak woodland consists of coast live oak and mixed evergreen hardwood with varying amount of live oak, shreve oak, California bay laurel, madrone and tanoak. The drainages contain areas with riparian woodland vegetation of alder and willow.

The forested land is located primarily on the eastern side of the property and consists of moderate to steep slopes along several creeks that are tributary to Scotts Creek. The majority of this forestland lies in a finger of property extending northeast along Little Creek, and with additional forest flanking either side of Swanton Road at the northern portion of the property. Forestland managed as commercial forest comprises approximately 701 acres of predominantly second-growth redwood/Douglas-fir forests, the majority of which was originally logged between 1909 and 1923.

The vegetation composition can be broken up into four broad categories, including forestland, rangeland, brush land and cropland. The resulting logical land uses also follow these divisions, and areas developed for structures are interspersed. Grassland accounts for roughly 1,320 acres, the majority of which is located on the coastal side of Scotts Creek. The principle landuse on the range, the livestock program, includes seasonal stockers and cow-calf operations. Brush land covers roughly 430 acres of the Ranch, primarily on the upper ridges and is not actively managed. The current cropland acreage is approximately 203 acres primarily on the flats adjacent to Scotts Creek, the majority of which is certified organic by CCOF. The only other property with timberland owned by California Polytechnic State University Corporation is the Valencia Creek ownership, located in the Corralitos area. This property is 617 acres total, 504 acres of which are covered by NTMP #1-01NTMP-018 SCR. Cal Poly Corporation collectively owns less than 2,500 acres of timberland, and therefore qualifies as a nonindustrial timberland owner.

A portion of the Ranch property, at the bottom of Little Creek, is dedicated to a narrow gauge railroad. It was started by Al Smith and is carried on by a dedicated group of railroad enthusiasts. The track takes a scenic journey south along Scotts Creek and circles Folger's field, named after a subdivision that was laid out there in the early 20th century. A Christmas tree farm is just getting underway in Folger's field, implemented by Cal Poly students on internships at the Ranch. Another learning opportunity is provided by the U-Pick apple orchard on the north end of the Ranch, also located on a fertile terrace flanking Scotts Creek, and also run by student interns at the Ranch.

A 12 acre reserve of redwood, Douglas-fir forest is located in the northern portion of the Ranch, north of the Seaside School. This reserve shall not be proposed for management and is dedicated for protection as part of the Ranch FSC Certification and is located outside the NTMP area. A portion of the infrastructure that accesses the far extent of the South Fork Unit is located on the neighboring property, owned by CEMEX. Approximately 500 feet of road and part of landing L14 is on CEMEX property. This road was built in 1989 in conjunction with THP# 1-89-539 SCR. A License Agreement is being negotiated to allow utilization of this road for timber harvest purposes. This Agreement is currently being reviewed by both landowners and is expected to be signed prior to NTMP approval, at which time it will be amended to NTMP Section V.

The lower portion of the haul road up Little Creek is owned by Frances LaMar and Big Creek Timber Company. An easement for use of this road is in NTMP Section V.

Additional forested portions of the Ranch were originally intended to be included in this NTMP, including areas in three parcels on the east side of Swanton Road, zoned Commercial Agriculture (CA). However, at the time of submittal, Coastal Commission zoning ordinances prohibit timber operations on parcels zoned CA within the Coastal Zone. This is expected to be resolved as the Coastal Commission reconsiders the CA ordinance in light of the Court of Appeal (before Supreme Court): *Big Creek Lumber Co. v. County of Santa Cruz*, 10 Cal. Rptr. 3d 356 (2004). A major amendment to add manageable timberland on the three CA parcels (057-131-18, 057-151-01, and 057-151-06) to the NTMP may be submitted in the future. Much of the information included in the NTMP is also relevant for evaluation of harvesting on these parcels.

In addition to the timberland affected by unresolved zoning, a forested area in the headwaters of Archibald Creek also has potential for future amendment onto the NTMP. This area does not have established Continuous Forest Inventory plots at the time of plan submittal, and therefore could not be evaluated in the NTMP for sustainability. However, in the future, after inventory is conducted, this portion of the Ranch may also be amended to the NTMP. Yarding access is available from NTMP infrastructure at landing L17.

Forest Certification

The Forest Stewardship Council (FSC) has certified Swanton Pacific Ranch as a “well-managed forest” under their intensive review process. Forest management at Swanton Pacific Ranch was reviewed by independent third-party auditors, Oakland-based Scientific Certification Systems. First certified in May 2004, the Swanton forest is the first school forest in California to be certified by FSC. FSC is a worldwide certification system that audits forests every year under the FSC Principles and Criteria (<http://www.fscus.org/>).

The FSC evaluates forest operations based on rigorous Principles and Criteria and awards certification to those land managers that demonstrate socially and environmentally responsible forest management. The organization was founded in 1993 by environmental groups, the timber industry, foresters, indigenous peoples and community groups from 25 countries. The FSC standards encourage environmentally appropriate, socially beneficial and economically viable management of the world’s forests. FSC Principles and Criteria are their basis for defining responsible forestry and evaluating sound management practices.

Climate

The climate in Santa Cruz County is Mediterranean. January and February are usually the wettest months, while July and August are virtually without rainfall. Mean annual temperature is 54 to 58 degrees Fahrenheit on the coast, with elevated inland areas fluctuating 3-5 degrees per 1,000 foot gain in elevation. The number of frost-free days ranges from 220 to 245 days annually (USDA, 1980). Annual precipitation for the area ranges between 20 - 60 inches a year. Skies are overcast for 30 - 40 percent of the daylight hours annually. Average humidity is between 70 - 80 percent in the winter, slightly lower in the summer. Winds are usually light, with gusts near the coast and on the ridges, especially. During the summer the warmer inland temperatures draw the marine fog inland from the coast. The fog settles in low-lying drainages and depressions. Summer coastal fog provides moisture that sustains the redwood population. The cooling and humidifying effect of redwood trees encourages other species that thrive in these conditions to grow.

Topography

The rugged topography of the Ranch, which is dissected by numerous stream channels of varying sizes, can be credited for the varied vegetation types and floristic diversity. Elevation ranges from sea level at the estuary of Scotts Creek to 1,000 ft at the eastern boundary of the property. An unnamed peak of 819 feet occupies the central portion of the site with Cooke's Peak on the range at 774 feet, which is monumented with a USGS benchmark. The riparian corridor of Scotts Creek extends across the property in a north/south orientation that is frequently incised in the upper reaches but has a well-developed floodplain along the lowermost 2,000 feet as Scotts Creek approaches the estuary. Tributaries to Scotts Creek, including Mill Creek, Little Creek, Winter Creek Archibald Creek and Queseria Creek work their way through and along geologic features such as the Davenport Syncline, uplifted marine terraces of Santa Cruz mudstone, and the contact of Cretaceous quartz diorite along the eastern boundary, where springs emerge. These stream channels define a complex array of slopes whose length, steepness and aspect have resulted in growing conditions that range from highly productive to nearly sterile. The cropland of the property is located on the floodplain on Scotts Creek where stream deposits are deep. The valley slopes on each side rise steeply in most locations.

The topography of the central part of the project area is generally defined by three west trending drainages leading to Scotts Creek. The northernmost drainage contains Little Creek followed by Winters Creek approximately 2,500 feet to the south, and Archibald Creek another 1,200 feet south. Hillslopes leading into these watercourses are generally steep with average slopes exceeding 50%. Broad ridges exist between the drainages where the bulk of the timber harvesting is proposed.

The published landslide deposit maps (Cooper-Clark and Associates, 1975) show several large landslide deposits through most of the project area. The subdued geomorphic features of these major landscape modifying landslides suggest an age of hundreds to thousands of years, and would be consistent with dormant young to dormant mature classification.

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Geology

Santa Cruz County is in the Coast Ranges geological province. The San Andreas Fault zone is northeast of the county and several smaller faults extend northeast of Swanton Pacific Ranch (Bailey, 1966). The San Gregorio Fault is northwest of the Ranch. The axis of the Davenport Syncline crosses the property. Most of the Ranch is underlain by Tertiary Santa Cruz Mudstone, which is a medium to thick bedded, laminated siliceous mudstone, grading locally to a sandy siltstone (Clark, 1981). The northeast corner of the Ranch is partially underlain by Paleozoic or Mesozoic metasediments, Cretaceous quartz diorite and tertiary Santa Margarita Sandstone.

Near the Pacific coast, stream-dissected Pleistocene marine terraces, most capped with fine to medium sand, underlie the soils. Scotts Creek and some of its tributaries have deposited Quaternary-age alluvium.

Landslides are common where the Santa Cruz Mudstone underlies the soils on steeper slopes (Clark, 1981). Some large landslides of Quaternary age have been mapped; one of these occurs on the Ranch. Extensive research on landslides throughout the Scotts Creek watershed was undertaken for the Scotts Creek Watershed Council in 2000 with the assistance of funding from the Scotts Creek Watershed Council and from the California Department of Fish and Game. The principal findings of this study as they relate to Swanton Pacific Ranch were that rotational slumps were more common on west or north-west slopes at varying elevations, but tend to arise in failures at or above the sharp slope breaks to marine terrace tops located at the top west side of the valley. Long translational slides are more likely to occur on the east and southeast sides, often at or near the heads of the indented small side canyons and are more likely to have debris flows enter the stream channels. Most of these landslides occur due to soil saturation from rainfall, with some evidence of greater activity in areas of less sun. Slides occur in both granite and mudstone formations.

During the 1997-1998 rain year there were 125 – 150 slides in the Little Creek watershed, although little landslide material reached the stream channels. Little Creek had abundant and destructive landsliding in the 1955 storms. It was the conclusion of the geologist who prepared the report that; despite the presence of numerous small slides throughout the watershed, these were mostly not caused by roads, which can sometimes act as debris traps. However, elsewhere in the report on roads, it was noted that many landslides did originate at road sites, often caused by the uprooting of a nearby tree during storm events (SCWC, 2000). The project area and access roads into the project are underlain by sandstone, shale and mudstone, quartz diorite and schist, according to Pulver (1979). The sandstone, from the Santa Margarita formation, is massive to indistinctly bedded in very thick beds. It is soft and friable on ridgecrests and slopes and is firm and weathered in stream bottoms. According to Pulver, a thin exposure of Santa Margarita Sandstone is present through the central part of the project area, north and south of Little Creek. This sandstone is arkosic in composition and ranges from very fine to very coarse-grained. The fine-grained sandstone commonly contains silt and glauconite. Santa Cruz Mudstone, the dominant geologic formation in the project area, consists of hard, brittle, porcelaneous shale and mudstone, with firm to soft nonsiliceous mudstone, siltstone, and sandstone. In some exposures, distinct thin-to-medium beds of porcelaneous mudstone alternate with beds of sandy siltstone or very fine-grained sandstone.

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Several areas on the middle ridge between the North and South Forks of Little Creek, as well as on the ridge north of Little Creek, are underlain by quartz diorite and schist. The areas where these units come in contact with Santa Cruz Mudstone and other rock units are characterized by large-scale landsliding. The contact between the various rock units, their degree of erodibility, and their slope stability characteristics, contribute to numerous landslides and landslide scarps. Most of these landslides are likely hundreds to thousands of years old and are primarily dormant. Several areas on the deep-seated slide block, such as Tranquility Flats, are composed of unconsolidated, slow-moving material. Movement is most likely when the soil is saturated, thereby increasing the water pore pressure. The extent of the large landslide deposits are depicted in the Focused Engineering Geologic Report, and differ somewhat from what Cooper-Clark mapped in 1981.

Stream channels throughout the project area, especially the mainstems of Scotts Creek and Little Creek have significant components of alluvium. The soils on the margins of the streams consist of colluvium deposits of weathered Santa Cruz mudstone.

Soils

The Swanton Pacific Ranch covers eighteen different soil types, 6 different soil types are present within the harvest area of the NTMP. The primary soil dominating most of the Little Creek watershed is the Ben Lomond-Catelli Sur complex. The Catelli soil makes up as much as 45 percent of the Southwesterly slopes of the Ben Lomond and Santa Cruz Mountains. A brief description of each soil type found in the NTMP area is provided below. Information obtained to determine soil distribution was taken from the Santa Cruz County GIS Database. A soil survey was conducted on the Ranch in 1980 by Lynn Moody. Soil characteristics were adopted from the 1979 USDA Soil Survey of Santa Cruz County, California.

Ben Lomond-Catelli-Sur complex, 30-75 % slopes

This soil is usually found on mountain ridgetops and drainageways from 400-3,000 feet, with a mean annual precipitation of 48 inches. It is made up of approximately 30% Ben Lomond sandy loam, 30% Catelli sandy loam, 20% Sur stony sandy loam, and 20% other inclusions. Base rock is at a depth of 35-46 inches. The Ben Lomond soil is deep and well drained. It formed in residuum formed on granite or quartz diorite. Permeability of the Ben Lomond soil is moderately rapid and runoff is rapid to very rapid. The Catelli soil is moderately deep and well drained. It is formed on residuum derived from sandstone, schist or granitic rock. Permeability of the Catelli soil is with is moderately rapid and runoff is rapid to very rapid. These soils are used mainly for timber production, recreation, wildlife habitat, and watershed. The Ben Lomond soil is well suited to redwood and Douglas-fir production, the Catelli soil is somewhat well-suited, and the Sur soil is somewhat poorly suited.

Bonnydoon loam, 30-50% slope

This shallow, somewhat excessively drained soil is on hills and mountains. It is mostly found on convex, south-facing side slopes of hills and mountains. It is formed on residuum derived from sandstone, mudstone, or shale. Elevation ranges from 100-2,100 feet, and the mean annual precipitation is about 30 inches. The base rock, weathered sandstone is at a depth of approximately 11 inches. Permeability is moderate and runoff is rapid. This soil is used mainly for range and home construction is very limited due to the prohibitive slope and depth of rock.

Maymen stony loam, 15-30 percent slopes

This shallow, somewhat excessively drained soil is mainly on ridgetops. It formed in residuum derived from shale, sandstone, or granitic rock. Typically a mat of undecomposed twigs covers the surface. The surface layer is pale brown, slightly acid stony loam about 6 inches thick. The subsoil is pale brown, medium acid shaly loam about 8 inches thick. Unweathered, fractured shale is at a depth of 14 inches. Permeability of this soil is moderate, runoff is rapid and the hazard of erosion is high. Rapid growth of population in the county has resulted in increased production of homes on this soil.

Maymen-Rock outcrop complex, 50-75% slopes

This complex is on ridges and the upper part of very steep slopes on mountains. This complex is about 45% Maymen stony loam, and 25% Rock outcrop. The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from shale, sandstone, or granitic rock. The surface layer is pale brown, slightly acid stony loam about 6 inches thick. The subsoil is pale brown, medium acid shaly heavy loam about 8 inches thick. Unweathered, fractured shale is at a depth of 14 inches. Permeability is moderate, runoff is very rapid and the hazard of erosion is high.

Santa Lucia shaly clay loam, 5-50% slopes

This moderately deep, well drained soil is found on hills and mountains with elevations ranging from 100-1,800 feet. It is formed on material weathered from siliceous shale and is well drained. The permeability is moderate with fractured shale at a depth of 38 inches. Nearly all areas of this soil are rangeland with a few homesites.

Tierra-Watsonville complex, 15-50% slopes

This soil consists of soils on alluvial and marine terraces with elevations ranging from 20-1,200 feet. The complex is approximately 55% Tierra sandy loam and 30% Watsonville loam. The Tierra soil is very deep and moderately well drained. It is formed on alluvium derived from sedimentary rock and the lower layers are clay and silty clay. Permeability of the Tierra soil is very slow with water perched above the clay at all times. The Watsonville soil is very deep and somewhat poorly drained. It also formed on alluvium derived from sedimentary rock but with lower layers of sandy clay loam. Permeability is very slow and roots can only penetrate below a depth of 10-20 inches through cracks in the clay. The mean annual precipitation is approximately 28 inches. Runoff is rapid and small areas that periodically have not had vegetative cover are moderately eroded. This complex is used mostly for range; however, population growth has spurred encroaching development.

Fire History

Fire has long had an influence on the Ranch's vegetative cover. Prior to European influence, the Native Americans set frequent fires to keep the valley opened up for good hunting and possibly to improve food production. Frequent fires tended to favor grass and restrict spread of Douglas-fir and Monterey pine on more open slopes with south and west facing aspects. Since Native American fire use along Scotts Creek sites dates to nearly 2000 years ago, and other nearby sites are even older, a fire adapted vegetation mosaic was probably well established.

Keeping the area open and promoting grass growth was also the objective of the earliest white settlers, the Staub family and the successive owners of Rancho Agua Puerca y las Trancas. From the 1850's until tractors became available for brush clearing, around 1930, fires remained the primary means of keeping ranches open for cattle grazing. Douglas-fir and Monterey pine have increased in acreage since that time as clearing efforts have been sporadic.

Fire was used as a slash clearing tool during the harvests around the turn of the century. These fires were lit after felling the trees to make retrieving them easier by burning up the surrounding vegetation. A conflagration larger than usual flared up in 1923, near the end of the San Vicente old growth logging era. The effects of past timber harvesting will be discussed further in the Harvest History section which follows.

The most dramatic fire event of recent times was the fire of 1948. A record by Al Smith recalls that it burnt over a four to five week period during August and early September, starting with an intense burn of four days, settling down for a three week period of creep, and then flaring up dramatically for another four or five days after that. It was during the last stretch that it came down far enough south to reach the Ranch, burning through the upper portion of Little Creek, across the ridge and into the upper end of Archibald Creek. Spirited resistance by the McCrary family and other local residents held the fire north of the Ranch in Scott Creek and kept it from reaching Swanton Road anywhere, although it did singe the Big Creek Fire Station located on Big Creek where the Kingfisher fish hatchery is now. A rough map showing the extent of the 1948 fire, based on recollection of Al Smith and Lud McCrary, is included in NTMP Section V.

Evidence of the 1948 fire and its intensity can still be detected within the NTMP area today. Extensive fire scarring of redwood and Douglas-fir trees and abundant distribution of tanoak are legacy effects. Significant amounts of decay are present in fire-damaged Douglas-fir trees. Conks of *Phellinus pini* are a visible sign of this decay.

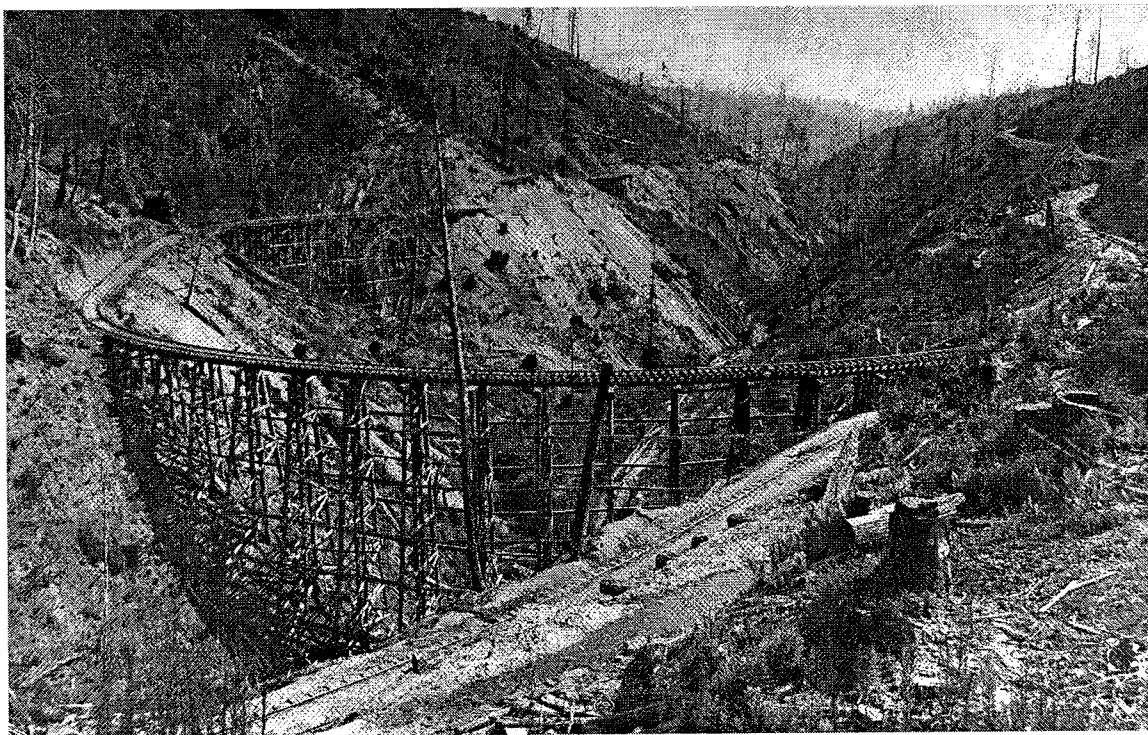
Due to the long history of fire in the Santa Cruz Mountains, many local plant communities are fire-adapted. Knobcone pine and chaparral, in particular, have fire-dependant regeneration mechanisms. The modern era of fire suppression has changed the vegetation dynamic in many plant communities across the Ranch. Without frequent low-intensity fires to burn through the stands, the forests have increased in density, with more vertical and horizontal continuity of fuels, compared to historic, frequently burned forests.

Harvest History

Little Creek is the only part of the Ranch harvested during the Swanton area's primary phase of old growth logging, which lasted from just before the turn of the century into the 1920s. As a result, it is the only part of the Ranch with significant stands of merchantable sized second growth redwood. Much of the Little Creek watershed was clearcut by the San Vicente Lumber Company between 1906 and 1923. Several miles of railroad grade up Little Creek and into Deadman's Gulch were constructed to provide access for this logging effort. The logging technique at that time was clear-cut and burn, leaving the ground relatively un-vegetated. Trees were felled and then the woods set on fire to burn up the limbs and debris which blocked access to the logs. Although this type of harvesting can be called a silviculture method, it was not

pursued with a eye to regeneration but to taking advantage of the best available log extraction technology.

Two Shay locomotive engines especially designed for mountain logging were used on the railroad. Steam donkey's and oxen were employed to pull logs to the skid roads and the railroad. The track ascended Little Creek on a fairly and constant steep gradient, nearly 10 percent, and included several switch-backs that required tight navigation. The historic photo below shows the railroad trestle over Little Creek and the surrounding bared hillsides following the clearcut logging.



**San Vicente Lumber Company Logging Operations circa 1920.
Photo Courtesy of the Swanton Pacific Railroad Society.**

The best estimate is that San Vicente completed their logging of what are now Swanton Pacific lands by 1910. Their ownership on Little Creek stretched nearly three-quarters of a mile east of Swanton Road, and encompassed the best stands on the Ranch. The San Vicente railroad logging operations lasted until 1923 on properties now owned by CEMEX and Lockheed, running to the headwaters of Little Creek and branching over into Big Creek.

The clearcut yielded an even-aged stand of redwood, Douglas-fir and tanoak. There are few residual old growth trees left on the Ranch that were not cut in the original harvest. These are located generally in three areas, 1) in the vicinity of the General Smith Tree, on the ridge between Little Creek and Berry Creek, 2) on either side of the mainstem of Little Creek, east of Swanton Road, and 3) to the west of Scotts Creek. These three stands have been surveyed for the presence of marbled murrelets and their boundaries are delineated on the map showing potentially suitable marbled murrelet habitat, which can be found in Section V.

The next period of logging on the Ranch occurred as San Vicente moved their operations upstream, probably in the years around 1920. Reportedly, a man named Clyde Adams had a sawmill roughly 2000 feet east of Swanton Road in the valley bottom adjacent to crossing R6.

The Staub family who lived on 40 acres at the central part of the Ranch probably cut some trees during the course of settling the Ranch and may well have worked some trees up for bolts or split them into shakes and shingles. Scattered residual old growth redwood and a good deal of second-growth redwood were harvested from the flatter portions of the Staub Ranch in the 1940's. More "modern" logging also took place on the Ranch during the period from 1950 through the 1960's using a partial cut method. Douglas-fir was removed from a majority of the Satellite Stands during the 1950's to supply raw material to a local box factory. Scattered residual old growth redwood and a good deal of second growth redwood were harvested from flatter portions of the Ranch in the early 1960's by Mr. Janes. This cut was somewhat of a high-grade selection and left very little merchantable sized timber in the central part of the Ranch. The logging was done by small tractor and resulted in a network of skid roads in the stand.

These Satellite stands were heavily cut-over in those harvests and were in need of a sanitation/salvage harvest which occurred in 2004 under THP #1-04-053 SCR, the "Lower Little Creek THP". The aim of the 2004 harvest was to rehabilitate some of the Satellite Stands and to improve stand health and vigor. Even so, site and timber quality are both low as are stocking levels. The 2004 harvest covered approximately 91 acres of redwood/Douglas fir forest that are encompassed in this NTMP.

Selective timber harvesting occurred again in Little Creek in 1991, 1993 and 1994. The first phase was a tractor operation south of the South Fork of Little Creek in the fall of 1991. The second phase was a combined tractor/skyline operation in the North Fork and on the middle ridge in 1993 and 1994. These entries were done in conjunction with road building in the North and South Forks to provide access throughout the area. Road positioning was done to serve the most appropriate yarding method for the varied terrain and timber types. The original hope had been to design a closed loop road system, but the South Fork of Little Creek proved too steep and difficult to cross. Fortunately, much of the old railroad grade and the Staub Ranch waterline road were already in the right locations. The principle change in the Staub Ranch road was its route to Swanton Road. The new route, the Winter Creek Road established good grade and provided valuable access by traversing through the Swanton Satellite stand. With realignments and extensions, these roads now form the core of the Ranch road system.

Vegetation and Stand Conditions

The vegetation mosaic on the Ranch can very generally be described as vegetation communities occurring in bands along a transect, starting from the coast and changing as elevation increases and from the east toward the top of Ben Lomond Mountain. The first vegetation type encountered is the Coastal Prairie grassland, which occurs on the west-facing slopes with coastal exposure.

The vegetation changes to a Monterey pine plant community after cresting the ridge of the coastal range that separates lower Scotts Creek from the Ocean. Behind a buffer of Monterey pine, more Douglas-fir become interspersed and on the east side of the ridge, dropping into

Scotts Creek, the Monterey pine phases out and the vegetation turns to a Douglas-fir/ hardwood forest. Redwood becomes more prevalent approaching Scotts Creek, especially in moist sites influenced by local microclimates. The steep hillside trending toward Scotts Creek also has a relatively high incidence of California nutmeg (*Torreya californica*). Several record-size nutmeg are found along the banks of Scotts Creek, including the world record holder with a circumference of 251 inches, rising to 96 feet tall with a crown spread of 68 feet. Another world record size tree, a large diameter buckeye (*Aesculus californica*), is located in the Swanton Pacific Railroad train yard.

The Scotts Creek riparian corridor and the mainstem Little Creek riparian corridor have a high hardwood component. Deciduous hardwoods including alder and maple grow on the sand bars of deposited sediment. These stretches of channel are most prone to deposition since due to the low channel gradient compared to the upstream reaches.

Human activity has had a significant impact on the forests of the Ranch. Indicators of prolonged Native American occupation are widespread from the mouth of Scotts Creek until redwood timber closes in the river bottom of the river bottom north of the Ranch and each tributary. The primary Native American impact on vegetation was their frequent setting of fires to keep the valley open for good hunting and possibly to improve blackberry production. Frequent fires tended to favor grass and restrict spread of Douglas-fir and Monterey pine on more open slopes. Since Native American fire use dates from nearly 2000 years ago and other nearby sites are even older, a fire adapted vegetation mosaic probably had time to become well established.

The main timber type encompassed by the harvest area is a typical coast redwood and Douglas-fir forest type for the Southern Sub-district in Santa Cruz County. Characteristic of forests in the Santa Cruz Mountains, trees on the Ranch occur in locations which offer some measure of relief from frequent drought conditions characteristic of the Mediterranean climate. This relief is found on slopes which have a northerly aspect or receive some protection from ridges immediately to the south. Redwoods are generally near the Class I, II, and III watercourses, or where springs or seeps remain evident at the surface well into the summer. The stand transitions to a heavy hardwood component with associated redwood and Douglas-fir progressing upslope from the watercourse areas. Continuing further up the ridges, this mixed forest transitions into a chaparral and knobcone pine community outside of the harvest area. Immediately east of Swanton Road, from Archibald Creek north, stands of Douglas-fir mixed with Monterey pine are provided protection by the high tableland of the Rancho Agua Puerca between Highway One and Scotts Creek.

The original growth redwood was almost entirely clearcut sometime between 1906 and 1922, creating an even-aged stand 80-100 years old, some of which has been selectively logged. The Douglas-fir in the Satellite Stands was later high graded in the 1950's for a nearby box factory. The redwoods are predominantly of sprout origin, growing in clumps around the old growth stump. While an individual stump may have supported as many as 20-30 sprouts within a few years after the clearcut, competition has thinned their ranks so that now as few as one to as many as six or eight are still growing. Where Douglas-fir and redwood trees are growing together, mature Douglas-firs are often dominant. Although tree heights are extremely variable, dominant

and co-dominant redwoods are usually between 125-150 feet tall, while dominant Douglas-fir are in the 145 to 180 foot range.

Tanoak is the primary understory tree and becomes the dominant tree species in a few areas, usually where soils are poorly developed or have low water holding capacity, compared to conifer areas. Larger tanoaks are usually between 80-100 feet tall. A stand of exceptional large tanoak is north of the North Fork of Little Creek and is afforded special protection under Mitigation Point MP32. Madrone, bay, big leaf maple, buckeye, nutmeg, Shreve oak, coast and interior live oak also make up a component of the forest stands. Within the riparian zones along Little Creek, although conifers are the dominant species, red alder is frequent, especially on sand bars. The zone is as much as 120 feet wide near Swanton Road, narrowing to little more than the channel width of 15 feet on the upper portions of the forks.

Stand health is generally good for the redwood and Douglas-fir, however, pitch canker is present in the Monterey Pine and red ring rot is present in many of the older Douglas-fir, especially those with fire scars.

The most productive site on the Ranch is in an area of the North Fork Unit called "Tranquility Flats". The area is situated on two highly productive landslide benches that typically have high soil moisture conditions with numerous surface springs and seeps. Inventory and growth studies of the flats have been undertaken in order to better establish and understand the upper limits if productivity on the Ranch.

The General Smith Sub-unit, identified as a forest of High Conservation Value (HCV) through FSC certification, is a small area on the ridge between Little Creek and Berry Creek on the northern panhandle of the Ranch. This is an interesting area to study plant succession in general and the effects of the 1948 fire in particular (see the map in Section V showing the extent of the 1948 fire). There are a number of large old growth trees along the ridge and to the north, dropping into Berry Creek. This area was harvested in the early 1900's and again in the 1990's. There has been significant invasion of young growth trees along the ridge and the more recent harvest attempted to release some of that second growth redwood. Further along the ridge in either direction away from the General Smith Tree, the redwood is replaced with knobcone pine and manzanita chaparral. A trail runs along the ridgeline that could be an important control point for fire suppression efforts.

The Satellite Stands Unit is highly variable in terms of species composition, including patches of pure Douglas-fir, pure redwood, planted non-native Monterey pine, and riparian forest where conifer species are scattered through a mixture of red alder and bay. Site quality is generally lower Site III with limited Site IV areas included in the NTMP. Much of the surrounding type can be characterized as invasionary stands of Douglas-fir which are expanding into areas formerly in grass or brush, since fires became infrequent. Areas excluded from the NTMP are those where the timber quality and site are too low to be managed for wood production.

The planted stands of non-native Monterey pine stock present in the Satellite Stands Unit are shown on the Botanical Conservation Map at the end of Section II. These cutover areas were planted between 1979 and 1984 with genetic clones of hybrids from New Zealand. Within the

planted areas, some trees have grown exceptionally fast. Portions of the plantations have been inter-planted with redwood and Douglas-fir seedlings which are now 5-10 feet tall. Due to the threat of gene contamination to the native pine population, the non-native plantation trees shall be gradually removed as described under Items 14 and 32 to allow redwood and Douglas-fir to re-colonize the site.

Vegetation / Timber Stand Types have been stratified across the Ranch based on a variety of factors including: density, site productivity, age (structure), and species composition. Past vegetation type mapping using the U.S. Forest Service classification system, which relies on percent of area occupied by tree crowns by species and by tree crown size, was utilized at the outset. These stands/types were further refined based on aerial photo interpretation, evaluation of Continuous Forest Inventory plot data, and extensive field reconnaissance. A map of the Timber Types is included at the end of Section II and a description of each type is included in Section III. The Sustainability Analysis is based on the stratification of these types.

Watershed and Stream Conditions

The major stream draining through Swanton Pacific Ranch is Scotts Creek (named after Hiram Scott who bought a portion of Rancho Agua Puerca y las Trancas in 1852). The Scotts Creek watershed is approximately 29.3 square miles and the mainstem channel is approximately 12 miles long. 7.5 miles are potentially accessible to migrating salmonids (Bulger, 1998). The stream originates between Eagle Rock and Blooms Creek between 1,600 and 2,000 feet elevation in the Santa Cruz mountains and flows southwestward for about five miles to a point near Gianone Hill and the Old Seaside School where the orientation turns southeastward for another five miles to enter the Pacific Ocean at the Scotts Creek lagoon (see the Watershed Map in Section IV). The proposed NTMP is located to the east of Scotts Creek, encompassing portions of the drainages of several tributaries to Scotts Creek, the largest of which being Big Creek and Little Creek.

The project area is primarily located in the Little Creek planning watershed, Calwater version 2.2 # 3304.110202. The area for the Little Creek watershed depicted by Calwater encompasses a total of 4,470 acres, approximately 1,552 acres of which, located on the Range, drain directly to the Pacific Ocean. The remainder of the watershed, approximately 2,918 acres, contains smaller subwatersheds which drain directly to Scotts Creek, from north to south they are and include: Little Creek – 1,315 acres, Winter Creek – 149 acres, Archibald Creek – 421 acres, and Queseria Creek – 478 acres. The NTMP covers approximately 644 acres within the Little Creek planning watershed, located in the Little Creek, Winter Creek, and Archibald Creek tributary watersheds to lower Scotts Creek.

The northern tip of the project area is in the Big Creek planning watershed, Calwater version 2.2 #3304.110201. Big Creek flows southwestward into Scotts Creek about three tenths of a mile north of the point where Little Creek flows into Scotts Creek. The NTMP area is located approximately 1.9 miles above the confluence of Big Creek with Scotts Creek on the headwaters of Berry Creek, which flows into Big Creek approximately 0.9 miles below the harvest area. The mainstem of Big Creek is accessible to migrating salmonids for approximately 2.5 miles from the confluence with Scotts Creek (Bulger, 1998). The Berry Creek tributary is a Class III watercourse at the top of the NTMP area, changing to a Class II watercourse near the

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downstream extent of the harvest boundary. Thirty-seven acres of the NTMP area are located in the 7,206 acre Big Creek planning watershed.

Little Creek is a Class I/II watercourse, 1.5 miles of which are accessible to anadromous steelhead and 0.25 miles of which are accessible to coho salmon (Bulger, 1998). The mainstem of Little Creek is approximately 1.2 miles long, above which point the North and South Forks diverge. The entire Little Creek watershed is approximately 1,315 acres. The North and South forks have a mixture of granitic parent material and Santa Cruz Mudstone. Both North and South Fork reaches as well as the mainstem have inner gorge characteristics and are prone to large debris flows. Watershed characteristics are heavily researched as part of the on-going paired watershed study, described in more detail previously under Water Quality Monitoring.

Small gravels are embedded in the stream channel with a high component of decomposed granite. Unembedded 3-5 inch cobbles of mostly mudstone and some granite are common substrate material in the channel. A moderate amount of pool filling is occurring. Pools will aggrade and scour out frequently over a season due to the mobility of gravels and fines in the system. Aggradation behind debris jams is also prevalent and may form temporary migration barriers. Generally speaking over geologic, Little Creek is downcutting leading to frequent incidences of streambank erosion and smaller near-stream mass wasting.

Near-stream mass wasting is moderate to high along Little Creek. This is a function of the stream system having a high frequency of steeper topography resulting in a high occurrence of bank-erosion and smaller near-stream landslides. There is a moderate to high amount of Large Woody Debris (LWD) in the channel. The LWD is mostly comprised of alder and bay, and a little redwood, and often cause temporary debris jams. Streamside vegetation is high and comprised primarily of alder and redwood.

Winter Creek is an intermittent stream, about 0.7 miles long with porous substrate causing it to flow below ground for much of its length. The watershed area is 149 acres and flows into Scotts Creek approximately 0.5 mile south of the Little Creek confluence. A historic Class II man-made pond is located in the channel several hundred feet below the headwaters. The pond has been identified as California red-legged frog habitat. Below Crossing R3, a spring brings water to surface for part of the year, however the crossing above Swanton Road, R2, is generally dry.

Archibald Creek is another intermittent stream, about 1.5 miles long that rises in the western part of Rancho San Vicente and flows southwestward to join Scotts Creek approximately 0.2 miles south of Winter Creek. At one time the upper reaches of this creek were known as Schoolhouse Gulch because the Seaside School was formerly located at the headwaters.

Queseria Creek is another tributary to Scotts Creek, located along the Southern Ranch boundary. This channel passes by the Gianone Rock House and Green House/Barn compound, where a restoration project to improve the hydrologic performance and salmonid habitat conditions was recently completed.

Mill Creek is another tributary to Scotts Creek, located north of the NTMP area. Mill Creek is a perennial stream that originates on the southern slope of Ben Lomond Mountain at an altitude of

2,000 feet near the present-day Lockheed Martin-Marietta Testing Site. The stream flows southwestward for five miles to join Scotts Creek near another former site of the Seaside School.

The west side of Scotts Creek in the vicinity of the Ranch has steep topography where several Class II and III tributaries have cut deep canyons trending toward Scotts Creek. These watercourses generally originate from spring areas just past the break in slope on the Range. Development of some of the springs has allowed the creation of livestock ponds, which are now used by California red-legged frogs as breeding habitat. Installation of spring boxes with gravity-fed water storage at several of these springs allows seasonal livestock watering from upland troughs.

The lower portion of the property is at or near sea level, and is poorly drained. Heavy rains cause periodic flooding in the crop fields in this location. The marsh at the estuary contains brackish water from salt-water intrusion and tidal action. The lagoon at the estuary is closed by a sandbar in the summer months except when breached. Runoff from the remainder of the property is moderate to rapid due to the steep slopes. There are historic records of a devastating flood and debris torrent that occurred down the Little Creek drainage in 1955. Flood levels were which measured several feet high on the basement walls of the Red House. Other less-devastating flood events have been recorded in 1940, 1982 and 1998.

Scotts Creek is one of the least disturbed streams in the Santa Cruz Mountains. The current stream condition of Scotts Creek is detailed in the "Baseline Instream Watershed Assessment", completed in 1998 by biologist John Bulger, (Bulger, 1998). This assessment compares the stream morphology and conditions found on Scotts Creek with "target" conditions put forth by the National Marine Fisheries Service. An excerpt from this report follows:
"Natural background levels of embeddedness and fine sediment loading are unknown for streams in the Santa Cruz Mountains, but are liable to comparatively high. Comprised largely of recent unstable sandstone parent material (CWDR, 1982), erosive processes in these mountains are abetted by one of the highest rainfall intensities on the west coast (Ranz, 1968). It is therefore doubtful that embeddedness and fine sediment levels on lower gradient streams in this region would ever be much below the suggested target levels."

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ADDITIONAL INFORMATION REGARDING TIMBER OPERATIONS

This addendum compliments Section II of the NTMP with additional technical and visual information.

ITEM 14: SILVICULTURE

Standard Regeneration Method 14 CCR 913.8(a)

Selection silviculture under 913.8(a) implements the principle of sustained yield by making periodic harvests of a portion of the stand to increase growth of the residual trees to replace those harvested. A forest can be harvested periodically over time as long as it continuously produces harvestable sized trees. In order for the forest to continuously produce harvestable sized trees it must always have pole sized trees ready to grow into harvestable sized trees, and saplings ready to grow into poles, and seedlings and sprouts ready to grow into saplings. In other words, a selection forest must have balanced numbers of trees of all sizes if the cycle is to keep growing smoothly.

The challenge then is to grow trees of all sizes at the same time on the same piece of ground. Because a selective harvest always leaves neighboring trees, young trees must grow up in a certain amount of shade, which is generally deepest at the forest floor. Shade is particularly prevalent at the base of redwood clumps, where trees of sprout origin grow unusually close together and depend on peripheral light to maintain favorable growth rates. Redwoods in the young reproduction phase of the growth cycle need plenty of light to become well established. Fortunately, although redwood is a fast growing species, which does best with plenty of light, it is quite tolerant of shade once established and will respond to a major increase in light by a dramatic increase in growth rate. These are ideal characteristics for trees that must grow in the shade of larger nearby trees. The objective of selective harvesting of redwood, then, is to let enough light penetrate to the stumps to stimulate sprouting and release the growth of smaller trees.

In addition to creating favorable growing conditions, harvesting must continue to change the stand structure from an even-aged forest with a closed canopy dominated by large trees to an all-aged forest with a variable enough canopy to grow balanced numbers of trees in all size classes. To perpetuate the sustained yield pattern of cycling growth in a stand transitioning from even aged to uneven aged, enough trees must be cut to break up the closed canopy and allow light down to the cut stumps to stimulate sprouting. Each subsequent harvest should help move the stand toward the goal of a more balanced, all aged stand. Two different styles of selection silviculture, individual tree selection and small group selection, have been developed to accomplish this. These methods will allow us to manage growth using harvesting to control light and spatial relationships.

Individual tree selection attempts to uniformly increase growing space for residual trees by harvesting evenly throughout the stand. To produce widespread redwood regeneration under the individual tree selection method, some experiences from local foresters suggest that 40 percent of the trees 18 inches in diameter and larger must be harvested. Such a harvest generally

removes approximately a third of the total number of redwoods on the site and less than a fifth of all the trees. After harvesting, growth of the forest canopy eventually re-established shady conditions, which threaten the health of the sprouts and saplings created by the previous harvest. To maintain the cycling growth pattern, subsequent harvests must be timed to provide more light and growing space before the vigor of the overtopped trees is lost. The common belief or it is theorized that once the individual tree selection system is begun, the biological needs of forest growth control the timing of all future harvests.

Alternative Regeneration Method 14 CCR 913.8(b)

An alternative regeneration method to 913.8(a) is proposed for understocked portions of the NTMP area. This alternative regeneration method will focus on hardwood-dominated portions of the property with pockets of Douglas-fir or redwood. Where there is evidence of past conifer presence, stumps or suppressed trees, this alternative will help in the rehabilitation and regeneration of conifers. Past logging methods, described under Harvest History (above), did not provide for adequate conifer regeneration following harvest. Areas where conifers were high-graded have grown thick with tanoak. In the opinion of the RPF, the regeneration method described in 913.8(a) is not silviculturally appropriate because management is so limited that successful conifer rehabilitation and regeneration cannot be accomplished within the guidelines of the rule.

The proposed alternative will maintain a well-distributed tree crown surrounding groups. At no time shall the crown cover be reduced to a level where the productivity of the land is jeopardized or to a level which would create a threat to soil and/or water resources. Provided the desired crown cover can be maintained, the removal of all trees in small groups not exceeding one-half acre in size shall be allowed under this alternative prescription. The creation of small group selections will help develop the conditions necessary for regeneration of Douglas-fir which are shade tolerant as seedlings yet become less shade tolerant as growth continues. This species in particular will be favored by the filtered light conditions created in the groups. Redwood seedlings also will be planted in group selection areas that show evidence of having the site qualities suitable for redwood production.

To comply with 14 CCR 913.8(b) the following information is included:

1. In the professional judgment of the RPF preparing the plan, a selective harvest in the hardwood dominated portions of the property is not appropriate to perpetuate the conifer growth in these areas. To re-establish the conifer component in these areas, a sound silvicultural method is to harvest small group selections that are planted with conifers following operations.
2. No more than 10% of the harvest unit shall be put in group selection cuts per harvest entry. Group selections shall not exceed ½ acre in size.
3. This alternative silvicultural method shall provide overall protection at least equal to that of the standard provided by 913.8(a) for watershed, wildlife, soil, and aesthetic resources.
4. Timber Stand Characteristics:
 - a. Stocking levels: The portions of the property proposed for this harvesting method are generally located near the ridgetops and are dominated by tanoak, Pacific madrone, and live oak, with some pockets of Douglas-fir and/or suppressed redwood. Due to the stipulations on placement of groups, the pre-harvest stocking will be inherently

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low in the <1/2 acre areas selected. Accurate stocking levels are not available, since only a few sample groups have been identified; however it is certain that stocking levels in areas slated for groups will be far less than the average stocking levels per acre, which are listed in Tables 12-18 in the Sustainability Analysis. Since groups will be situated in the least-stocked portions of the harvest area, pre-harvest stocking in groups will not come close to approaching the average stocking per stand type.

- b. Cutting goals: The goal of the landowner in these areas is to encourage the growth of suppressed conifers by removing some of the hardwood overstory, while maintaining exemplary hardwood specimens. Prior to the clearcut approximately 100 years ago, the conifer component on these ridges was probably much higher. The landowners would like to return the forest to more of a pre clear-cut species composition. To accomplish this, the preferred prescription is to remove the hardwoods in small group selections and re-plant with conifer stock. This will happen gradually on a landscape scale and the forest response to treatments will be monitored over time by the RPF with inventory data collected as sites fall within inventory plots.
- c. Timber stand growth: Removal of the hardwood overstory will stimulate the growth of the existing and planted conifers. Growth is anticipated at the rate determined for Site III stand types in the Sustainability Analysis according to site potential. Groups will be planted with conifer seedlings in combination with existing understory conifer trees to equal at least 450 countable trees per acre. Existing trees and planted seedlings are anticipated to grow in the following increments per 15 year period for each stand type.

Douglas-fir trees growth

DF	
DBH	15 yrs.
2.0 - 6.0	3.87
8.0 - 12.0	4.28
14.0 - 18.0	3.82
20.0 - 24.0	2.70
26.0 - 30.0	3.62
32.0 - 36.0	3.50
38.0 +	3.68

RW III and DF HW	
DBH	15 yrs.
2.0 - 6.0	3.17
8.0 - 12.0	5.09
14.0 - 18.0	5.72
20.0 - 24.0	3.96
26.0 - 30.0	4.46
32.0 - 36.0	3.46
38.0 +	3.47

Redwood trees growth

RW III	
DBH	15 yrs.
2.0 - 6.0	1.89
8.0 - 12.0	2.98
14.0 - 18.0	2.81
20.0 - 24.0	3.36
26.0 - 30.0	4.09
32.0 - 36.0	4.04
38.0 +	4.92

DF and DF HW	
DBH	15 yrs.
2.0 - 6.0	1.89
8.0 - 12.0	2.98
14.0 - 18.0	2.81
20.0 - 24.0	3.36
26.0 - 30.0	4.09
32.0 - 36.0	4.04
38.0 +	4.92

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- d. Future harvest timing: Several harvest cycles must pass before commercial conifer harvesting can occur in these areas. When tree size dictates that a commercial harvest is viable, these area shall be managed according to single-tree selection per 14 CCR 913.8(a).
5. Groups may be proposed in suitable areas where there is a Douglas-fir/hardwood (DF HW), Douglas-fir (DF), Redwood Site III, (RWIII), or Monterey pine plantation (MPP) timber type. The locations of proposed group selection cuts shall be shown on a map accompanying the Notice of Timber Operations when submitted to CDF and shall be available for inspection by the reviewing agencies 30 days prior to the commencement of operations. Two group selection areas have been delineated in the field prior to the pre-harvest inspection to aid the review team by demonstrating the typical conditions that will make an area candidate for group placement. Areas suitable for group placement within the designated timber types include places where site quality is adequate for conifer establishment or there is evidence that of a past conifer presence where hardwood now dominates. A well-distributed tree crown cover shall be maintained surrounding groups. Exemplary large hardwood or conifers with significant structural characteristics will be considered for retention in group placement.
6. The RPF shall work closely with the plan LTO to insure compliance with the approved rehabilitation and regeneration prescription.
7. The logging areas shall meet the stocking standards described in 913.8(a)(2) within five years following completion of timber operations. The group selections will be planted with conifer seedlings in combination with existing understory conifer trees to equal at least 450 countable trees per acre. Group B hardwood species will be used to meet stocking requirements.
8. Once the groups have fully established conifer stocking, single tree selection will be reinstated to perpetuate conifer growth and move these areas toward an uneven aged structure over time.

EXPLANATION: An alternative regeneration method to 913.8(a) is proposed for select acres of hardwood dominated forest type with small pockets of Douglas-fir or redwood. These areas have untapped conifer growing capacity. In the opinion of the RPF, the conifer component in these areas was probably much higher prior to the clearcut harvesting that took place approximately 100 years ago, in the era of the San Vicente Railroad. Where a conifer/hardwood mix was present prior to logging and mainly conifers were removed. Conifers were not replanted, and hardwoods out competed the conifers resulting in a forest now dominated with hardwoods. The removal of all trees in small groups not exceeding one-half acre in size shall facilitate planting of conifer stock and the transition of these areas to the desired species composition. This practice is proposed for rehabilitation and regeneration in areas where conifers were not able to re-establish to historic levels based on stumps that have little or no regeneration nearby. Areas where conditions indicate that conifers would grow will be targeted for placement of groups. The groups will be planted with conifer seedlings following harvesting. Within five years, stocking will be met in group selection areas with conifer trees that equal at least 450 well-distributed countable trees per acre, per 14 CCR § 913.8(a).

Areas where this treatment is appropriate are located in the DF HW, DF, MPP and RW III timber types. The exact locations of the group placements have not been identified prior to the initial pre-harvest inspection. Due to the long-term nature of this plan, it is desirable to select areas

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suitable for placement of groups at the time of submission of the Notice of Timber Operations (NTO) for each entry. In this way, the identification of group selection areas may take into account the stand conditions at the time of harvest and the RPF will have the ability to situate groups in the most appropriate place in the context of the surrounding stand matrix. To make agency review of the group placements possible, the NTO for each harvest will be submitted to the reviewing agencies 30 days prior to the anticipated start of operations, when group selection is proposed.

JUSTIFICATION: In the professional judgment of the RPF preparing the plan a selective harvest in the hardwood dominated portions of the property is not appropriate to increase the conifer growth in these areas. To rehabilitate and regenerate the conifer component in these areas, a sound silvicultural method is to harvest small group selections that are planted with conifers following operations.

Coastal Commission Special Treatment Area Alternatives to 14 CCR 921

The Molino Creek Coastal Commission Special Treatment Area (CCSTA) spans 235 acres of the Satellite Stands Unit, as shown on the Operations Maps at the end of Section II. This CCSTA was established to protect the visual character of the wooded groves, situated in finger-like gulches from the relatively flat agricultural lands eastward to the first coastal ridge, for the continued enjoyment of highway travelers and beach users (see the Molino Creek CCSTA description in Section V). Proposed NTMP operations are in-keeping with the goals of the CCSTA, and need not be modified significantly to maintain and protect the scenic resources within the CCSTA. Measures to ensure maintenance of visual aesthetics such as RPF designation of skid trails and marking to retain wildlife habitat features are described throughout Section II. Alternatives to the standard CCSTA rules, 14 CCR 921.1-921.8, are proposed which will achieve protection at least equal to the rules and in harmony with the goals of Section 921.

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**Molino Creek Coastal Commission Special Treatment Area
- View from Swanton Road, CCSTA on the right.**

An alternative to stocking requirements per 14 CCR 921.4(a) is proposed such that the residual basal area post-harvest shall be at least 100 sq. ft. per acre on Site II timberlands, 75 sq. ft. per acre on Site III timberlands, and 50 sq. ft. per acre on Site IV timberlands, consistent with the standard Southern Subdistrict selection rules, 14 CCR 913.8(a)(1). The area within the CCSTA was last harvested in 2004 under THP 1-04-094 SCR, according to the proposed stocking standards, with no deleterious impact on the visual resources occurring within the CCSTA.

The proposed alternative, to abide by the minimum stocking standards for Santa Cruz County, is completely in line with the goals of 921. Within the CCSTA the proposed stocking standards will maintain an intact healthy forest, which is pleasing to the eye throughout operations. The objective cited when the Molino Creek CCSTA was established, "to maintain the visual character of the wooded groves for the continued enjoyment of highway travelers and beach users" will be achieved through compliance with the Southern Subdistrict selection rules, as proposed. These rules and the corresponding stocking standards are adequate to maintain the view of "dense conifer groves consisting mainly of Redwood and Douglas-fir trees ... as seen by travelers from both directions on the highway and beachgoers", and therefore support the CCSTA reasons for development. Flexibility beyond that provided by 14 CCR 921.3 is desired within the CCSTA to appropriately manage according to the goals of the NTMP and the Sustained Yield Analysis. The latitude provided by the proposed NTMP stocking standards will

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not jeopardize visual resources but will provide for prudent management according to the conservative Southern Subdistrict stocking standards.

An alternative to 14 CCR 921.1(a) is proposed to eliminate the need to identify the boundary of the CCSTA on the ground. The CCSTA covers the majority of the Satellite Stands Unit, and given the uniform prescriptions and mitigations in and out of the CCSTA, the delineation of the actual boundary on the ground is not operationally relevant. The RPF can show the Review Team where the CCSTA boundary crosses infrastructure on the pre-harvest inspection to give the agencies an opportunity to review the appropriateness of the proposed alternative in the field. Given the overall protective nature of prescriptions plan-wide and the careful layout of harvest infrastructure, visual resources shall be protected over the entire plan area; therefore specific delineation of the CCSTA boundary is unnecessary and the natural and scenic qualities within the CCSTA shall be protected by implementation of the project as proposed.

ITEM 15: PESTS

Regulated *Phytophthora ramorum* Hosts of Concern when Filing Timber Harvest Documents

Plants on the federal *P. ramorum*-Regulated Host list should be addressed by Registered Professional Foresters (RPFs) in harvest documents. These plants are: naturally infected by *P. ramorum*; found in California's forests; and have had Koch's postulates completed, documented, reviewed, and accepted. Further details on regulated plants and plant parts can be found at <http://www.aphis.usda.gov/ppq/ispm/pramorum/>.

Plants on the federal *P. ramorum* Associated Host list are regulated in nurseries only and not in wildland settings; therefore, they do not have to be addressed by RPFs.

<u>Scientific Name</u>	<u>Common Name</u>
<i>Acer macrophyllum</i> -----	Bigleaf maple
<i>Adiantum aleuticum</i> -----	Western maidenhair fern
<i>Adiantum jordanii</i> -----	California maidenhair fern
<i>Aesculus californica</i> -----	California buckeye
<i>Arbutus menziesii</i> -----	Madrone
<i>Arctostaphylos manzanita</i> -----	Manzanita
<i>Frangula californica</i> -----	California coffeeberry
<i>Frangula purshiana</i> -----	Cascara
<i>Heteromeles arbutifolia</i> -----	Toyon
<i>Lithocarpus densiflorus</i> -----	Tanoak
<i>Lonicera hispidula</i> -----	California honeysuckle
<i>Maianthemum racemosum</i> -----	False Solomon's seal
<i>Pseudotsuga menziesii</i> var. <i>menziesii</i> -----	Douglas-fir
<i>Quercus agrifolia</i> -----	Coast live oak
<i>Quercus chrysolepis</i> -----	Canyon live oak
<i>Quercus kelloggii</i> -----	California black oak
<i>Quercus parvula</i> var. <i>shrevei</i> -----	Shreve's oak

<i>Rhododendron spp.</i> -----	Rhododendron (including azalea)
<i>Rosa gymnocarpa</i> -----	Wood rose
<i>Sequoia sempervirens</i> -----	Coast redwood
<i>Trientalis latifolia</i> -----	Western starflower
<i>Umbellularia californica</i> -----	California bay laurel/pepperwood
<i>Vaccinium ovatum</i> -----	Evergreen huckleberry

ITEM 16: HARVESTING PRACTICES

Unit and Yarding Descriptions

The lay out of the units for the NTMP accomplishes a number of different educational and administrative objectives. 1) the road system provides access throughout the Little Creek and Satellite Units while also providing unique teaching opportunities including historical significance, crossing design, unstable area considerations, WLPZ mitigations, etc., 2) the topography of the Units provides an opportunity to demonstrate helicopter, cable, and ground based yarding. 3) the North Fork and South Fork Units in Little Creek provide similar areas for comparison in the on-going Paired Watershed Study, and 4) the Satellite Stands incorporate the most manageable ground in the remainder of the property on the East side of Swanton Road. Inclusion of these stands will facilitate demonstration of rehabilitation and regeneration cutting to open up sites with the best planting potential.

The overall management objectives to be attained through implementation of this NTMP are described under Item 42 in this Section.

The individual Management Units have been developed to lay out how the area is most logically approached from an operational standpoint. Within each Management Unit, the forest is stratified to delineate areas into Stand Types that are to be managed in a like fashion. Each Stand Type has detailed information on age class, cutting cycle, harvest prescriptions, and stand structure contained in the Sustained Yield Analysis, located further along in Section III. Brief descriptions of each Management Unit and Sub-Unit are provided below, including access. Yarding Methods and Stand Types within each Management Unit are shown on maps at the end of Section II. Additional information regarding pre-existing conditions and management activities to achieve the overall objectives is provided under Item 43 in this Section.

North Fork Unit (Little Creek)

This unit includes the manageable timberland on the Ranch that drains to the North Fork of Little Creek. A selection harvest occurred in most of this area in 1993 and 1994. For purposes of planning convenience and clarity, two portions of the North Fork Unit have been broken out into sub-units. These sub-units, called the General Smith Stand and Tranquility Flats will be managed under different silvicultural prescriptions than the rest. The Tranquility Flats Sub-Unit is an 11 acre area within the Redwood Site II growing ground of the North Fork Unit that will be managed to increase the prevalence of larger size classes. The General Smith Stand Sub-Unit is a 34 acre area in the upper North Fork Unit that contains individuals and small groups of old growth trees. This stand shall be protected as a High Conservation Value Forest as described in Section II under Items 14 and 32. Management in this stand shall protect the scattered residual

old growth trees, continue to foster the development of large diameter trees and desirable wildlife habitat attributes, and improve stand health and vigor.

The North Fork Unit will be the first unit harvested under this NTMP. Harvest operations in the majority of the North Fork Unit are planned for summer 2008, with the exception of a small area up the panhandle to the north that drains to the North Fork of Little Creek above the Upper North Fork monitoring station, shown as the Paired Watershed Study Out-Area on the Water Resources Map.

Several different yarding systems are proposed in the Little Creek watershed to be consistent with the varied terrain and timber. Helicopter and skyline yarding configurations are proposed for steeper areas while ground skidding is proposed for the balance of the unit. Some areas where deflection is possible, yet slopes are not prohibitively steep, are proposed for both tractor and cable or helicopter operations in order to leave the most appropriate option open. Although it is not desirable to set up yarding corridors and tractor yard from within the corridor's reach, particular topographic features may warrant a combination of methods. Tractor operations are desirable where feasible tractor ground and existing skid trails are present. Since these conditions exist and tractors are often the most economical yarding method, areas which have both appropriate ground-based access and deflection for cable yarding are proposed for both. Small pockets within the proposed cable/tractor ground may have sub-optimal deflection, yet appropriate ground access, therefore having the flexibility of both methods is desirable. There are 65 acres in the North Fork Unit that have both tractor and cable access, as delineated on the Yarding Methods Map at the end of Section II.

Springs, seeps and unstable areas occur in helicopter, cable, and tractor operating areas. Above the historic railroad grade, redwood is scattered amongst low-quality Douglas-fir. The combination of low timber value, low timber density and difficult terrain rules makes this a difficult portion of the unit to manage, which should only be entered on a long rotation. Some areas with conifer stocking have been omitted from the NTMP because they are deemed not commercially harvestable at the present time but were included in the overall assessment for timberland per the requirements of NTMP acreage.

Tranquility Flats Sub-unit

The Tranquility Flats Sub-Unit is approximately 11 acres in the North Fork Unit that has been managed to foster development of larger diameter trees and shall be managed accordingly in the future as prescribed in the Sustained Yield Analysis. This Sub-unit is in the best Site ground on the Ranch and estimated to have 48 MBF per acre of redwood and Douglas-fir with approximately 1 MBF growth per acre per year. The general cutting prescription will continue to transition more trees into the upper size classes predominantly maintaining the mean diameter of the stand. Silviculture is guided by the prescription laid out in Section III, Item 43(b), which shall comply with the single tree selection standards described above per 14 CCR 913.8(a).

General Smith Stand Sub-unit

This sub-unit includes the timber along the ridge, which divides the Little Creek and Berry Creek drainages, and a corner of the Unit extends to the Berry Creek channel. The unit contains a number of large old growth trees, including one for which the Unit is named. The old growth

trees in this unit will not be cut, but the surrounding second growth trees will be thinned from below. The area is delineated as Type II previously entered old growth and is considered a forest with High Conservation Value (HCV) status under Swanton Pacific Ranch's FSC Certification. Harvesting occurred in this stand in the early 1900s and again in the mid 1990s. Thinning from below to reduce competition and remove fuel ladders is proposed around the old growth trees. This management will essentially aim at highlighting the old growth trees by manipulating the second growth resource. However, equipment will stay on designated trails and remain away from the base of the old growth trees to prevent root damage and soil compaction. This sub-unit was last harvested in 1994. It is planned for harvest in the next harvest scheduled for the North Fork Unit. More information on the Smith Stand is provided in Section III under Item #34, Late Succession Forests (LSF) and portions of the Sustained Yield Analysis (SYA).

Road access to the ridge is not currently suitable for log trucks due to steep grade and tight switchbacks. The second growth does not have sufficient value at this time to warrant trying to upgrade the road significantly. A trail system from landing L20 reaches the ridge and continues on a narrow grade down the north-facing slope toward Berry Creek. This is an incredibly long skid distance, the cost of which may not be offset by the value of the timber being removed. Alternate options include bunching the skidded logs with ground-based equipment and moving them in bunches when a helicopter operation is underway. In this instance, logs would be flown to helicopter landing L23, approximately 0.8 miles from the ridgetop. Another alternative that could be viable with interested student involvement would be to set up an on-site mobile milling facility. Large trucks would not be necessary to move the finished product and the logs could be manufactured into firewood, fence-posts and Alaskan milled lumber before being transported down the hill.

South Fork Unit (Little Creek)

The South Fork Unit includes manageable timberland that drains to the South Fork of Little Creek. A selection harvest in conjunction with infrastructure development occurred here in 1989 and 1990. Due to the on-going paired watershed study, harvesting in the South Fork will commence only after the results of harvesting in the North Fork can be analyzed. This is forecast for roughly 2011.

Access to the South Fork Unit is from Swanton Road via the road up Archibald Creek, and across Winter Creek. This road was constructed in fall 1989.

Yarding in the South Fork Unit is a combination of skyline cable yarding from landing L23 and the south ridge access road, including tractor yarding from designated skid trails. Logs must be skidded on the road to the landing in some portions of this Unit. Like the North Fork Unit, select areas are designated for both ground-based and cable yarding. Conditions warranting the flexibility of both yarding methods include adequate deflection and feasible tractor ground with existing skid trails. A combination of methods will provide needed operational flexibility and yield the best results. 17 acres in the South Fork Unit that have both tractor and cable access, as delineated on the Yarding Methods Map at the end of Section II.

Satellite Stands Unit

The Ranch timberlands outside the Little Creek drainage are dominated by Douglas-fir and hardwood with non-native Monterey pine stock in several plantations and small pockets of redwood in more protected and moister sites. These areas were evaluated for their management potential under the NTMP based on current stocking levels, stand condition, and access. Parts of this Unit were harvested in 2004 under THP # 1-04-053 SCR. That harvest focused on removing some defect and improving spacing in areas affected by heavy cutting done in the late 1940's to early 1960's. Future harvests under the NTMP will build on the timber stand improvement by using selection silviculture, group selection harvests, timber stand improvement, and planting operations to continue establishing reasonably healthy stands with good stocking. Areas in the Satellite Stands, which have merchantable timber under current standards and a viable and economic route to access that timber, are included in the NTMP.

The areas previously planted with Monterey pine stock from New Zealand will be managed to phase-out the non-native stock. Some of this area is already interplanted with redwood and Douglas-fir seedlings and indicate that continued planting of these species will likely result in a stocked stand over time. As new opportunities for spot planting occur, more conifer seedlings may be planted. Release of established saplings from non-native pine or hardwood competition will also continue.

The individual areas that make up the Satellite Stands are broken up mainly by drainage and continuity of timber, and are crossed by multiple roads. These areas are primarily accessible with ground-based equipment which will re-use select portions of the existing infrastructure. Trails on the ridgelines are maintained for fire access purposes. Several sections of road and trail are partially located in the WLPZ, however these sections are stable and mitigations to minimize water quality impacts are proposed. Where redwood stocking is high enough to warrant a harvest in the future, and no other yarding method is feasible, a small portion of helicopter yarding is proposed. For management of the area along Winter Creek, the closest potential helicopter yarding landings are L1, L7 or L10.

A small area of skyline cable yarding is proposed for this same area as an alternative to helicopter operations. Portions of the stand have both ground-based and cable operations proposed for reasons discussed above, as shown on the Yarding Methods Map. These areas have been assessed to have both adequate deflection as well as suitable ground-based access and existing skid trails. Within the Satellite Stands Unit, there are 33 acres designated for both ground-based and skyline cable operations.

ITEM 21: IN-LIEU PRACTICES – GROUND BASED EQUIPMENT

Item 21 (a) Ground based equipment on unstable soils or slide areas

MITIGATION POINT MP2

EXPLANATION: This location is an existing skid trail previously used in the 2004 harvest that crosses an unstable area. No problems resulted from the use of this trail in the past using mitigations similar to those proposed in the NTMP. Mitigations include avoiding cutting into the toe of the slope while skidding. Following use, the skid trail shall be outsloped and tractor packed with slash.

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JUSTIFICATION: The option to skid logs across this unstable area is desirable in order to avoid the necessity to skid on Archibald Creek Road or utilize a landing in the WLPZ. The mitigations employed at this site in conjunction with the 2004 harvest left it in a stable condition with adequate drainage and slash coverage to mitigate erosion and instability. Use of this trail allows logs to be skidded directly to landing L1 on existing infrastructure. A small volume of logs will cross the site from the east end of the Archibald stand. The trail can be routed slightly around the toe of the slope to avoid undermining the slide mass. Installation of appropriate drainage, including outsliping, will negate concentration of water, thereby not overly-saturating the slope. Addition of slash mulch will aid in raindrop dissipation and runoff filtration, minimizing erosion potential. If this trail were not used, logs would be skidded directly to Archibald Creek Road to an existing landing in the WLPZ. This alternative has merit, although it would require buffer protection of the road surface and would create a through-cut where the trail meets the road, a difficult drainage situation to remedy. In addition, several residents live beyond this point up Archibald Creek Road and the road must remain open at all times. Due to the ability to appropriately drain this location following operations if used as a continuous skid trail, the mitigations proposed are deemed to meet or exceed the resource protection requirements of 14 CCR § 914.

TRANQUILITY FLATS

EXPLANATION: In the vicinity of Tranquility Flats, existing skid trails are located on unstable slopes of a deep seated landslide. The extent of the slide margins and their relative ages are shown on the Geologic and Landslide Maps in Sections II. Along the slide margins, tipped trees have been noted and significant cracks in the earth are present in several places above L21. Skidding equipment shall only operate on designated skid trails in this area. The LTO shall conduct operations with as little blade work as possible so as to minimize vegetation and soil disturbance. Prior to the winter period the trail shall be tractor packed with slash and waterbarred to a high erosion hazard rating spacing.

JUSTIFICATION: The NTMP proposes to use the existing skid trail network that was previously used in 1994 to harvest this area. No significant slide movement has resulted from the single tree selection harvest of that operation. The skid trail locations are limited to avoid many of the springs and seeps that originate at the margins of the slide mass. One crossing is proposed at S1 that crosses the watercourse near its origin and is relatively straight-forward to install and remove without lasting environmental effects. This crossing was also utilized in the previous harvest. The engineering geologic review for the NTMP states that it is unlikely that the proposed harvest will have any measurable impact on deep-seated stability and associated sediment delivery to the stream network for several reasons. First, the harvest will employ single tree selection retaining a substantial component of the total stand. Harvesting on slides shall incorporate single tree selection maintaining a minimum of 50% of the existing stand greater than 12-inch dbh except those incidentally damaged during harvest operations. Any changes in hydrologic balance due to reduced evapotranspiration is expected to be minor. Second, the proposed selection harvest is not expected to have a measurable impact on root strength, particularly in redwood and hardwood which dominate the site and which resprout vigorously after cutting. Moreover, any reduction in root strength will have negligible impact on a deep-seated landslide where the depth of failure extends well below the zone of root penetration. Third, there is no empirical evidence in the professional literature or from geologic

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reconnaissance of harvest plans in the Santa Cruz area to indicate that a partial harvest under selection silviculture (or equivalent) has significantly increased the risk of deep-seated slide movement.

Item 21 (f) Ground based equipment on slopes over 50% with a High Erosion Hazard Rating or slopes over 65%

EXPLANATION: Existing infrastructure has been proposed for use wherever possible in the NTMP area. Where existing infrastructure that provides valuable access is located on slopes over 50% and it can be re-used while maintaining a high standard of environmental protection, re-use has been proposed. The NTMP proposes to use five short sections of existing skid trail and one section of proposed skid trail on slopes greater than 50%, in order to minimize new construction. These trails shall be outsloped to the extent feasible and waterbarred at the best available locations as determined by the RPF, at a spacing equivalent to the high erosion hazard rating. The trail surfaces shall be covered with tractor packed slash or hand placed slash if tractor-packing is not feasible.

JUSTIFICATION: Utilization of existing infrastructure is desired where it meets the resource protection goals of the NTMP. The sections of trail covered by this in-lieu practice are in locations that can be treated to minimize erosion potential. Properly placed waterbars will negate future erosion on the skid trail. Slash packing of the skid trail will eliminate sheet erosion and the transport of sediment. The alternative to not using the trail would be to long-line a portion of the logs from above or below where there is access or propose an alternative yarding method. Where feasible, alternative yarding methods are proposed, such as the option to helicopter yard the panhandle north of the North Fork of Little Creek and therefore avoid the steep bypass trails. Cable yarding is a proposed alternative for areas in the NTMP where there is adequate deflection for a skyline yarder. These alternative yarding methods may be utilized if they mesh with overall operations. At several mitigation points, alternatives are not available or are not the most desired option due to impacts in other areas. The proposed treatments shall minimize any potential sediment input to a watercourse and shall not compromise other habitat values such as snags or LWD. With the proposed mitigation measures, the exception will provide equal to or greater protection than the standard rule.

ITEM 22: ALTERNATIVE EROSION CONTROLS

Erosion Controls on Recreation Trails

EXPLANATION: An alternative to slash-packing of skid trails, as proposed in general for this NTMP, is proposed where existing trails are also used as recreation trails, making up part of the extensive hiking and horse trail network of the Swanton area. Existing trails that are aligned with recreational trails shall be maintained as open trails following operations. The LTO shall not heavily slash pack these trails but shall apply alternative erosion controls as necessary that allow uninhibited hiker and horse passage. Alternative erosion controls shall include: decreasing the waterbar spacing, slightly outsloping, applying seed and/or straw mulch, or other treatments as appropriate. A map of the recreational trail network is included in Section V.

JUSTIFICATION: Recreation trails provide a valuable asset to the Ranch in terms of leisure value and access. These trails are in very good condition, many of them built by Bud and Emma

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McCrary with switchbacks to maintain the low gradient where the trails traverse along the contour across the hillside. The majority of the trails are only a few feet wide, slightly outsloped, and have low-profile drainage facilities so they require little winter maintenance. The NTMP layout could not entirely avoid these trails and therefore some sections of existing skid trail are on the alignment of recreation trails as well. Slash-packing is not acceptable on recreation trails as it encumbers horses and hikers. Therefore, the alternative erosion controls provide options for trail close-out that maintain the trail function and achieve environmental protection equal to or greater than the standard rule.

The intent of Santa Cruz County rule 14 CCR 926.19 is to eliminate erosion that might compromise the beneficial uses of water. The rule requires that skid trails, landings, and work areas shall be reseeded, mulched, or protected by compacting slash and debris. The alternative erosion control measures proposed for potential use on recreation trails will achieve the same objective. Increasing the number of waterbars or outsloping the trail (not options under 14 CCR 926.19), removes the water from the trail surface, thus eliminating scour and erosion potential. In the forested environment, leaf litter will be deposited on the trail surface in the first year thereby adding filtration. The proposed alternative applied on a site specific basis will achieve resource protection at least equal to the standards in 14 CCR 914 and 926.19.

ITEM 24: ROADS AND LANDINGS

Road Inventory Program (RIP)

Swanton Pacific Ranch is approximately 3,282 acres with approximately 8.4 miles of road to be utilized for implementation of this management plan. The roads are categorized as *permanent*, meaning paved or rocked and suitable for all-weather use, and *seasonal*, meaning unsurfaced native material, not driven with vehicles (except light tracking quads) during saturated periods of the winter. Approximately 2 miles of permanent road and 6.4 miles of seasonal road are proposed for use. The road network in its entirety is shown on the Operation Maps at the end of Section II. Locations requiring mitigation work in conjunction with NTMP operations are described in Section II under Item 25. All roads necessary for NTMP operations were analyzed for essential maintenance during plan preparation. The existing road system is in good condition and nearly complete for the proposed operations. As described under Item 25, a short spur (<200 feet) is proposed for construction across relatively flat ground to reach landing L16. In addition, a portion of the Winter Creek Road is proposed for reconstruction to improve the integrity of the

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road base and facilitate erosion control. This equates to approximately 0.2 miles of road proposed for reconstruction, as shown on the Operations Maps.

All other logging roads were established over a decade ago. Maintenance of these roads requires periodic inspection, monitoring and reporting by the landowner. The RIP provides the procedures for conducting and recording road inventories and determining the timing and action of appropriate treatments. The LTO shall conduct their inspections, fine-tuning and maintenance of erosion control structures in the pertinent management unit following operations, the RPF shall also inspect and oversee fixes. The Ranch staff shall be responsible for erosion control following director approval of the work completion report the rest of the erosion control maintenance period, and the duration of the Regional Water Board Waiver, and thereafter. While the operation is active, and through the first winter following operations, roads will be inspected a minimum of three times over each 12 month period following 2 inch rain events. In years 2-5, roads will be inspected at least twice per winter period, starting after the first 2 inch event.

When conducting road inventory, personnel will carry appropriate hand tools and maps. Handwork will be done on-site when possible to clear culvert inlets, inside ditches and waterbars and restore proper road drainage to limit sediment impacts on water quality. For each portion of road inventoried, a form will be filled out with observations about problems encountered, location, date, on-site solution applied, or proposed solutions. The information from the field form will be entered into a database, and photos will be catalogued for future retrieval. The database will include observations made during inspections, proposed treatments, prioritizations, and dates of completion.

If there is a need for immediate repair identified during road inspection and it cannot be accomplished at the time of inspection, the landowner will be notified and repair options discussed. If on-site conditions allow the use of heavy equipment, then such work will be performed as quickly as possible. Often, small road failures that do not constitute a risk to water quality or further road loss occur during winter months, that can be handled by hand or in the spring when conditions are drier. The RIP will be summarized to ensure all road issues have been identified and either repaired or scheduled for repair each year prior to November 15.

Weather data to trigger inventories will be based on rainfall collected at Swanton Pacific Ranch.

ITEM 26: WATERCOURSE AND LAKE PROTECTION ZONES

Pre-harvest Canopy Cover

Pre-harvest canopy cover was measured on either side of several Class II watercourses and in the inner and outer band of both side of the Class I watercourse in the North Fork Unit. Canopy cover was measured using a vertical sighting tube at 25-foot intervals along transects running parallel to the watercourse. The results of the Canopy Study are as follows:

North Fork Little Creek (Class I)

East Bank: Inner band: 79% canopy
Outer band: 85% canopy

West Bank: Inner band: 83% canopy
Outer band: 80% canopy

Class II Tributaries to the North Fork of Little Creek

Class II wet area with Causeway: 93% canopy

Class II with R12: 77% canopy

Class II with R14 and 2 flumes: 86% canopy

Class III with R15: 72% canopy

Class II with R16: 72% canopy

Class II wet area with R17: 80% canopy

ITEM 27: IN-LIEU PRACTICES - WATERCOURSES

Item 27(a), (f): In-Lieu Use of Roads as Skid Trails in the WLPZ

EXPLANATION: Portions of the two existing haul roads are in the ELZ/WLPZ of Little Creek and Archibald Creek. They shall be used to skid logs and for the movement of heavy equipment. Following operations or prior to the start of the winter period, the roads shall be treated to prevent waterborne transport of sediment and concentration of runoff as a result of timber operations as stated specifically under Section II Item 27, or per the specifications set forth in Section II, Item 18.

LITTLE CREEK HAUL ROAD

Mitigation Point MP20: The main haul road along the mainstem and North Fork of Little Creek is located in the WLPZ for several segments where the road is within 150 feet of the watercourse on steep slopes. Sections of this road may be skidded on to bring logs from above and below the road to nearby landings. The LTO will also occasionally run the log loader from landing to landing and the road will be used for hauling. Prior to the winter period following completion of operations, the haul road along this section shall be treated as described under Item 18 of the NTMP, "Discussion of Little Creek Haul Road Upgrade and Maintenance."

ARCHIBALD CREEK HAUL ROAD

Mitigation Point MP21: The existing road up Archibald Creek has portions located in the ELZ and WLPZ. Archibald Creek is a Class III in the lower stretch due to extremely permeable substrate, changing to a Class II above crossing R1. Operations will be limited to minor skidding around landing L1 and hauling from L1 to Swanton Road. The road is very flat and is routinely used for farm operations and residential access. Following past operations in 2004, the road berm was broken in some sections to drain the road north toward the watercourse and ¾" drain rock was applied to the road in the WLPZ and the watercourse approaches. The drainage structures will be accentuated following future harvests and rock may be re-applied as necessary to maintain a stable operating surface.

JUSTIFICATION FOR EACH OF THE TWO LOCATIONS: Use of the existing roads to skid logs will minimize the construction of additional skid trails outside of the WLPZ on steeper ground. The road surfaces shall be treated at the end of operations by applying additional rock, or straw mulching and seeding the surface, as specified for each road section individually. The surface treatment combined with the well-vegetated filter strips between the roads and watercourse edge will prevent soil movement following the completion of operations. Minimizing the construction of additional skid trails and treatment of the road surface following operations will provide protection equal to the standard rule.

Protections afforded by the standard rule will be maintained under this proposed in-lieu practice because no impacts will occur to affect water temperature, large woody debris, upslope stability,

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bank and channel stabilization, and spawning and rearing habitats for salmonids. Further, filtration of organic and inorganic material and vegetation structure diversity for wildlife habitat will be left intact because this infrastructure is existing. A primary objective of the layout for this NTMP was to use existing infrastructure wherever possible. This ground has been successfully used as a road and skid trail by current and previous landowners. No part of this proposed in-lieu practice should create an opportunity for the timber operator to place, discharge, or dispose of, or deposit in such a manner as to permit to pass into the water of this state, any substances or materials, including, but not limited to, soil, silt, bark, slash, sawdust, or petroleum, in quantities deleterious to fish, wildlife, or the quality and beneficial uses of water, because operations will stay on existing infrastructure in the WLPZ and following operations, the road will be have drainage structures installed.

If these roads were to go unused, consideration would then have to be given to longer, steeper skidding distances, or construction or use of an additional section of unnecessary road or skid trail. This would surely have a greater potential for ground disturbance than the current proposal.

Although originally proposed, the portion of Winter Creek Road upslope of the pond will not be reconstructed for use as a haul route. The non-native Monterey pine trees planted along the outboard edge of the existing grade may be felled downhill and the stumps retained to limit sediment delivery to Winter Creek; however, no equipment work will be undertaken in connection with harvest operations to keep this road open (see MP3).

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Item 27(a), (f): In-Lieu Use of Existing Landings in the WLPZ/ELZ (L18, L21/MP16) and Item 24 (i) Landing proposed in an area of unstable soils (L21/MP16)

EXPLANATION: The in-lieu practice identified in Section II, Item 24(i) and Item 27(a,f) proposes to use two existing landings (L18 and L21) within the boundaries of a Class I, II, or III WLPZ or ELZ. Landing L21/MP16 is in an area of unstable soils.

Landing L18: Landing L18 is an existing landing within the Class I WLPZ of Little Creek as well as the Class II WLPZ for the watercourse crossed by R8. This landing is located on an existing flat, wide, cleared area at a fork in the road and was rocked following the 2003-04 harvest. Prior to landing use, the surface drain rock shall be scraped aside. Prior to the winter period following operations:

1. The landing shall be positively drained.
2. Rock initially removed from the surface shall be re-spread.
3. An additional layer of drain rock shall be placed if necessary to achieve an approximate depth of 2 inches.

Landing L21: Landing L21 is partially in the WLPZ of a Class II watercourse. The landing is approximately 20' from the Class II watercourse, below the crossing, with several redwoods and a vegetated filter strip in between. The south side of the landing has settled approximately 2 feet due to large-scale geologic movement in the area. This location has been reviewed by the project CEG and is discussed in the Focused Engineering Geologic Report which is located in Section V. The following mitigations shall be implemented while opening the landing, during and following use:

1. The LTO shall grade over the scarps.
2. No soil or debris shall be pushed past the landing edge.
3. If necessary, to prevent material from nearing the watercourse, a barricade or silt fence shall be constructed on the landing edge closest to the watercourse.
4. Refueling may occur at this landing, at least 60 feet from the watercourse transition line.
5. The landing will be shaped to drain by outslipping.
6. Prior to the winter period following operations soil stabilization shall be implemented as described under Section II, Item 18.

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JUSTIFICATION: Protections afforded by the standard rule will be maintained under this proposed in-lieu practice because no impacts will occur to affect water temperature, large woody debris, upslope stability, bank and channel stabilization, or spawning and rearing habitats for salmonids. Filtration of runoff shall be maintained as the vegetated filter strip between the edge of either landing and the watercourse shall not be disturbed by harvest operations. Precautions will be taken to ensure that deleterious materials such as soil, silt, slash, bark, or petroleum do not enter the watercourse. If necessary to accomplish this, a barricade or silt fence shall be constructed on the landing edge closest to the watercourse. In addition, as a precaution, if refueling is to occur at this landing, it must be at least 50 feet from the watercourse transition line.

The use of existing infrastructure shall alleviate the necessity to construct another landing in productive ground outside of the WLPZ. The surfaces of landings L18 and L21 are already flat and wide enough for landing use as they were both used for previous harvest operations (L18 - Lower Little Creek THP #1-04-053 SCR, and L21 North Fork THP #1-94-071. The alignment of the San Vicente Lumber Company railroad was next to landing L18 and both areas have been wide turnouts since the improved road up the North Fork was reconstructed in 1989. Only minor grading will be necessary to use either landing. Prior to use of landing L18, the LTO will have to move surface drain rock to a storage location for replacement after harvest operations, if possible. Prior to the use of landing L21, the LTO will have to grade over the scarp in the landing.

This practice will cause no impacts to degrade the beneficial uses of water. Landing surface treatment prior to the winter period will lock-up the landing surface and filter fine sediment. Landing drainage shall be directed to drain onto stable soil configurations. Relocation of the landing out of the WLPZ would likely cause more environmental harm and disturbance. New areas of complex vegetation would be disturbed and an additional area would have to be graded. Skidding distance for a majority of the trees would likely be increased, depending on the landing location. This in-lieu practice as proposed maintains the beneficial uses of water and provides protection equal to the standard rule.

ADDITIONAL JUSTIFICATION FOR L21: This is an existing landing located on a large-scale deep-seated rotational/translational landslide complex. The crack in the landing surface is evidence of recent incipient movement of the deep-seated landslide. The crack is not associated with failure of the road fill and trees adjacent to the landing are not tipped as a result. This landing was utilized for harvest operations in the 1994 harvest of THP 1-94-071 SCR. No evidence of increased slide movement resulted from that harvest and the slide is expected to continue to settle slowly. Precautionary measures are proposed to keep landing debris and sediment from entering the adjacent Class II WLPZ. Opening this landing will require only minor surface grading, which is far superior to the alternatives, either attempting to create a new landing location or skidding on the road for almost 200 feet to the next existing landing, L21. Re-use of this landing for future harvests under the NTMP are not expected to exacerbate slide movement or cause any significant adverse environmental impacts.

Use of Existing Skid Trails in the WLPZ/ELZ (MP5, MP17, MP19)

EXPLANATION: The in-lieu practice identified in Section II, Item #27 proposes to use several existing segments of skid trail within the boundaries of a Class II, or III WLPZ or ELZ.

Mitigation Point MP5: At this location a skid trail enters a Class II WLPZ for approximately 160' and also touches the Class I WLPZ of Little Creek. The skid trail is existing infrastructure, used as an access road to reach the bridge over Little Creek. The section of skid trail in the WLPZ is on a switchback in the road and will be drained to a stable surface above and below the bend. A spring in the WLPZ comes within 25' of the road edge and shall be protected. Following operations the trail surface shall be seeded and/or straw mulched for soil stabilization.

Mitigation Point MP17: At this location a wet area above and east of the skid trail seeps onto the inside edge of the skid trail where *Carex* and *Woodwardia* (wet area species) are growing. This trail is an access route to the General Smith Stand that is too steep with tight switchbacks for truck traffic. The flagged skid trail bypasses the tightest switchbacks by going straight upslope. At MP17, the trail stays away from the wet area, by avoiding the switchback closest to the seep. The trail is currently drained with a functioning rolling dip and is in good condition. The flagged trail shall be used as is and prior to the winter period following operations, the following mitigations shall be implemented:

1. The main trail shall be dipped out to drain away from the switchback following use.
2. The main trails shall be seeded and/or straw mulched as necessary to mitigate erosion.
3. The switchback by-pass shall be covered with tractor crushed or hand placed slash to discourage use.

Mitigation Point MP19: At this location an existing skid trail is located within 10 feet of a seep that forms a Class III watercourse below. Above the seep there is approximately 30 feet of channel that does not show signs of recent sediment movement. The following mitigations shall be implemented for operations:

1. Brow logs shall be placed on the skid trail edge if necessary to prevent sediment movement into the channel.
2. Prior to the winter period following operations the skid trail shall be treated as specified in Soil Stabilization under Section II, Item 18.

JUSTIFICATION: This in-lieu practice, identified in Section II, Item #27(a) proposes to use several segments of existing skid trail within the boundaries of the Class I, II or III WLPZ or ELZ. At MP5 and MP17, the mitigation points are on designated skid trails that are actually on existing access roads. The road at MP5 is a seasonal road with tight switchbacks that crosses Little Creek at crossing R6. MP5 was used for operations under the Lower Little Creek THP #1-04-053 SCR. The skid trail is approximately 20 feet from the Class II watercourse and 100 feet from the Class I watercourse at its closest point. Currently the skid trail is in good condition and shows no signs of sediment transport to a watercourse.

The road at MP17 is a narrow light-tracking vehicle road with tight switchbacks that climbs the ridge to the General Smith tree. MP 17 was used for operations under the North Fork THP #1-94-071. The skid trail is within 20 feet of the edge of a flagged wet area with hygric plants. The integrity of the wet area will be maintained by proposed operations because the proposed skid

trail alignment will avoid the area. The trail is in good condition and has functioning erosion controls in place.

Protections afforded by the standard rule will be maintained under this proposed in-lieu practice because no impacts will occur to affect water temperature, large woody debris, upslope stability, bank and channel stabilization, or spawning and rearing habitats for salmonids. Filtration of runoff shall be maintained as the vegetated filter strip between the edge of the skid trail and the watercourse or wet area shall not be disturbed by harvest operations. The use of existing infrastructure shall alleviate the necessity to construct other skid trails in different locations. A primary objective of the layout for this NTMP was to use existing infrastructure wherever possible to avoid additional skid trail construction on less favorable ground. These locations have been used successfully as skid trails in the past without lasting damage to the environment. The waterbars and dips that will be installed following use will be improvements on those currently present and surface integrity will be maintained by soil stabilizing surface treatments. This in-lieu practice as proposed maintains the beneficial uses of water and provides protection equal to or greater than standard rule.

Items #27 (c): Directional felling of trees within the WLPZ parallel to or toward the watercourse or lake where added protection is afforded by the alternative practice

EXPLANATION: Rule 14 CCR 916.3(e) states: “Trees cut within the WLPZ shall be felled away from the watercourse by pulling or other mechanical methods if necessary, in order to protect the residual vegetation in the WLPZ. Exceptions may be proposed in the THP and used when approved by the Director.” The proposed in-lieu practice is as follows: Trees may be felled in any direction within a Class II WLPZ or Class III ELZ, including parallel to or toward a watercourse, when doing so will improve the safety of operations or better protect residual vegetation and the beneficial uses of water within the watercourse, as compared to the standard rule. Timber fallers shall minimize canopy reduction in the WLPZ by preserving hardwoods whenever possible. Cross falling of Class II watercourses will be allowed only in the general logging season in order to minimize reduction in canopy or for concerns of safety. Cross falling of Class III watercourses will be allowed in the winter period in order to minimize reduction in canopy or for concerns of safety. If a cross felled tree inadvertently lands in the watercourse it shall be brought to the attention of the RPF and based on a determination of whether the watercourse is lacking in large woody debris (LWD), the tree may be left. If the watercourse is not lacking in LWD, the tree shall be yarded appropriately and if the presence of the wood could potentially negatively impede the flow of water, that section of wood shall be bucked out immediately by hand. Trees will not be felled into, or across a watercourse where negative impacts to the beneficial uses of water are anticipated. No sediment shall be discharged as a result of cross-falling. If a significant sediment discharge occurs, forensic monitoring and reporting shall be conducted.

JUSTIFICATION: The RPF reserves the right to direct the LTO to fall trees in any direction within a WLPZ or ELZ, including parallel to or toward a watercourse, when doing so will better protect residual vegetation and the beneficial uses of water within the watercourse as compared to the standard rule. This practice is proposed to allow the LTO to fall trees in the best available lay, with respect to topography, vegetation, yarding method and safety concerns. The flexibility this in-lieu practice affords will allow the LTO to save as much residual vegetation as possible

and facilitate yarding that will ultimately minimize impact. Trees to be felled parallel to or toward a watercourse may not be identified on the ground in a manner any different from that used to mark other trees for harvest so that the faller may use their professional judgment. Trees will not be felled into, or across a watercourse where negative impacts to the beneficial uses of water are anticipated.

This practice could be of particular use in situations where yarding trees felled directionally away from watercourses would require significant rotation of logs in the horizontal plane, resulting in unnecessary ground disturbance. Where truck road and tractor road infrastructure is conducive, trees felled parallel to watercourses may be yarded straight to roads, with little or no rotation necessary and less ground disturbance than under the standard rule. Also, the proposed in-lieu practice may result in better protection of residual canopy as it will allow the timber faller to assess which falling direction will minimize impacts to surrounding trees.

The proposed in-lieu practice differs from the standard rule in that the standard rule requires trees in the WLPZ to be felled directly away from the watercourse, while the proposed practice would allow falling trees within the WLPZ in any direction. Watercourse protection will not be diminished, as trees will still be prevented from being felled into or across a watercourse in potentially deleterious situations. This practice is not proposed for the Class I watercourses in the NTMP area. These include the North Fork, South Fork, and mainstem of Little Creek, where steeper slopes make cross-falling a potentially more risky proposition. In addition, cross-falling is not proposed in the winter period for Class II watercourses in the NTMP area.

Protections afforded by the standard rule will be maintained under this proposed in-lieu practice because no impacts will occur to affect water temperature, large woody debris, upslope stability, bank and channel stabilization, and spawning and rearing habitats for salmonids. This practice will actually have a positive effect on the above watercourse attributes. Should a tree unintentionally wind up in the watercourse, it shall be assessed for its potential as beneficial large woody debris recruitment. Further, filtration of organic and inorganic material and vegetation structure diversity for wildlife habitat will be left intact because of the intent of this in-lieu practice. The intent of this in-lieu practice is to preserve residual vegetation in the WLPZ and avoid the ground disturbance and/or understory vegetation disruption that results from falling damage or rotating a log on the ground in order to skid it to a haul road or skid trail.

No part of this proposed in-lieu practice should create an opportunity for the timber operator to place, discharge, or dispose of, or deposit in such a manner as to permit to pass into the water of this state, any substances or materials, including, but not limited to, soil, silt, bark, slash, sawdust, or petroleum, in quantities deleterious to fish, wildlife, or the quality and beneficial uses of water. Per 14 CCR 916.3(b), any accidental depositions of soil or other debris in lakes or below the watercourse or lake transition line in water classed I, II, and IV shall be removed immediately following deposition, or as soon as feasible. 14 CCR 916.4(b)(6) requires that within the WLPZ, at least 75% surface cover and undisturbed area shall be retained to act as a filter strip for raindrop energy dissipation, and for wildlife habitat. This objective will provide protection equal to or greater than the standard rule.

ITEM 32: BIOLOGICAL RESOURCES

The scoping and biological resources assessment for the NTMP was conducted in consultation with professional biologist John Bulger (animals) and professional botanist Grey Hayes (plants).

Scoping

The biological resources scoping process for the NTMP was intended to identify all species and habitats that could potentially be impacted by the project. As a first step, the California Natural Diversity Database (NDDDB) and the California Wildlife Habitat Relationship database (CWHR) were queried for sensitive species that might occur on or within 5 miles of the proposed NTMP area. A map and table to show the distribution of recorded animal and plant occurrences from the NDDDB query are provided in NTMP Section V. A list of potential species from the CWHR query, as well as the search parameters set for that query is provided in NTMP Section V. The list of Threatened, Endangered or Animals of Special Concern in Santa Cruz County from the Santa Cruz County General Plan was also consulted and is in Section V.

For potential animal species, this initial list was then refined based on an assessment of habitats present in the NTMP area by biologist John Bulger and by consulting additional resources, identified below. Mr. Bulger is a vertebrate ecologist with 10 years of professional experience in the Scotts Creek watershed. A final determination regarding which species to address in this plan was then made based on the known geographic distribution of the particular listed taxon, its habitat affinities, and results of previously conducted field work in the Scotts Creek watershed. Species that were rejected from the initial CWHR query are listed at the end of this discussion of biological resources.

A list of rare plant species with potential to occur within the project area was compiled by reviewing NDDDB occurrences within 5 miles of the project area, papers on botanical research conducted at Swanton Pacific Ranch, and results of past rare plant surveys from the area. The Swanton area has great diversity in plant species as well as a high incidence of rare plants recorded on the NDDDB. The NDDDB database was queried in March 2006 and all recorded element occurrences of state or federally listed species and any species found on the California Native Plant Society (CNPS) list were reviewed. 26 plant species have records within the 5 mile radius. Although the NDDDB is a positive find database only, it is a helpful means of determining the types of habitats and potential species to look for in the project area. For potential plant species the initial list was then reviewed for presence of suitable habitat within the NTMP area. Botanical research and past surveys conducted on the Ranch were consulted to determine the locations of known rare plant populations. Past THPs were reviewed for mitigation measures that have been implemented to protect those populations in the past. Books on species distribution, ecology, and taxonomy were utilized to describe each species and determine whether suitable habitat could be considered present.

The harvest areas and surrounding infrastructure were surveyed by local botanical consultant, Grey Hayes, during the blooming periods of 2006 and 2007. Dr. Hayes has done plant surveys for Swanton Pacific Ranch several times in the past and has an on-going study on the Range of the effects of grazing on coastal meadow plant diversity, which was begun in 1999. The survey for this NTMP focused in particular on rare plant species with potentially suitable habitat

present, and especially on any infrastructure located in those areas. The survey report is included in Section V of the NTMP. Surveying included visitation of areas previously identified as having rare plant populations, to assess the current status of those populations. The majority of the road, landing and skid trails locations had been previously flagged, therefore, potential impacts to plant communities could be assessed on-site. The RPF accompanied Dr. Hayes on several occasions to review sensitive areas and develop mitigation measures to adequately protect the species present. These mitigation measures have been incorporated in Section II of the NTMP.

To assist in accurate identification of biologically rich and potentially sensitive areas, a GIS map depicting the various vegetation types on the Ranch was prepared. The Botanical Conservation Map at the end of Section II is based on this map. The stand types delineated for this NTMP are described in Section III under Item 41. Refer to the CFI Plot Locations and Stand Types Map at the end of Section II. Maps with locations of Occupied California Red Legged Frog Habitat, Potentially Suitable Marbled Murrelet Habitat and Natural Barriers to Upstream Migration of Anadromous Fish are included in Section V.

Other useful tools used in scoping for rare plant and animal species are listed below. In combination, these lists and guides help identify what species look like and where they might be found. Of particular botanical relevance locally, is a paper documenting the array of plant species encountered on a traverse of Swanton Road. With only minor detours from the road, this journey intercepts about 800 distinct species, roughly 55% of the species found in Santa Cruz County (West, 2005).

Resources Used in the Scoping Process

1. CDFG Natural Diversity Database and related digital overlay maps dated December 2005. The NDDDB queried species and habitat types within five miles of the NTMP area.
2. The California Wildlife Habitat Relationships System (version 8.0). The CWHHR queried species based on county, habitat elements, and listed species. The species list was further revised using expert knowledge and additional resources cited below.
3. The CDFG list of "*Special Animals*", February 2006 version. This list, maintained in conjunction with the NDDDB, contains the most accurate and up to date information on the status of animals listed by State and Federal entities.
4. The Santa Cruz Mountains Bioregional Council's list *Sensitive Fauna of the Santa Cruz Mountains Bioregion*, available at www.scmb.net/speciesatrisk-04.htm.
5. Federal recovery plans for species listed as threatened or endangered under the U.S. Endangered Species Act (ESA).
6. Individual species distribution and life history materials available on the CDFG and USFWS websites.
7. California's Wildlife Volume I and II Amphibians and Reptiles and Birds. From the Department of Fish and Game.
8. National Audubon Society Field Guide to North American Reptiles and Amphibians. Behler and King. 1996.
9. A field guide to western reptiles and amphibians. Third edition. Houghton Mifflin Company, New York, New York. 533 pp. Stebbins, R.C. 2003.

10. Handbook of frogs and toads of the United States and Canada. Third Edition. Comstock Publishing Company, Ithaca, New York. xii+640 pp. Wright, A.H. and A.A. Wright. 1949.
11. Barry, S., H. Shaffer. 1994. The status of the California tiger salamander (*Ambystoma californiense*) at Lagunita: a 50 year update. *Journal of Herpetology*, 28(2): 159-164.
12. Interim Guidelines for Assessing California Red-legged Frog Presence and the Likelihood of Take of Red-legged Frogs During Timber Harvest Plan Activities Approved by the California Department of Forestry. U.S. Fish and Wildlife Service. Sacramento, CA. 1996.
13. Distribution and Abundance of Juvenile Coho and Steelhead in Gazos, Waddell, and Scott Creeks in 2001. Jerry J. Smith. December 31, 2001.
14. Baseline Instream and Watershed Assessment: Scott Creek, Santa Cruz County, California. Prepared for Big Creek Lumber Company. By John Bulger. September 1998.
15. Coho Salmon and Steelhead Habitat and Population Surveys of Scott Creek, Santa Cruz County, 1993. Prepared for California Department of Fish and Game. By Jennifer Nelson. June 1, 1994.
16. The Birder's Handbook: A Field Guide to the Natural History of North American Birds. Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. Simon & Schuster, New York.
17. The Birds of North America. Edited by A. Poole and F. Gill. Philadelphia: The Academy of Natural Sciences, Philadelphia, and the American Ornithologists' Union, Washington, D.C.
18. Checklist of the birds of Santa Cruz County. Prepared by D.L. Suddjian, December 31, 2005.
19. Environmental documents prepared for nearby projects that have occurred within the Scotts Creek watershed. These include:
 - Scott Creek Timber Harvest Plan THP No. 1-02-101 SCR (Big Creek Lumber Company)
 - Little Creek Timber Harvest Plan THP No. 1-04-053 SCR (Cal Poly State University, Swanton Pacific Ranch)
 - Documents associated with the Queseria Creek Restoration Project (Cal Polytechnic State University, Swanton Pacific Ranch)
20. Flora of the Santa Cruz Mountains of California: A Manual of the Vascular Plants. By John Hunter Thomas. Stanford University Press. 1961.
21. Plants of the Coast Redwood Region. Text by Kathleen Lyons and Mary Beth Cooney-Lazaneo, photography by Howard King. Shoreline Press. 2003.
22. Visual Guide to Native and Naturalized Coastal County Plants From Santa Cruz to Mendocino. By George L. Pikkarainen. Pikkdata. 2002.
23. The Jepson Manual: Higher Plants of California. James C. Hickman (Editor). University of California Press. 1993.
24. The Rare and Endangered Plants of San Mateo and Santa Clara County. Toni Corelli and Zoe Chandik. 1995
25. The Cal Flora website was used to identify habitat types where plant species of concern, state listed, or federally listed might be located. The website address is <http://www.calflora.org/>.

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26. The California Native Plant Society website was used to assist in identification of habitat types where plant species of concern, state listed, or federally listed might be located. The website address is <http://cnps.org/>.
27. West, James A., Traversing Swanton Road, circa 2005.
28. An Annotated Checklist of Vascular Plants of Santa Cruz County, California. By Randall Morgan, et al. 2005.
29. Other more specialized references, cited as appropriate in the text.

FISH

Coho Salmon (*Oncorhynchus kisutch*)

Central California Coast ESU coho salmon are listed as threatened under the federal ESA and endangered under the California ESA. In the greater Scotts Creek watershed, approximately 14.1 miles of stream are accessible to salmonids, see Map 1. The size of the coho spawning run in the Scotts Creek system varies from year to year, but is never more than a few hundred fish. Statistically reliable population estimates are not available for this population (www.scottscreekwatershed.org). Coho salmon numbers in the Scotts Creek system are augmented by releases from the Kingfisher Flat hatching and rearing facility located on Big Creek. This facility is operated by the Monterey Bay Salmon and Trout Project (www.mbstp.org).

Within the vicinity of the NTMP, coho salmon occupy the Scotts Creek mainstem, and the lower reaches of Mill Creek, Big Creek, Little Creek, and Queseria Creek, which are tributary to Scotts Creek. Coho salmon use the Scotts Creek tributaries up to natural migration barriers, shown on the map in Section V. Salmonids are particularly likely to use the tributaries as refugia during winter storm events. The NTMP area contains both designated (64 FR 24049) and proposed (69 FR 71880) critical habitat for Central California Coast ESU coho salmon. Critical habitat includes all naturally accessible stream channels to the ordinary high water mark.

Coho spawning usually occurs during December and January in the Scotts Creek watershed, and the embryos hatch after 2-3 months of incubation in the stream gravels. Hatchlings remain in the gravel until their yolk sacs have absorbed, typically within 10 weeks of hatching. The emerging fry form schools and inhabit shallow water at the stream margins or elsewhere. As they mature, the parr establish territories in pools, requiring deeper water in low gradient stream sections (<3%) as they grow larger. Optimal rearing habitat is considered to consist of heavily shaded, deep (>1 m) pools with some overhead cover. At between 14-18 months of age, the parr undergo smoltification in preparation for outmigration and life at sea. Outmigration occurs during late spring and early summer. Mitigations for coho salmon and steelhead are outlined jointly below.

Steelhead (*Oncorhynchus mykiss*)

Central California Coast ESU steelhead are listed as federally threatened and are a State Species of Special Concern. Steelhead spawning runs comprise a few hundred adult fish annually in Scotts Creek, and the population appears to be comparatively stable and at or near carrying capacity for this system (www.scottscreekwatershed.org).

Within the NTMP area steelhead occupy the mainstem of Little Creek to a natural rock fall that is considered a likely barrier to migration, located approximately 500 feet upstream of crossing R6. Refer to the Natural Barriers to Anadromous Fish Map in Section V. Upstream of this fish barrier, a resident population of rainbow trout can be found. The furthest upstream extent of rainbow trout found during electro-fishing in 2006 is also shown on the map indicated above. The NTMP area contains both designated (65 FR 7764) and proposed (70 FR 52488) critical habitat for the Central California Coast steelhead ESU. Critical habitat within the NTMP area includes all naturally accessible stream channels to the ordinary high water mark.

In the Scotts Creek system, the bulk of the upstream steelhead migration and spawning occurs from January through March or April. Time to hatching is about 30 days. The fry generally emerge from the gravel 4 to 6 weeks after hatching and move to shallow water where there is suitable cover at the stream margins. As parr grow, feeding stations are established, most frequently in riffles or deeper runs, and occasionally in pools. Estuaries at the mouths of coastal streams are particularly important rearing areas for larger juveniles. Steelhead remain in their natal stream for 1 to 7 years prior to migrating out to sea.

Coho Salmon and Steelhead Mitigations:

To avoid incidental take of coho salmon and steelhead, the following mitigations are proposed.

1. Canopy retention standards as discussed under Item #26 of the NTMP.
2. Limitations on use of heavy equipment in the WLPZ as discussed under Item #26 of the NTMP.
3. Treatment of roads, skid trails, and landings near watercourses as discussed under Item #27 of the NTMP.
4. Soil stabilization as discussed under Item #18 of the NTMP.
5. Winter operating restrictions as discussed under Item #23 of the NTMP.

Tidewater Goby (*Eucyclogobius newberryi*)

The tidewater goby is a federally endangered species and a CDFG Species of Special Concern. The species is endemic to California. At all life stages it inhabits shallow, brackish-water habitats, including coastal lagoons, estuaries and marshes. The species reproduces year-round, although the peak spawning time often occurs during spring or summer. Sandy substrates are preferred for breeding. The Scotts Creek tidewater goby population varies widely in size over time and is susceptible to being decimated or extirpated as a result of high floods or droughts. Although habitat for this population is largely confined to the estuarine lagoon near the creek mouth, gobies have been found as far upstream as Queseria Creek. Mitigations proposed for anadromous salmonids should suffice to avoid take of tidewater gobies or their habitat, all of which is located downstream from proposed harvest areas.

North Central Coast Stream

Scotts Creek possibly has additional native fish species present including: Pacific lamprey (*Lampetra tridentata*), Sacramento sucker (*Catostomus occidentalis*), California roach (*Hesperoleucus symmetricus*), Speckled dace (*Rhinichthys osculus*), Threespine stickleback (*Gasterosteus aculeatus*), and Sculpin spp. (*Cottus spp.*) These small fish, if present, are threatened mainly by exotic fish species and dewatering of the stream due to water diversions.

Habitat for these species is not present on the project area and proposed operation will not have a negative impact on downstream habitat.

AMPHIBIANS

California Tiger Salamander (*Ambystoma californiense*)

The California tiger salamander is a federally threatened species and a CDFG Species of Special Concern. This salamander breeds in primarily in vernal (seasonal) pools and small, fishless ponds in grassland habitats. Adults are fossorial for most of the year, inhabiting burrows of ground squirrels and pocket gophers and emerge in winter of wetter years to breed (mostly in a single breeding attempt). The aquatic larvae complete metamorphosis in 10 weeks and juvenile salamanders migrate to subterranean refugia where they remain until they reach sexual maturity. The species does not occur in the vicinity of the NTMP area, although potentially suitable habitat is present. Coastal populations have been documented from the vicinity of Watsonville in Santa Cruz County, southward to Santa Barbara County. Most existing populations are likely isolated from one another. These salamanders migrate 0.5 miles or more; however, dispersal is limited by physical barriers such as roads, railways, pipelines, and canals. The habitat is fragmented and it is unlikely that the species will occupy the NTMP vicinity in future. The proposed harvest will not significantly alter the ponds or upland habitat available. Timber harvest operations are not anticipated to affect this species.

Santa Cruz Black Salamander (*Aneides flavipunctatus*)

The black salamander is thought to be scarce in the Santa Cruz Mountains and has no official listing status. It is a lungless salamander that lays its eggs in moist habitats on land in summer. They are most often found under rocks and logs in relatively moist habitats (riparian woodlands, mixed evergreen and conifer forests). Selection silviculture will maintain large woody debris recruitment, no large woody debris will be removed as part of the proposed timber harvest and available habitat will remain.

Western Spadefoot (*Spea hammondi*)

The western spadefoot is a CDFG Species of Special Concern. Spadefoot toads breed in vernal pools and quiet sections of streams. In the Coast Ranges, their preferred habitat is grassland or areas of very open vegetation. Larva of this species were reported by Norm Scott to have been recently found at Swanton. Although potentially suitable habitat is present within the NTMP area, this species will not be affected by harvest operations due to the protection afforded to wet areas and streams as well as the diverse conditions maintained in upland habitat.

California Red-Legged Frog (*Rana aurora draytonii*)

The California red-legged frog is a federally threatened species and a CDFG Species of Special Concern. Breeding habitats include natural and artificial ponds and reservoirs, deepwater marshes, and freshwater coastal lagoons. Streams in the Santa Cruz Mountains are not used for breeding, presumably because spawning and early larval development occur coincident with the timing of peak flows. Spawning occurs from January through March. Eggs hatch within two weeks after oviposition, and larvae metamorphose four to seven months after hatching. Adults feed on aquatic and terrestrial invertebrates and small vertebrates. Tadpoles graze on algae.

California red-legged frogs and their habitats are ubiquitous in the general vicinity of the NTMP area, see the California Red-legged Frog Distribution Map. Virtually all ponds and reservoirs in the area are occupied by red-legged frogs, and most support breeding.¹ Scotts Creek and some of its tributaries are also occupied by red-legged frogs. In these streams, red-legged frogs are almost exclusively associated with deep (>2 feet) pools. Red-legged frog presence has been documented in Scotts Creek from the estuary upstream continuously for at least 5 miles. A large proportion of the frogs inhabiting the streams are juveniles that disperse to the creek after metamorphosing at breeding ponds. Whereas most juveniles are likely to be year-round residents of the creek and adjacent riparian habitats, adult red-legged frogs use the streams principally as summer habitat, and then move upslope to breeding ponds for the winter. No breeding has been documented on any of the local streams.

Although this species is highly dependent on aquatic habitats, it is able to reside in both riparian and upland habitats when precipitation and ambient moisture conditions allow. During the dry summer months, red-legged frogs rarely are found more than 10 feet from water. With the onset of winter rains (October/November), most red-legged frogs move into terrestrial habitats adjacent to their aquatic home site, where they reside nearly continuously at distances of up to 300 feet from water until breeding activities commence.² Some adults reside at breeding sites the year around, while others disperse to and from breeding sites, residing at streams or other permanent aquatic habitats during the summer months. California red-legged frogs have been documented migrating overland between aquatic sites that are separated by distances as great as two miles. These overland movements occur at night, usually during or following rains.

The NTMP area contains proposed critical habitat for the California red-legged frog (69 FR 19620). California red-legged frogs are mobile and, during different life history stages or different seasons of the year, may occupy a variety of aquatic and upland habitats. Proposed critical habitat includes (1) all aquatic habitats having a minimum pool depth of 20 inches and which can maintain water during the entire tadpole rearing season; (2) upland areas within 300 feet of suitable aquatic habitat, as defined above; and (3) upland dispersal habitat that is barrier-free and at least 300 feet wide and that connects two or more suitable breeding locations.

California Red-Legged Frog Mitigations

To avoid incidental take of this species, timber operations shall proceed in accordance with the take avoidance measures outlined below. These measures are based on guidelines developed by the U.S. Fish and Wildlife Service, with technical assistance from Bill McIver of the Ventura USF&WS office.

1. All road, skid trail, and landing construction shall occur prior to the start of the wet season (*see below for the definition of the wet season). All ground based yarding and skidding activities shall occur prior to the onset of the wet season. All temporary crossing shall be removed prior to the onset of the wet season.

¹ Data are from unpublished surveys conducted by John Bulger, 1997-2006. Also available in the CNDDDB.

² Bulger, J.B., N.J. Scott Jr., and R.B. Seymour. 2003. Terrestrial activity and conservation of adult California red-legged frogs *Rana aurora draytonii* in coastal forests and grasslands. *Biological Conservation* 110: 85-95.

2. As the wet season approaches, the number of open landings will be limited to the minimum necessary and areas where harvesting is complete will be closed out with erosion controls in progress.
3. Construction activities associated with installation and removal of crossings will occur during daylight hours only. Hauling and loading of logs during the wet season shall occur during daylight hours only.
4. All segments of skid trail in the WLPZ shall be packed with slash, straw mulched to a depth of 3 inches, and/or seeded. All segments of road in the WLPZ shall be rocked, straw mulched to a depth of 3 inches, and/or seeded.
5. Trees shall be felled away from riparian habitat, including springs, seeps, bogs, and other wet areas with saturated ground in most cases; however, in site-specific situations to improve the safety of operations or to better protect residual vegetation and the beneficial uses of water within the watercourse, trees may be felled in whichever direction spares the most residual vegetation, including parallel to or toward a watercourse, where circumstances warrant it.
6. Prior to operations occurring in the late fall or involving crossing work, a qualified biologist will conduct a biological resources education program for workers, and will appoint a crew member to act as an on-site biological monitor. The educational program will include a description of the California red-legged frog and its habitat, and the guidelines that must be followed by all harvest personnel to avoid take of the species during the operational period. The Licensed Timber Operator will be responsible for ensuring that crew members comply with the guidelines. Educational programs will be conducted for new personnel before they join harvest activities. Brochures, books and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions.
7. Before timber harvest activities begin each day, for operations occurring in the late fall or involving crossing work, a biological monitor will inspect logging vehicles and equipment to look for California red-legged frogs. If a red-legged frog is found, the red-legged frog will not be relocated or captured, all activities that could result in take will cease and the USF&WS will be consulted to ensure that appropriate actions are taken in order for project activities to continue.
8. All refueling, maintenance, and staging of equipment and vehicles will occur at least 60 feet from riparian habitat or water bodies in a location where a spill would not drain directly toward aquatic habitat. The LTO will insure that all heavy vehicles and equipment are inspected for fuel leaks, oil leaks, and other fluid leaks before and during their operation, to ensure that aquatic and upland habitats are not contaminated. Prior to the onset of work, the LTO will ensure that a plan is in place for prompt and effective response to accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.
9. During project activities, all trash that may attract predators will be put in sealed trash containers, removed from the work site, and disposed of regularly. Following project activities, all trash and construction debris will be removed from work areas.

(*For purposes of protection of red-legged frogs, the wet season begins when precipitation events are sufficient to cause saturated soil conditions, according to a wildlife biologist familiar with California red-legged frog life history, which could

include the RPF. Saturated soil conditions, described in 14 CCR 895.1 could occur after one downpour at the start of the winter period, or following a succession of light rains. However, if light rains are dispersed with dry periods in-between and the soil does not become saturated, the wet season restrictions will be deferred. The California red-legged frog does not become mobile in upland habitat until moisture conditions are such that dessication is not a great risk. This guideline allows assessment of site-specific conditions to provide operational flexibility when the red-legged frog is not at risk. Barring rain events that cause saturated soil conditions at the start of the winter period, wet season restrictions will apply on November 30, or when cumulative rainfall exceeds 4 inches as measured at the Cal Poly rain gauge, whichever comes first.)

The guidelines outlined above as California Red-legged Frog Mitigations provide protection for this species in a watershed where they are known to be present. The management of Swanton Pacific Ranch by Cal Poly has sought to nurture the population of California red-legged frogs. Cal Poly has approximately 19 ponds and reservoirs with confirmed red-legged frog presence (see map of CRLF Distribution). Several ponds on the Ranch have been restored and partially fenced to protect them from cattle damage. Two spring development projects to create enhanced red-legged frog habitat have been completed with a USF&WS matching fund grant.

Foothill Yellow-legged Frog (*Rana boylei*)

The foothill yellow-legged frog is a CDFG Species of Special Concern. This species inhabits rocky streams and is highly aquatic, seldom venturing more than a few meters from the stream channel. Low-gradient stream reaches are preferred for breeding. This species has not been recorded in the Scotts Creek watershed. On the western slope of the Santa Cruz Mountains, foothill yellow-legged frogs have been reported only from Soquel Creek, approximately 15 miles east of the NTMP area. Proposed timber harvest operations will not affect this species.

INSECT

Monarch Butterfly (*Danaus plexippus*)

Monarch butterflies migrate in groups to winter ranges south of the freeze line. They require dense tree cover for overwintering and are intolerant to frost. Winter roost sites are located along the coast in wind-protected groves of eucalyptus, Monterey pine, and cypress with nectar and water sources nearby. Autumnal sites are located 1.9 and 2.8 miles south of the harvest area near Davenport. The cluster trees in these locations, as identified on NDDB maps, are Monterey cypress (*Cupressus macrocarpa*) and blue gum eucalyptus (*Eucalyptus globulus*). Habitat is present although there are no confirmed roosts approximately 2 miles northwest of the harvest area, just south of Waddell Creek, in a native Monterey pine stand above the Big Creek sawmill. Breeding habitat is greatly dependent upon the presence of milkweeds (*Asclepiad*) flora. Suitable groves do not exist within the harvest area and monarch butterfly habitat will not be affected by the proposed operations.

REPTILES

Western Pond Turtle (*Emys marmorata*)

The western pond turtle is a CDFG Species of Special Concern. Western pond turtles occur in a variety of permanent and intermittent aquatic habitats, but most frequently inhabit lowland streams, rivers, and sloughs. In streams they avoid fast-moving and shallow water, and tend to be concentrated in pools, backwater areas, and estuaries. Occupied habitats often contain some aquatic vegetation as well as good basking sites. Pond turtles are usually absent from heavily shaded streams. Nests may be excavated more than 0.25 mile from water, and are generally located in exposed (unshaded) upland locations. The nesting season extends from April through August.

The nearest NDDDB records to the NTMP area are from Waddell Creek, one mile northwest of the NTMP area. Suitable pond turtle habitat may be present in the NTMP area, but the species has not been recorded anywhere in the Scotts Creek watershed. Because this species is primarily aquatic, timber harvest operations would not be expected to adversely affect its foraging and resting habitat. Moreover, because pond turtles select upland nesting sites in unforested, exposed locations, it is unlikely that nesting habitat would be disturbed by harvest operations.

Coast Horned Lizard (*Phrynosoma coronatum frontale*)

The coast horned lizard is a CDFG Species of Special Concern. The species generally occurs in habitats with exposed sand substrates or unconsolidated soils that support scrub vegetation. It forages on ants. Coast horned lizards are not known to occur in the Scotts Creek watershed, and suitable habitat is probably lacking within the NTMP area. Because this species occupies a habitat type that will not be significantly disturbed by harvest-related activities, no detrimental effects are anticipated.

California Legless lizard (*Anniella pulchra*)

The California legless lizard is a CDFG Species of Special Concern. The silvery and black forms of the California legless lizard were formerly considered separate subspecies. Both forms occur primarily in coastal sand dunes, although the silvery legless lizard is also found at inland sites in association with sandy soils through which it can burrow. Legless lizards are fossorial and feed on small invertebrates. No suitable habitat is present within the NTMP area.

San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*)

The San Francisco garter snake is listed as an endangered species under both State and federal law. It occurs in the vicinity of ponds and marshes where it preys chiefly upon frogs, salamanders, and small fish. San Francisco garter snakes often bask in open areas near shelter where they can take refuge if disturbed. Dense vegetation (aquatic, riparian, or scrub) and rodent burrows provide escape cover for this species. Regular use of upland habitats adjacent to occupied wetlands has been documented but is not yet well described. Coastal populations in southern San Mateo County seem to prefer upland habitats that are transitional between pure grassland and pure scrub.

There are no historical records of San Francisco garter snake occurrence in the Scotts Creek watershed or in any coastal watershed south of Waddell Creek, in northern Santa Cruz County. Timber harvest operations are unlikely to affect this species.

NOTE: The following threatened species was queried solely based on California Wildlife Habitat Relationships Version 8.0 (CWHR). It should be recognized that this program provides only a general list of species that might be found in the project location as opposed to NDDDB, which bases queries specifically on known locations of rare, threatened, or endangered species. Other listed species were queried, but following further analysis, these species were excluded from the final assessment due to specified range or habitat dynamics restrictions. See the Scoping section, above, for further explanation of CWHR method. A list of the initial species queried including habitat importance ratings using the CWHR version 8.0 can be found in Section V.

Rubber Boa (*Charina bottae*)

The rubber boa snake is listed as threatened under the California ESA. Food consists primarily of small mammals and lizards. Found in montane forests habitats including red fir, ponderosa pine, hardwood, hardwood-conifer, Douglas-fir, redwood, mixed conifer and riparian. Also found in montane chaparral and wet meadow habitat. Considered an extremely secretive snake seeking cover in rotting logs, pieces of bark, boards, rocks, and other surface debris. The boa burrows through loose soil or decaying vegetation. Usually found in the vicinity of streams or wet meadows or within or under surface objects with good moisture-relating properties such as rotting logs. The snake's activity is crepuscular and nocturnal. Selection silviculture will maintain large woody debris recruitment, no large woody debris will be removed as part of the proposed timber harvest and available habitat will remain. It is expected that no impact will occur to the Rubber Boa.

BIRDS (CDFG Species of Special Concern, Board Listed Species, Sensitive Species)

All nesting bird species are protected by the Migratory Bird Treaty Act. Harm to active nests will be avoided through the diligent nest searches conducted by the RPF and supervised deignee during timber marking as well as the timber fallers, prior to falling each tree. If nests are located which have indicators of current nesting activity, active operations shall cease in the immediate vicinity of the tree. The LTO shall notify the RPF and, in consultation with a qualified biologist, a determination of the nesting status and species shall be made and appropriate protection measures formulated.

Marbled Murrelet (*Brachyramphus marmoratus*)

The marbled murrelet is listed as endangered under CESA and as federally threatened in Washington, Oregon, and California. Marbled murrelets inhabit near-shore marine waters where they feed on small fish and invertebrates, but during the breeding season adults fly inland to nest in mature conifer forests within 50 miles of the ocean. The southernmost breeding population of marbled murrelets in North America occurs in association with the Santa Cruz Mountains. This is also the smallest and most isolated population, separated from the northern California murrelet

population by a distance of 300 miles. The size of the Santa Cruz Mountains murrelet population is estimated to be approximately 600 adults.³

In California, nesting occurs from late March to late September. The female lays a single egg on a large limb or other structure that forms a platform in the nest tree. No nest is constructed, although moss, lichen, duff, or litter often covers the platform. Structures greater than 6 inches wide are large enough to support an egg and an adult murrelet, but in general platforms tend to be considerably wider. Nest platforms include large primary or secondary branches, mistletoe infections, damaged or deformed limbs, witches' broom, and occasionally disused raptor or squirrel nests.

Tree species utilized for nesting in the Santa Cruz Mountains include redwood and Douglas-fir. Although murrelets typically nest in late-seral forest stands, the species has also been documented nesting in residual mature trees that have been left uncut in stands that have a history of harvesting. In consequence, any timber stand that contains redwood or Douglas-fir trees with apparent nesting platforms is considered to be "potentially suitable nesting habitat" for murrelets.

There is no designated (61 FR 26256) or proposed (71 FR 53838) critical habitat for murrelets within the NTMP area. However, potentially suitable murrelet nesting habitat is present at three locations within the NTMP Area (Map 3). All three habitat areas have been harvested at least once previously, and murrelet habitat elements are present within these stands as widely scattered individual trees. All three potentially suitable murrelet habitat areas were recently (2000-2003) surveyed in accordance with protocol standards developed by the Pacific Seabird Group and California Department of Fish and Game and found not to be occupied. Protocol-level murrelet surveys have also been conducted on adjacent forest lands owned by Big Creek Lumber Company. This includes nearly all of the Scotts Creek drainage upstream from the NTMP area for a distance of 2.5 miles, as well as the lower portions of the Big Creek drainage. Based on the results of these field studies, the nearest timber stand known to be occupied by murrelets is located approximately one mile north of the northern boundary of the NTMP area in T9S, R4W, Section 36. Murrelets have been observed flying over the Big Creek drainage, but there have been no observations indicative of site occupancy. A list of pertinent murrelet reports is given below.

Murrelet Survey Reports for NTMP Area:

Bulger, J.B. 2001a. Final report on marbled murrelet surveys at the Swanton Pacific Ranch. Letter to Dr. Wally Mark, Director, Swanton Pacific Ranch, Davenport, California, dated 28 August 2001.

Bulger, J.B. 2003a. Results of marbled murrelet surveys during 2002 and 2003 in the Little Creek drainage, Swanton Pacific Ranch, Santa Cruz County, California. Report prepared for Swanton Pacific Ranch, Davenport, California, August 2003.

³ McShane, C., et al. 2004. Evaluation report for the 5-year status review of the marbled murrelet in Washington, Oregon, and California. Unpublished report. EDAW, Inc. Seattle, Washington. Prepared for U.S. Fish and Wildlife Service, Region 1. Portland, Oregon.

Bulger, J.B. 2003b. Results of marbled murrelet surveys during 2002 and 2003 in the General Smith stand, Berry Creek, Swanton Pacific Ranch, Santa Cruz County, California. Report prepared for Swanton Pacific Ranch, Davenport, California, August 2003.

Murrelet Survey Reports for Adjacent Areas of the Scotts Creek Watershed:

Bulger, J.B. 2000a. Surveys for marbled murrelets on Big Creek Lumber Company's Scott Creek Unit, Santa Cruz County, California, during 1999 and 2000. Report prepared for Big Creek Lumber Company, Davenport, California, September 2000.

Bulger, J.B. 2000b. Surveys for marbled murrelets at Big Creek Lumber Company's Big Creek Unit, Santa Cruz County, California, during 1999 and 2000. Report prepared for Big Creek Lumber Company, Davenport, California, October 2000.

Bulger, J.B. 2001b. Surveys for marbled murrelets in Lair Gulch on Big Creek Lumber Company's Scott Creek Unit during 2001. Report prepared for Big Creek Lumber Company, Davenport, California, September 2001.

Bulger, J.B. 2002. Marbled murrelet surveys in Bannister Gulch on Big Creek Lumber Company's Scott Creek Unit during 2001 and 2002. Report prepared for Big Creek Lumber Company, Davenport, California, August 2002.

Marbled Murrelet Mitigations:

The following mitigations are proposed to avoid take of marbled murrelets.

All potentially suitable marbled murrelet nesting habitat within the NTMP area shall be surveyed in accordance with the most recent protocols issued by PSG and CDFG prior to commencing harvest operations in or immediately adjacent to these stands. The three stands are denoted as the Lower Scotts Creek, Little Creek and General Smith stands and are depicted on the map 'Potentially Suitable Marbled Murrelet Habitat' which can be found in Section V. The results of the survey shall be submitted to CDFG prior to filing a Notice of Timber Operations. The surveys shall be completed within three years of the onset of operations or, with CDFG consultation, surveys may remain valid for up to five years. Operations in the North Fork harvest area may proceed through 2008 without the need to resurvey, per the CDFG preconsultation letter located in Section V. The survey requirement shall apply to all harvest entries for the lifetime of the NTMP. In the absence of such surveys, the three stands shall be protected by means of 300-ft no-cut buffer zones and 0.25-mile operational restriction buffers during the murrelet nesting season, which is March 24 to September 15. Survey results that show no occupied behavior within the potential habitat areas shall lift the 300-ft no-cut buffer zones and 0.25-mile operational restriction buffers for the duration that the surveys are valid.

Double-crested Cormorant (*Phalacrocorax auritus*)

Double-crested cormorants are a CDFG Species of Special Concern (rookery sites only). The species inhabits nearshore coastal waters, lakes, and rivers, and nests colonially on sea-cliffs or in trees. Cormorants occasionally forage in the lower reaches of Scotts Creek but no rookery sites are known within the watershed. If cormorants are found to be nesting within the NTMP area, CDFG and a qualified wildlife biologist will be contacted and appropriate mitigation measures to avoid harm to this species will be amended to the NTMP.

Great Blue Heron and Great Egret (*Ardea herodias* and *A. alba*)

Great blue heron and great egret rookeries are listed as Sensitive by CDF. These species nest colonially (occasionally solitarily), usually in live or dead deciduous trees within or adjacent to marshes, swamps, lakes or larger rivers. Both species build large platform-type stick nests. Foraging habitat consists of the full range of wetland and open aquatic habitats. Both species feed principally on fish and other vertebrates, although they will also hunt mice and frogs in wet meadows or grasslands after rains. Whereas both species are liable to forage in suitable habitat within and adjacent to the NTMP area, no nesting sites have been found in this area. If either great blue heron or great egret are found to be nesting within the NTMP area, CDFG and a qualified wildlife biologist will be contacted and appropriate mitigation measures to avoid harm to this species will be amended to the NTMP.

California Black Rail (*Laterallus jamaicensis coturniculus*)

The California black rail is listed as threatened under CESA. It has a highly localized distribution, and occurs principally in brackish marshes. Black rails are reported to have been extirpated from Santa Cruz County, although there is one NDDDB record from the Waddell Creek lagoon in the mid-1990s. No appropriate habitat is present within or immediately adjacent to areas proposed for harvesting under this NTMP.

California Clapper Rail (*Rallus longirostris obsoletus*)

The California clapper rail is listed as endangered under ESA and CESA. It occurs in brackish, coastal wetlands from San Francisco Bay southward. The species has been extirpated from Santa Cruz County. No appropriate habitat is present within or immediately adjacent to areas proposed for harvesting under this NTMP.

Black Swift (*Cypseloides niger*)

The black swift is a CDFG Species of Special Concern (nesting only). The black swift has a highly localized breeding distribution in California due to its specialized nesting requirements. Nests have been found only on steep coastal bluffs and behind or adjacent to waterfalls on cliffs. There are several NDDDB records of black swifts nesting on coastal bluffs from Point Año Nuevo south to near Santa Cruz. There is no suitable nesting habitat within the NTMP area. Harvest operations will not affect black swifts.

Vaux's Swift (*Chaetura vauxi*)

The Vaux's swift is a CDFG Species of Special Concern (nesting only). The species generally occurs in association with conifer forests that have at least some mature characteristics. Vaux's swifts nest and roost in hollow snags or in senescing live trees with heartwood decay. Nest and roost trees are usually more than 20 inches in diameter and frequently have broken tops. Pileated woodpeckers excavate most of the cavities used for nesting. The species feeds aerially on small insects, often over water, but also over grasslands and forested areas. It roosts communally in hollow trees or chimneys. Vaux's swifts are likely to be present in the NTMP area but are not expected to be negatively affected by timber harvest operations. Snags will be retained in all areas proposed for harvest.

Red-breasted Sapsucker (*Sphyrapicus ruber*)

The red-breasted sapsucker is a federal Species of Concern (nesting only). It is a cavity nester that potentially occurs in most forest and woodland habitats. The species is rare in Santa Cruz County during the breeding season, occurring more commonly during fall and winter. Suitable nesting and foraging habitat may be present in the project area. Timber harvest activities are unlikely to detrimentally affect this species since snags will be retained.

Olive-sided Flycatcher (*Contopus cooperi*)

The olive-sided flycatcher is a federal Species of Concern. It occurs primarily in coniferous forests, frequently perching atop tall trees or snags from which it hawks insects. It prefers forests with more open canopies, and often occurs in association with openings or edges. Nests are built in trees. Olive-sided flycatchers occur as a breeding species in the Scotts Creek watershed and are absent (migrates) in winter. Suitable nesting and foraging habitat is present in the NTMP area. Due to its association with open canopies, selective harvests proposed under this NTMP would be expected to either maintain or enhance overall habitat quality for this species.

Loggerhead Shrike (*Lanius ludovicianus*)

The loggerhead shrike is a CDFG Species of Special Concern (nesting only). This species resides in a variety of open grassland and scrub habitats where it hunts insects and small vertebrates. It does not inhabit forests. Nests are built in shrubs or small trees. Loggerhead shrikes are known to occur within the NTMP area in appropriate habitat during the fall and winter months, and potentially suitable nesting habitat is present. Due to its open-habitat affinities, timber harvest operations are not expected to affect loggerhead shrikes.

California horned lark (*Eremophila alpestris actia*)

The California horned lark is a CDFG Species of Special Concern. Horned larks occur in open habitats, favoring areas with sparse vegetation and exposed soil for foraging. The species nests on the ground. Suitable habitat for this species may be present in agricultural fields adjacent to the NTMP area and on the range. These habitats will not be detrimentally affected by timber harvest operations.

Purple Martin (*Progne subis*)

The purple martin is a CDFG Species of Special Concern (nesting only). It is a rare and localized breeder in a variety of open forest types in California; it may no longer nest in Santa Cruz County. Tall, old snags with woodpecker holes are required for nesting. Martins often forage over water. The species, if present in the NTMP area, is not expected to be detrimentally affected by harvest operations because snags will be retained.

Bank Swallow (*Riparia riparia*)

The bank swallow is listed as Threatened under CESA. Bank swallows nest colonially in sandy, vertical bluffs and riverbanks. They excavate their own nest burrows. The upper Sacramento River supports most of the remaining populations of this species, but isolated colonies are found elsewhere. No nesting sites are known from Santa Cruz County, although an active colony exists at Point Año Nuevo, approximately 3 miles northwest of the NTMP area. Bank swallows are unlikely to be affected by proposed timber harvest operations.

California Thrasher (*Toxostoma redivivum*)

The California thrasher is a federal Species of Concern. It occurs chiefly in dry brush and chaparral habitats, and is uncommon in the Scotts Creek watershed. Habitats utilized by this species will not be detrimentally affected by timber harvest operations.

Yellow Warbler (*Dendroica petechia brewsteri*)

The yellow warbler is a CDFG Species of Special Concern (nesting only). Yellow warblers are found primarily in riparian habitats dominated by deciduous trees such as alders, willows, maples, sycamores, and cottonwoods. The species has been recorded from Scotts Creek. Suitable nesting and foraging habitat for yellow warblers is present in the NTMP area along Scotts Creek and the lower portions of Mill Creek and Little Creek. The broadleaf riparian habitat type potentially occupied by this species will not be significantly affected by harvest operations.

Saltmarsh Common Yellowthroat (*Geothlypis trichas sinuosa*)

The saltmarsh common yellowthroat is a CDFG Species of Special Concern (nesting only). There is an NDDDB record for the mouth of Scotts Creek from 1988. Yellowthroats inhabit brackish and freshwater marshes, and moist riparian habitats. Suitable breeding habitat may occur within and adjacent to the NTMP area, particularly in ponds with dense emergent vegetation and in the marsh at the mouth of Scotts Creek. These habitats will not be affected by timber harvest operations.

Yellow-breasted Chat (*Icteria virens*)

The yellow-breasted chat is a CDFG Species of Special Concern (nesting only). Chats inhabit riparian shrub thickets comprised of willow, dogwood, and similar species. The species is quite rare in Santa Cruz County and may not occur in the Scotts Creek watershed. Potentially suitable habitat for this species is present in the NTMP area along portions of the Scotts Creek riparian corridor and perhaps elsewhere. Riparian shrub habitats will not be affected by harvest operations.

Lark Sparrow (*Chondestes grammacus*)

The lark sparrow is a federal Species of Concern. The species resides in grassland dominated habitats where it nests on the ground or in a small shrub. This is an uncommon, localized breeding species in Santa Cruz County. Suitable habitat is present on the Range, although it may not be occupied. Timber harvest operations will not occur in the grassland habitat utilized by this species.

Bell's Sage Sparrow (*Amphispiza belli belli*)

The Bell's sage sparrow is a CDFG Species of Special Concern. Bells' sage sparrow occurs in chaparral and coastal sage scrub habitat, often in association with chamise. It is a rare and localized breeder in Santa Cruz County where only two breeding localities are known. Potentially suitable nesting habitat for this species may be present on and adjacent to the NTMP area. No significant impacts are anticipated since harvest operations will not significantly alter scrub or chaparral habitats.

Tricolored Blackbird (*Agelaius tricolor*)

The tricolored blackbird is a CDFG Species of Special Concern (nesting colony). The species nests colonially in emergent aquatic vegetation or (in the Central Valley) in dense thickets of Himalayan blackberry. It forages in large flocks in grasslands and agricultural fields. Potentially suitable nesting and foraging habitat are present on and adjacent to the NTMP area, but these habitats will not be impacted by timber harvest operations. The tricolored blackbird colony that inhabits Laguna de las Trancas (0.5-mile northwest of the NTMP area) routinely forages in the grasslands of the Range.

BIRDS OF PREY (RAPTORS)

Fish and Game Code 3503.5 states that “*It is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto.*” Thus, nesting sites of all birds of prey that potentially occur in the NTMP area are of some concern. Moreover, in addition to being covered under Fish and Game code 3503.5, several species of raptors are also listed by federal (ESA) or state (CESA, CDF, CDFG) entities. Listed species are discussed in part A below, unlisted Fish and Game Code 3503.5 species are discussed in part B below.

In general, if a nest of a vulture, hawk, falcon or owl is detected or is suspected to be present during layout, pre-harvest inspection, marking, or harvesting, operations will cease in the immediate vicinity of the nest and CDFG and a qualified independent biologist will be notified and consulted. Site-specific mitigations will be developed in consultation with appropriate regulatory agency personnel.

BIRDS OF PREY (LISTED RAPTOR SPECIES)

Osprey (*Pandion haliaetus*)

The osprey is a CDFG Species of Special Concern (nesting only) and a CDF Sensitive Species. It is a bird of large rivers, lakes, and sea-coasts where it preys almost exclusively on fish. Ospreys nest on rock pinnacles and in the tops of snags, live trees, or similar artificial structures near water. Nests are large, conspicuous, and often easily located. Throughout the osprey's range, when available, snags surrounded by water are preferred as nest sites. Nests usually are built in very close proximity to water, but may occasionally be found up to a mile from water. Ospreys do not currently nest in the NTMP area. Timber harvest operations are not anticipated to affect this species.

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is listed as Threatened under ESA and Endangered under CESA. It is also a CDF Sensitive Species. Bald eagles do not nest in the Santa Cruz Mountains and are rare visitors outside the nesting season. Timber harvest operations are not anticipated to affect this species.

White-tailed Kite (*Elanus leucurus*)

The white-tailed kite is a federal Species of Concern and a CDFG Fully Protected Species. White-tailed kites occur in a variety of unforested habitats, including orchards, marshes,

grassland, farmland, and sparse woodlots. They nest in deciduous or broadleaved trees near open foraging areas. The diet consists of small mammals, insects, reptiles, and amphibians. The species is occasionally observed foraging over the Range. No nest sites are known within the NTMP area. Timber harvest operations are not anticipated to have any effect on this species because it does not inhabit forests.

Northern Harrier (*Circus cyaneus*)

The northern harrier is a CDFG Species of Special Concern (nesting only). The species nests on the ground among shrubs, grasses or forbs, principally within or adjacent to emergent wetlands or wet meadows, less often in grasslands and agricultural fields away from water. Tall grasses and forbs are also utilized for roosting cover. Harriers are known to nest in the vicinity of the Scotts Creek estuary. Suitable nesting habitat potentially is also available on the Range. These habitats will not be affected by timber harvest operations.

Sharp-shinned Hawk (*Accipiter striatus*)

The sharp-shinned hawk is a CDFG Species of Special Concern (nesting only). This species occurs year-round in the Scotts Creek watershed and is known to nest there. Sharp-shinned hawks typically nests in relatively dense stands of second growth conifers, building a new nest each year. The species forages in a range of forested and lightly wooded habitats. Small birds comprise the bulk of the diet. Although no nest sites are currently known from the project area, potentially suitable nesting habitat is present. Should nesting be confirmed or suspected on the basis of behavioral observations, CDFG and a qualified wildlife biologist will be consulted.

Cooper's Hawk (*Accipiter cooperii*)

The Cooper's hawk is a CDFG Species of Special Concern (nesting only). It potentially occurs in the Scotts Creek watershed year-round, but is more common as a migrant and wintering bird. Cooper's hawks tend to occur in more open forests than do sharp-shinned hawks, and nesting is most often associated with broadleaf woodlands or mixed conifer/broadleaf forests. Dense surrounding cover is preferred in the vicinity of the nest site. Nests typically are built in broadleaf trees. Cooper's hawks show a greater tendency to reuse previous nests than do sharp-shinned hawks. The diet is composed chiefly of small birds, but small mammals, reptiles, and amphibians are also taken. Potentially suitable Cooper's hawk nesting habitat and foraging habitat may be present within the project area. Timber harvest operations are not likely to significantly affect foraging habitat of this species and would be less likely to negatively impact potential nesting habitat than is the case with the sharp-shinned hawk. Should nesting be confirmed or suspected within the NTMP area on the basis of behavioral observations, CDFG and a qualified wildlife biologist will be consulted.

Ferruginous Hawk (*Buteo regalis*)

The ferruginous hawk is a CDFG Species of Special Concern (wintering). The species occurs in grasslands and arid shrub habitats, where it forages on small mammals. It does not breed in Santa Cruz County and is a rare winter visitor. Timber harvest operations will not affect winter foraging habitat of this species.

Golden Eagle (*Aquila chrysaetos*)

The golden eagle is a CDFG Species of Special Concern and a CDF Sensitive Species. Golden eagles require wide-open country for foraging, and prey predominantly on jackrabbits and ground squirrels. Nests typically are built on cliffs throughout the range of this species, although in the oak/grass savannas of the inner California coast ranges most nests are built in trees, principally oaks, cottonwoods, and sycamores. This species does not nest within the NTMP area and there are no suitable cliff nesting sites. Individuals occasionally are seen outside the breeding season. Potentially suitable foraging habitat is present on the Range and in other smaller areas of grassland habitat within the NTMP area. These unforested habitats will not be affected by timber harvest operations.

Merlin (*Falco columbarius*)

The merlin is a CDFG Species of Special Concern (wintering). It does not breed in California. Merlins hunt small birds in open habitats such as grasslands and seashores. The species may occur occasionally on the Range during the winter months. Because merlins utilize habitats that will remain unaffected by harvest operations, no harvest related impacts would be anticipated.

American Peregrine Falcon (*Falco peregrinus anatum*)

The American peregrine falcon is listed as Endangered under CESA and is a CDF Sensitive Species. Peregrine falcons occur in a variety of habitats, but require open areas for foraging. Food consists almost exclusively of birds that are caught on the wing. While tree nesting has been recorded for this species, nesting usually occurs on ledges and cavities in sheer rock formations. Peregrine falcons are not known to nest on or near the NTMP area and there are no rock outcroppings that could be considered as potentially suitable nesting sites. Timber harvest operations are anticipated to have no effect on this species.

Burrowing Owl (*Athene cunicularia*)

The burrowing owl is a CDFG Species of Special Concern (nesting and wintering in Santa Cruz County). It occurs in grassland and desert habitats, where it uses ground squirrel burrows for nesting and roosting. The species has been nearly extirpated as a breeder in Santa Cruz County, and is a rare, localized winter resident. Burrowing owls formerly occurred on the Range, but have not been observed there for several decades.⁴ Timber harvest operations will not affect potentially suitable nesting and foraging habitat for burrowing owls within the NTMP area.

Long-eared Owl (*Asio otus*)

The long-eared owl is a CDFG Species of Special Concern (nesting only). In California long-eared owls typically inhabit dense tree or shrub thickets within or adjacent to open habitat areas, which are favored for hunting. The species occurs less commonly in conifer forests or mixed conifer/broadleaf forests. Rodents comprise the bulk of the diet. Long-eared owls use abandoned nests of corvids, hawks, and squirrels for nesting. Nests tend to have dense surrounding cover and are located either in a tree or in a thicket of tall shrubs, often found near water. This is a very secretive and highly nocturnal species. It is non-migratory at this latitude. Because long-eared owls tend to hunt in open-areas, timber harvest operations are unlikely to affect foraging habitat for this species. Nesting has not been documented within or near the

⁴ Jim West, personal communication. Mr. West is a professional botanist and lifetime resident of the Scotts Creek watershed.

project area, but suitable habitat may be present. If a long-eared owl nest is discovered in the course of harvest operations, CDFG and a qualified wildlife biologist will be consulted.

Short-eared Owl (*Asio flammeus*)

The short-eared owl is a CDFG Species of Special Concern. It does not nest in Santa Cruz County and is a rare visitor at other seasons. Habitats utilized for foraging include emergent wetlands, wet meadows, and less frequently grasslands. Timber harvest operations will not affect potentially suitable foraging habitat for this species.

BIRDS OF PREY (UNLISTED RAPTOR SPECIES)

Turkey Vulture (*Cathartes aura*)

The turkey vulture is a common, widespread scavenger that occurs in a variety of habitats throughout North America. The species generally forages over relatively open country, scanning the ground for carrion. Turkey vultures usually nest in large fissures or cavities on sheer cliffs, but may also occasionally use hollow snags of large disused stick nests of other species in dead or live trees. No potentially suitable cliff nesting-sites are known in the NTMP area. Due to the infrequency with which tree nests are used, it is unlikely that turkey vultures nest within or adjacent to forest stands proposed for harvesting. No adverse impact of timber harvest operations is anticipated for this species.

Red-shouldered Hawk (*Buteo lineatus*)

The red-shouldered hawk most frequently occurs in association with streams and riparian woodlands, but may nest in any forest type except very dense second-growth. Stick nests are constructed in either broadleaf or coniferous trees, generally quite high up and against the bole. Unlike most other buteos, red-shouldered hawks forage both in wooded and open areas. Red-shouldered hawks are known to nest within the NTMP area, particularly along watercourses. Should nesting be confirmed or suspected on the basis of behavioral observations in areas scheduled for harvesting, CDFG and a qualified wildlife biologist will be consulted.

Red-tailed Hawk (*Buteo jamaicensis*)

This very common and widespread hawk occurs throughout North America. It requires open areas for foraging, where it preys chiefly on small mammals. Red-tailed hawks build large stick nests either on cliffs or in trees. Nests rarely are built in the forest interior because this species is not adept at flying through forest cover and also tends to select nesting sites that allow a commanding view of the landscape. Thus, suitable nest trees usually are prominent specimens that are situated in the open, on ridgetops, or at the forest edge. Red-tailed hawks are known to nest in the vicinity of the NTMP area. Should red-tailed hawk nesting be confirmed or suspected on the basis of behavioral observations in an active harvest area, CDFG and a qualified wildlife biologist will be consulted.

American Kestrel (*Falco sparverius*)

The American kestrel is a common, widespread species that inhabits a variety of open habitats, often with scattered trees. It is not generally a forest-dwelling bird. Kestrels nest predominantly in cavities in snags. Holes in cliff faces and clay banks are also used as nest sites. The diet consists of insects and small vertebrates. Because snags will be retained during timber harvest

operations, it is unlikely that potential breeding habitat of kestrels will be negatively affected by activities proposed under this NTMP. Should nesting be confirmed or suspected on the basis of behavioral observations, CDFG and a qualified wildlife biologist will be consulted.

Barn Owl (*Tyto alba*)

Barn owls occur in association with a variety of open and semi-open habitat types. They generally avoid forested areas. The species most frequently nests in human structures (barns, silos, abandoned houses, etc), but also uses cavities in cliffs, clay banks, and large snags. Due to its preference for open habitats, this species is not expected to be negatively affected by timber harvest operations.

Great Horned Owl (*Bubo virginianus*)

This is a common widespread species, found in virtually all habitat types in North America, including conifer forests. Great horned owls nest in trees and on cliffs. In trees it uses abandoned stick nests of other raptors, corvids, squirrels and woodrats. Great horned owls are known to nest within the NTMP area, although no precise nest site locations are currently known. Should nesting be confirmed or suspected on the basis of behavioral observations in an active harvest area, CDFG and a qualified wildlife biologist will be consulted.

Western Screech Owl (*Otus kennicottii*), Northern Pygmy Owl (*Glaucidium gnoma*), and Northern Saw Whet Owl (*Aegolius acadicus*)

These three species of small owls inhabit forested areas and nest in woodpecker holes and natural cavities in snags. Nests typically are difficult to find. Any of these three species may nest in the NTMP area. Timber harvest operations are unlikely to significantly affect breeding habitat for these species because the critical habitat element (i.e. snags) will be retained.

MAMMALS

Bats

Six bat species that are either CDFG or USFWS Species of Concern potentially occur in association with coniferous forest habitats of the NTMP area. These include pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), long-eared myotis (*Myotis evotis*), fringed myotis (*M. thysanodes*), long-legged myotis (*M. volans*), and Yuma myotis (*M. yumaensis*). Bat species distribution and abundance within the Scotts Creek watershed is not well known. Of principal concern with regard to timber harvesting is the potential loss of tree roosting and nursery sites. These include basal hollows of fire-scarred trees and cavities or other hollows in snags. Because these habitat elements will be retained during harvesting, no significant impacts are anticipated for bats.

American Badger (*Taxidea taxus*)

The American badger is a CDFG Species of Special Concern. In California, Badgers occupy a diversity of habitats, the principle requirements including sufficient food, friable soils, and relatively open, uncultivated ground. Grasslands, savannas, and mountain meadows near timberline are preferred. Local populations have been very sparse for many years; however, several recent sightings on the Cal Poly Range have given reason to believe that Badgers are re-occupying the area. Threats to Badgers include agricultural and urban developments, as well as

rodent poisoning. Badgers prey primarily on burrowing rodents such as gophers and make their homes in larger burrows as well. Proposed operations are not anticipated to negatively impact Badgers since harvesting will occur in the forested portions of the Ranch and will not alter the grassland habitat.

San-Francisco Dusky-footed Woodrat (*Neotoma fuscipes annectens*)

The San Francisco dusky-footed woodrat is a CDFG Species of Special Concern. Dusky-footed woodrats occur within and adjacent to the project area and are common and widespread throughout forested and chaparral habitats of the Santa Cruz Mountains. Woodrat houses (lodges or nests) made of sticks are usually built at the base of a shrub or tree. Individual houses may be occupied by successive generations for decades. The species feeds principally on woody plants, acorns, and grasses. Project activities are not anticipated to significantly impact this species. Care will be taken not to disturb woodrat houses during harvest operations.

Ringtail (*Bassariscus astutus*)

The ringtail is a CDFG Fully Protected Species. Ringtails are highly nocturnal and occur in forest and shrub habitats. Refuge and nesting sites include snags, hollow trees and logs, caves, burrows, and abandoned woodrat nests. The species is primarily carnivorous. Ringtail distribution and abundance in the Santa Cruz Mountains is poorly known. Suitable habitat may be present within the NTMP area. Timber harvest operations are not expected to significantly impact foraging or nesting habitat for this species because key habitat elements noted above will be retained throughout the NTMP area.

Monterey Ornate Shrew (*Sorex ornatus salaries*)

The Monterey Ornate Shrew is considered a Species of Special Concern by the state of California. Little is known about the habits of the Monterey ornate shrew, but they are probably similar to those of other small, long-tailed shrews. Ornate shrews typically are found: in brackish water marshes; along streams; in brushy areas of valleys and foothills; and in forests. They especially favor low, dense vegetation that forms a cover for worms and insects. No Monterey Ornate Shrews are known to occupy the vicinity of the NTMP area. Potential habitat will be retained over the course of operations as wet areas will be protected and the majority of the suitable foraging habitat will be maintained.

TERRESTRIAL NATURAL PLANT COMMUNITIES

In addition to querying the NDDDB for plant taxa in the vicinity, the NDDDB was consulted for sensitive plant communities. The following terrestrial natural communities are noted as occurring within 5 miles of the project area. Following the description, the likely presence of each community within the area potentially impacted by the proposed harvest is noted.

Monterey Pine Forest

Monterey Pine Forest is a vegetation type that occurs in three areas on the California coastline in San Mateo, Santa Cruz, Monterey, and San Luis Obispo Counties. The Monterey pine forest is present in the fog belt, from the coastline, extending inland to the foothills. This forest type is composed of Monterey pine (*Pinus radiata*) in association with Douglas-fir (*Pseudotsuga menziesii*) and grassland, with knobcone pine (*Pinus attenuata*) introgression on ridges. Local

research by botanist Jim West has reportedly identified knobcone traits (such as the formation of the cone bract) moving into stands of Monterey pine, although the reverse has not been observed.

Stands of Monterey pine forest are located on the Ranch outside of the harvest area on the ridge west Scotts Creek. The northern extent is north of Ano Nuevo and the stand extends south, onto Swanton Pacific Ranch. On the west side of Scotts Creek, the Ranch has approximately 125 acres of Monterey pine forest, extending from around the northern property boundary, as far south as the ridge opposite Winter Creek. These groves are generally more dense and vigorous with less herb understory than similar stands on the Monterey Peninsula.

In 2002, a gap analysis study was initiated on the west side of Scotts Creek to plant native Monterey pine stock in $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ acre cleared openings. 27 groups of various sizes were selected, and 18 of those were harvested and replanted, while 9 remain un-cut as controls. These groups are part of an on-going research study, testing variable regeneration techniques to help inform adaptive management of Monterey pine. This vegetation type is also part of the continuous forest inventory (CFI) and is re-measured every 10 years. At each CFI plot, regeneration and herbaceous ground cover are assessed and photographs are taken from plot center in each cardinal direction.

An additional study on the Range involved planting approximately 14 acres of hayfield with Monterey pine from a variety of sources, including New Zealand, Australia, and Chile. These trees were planted in 2003 and will be grown for approximately 5 years to test their resistance to pitch canker. The plantation will be cut down prior to producing extensive pollen so that it cannot contaminate the native pine stands. Non-native stock shall be phased out over the course of NTMP operations, however, native Monterey pine trees will not be negatively affected by the proposed harvesting operations. Plantations of non-native Monterey pine are scattered throughout the Satellite Stands Unit and are discussed in more detail below.

Northern Interior Cypress Forest

1 Northern Interior cypress forest grove is shown on NDDDB maps approximately 3 miles east of the harvest area in Bonny Doon. This forest type includes Santa Cruz cypress (*Cupressus abramsiana*) in association with knobcone pine (*Pinus attenuata*) and Ben Lomond wallflower (*Erysimum teretifolium*). Habitat exists on pockets of sandy soil on Miocene vaqueros sandstone. The NTMP area lacks the substrate and/or edaphic conditions which support this community.

Maritime Coast Range Ponderosa Pine Forest

Maritime coast range ponderosa pine forest occurs in Bonny Doon, in two isolated stands approximately 3.5 miles east of the harvest area, according to NDDDB maps. The plant community is dominated by dense Ponderosa pine (*Pinus ponderosa*) in association with Santa Cruz manzanita (*Arctostaphylos silvicola*), and Santa Cruz cypress (*Cupressus abramsiana*). The soils are consolidated marine sediments, primarily Zayante coarse sands. The habitat is not listed federally or by the state of California and is threatened by sand quarrying, conversion to vineyard and development. Habitat for this vegetation type does not occur in the harvest area and timber operations will not affect its presence.

Northern Maritime Chaparral

Northern maritime chaparral is a plant community usually including endemic, relict, and locally rare plant species. It occurs on marine sands and Zayante coarse sand soils in association with Santa Cruz cypress (*Cupressus abramsiana*), Ponderosa pine (*Pinus ponderosa*), Bonny Doon manzanita (*Arctostaphylos silvicola*) and annual grasses and forbs. One area dominated by *Arctostaphylos* within the zone of heavy summer fog incursion is located on the ridge south of Winter Creek. The type of northern maritime chaparral found at this site is primarily composed of the most widespread of maritime chaparral-associated species, the brittle-leaf manzanita (*Arctostaphylos crustacea* spp. *crinita*). A portion of this site was included in the harvest area for the Lower Little Creek THP #1-04-046 and a skid trail on the ridgeline was used for approximately 75 yards. Mitigation measures implemented at that time included minimizing the amount of soil disturbance, installing waterbars at regular intervals to maintain hydrology and reduce erosion, and keeping the trail surface free from slash. These mitigations appear to have been effective at maintaining the presence and diversity of species. Since seeds from some sensitive plant species may occur in the dormant seedbank, these mitigations reduce potential impacts to this site and may even encourage native seed germination. Mitigation measures to be carried out for operations under this NTMP are similar and are described under Mitigation Point MP30 in Item #32 in Section II.

Coastal Brackish Marsh

Coastal brackish marsh covers approximately 9 acres, slightly southeast of the mouth to Waddell Creek, 3.5 miles northwest of the harvest area. This plant community occurs where fresh and salt water converge and is dominated by inland saltgrass (*Distichlis* spp.) and bulrushes (*Scirpus* spp.) Harvesting operations will have no effect on the marsh.

Northern Coastal Salt Marsh

Salt marsh covers approximately 15 acres on the lower portion of Scotts Creek. The marsh is approximately .6 miles from the harvest area, downstream of watercourses that flow through the harvest area. The marsh is closed off from the ocean during the dry season by a sandbar at the mouth of Scotts Creek, creating a lagoon. The beach at Scotts Creek is heavily used for recreation and agricultural cultivation and grazing are the predominant land uses surrounding the marsh. Proposed operations will have no effect on the marsh.

PLANTS

Monterey Pine (*Pinus radiata*)

Monterey pine is classified as a group 1B species (rare or endangered in California) by the California Native Plant Society (CNPS). This listing status is due to several factors, including habitat alteration and threats from disease. The Monterey pine stand to the west of Scotts Creek (described in Section III), are more threatened by the latter than the former. Many of the native Monterey pine trees in the area are infected with the exotic fungus that causes pitch canker (*Fusarium circinatum*). The NTMP is located in Santa Cruz County, which is within the Coastal Pitch Canker Zone of Infestation. The pine pitch canker fungus is a wound pathogen, i.e. it enters the tree through a wound. Naturally occurring wounds such as wind stress and various animals (including insects feeding) as well as branch removal and other mechanical damage can provide entry sites for spores. The spores are spread by wind, rain splash, and by insects such as

bark, twig, and cone beetles. Beetles normally over-winter as adults and find new brood material when the weather warms. To avoid infestation, the objective is to not have a lot of brood wood available for them in the spring when they are looking for new breeding sites. Limiting the creation of pine brood material to summer months in combination with the mitigations below will facilitate rapid drying.

To inhibit the spread of pitch canker, pine slash generated by operations shall be lopped and spread out to increase direct solar radiation. Heat from the sun increases the temperature under the bark and hastens drying. Both heat exposure and drying can greatly reduce the breeding success of bark beetles that spread the pitch canker pathogen. Lop and scatter of brood material should occur within one week of slash creation. As an alternative, activities in pine stands that will place “green” brood material on the ground should be avoided from October through May.

The only known specimens of native Monterey pine trees in the NTMP area are located approximately 50 feet south of Little Creek, just above Swanton Road, around a small parking area, according to Dr. Walter Mark, refer to the Botanical Conservation Map at the end of Section II. These shall be retained. Within the NTMP area, several plantations of non-native Monterey pine stock are present in the Satellite Stands Unit as shown on the Botanical Conservation Map at the end of Section II. These cutover areas, comprising approximately 52 acres, were planted between 1979 and 1984 with genetic clones of hybrids from New Zealand. Within the planted areas, some trees have grown exceptionally fast. Portions of the plantations have been inter-planted with redwood and Douglas-fir seedlings which are now 5-10 feet tall. The non-native pine plantings present the threat of introducing genes that may make the natural, locally adapted pines more susceptible to disease. Due to the threat of gene contamination to the native pine population, the non-native plantation trees shall be gradually removed as described under Item 14 to allow redwood and Douglas-fir to re-colonize the site.

During pine removal, to mitigate the spread of the pitch canker pathogen, no pine material will be removed from the zone of infestation. Monterey pine brood material shall be treated in the following manner as soon after creation as is practical:

1. Lop all branches from the sides and tops of the bole of the tree bole which are three inches or more in diameter.
2. Lopped stems should be cut into short segments to decrease drying time and further reduce hazard.
3. Branches should be scattered so that stems have maximum exposure to solar radiation.
4. Do not pile pine slash or stack pine firewood next to living pine trees.
5. Logs from diseased trees may be split for firewood for local use, but the wood should be seasoned beneath a tightly sealed, clear plastic tarp to prevent the buildup of destructive insects.

Shreve oak (*Quercus parvula* var. *shrevei*)

Shreve oak stands are patchily distributed in moist slopes, from approximately 100-2000' elevation, west of the Coast range crest from Marin to Monterey Counties. The species is similar taxonomically to interior live oak, and although its taxonomic status is currently being reviewed, most scientists currently suggest stands receive conservation attention for two reasons. First, the species is threatened by sudden oak death (*Phytophthora ramorum*). Second, much of the

distribution of stands occurs in proximity to areas of high development pressure. The Shreve oak stands on the Ranch are experiencing the threat of Douglas-fir introgression. Common associated tree species include coast redwood, Douglas-fir, and tan oak, Monterey pine and buckeye. Common understory species include poison oak, sword fern, bracken fern, and nightshade (*Solanum douglasii*).

Shreve oak is a common component of many of the vegetation communities throughout the NTMP. However, the species is the definitive element of stands between the Al Smith House and Swanton Road, as shown on the Botanical Conservation Map at the end of Section II. Management actions addressing ecological succession to foster Shreve oak habitat are proposed for a component of the stand. It is recommended by Dr. Hayes that this treatment be conducted on approximately 2 to 3 acres within the stand, which are also delineated on the Botanical Conservation Map. The treatment shall include:

1. Douglas-fir trees shall be removed to reduce Shreve oak competition.
2. Taller-statured trees shall not be planted within the stand area.
3. Shreve oak trees shall be pointed out to the LTO and protected from damage during operations, to the extent feasible.
4. Mitigations to inhibit the spread of sudden oak death, as described in Item 15, shall be followed.

Santa Cruz Microseris (*Stebbinsoseris decipiens*)

This plant is an annual herb with no state or federal listing but is a species on the CNPS 1B list. This species occurs in open areas with loose or disturbed soil, usually derived from sandstone, shale or serpentine, on seaward slopes. Small colonies of this species have been located on NDDDB maps north and northwest of the project area. These sightings are located in grassy openings and pastures that are lightly grazed. Habitat for this species may exist on Swanton Pacific Ranch; however, it will not be part of the harvest area.

White-rayed Pentachaeta (*Pentachaeta bellidiflora*)

This plant is an annual herb with a state and federal listing of endangered and is a species on the CNPS 1B list. Habitat for the species includes valley and foothill grassland, often on serpentine substrate, which is not present in the harvest area. This species has been identified on NDDDB maps over 5 miles away from the harvest area.

Santa Cruz Wallflower (*Erysimum teretifolium*)

The plant is a perennial herb with a state and federal listing of endangered and is a species on the CNPS 1B list. Habitat for the species includes chaparral, lower montane coniferous forest and inland marine sands. Santa Cruz Wallflower has been located east of the project area in Bonny Doon. Development, sand mining, and vandalism seriously threaten this species. No habitat is present in the harvest area and the proposed operations will not affect distribution.

San Francisco Campion (*Silene verecunda* ssp. *verecunda*)

San Francisco is a perennial herb with no state or federal listing and is a species on the CNPS 1B list. Development threatens this species. Habitat for the species includes coastal bluff scrub, chaparral, coastal prairie, valley and foothill grassland. It is most often found on mudstone or

shale outcrops. Potential habitat (rocky outcrops with scrub or grass cover) exists within the harvest area, but will not be impacted by operations; therefore impacts are not anticipated.

Santa Cruz Manzanita (*Arctostaphylos andersonii*)

Santa Cruz manzanita is an evergreen shrub with no state or federal listing and is a species on the CNPS 1B list. It is located in broadleaf upland forest, chaparral, and north coast coniferous forest. Within these habitats it can be found in openings and on edges. Potential habitat for Santa Cruz manzanita is located on Swanton Pacific Ranch, though it is not known to exist in or near the harvest area. Manzanita requires a great deal of sunlight and therefore open canopied habitats. Redwood and Douglas-fir trees proposed for management typically over-shadow manzanitas and NTMP operations are to occur in forest stands that do not provide enough light for manzanita to succeed. This species is recognizable due to its upright form and heart-shaped leaves that nearly wrap around the branch with almost no stem or pedicle.

Schreiber's Manzanita (*Arctostaphylos glutinosa*)

Schreiber's manzanita is an evergreen shrub with no state or federal listing and is a species on the CNPS 1B list. Habitat includes closed-cone coniferous forest and chaparral on a substrate of mudstone or diatomaceous shale, usually in association with other manzanita species. Potential habitat for Schreiber's manzanita is located on Swanton Pacific Ranch, though it is not known to exist in or near the harvest area.

Pajaro Manzanita (*Arctostaphylos pajaroensis*)

Pajaro manzanita is an evergreen shrub with no state or federal listing and is a species on the CNPS 1B list. It is found in chaparral communities occurring on sandy soils in northern Monterey County. Prior recording of this species in this area was a mistaken *Arctostaphylos andersonii*.

Bonny Doon Manzanita (*Arctostaphylos silvicola*)

Bonny Doon manzanita is an evergreen shrub with no state or federal listing and is a species on the CNPS 1B list. Habitat for the species is chaparral, closed-cone coniferous forest, and lower montane coniferous forests in Santa Cruz County. It can be found only in the Zayante sandhills, in Bonny Doon and at the Chalks, on Lockheed property, growing on shale. Suitable habitat for this species does not exist within the NTMP boundary.

Kellogg's Horkelia (*Horkelia cuneata* ssp. *sericea*)

This plant is a perennial herb with no state or federal listing and is a species on the CNPS 1B list. Development threatens this species. One occurrence is recorded on NDDDB maps, 1 mile northwest of the harvest area, on a northwest facing grassland slope. Habitat for the species is in openings of closed-cone coniferous forest, chaparral (maritime), and coastal scrub on old dunes and coastal sandhills. Habitat for this species exists within the harvest area, but the species was not located during surveys.

Santa Cruz Clover (*Trifolium buckwestiorum*)

Santa Cruz clover has no state or federal listing and is a species on the CNPS 1B list. This species is an annual herb, endemic to Santa Cruz County, known from about 10 very small occurrences. Habitat is in broadleaf upland forest, coastal prairie, and cismontane woodland.

This species has been located on NDDB maps to the northwest and overlapping on the project area. Habitat for this species exists within the harvest area, but the species was not located during surveys.

Ben Lomond Spineflower (*Chorizanthe pungens* var. *hartwegiana*)

This annual herb has no state listing, is federally listed as endangered and is a species on the CNPS 1B list. The plant is known only from sandhill parklands in the Santa Cruz Mountains and is threatened by sand mining, development, and non-native plants. This species has been recorded on NDDB maps east of the project area in Bonny Doon, as well 5 miles north of the project area. Suitable microhabitat includes Zayante coarse sands in maritime ponderosa pine sandhills which does not exist on Swanton Pacific Ranch. Appropriate habitat is not present in the harvest area and distribution will not be affected by proposed harvesting operations.

Santa Cruz Mountains Beardtongue (*Penstemon rattanii* var. *kleei*)

Santa Cruz Mountain beardtongue is a perennial herb that can be found in chaparral vegetation types, lower montane coniferous forests, and north coast coniferous forests, on sandy shale slopes. The plant has no state or federal listing and is a species on the CNPS 1B list, known only from Santa Cruz and Santa Clara Counties. Habitat for this species exists within the harvest area, but the species was not located during surveys.

Dudley's Lousewort (*Pedicularis dudleyi*)

Dudley's lousewort has no federal listing, is listed by the State as rare, and is a species on the CNPS 1B list. The habitat for Dudley's lousewort is chaparral, valley grassland and redwood forest mainly in coastal habitats. This species was not encountered during surveys; it is thought that this species is extinct in Santa Cruz County.

Santa Cruz Cypress (*Cupressus abramsiana*)

Santa Cruz cypress is state and federally listed as endangered and is a species on the CNPS 1B list. Habitat for this evergreen tree consists of closed-cone coniferous forest, chaparral, and lower montane coniferous forest on sandstone or granitic parent material. Habitat for this species exists east of the harvest area, but the species was not located during surveys.

Blasdale's bent grass (*Agrostis blasdalei*)

Blasdale's bent grass is not federally or state listed and is a species on the CNPS 1B list. Habitat for this perennial herb consists of coastal bluff scrub, coastal dunes, and coastal prairie on sandy or gravelly soil. Appropriate habitat is not present in the project area.

San Francisco Popcorn-Flower (*Plagiobothrys diffuses*)

San Francisco popcorn-flower is not federally listed but is listed as endangered under the CESA and is on the CNPS 1B list. Habitat for this species is moist areas of coastal prairie and valley and foothill grassland. One occurrence is recorded on NDDB maps 5 miles southeast of the harvest area; it is also found on private property adjacent to the Swanton Pacific Ranch. Suitable habitat is within the project area, but the species was not located during surveys.

Awned bentgrass (*Agrostis aristiglumis*)

Awned bentgrass is listed by the County of Santa Cruz but has no other federal, state, or CNPS status. The species has been subsumed into *Agrostis microphylla* by recent taxonomic treatments. Habitat for the species locally includes moist mudstone cliffs. The species was noted in the county list as occurring locally only from the bluffs near Greyhound Rock. Appropriate habitat is present in the project area, but the species was not located during surveys.

Bent-flowered fiddleneck (*Amsinckia lunaris*)

Bent-flowered fiddleneck is an annual spring wildflower that is not federally or state listed but is listed on the CNPS 1B list. Habitat for this species is coastal prairie, valley and foothill grassland, and cismontane woodland. This species is only known in Santa Cruz County from the Swanton area, on steep grasslands within the forested matrix areas near the harvest area. Appropriate habitat is present in the project area, but the species was not located during surveys.

Slender silver-moss (*Anomobryum julaceum*)

Slender silver-moss is listed on the CNPS list 2 but has no other federal, state, or County status. Habitat for this species includes broadleaf upland forest, lower montane coniferous forest, and north coast coniferous forest. Appropriate habitat is present in the project area, but would not be impacted by the proposed activities.

Coast rock cress (*Arabis blepharophylla*)

Coast rock cress is a semi-woody perennial subshrub which is listed by the County of Santa Cruz and on List 4 by the CNPS but has no other federal or state status. Habitat for this species includes rocky outcrops and coastal scrub. A nearby colony is known from Santa Cruz County, at Eagle Rock. Santa Cruz County populations appear to be distinct from others, and so may represent an undescribed taxon. Suitable habitat exists within the project area, but the species was not found during surveys.

Santa Cruz Mountains pussypaws (*Calyptridium parryi* var. *hesseae*)

Santa Cruz Mountains pussypaws is an annual late spring wildflower listed by the County of Santa Cruz and on List 3 of the CNPS but has no other federal or state status. The species may no longer exist in the county. Habitat for this species includes sandy chaparral, which is not present in the project area.

Franciscan thistle (*Cirsium andrewsii*)

Franciscan thistle is a biennial wetland plant, which not federally or state listed but is included on List 1B by CNPS. Habitat for the species includes mixed evergreen forest, coastal scrub (sometimes serpentine), coastal prairie, and coastal bluff scrub. Habitat for this species is present in the area, but the species has never been found in the Scotts Creek watershed and was not located during the surveys.

San Francisco Collinsia (*Collinsia multicolor*)

San Francisco Collinsia is an annual spring wildflower which is not federally or state listed but is listed on the CNPS 1B list. Habitat for the species includes closed-cone coniferous forest and coastal scrub, on mesic north to north easterly slopes. Although somewhat acceptable habitat for

this species is found in the project area, this conspicuous species has not been found within the NTMP area.

California bottlebrush grass (*Elymus californicus*)

California bottlebrush grass is a tall statured perennial bunchgrass listed by the County of Santa Cruz and on List 4 of the CNPS but has no other federal or state status. Habitat for the species includes riparian and cismontane woodlands, north coast coniferous forest, and broadleafed upland forest, all of which are present in the NTMP area; but, this conspicuous species was not located during the surveys.

Zayante buckwheat (*Eriogonum nudum decurrens*)

Zayante buckwheat is an herbaceous perennial species listed by the County of Santa Cruz and on List 1B by the CNPS but has no other federal or state status. Habitat for this species includes sandy chaparral, which is not present in the project area.

Coast wallflower (*Erysimum ammophilum*)

Coast wallflower is a biennial semiwoody subshrub which is not federally or state listed but is listed on the CNPS 1B list. The species is found on sandy substrates close to the coast. The closest population to the project site was located within the Highway 1 right of way, south of Waddell Creek; it was eliminated by roadside herbicides and/or competition with exotic species 10 years ago.

Zayante everlasting (*Gnaphalium zayatense* (pro sp))

Zayante everlasting is an herbaceous perennial species listed by the County of Santa Cruz but has no other federal, state, or CNPS status. The species has not yet been officially described, though botanists familiar with it recognize the strong potential for it to receive recognition. Habitat for this species includes chaparral associated with Santa Margarita sandstone, which is not present in the project area.

Short-leaved evax (*Hesperivax sparsiflora* var. *brevifolia*)

Short-leaved evax is a short-statured annual herb which is not federally or state listed but is listed on the CNPS 2 list. Habitat for the species includes coastal bluff scrub and coastal dunes, neither of which occur on the project site.

Redwood lily (*Lilium rubescens*)

Redwood lily is an herbaceous geophyte perennial listed by the County of Santa Cruz but has no other federal, state, or CNPS status. Habitat for the species includes lower and upper montane coniferous forest, broadleaf upland forest, chaparral, and north coast coniferous forest. The species was once reported to occur in Santa Cruz County, which, if accurate, would represent a range extension from the southern range limit, Sonoma County. The species has not been documented in recent history. Potential habitat for the species exists within the project area, though this conspicuous species was not found during surveys.

Arcuate bushmallow (*Malacothamnus arcuatus*)

Arcuate bushmallow is a perennial shrub listed by the County of Santa Cruz and on List 1B by the CNPS but has no other federal or state status. Recent treatments of the *Malacothamnus*

genus controversially lumped arcuate bushmallow with the chaparral mallow, though most recognize the previous name. Habitat for the species includes chaparral and cismontane woodland. It has been found locally in chaparral near Big Basin. Potential habitat for the species exists within the project area, though this conspicuous species was not found during surveys.

Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*)

Gairdner's yampah is a perennial geophyte herb. It is listed as by CNPS on their List 4 but has no other listing status. Habitat locally includes moist coastal prairie. Potential habitat for the species exists within the project area, though this conspicuous species was not found during surveys.

Michael's rein orchid (*Piperia michaelii*)

Michael's rein orchid is a perennial geophyte herb. It is listed by CNPS on List 4, but has no other listing status. Habitat locally includes closed cone pine forest, coastal scrub, and cismontane woodland. Potential habitat for the species exists within the project area, though this species was not found during surveys.

Artist's popcornflower (*Plagiobothrys chorisianus* var. *chorisianus*)

Artist's popcornflower is a short-statured annual spring wildflower which is not federally or state listed but is listed on the CNPS 1B list. It is found in moist areas of coastal scrub, chaparral, and coastal prairie habitats. Potential habitat for the species exists within the project area, though it was not found during surveys. *Plagiobothrys* species have notorious long-lived seedbanks, and so the species could appear within the project area at some later date.

Straggly gooseberry (*Ribes divaricatum* var. *pubiflorum*)

Straggly gooseberry is a perennial woody shrub which listed by the County of Santa Cruz but has no other federal, state, or CNPS status. It is found in moist areas within scrub and woodland habitats with moderate light levels. Although there is potential habitat for the species in the NTMP area, the species was not encountered during surveys. The species is known from the Swanton area and has been noted to have variant forms deserving further scientific study.

Hoffmann's sannicle (*Sanicula hoffmannii*)

Hoffmann's sannicle is a perennial herb which is listed by the County of Santa Cruz but has no other federal, state, or CNPS status. It is found in cismontane woodlands, coastal scrub, and broadleaf upland forest. The species is only known from the Swanton area within Santa Cruz County, though there are additional populations just north in San Mateo County. There is potential habitat for the species within the NTMP area, but the species was not found during the surveys.

Mt Diablo cottonweed (*Micropus amphibolus*)

Mt Diablo cottonweed is a very short-statured annual herb which is listed by the County of Santa Cruz but has no other federal, state, or CNPS status. It is found in sunny, rocky outcrops and shallow-soiled areas of grasslands. Populations in Santa Cruz County include Scotts Valley, Swanton, and Santa Cruz City. There is no potential habitat for the species within the NTMP area.

Elmer's fescue (*Festuca elmeri*)

Elmer's fescue is a short-lived perennial bunchgrass which lacks any status; it is, however, regionally uncommon and is in decline throughout its range. The species is found in cismontane or coniferous forests in understory areas that receive moderate light levels. Local populations are known only from the Swanton area and the University of California at Santa Cruz (where it may have been recently extirpated). This species is widespread in grasslands on Swanton Pacific Ranch and on roadsides and landings in the NTMP area. It shall not be negatively affected by operations and is in fact favored by practices. Populations in proximity to the NTMP area shall be monitored during periodic visits by a botanist to the Ranch. Several permanent plots, each with a current population of Elmer's fescue are selected for monitoring. If Elmer's fescue presence is observed to diminish at these plots, a botanist shall be consulted and mitigations may be developed, which will be amended to the NTMP as necessary. Monitoring plot locations are shown on the Botanical Conservation Map at the end of Section II.

Botanical Mitigation – Monitoring for Hygric plants (Mitigation Point MP31)

This section of existing skid trail goes through a spring-fed wet area with hygric plants, refer to crossing S1 under Item 26. In order to maintain the integrity of this area, this section of trail shall only be skidded across in a condition when approaches are not saturated. Accessing this area with equipment is considered favorable for the species diversity since the diversity is maintained by allowing light in, a result of the previous harvest. Following skidding, the trail will be re-contoured to mimic the pre-operations condition, such that it gently slopes away on either approach. No seed or straw mulch will be applied to the trail surface, to allow the native species to re-occupy the site. Slash may be applied. Since this trail was used similarly in the past and the plants have responded positively to the increased light conditions, future use is expected to maintain the species diversity and not cause harm. To ascertain the impacts, if any, of future operations at this site, monitoring of species composition and percent cover shall be undertaken prior to operations to establish a baseline and again several years following operations to monitor species response. Monitoring shall entail:

1. Monitoring to determine percent cover shall be done using the line-intercept method. The protocol is to stretch a tape down the thalweg of the channel, from approximately 10 meters above the crossing to approximately 10 meters below the crossing. The first time this is done, a tree on either end should be marked with a tag facing toward the transect which indicates the distance and azimuth to the beginning or ending of the transect. At every 1 meter marker, the botanist should record the top species encountered by a sharp object lowered from the meter marker. If no species is encountered, bare ground is recorded. This list yields percent cover.
2. Monitoring to determine species composition shall be done using a 1 meter belt transect on the above thalweg transect. The protocol is to place a 1 meter yardstick perpendicular to the thalweg transect and record every species noted within the meter-wide band, from approximately 10m upstream of the crossing to approximately 10m downstream of the crossing.
3. This monitoring will elucidate the response of the site to harvest operations within the context of the external environmental conditions. A professional botanist may be consulted to review the monitoring results, and potentially develop mitigations if necessary. Any mitigations affecting future harvest operations shall be amended to the NTMP. Negative

impacts from operations are unlikely; however, possible impacts that will be monitored for include: reduction in total percent cover (below 20% with 2-3 years post-harvest) or a significant increase in invasive species presence.

APPENDIX TO ITEM 32

Rationale for rejecting selected animal species from the CWHR query results for the Swanton Pacific Ranch NTMP:

1. For the following species, the listing as threatened, endangered, or species of concern applies to a subspecies or other taxon whose geographic range lies well outside the NTMP assessment area. The names shown in parentheses are for the actual listed taxa, taken from CDFG's "Special Animals" list, February 2006 version.

Amphibians

Long-toed salamander	(Santa Cruz long-toed salamander)
California newt	(Coast Range newt: Monterey Co. southward)
Ensatina eschscholtzi	(Yellow-blotched salamander)

Reptiles

Western skink	(Coronado skink)
Rubber boa	(Southern rubber boa)
Striped racer	(Alameda whipsnake)
California mountain kingsnake	(San Bernadino population)

Birds

Northern flicker	(Gilded flicker)
Western scrub jay	(Eagle Mountain & Island scrub jays)
Spotted towhee	(San Clemente towhee)
California towhee	(Inyo California towhee)
Rufous-crowned sparrow	(Southern California rufous-crowned sparrow)
Savannah sparrow	(Belding's & large-billed savannah sparrows)
Song sparrow	(Suisan, Alameda & San Pablo song sparrows)
Dark-eyed junco	(Gray-headed junco)

Mammals

Vagrant shrew	(Saltmarsh wandering shrew)
Ornate shrew	(Buena Vista Lake shrew, Salinas ornate shrew, Southern California saltmarsh shrew, Suisun shrew & Santa Catalina shrew)
Broad-footed mole	(Alameda Island mole, Angel Island mole)
Brush rabbit	(Riparian brush rabbit)
Black-tailed jackrabbit	(San Diego black-tailed jackrabbit)
California pocket mouse	(Dulzura pocket mouse)
Heermann's kangaroo rat	(Berkeley, Merced & Morro Bay kangaroo rats)
Deer mouse	(Anacapa Island & San Clemente deer mice)
California vole	(Mohave River vole, San Pablo vole, Amargosa vole, Stephens' California vole, Owens Valley vole)
Red fox	(Sierra Nevada red fox)
Northern river otter	(Southwestern river otter)
Western spotted skunk	(Channel Islands spotted skunk)
Mountain lion	(Yuma mountain lion)

2. All marine birds and mammals that were listed among the CWHR query results were rejected for obvious reasons.
3. Prairie falcon (species of concern: nesting), long-billed curlew (species of concern: nesting), and willow flycatcher (State endangered: nesting) do not nest in Santa Cruz County.

ITEM 34: LATE SUCCESSION FOREST STANDS (LSF)

It is required in Section II, Item 34 of the NTMP to determine whether or not harvest will occur in LSF stands. In order to determine this we first define LSF:

Based on 14 CCR 895.1 LSF is defined by the following:

“Means stands of dominant or predominant trees that meet the criteria of WHR class 5M, 5D, or 6 with an open, moderate, or dense canopy closure classification, often with multiple canopy layers, and are at least 20 acres in size. Functional characteristics of late succession forests include large decadent trees, snags, and large, down logs.”

It is further clarified in “The Clarification of the Measurement of California Wildlife Habitat Relationships (CWHR) System Size Classes 5 and 6 for Tree Habitats” by Parisi, Motroni, Robards, May 2007, (Draft form), to suggest that LSF relates to an overstory of forest where a Quadratic Mean Diameter (QMD) of ≥ 24 ” implying a tree size classification of 5 or 6 in CWHR. It is also strongly implied that before QMD is calculated, a determination of stand structure is critical in the sense of forest layers and that QMD should be calculated at each of these layers if enough canopy exists per layer.

With more regard to LSF, the memorandum from Duane Shintaku, March 2, 2005, titled “Disclosure, evaluation and protection of large old trees” draws significance to large old trees and suggests disclosure for stands less than 20 acres in size or on an individual basis including extensive discussion on impacts that could result from harvest activities.

If it is determined that we have LSF Stands and per 14 CCR 919.16 they are “proposed for harvesting and such harvest will significantly reduce the amount and distribution of LSF stands or their functional wildlife habitat value so that it constitutes a significant adverse impact on the environment as defined by Section 895.1, the RPF shall provide habitat structure information for such stands.” and supply information per 14 CCR 919.16 (1-6).

With extensive background provided on this issue the following questions will be answered:

1. Are LSF Stands present?
2. If LSF Stands are present, will harvesting significantly reduce the amount and distribution of LSF or their functional wildlife characteristics? If so 14 CCR 919.16, (1-6) will be discussed.

Swanton Pacific Ranch has seven different stand types stratified over the property, RW III, RW II, RW IV, DF, DF HW, and the Smith Stand (More information on forest stratification can be found in Section III, Item # 39 where the Sustained Yield Analysis (SYA) begins. The table

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below provides QMD for all seven stands, first down to 2" DBH classes, and then QMD for DBH classes > 24" in an attempt to represent dominant and predominant trees:

Quadratic Mean Diameter for all Seven Stand Types

	RW III	RW II	RW IV	DF	DF HW	MPP	Smith Stand
>2" DBH	18.5	24.3	16.2	16.4	17.9	16.8	28.7
>24" DBH	31.7	34.7	31.9	31.8	33.1	34.0	44.4

Although not required, a Board Feet (BF)/acre table is also provided by stand type to interject an additional factor. LSF implies large decadent trees suggesting that BF/Acre should also be high.

Board Feet/Acre for all Seven Stand Types

	RW III	RW II	RW IV	DF	DF HW	MPP	Smith Stand
Acres	231	31	71	90	192	52	34
RW	27790.1	46300.8	22562.7	0	6176.6	0	85750.3
DF	6877.7	2028.4	10291.4	22052.3	11306.8	8992.0	29840.3
MP	0	0	0	0	0	26704.3	0
Total							
BF/Ac.	34667.8	48329.2	32854.1	22052.3	17483.4	35696.2	115590.6
QMD >24"	31.7	34.7	31.9	31.8	33.1	34.0	44.4

Just looking at QMD suggests that every stand has qualified for CWHR size class 5 or 6 based on >24" QMD. However, volume relationships suggest further investigation into stand and stock tables provided in Section III, Item # 41, (d),(e) and size class distribution tables under Section III, Item #41(f), which add more information to the investigation of trees in size class 5 or 6. Ultimately, trees require age to produce structure, which should mean increased volume and higher size class distributions, which points directly to the Smith Stand.

An important component to recognize at this stage of the assessment is that selective timber harvesting on Swanton Pacific Ranch utilizes a "crop tree" method where trees are grown to approximately 32-38" DBH, depending on site quality, and approximately 20-40% of these trees are harvested every 10-20 years. Remaining trees vigorously proliferate following entries and the cycle of larger "crop tree" occupation persists. Coupled with the "cut what you grow" mentality of the NTMP, this silvicultural method will always generate trees of significant diameter through time.

The definition of LSF from 14 CCR 895.1, also includes the decadent characteristic, insinuating age related to structural wildlife characteristics, and goes on to include snags, and large, down logs. The only stand that has all of these characteristics (QMD >24", decadent trees, snags, and downed woody debris) is the Smith Stand located in the northeastern portion of the NTMP. The other six stand types are approximately 100 years old and have been entered utilizing selective harvesting within the last twenty years. These stands do not exhibit stand characteristics of decadent trees, a high number of snags, or large, downed logs at any level nearing the Smith Stand. As a matter of interest it should be noted that, the MPP stands are 20-30 year old planted

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stands of non-native Monterey Pine infested with Pitch Canker that produced a 34" QMD. Snag tallies are quite low in the six other stand types (excluding the Smith Stand) and extra consideration is being given to the creation of snags in Section II, Item #14.

Per Shintaku's Memorandum, the RW III and DF HW stand types do offer some lone trees with potentially suitable Marbled Murrelet habitat identified in the Botanical Conservation Map at the end of Section II that are to be protected as stated under Section II, Item #14 of the NTMP. Included in the RW II stand type, 2 trees will also be protected per the request of Al Smith, who donated the property to Cal Poly.

General Smith Stand-Late Succession Forest (34 acres)

This Sub-Unit in the North Fork Unit can be located on the Botanical Conservation Map at the end of Section II.

This area is designated as a forest with High Conservation Values (HCV) per the Forest Stewardship Council (FSC) principles and criteria, which are followed by the Ranch to maintain certification. Due to the HCV characteristics within this stand, it is managed according to the following guidelines that satisfy the FSC, which are detailed throughout the NTMP:

Excerpt taken from Section III, Item #43 (b) of the Sustained Yield Analysis (SYA)

"Although a general prescription is provided for the Smith Stand, more important guidance comes from FSC that requires that any activity in the Smith Stand shall adhere to the following language:

Type II old growth redwood is previously entered stands of old growth. These stands can have harvesting in them; however, none of the old trees will be harvested or negatively impacted during operations. Thinning from below to reduce competition and to remove fuel ladders is permitted. Equipment should remain away from old growth trees to prevent root damage and soil compaction. Large downed woody debris and standing snags are left to provide diversity.

Other guidelines in Section II are provided to identify use of skid trails only where flagged, snag retention, and retention of downed woody debris greater than 24" DBH in the Smith Stand.

FSC has an annual audit of forest operations where this location will be inspected if any harvesting activities occur in the Smith Stand or nearby. If these guidelines are not adhered to loss of certification as well as CDF enforcement action could occur. The harvestable volume from the Smith Stand is incorporated in the gross volume summary in Tables 19-22. Due to the limited nature of harvest activities allowable in this area, the harvestable volume from the Smith Stand has been removed from the gross volume summary in Tables 23-26 to provide a more accurate estimate of manageable volume for general management purposes.

The QMD for the Smith Stand is 44", making it a candidate for CWHR size class 5, although the presence of a scattered old growth strata put it in the category of CWHR size class 6 for a multi-

storied stand. The prescription for the Smith Stand in Table 84 states that no trees >38" shall be harvested. Consequently, the QMD and will only increase over time. The thinning prescription for the Smith Stand in the SYA and the clear guidelines in Section II that protect both species and habitats of this stand are more than adequate to determine that the light harvesting, "thinning from below", proposed in the Smith Stand shall not "significantly reduce the amount and distribution of LSF stands or their functional wildlife habitat value so that it constitutes a significant adverse impact on the environment." The proposed management will not reduce the QMD and will maintain the CWHR size class 6 for un-even structure by thinning from below.

SUSTAINED YIELD ANALYSIS (SYA)

41. Provide a description by management unit(s) of the timber stand characteristics including the items listed below, in Section III. Such description shall provide the basis for the information provided in the NTMP, as per 14 CCR 1090.5 (g):

Supporting maps for management units, stand types, and inventory points are found at the end of Section II.

Management Units

Management units were selected based on previous operational boundaries from the three Timber Harvest Plans that have occurred on Swanton Pacific Ranch. These unit boundaries were selected because of operational boundaries between yarding methods and that they were units of reasonable size to be economically feasible for a larger scale management operation.

Three Management units exist in the Swanton Pacific Ranch NTMP:

1. North Fork (Little Creek) Unit (191 acres)
2. South Fork (Little Creek) Unit (84 acres)
3. Satellite Stands Unit (426 acres)

North Fork (Little Creek) Unit

This management unit is comprised predominantly of second-growth redwoods resulting from the clearcuts that generally occurred across the Santa Cruz Mountains at the turn of the century. Along with second growth redwoods, Douglas-fir and variety of different hardwood species also occupy this site including, tan oak, coast live oak, California bay, bigleaf maple, California buckeye, and California nutmeg. This stand is characterized as a typical managed stand in the Santa Cruz Mountains. The stand has been harvested once in the early 90's, since the clearcut, and a new age class can be seen taking position in the stand with the remaining portion of the stand predominantly even-aged although reasonably well distributed throughout diameter classes.

The North Fork unit also has a stand of old growth trees in the northeastern panhandle of the property that was not harvested at the turn of the century. This stand is known as the General Smith Sub-unit and is discussed above under Item 34, Late Succession Forest Stands. It has similar species with respect to other portions of the North Fork Management Unit except conifers in the >50" DBH class are more prominent.

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The southern portion of the North Fork Unit has approximately 31 acres of Site Class II growing ground, depicted on the CFI Plots and Stand Types Map as RW II and Tranquility Flats. This portion of the North Fork Unit in the Redwood Site II stand type exhibits a greater percentage of trees in the >40" DBH class due to the rate of growth. An 11 acre area of the Redwood II stand type has been designated a Big Tree Management Unit and is referred to as the Tranquility Flats Sub-Unit in this NTMP. The Tranquility Flats Sub-Unit is on the upper end of productivity within the delineated Site II area. The Ranch has made a commitment to manage for a larger tree sizes in this Sub-Unit. Guided by the Sustained Yield Analysis that's based on "cut what you grow", the crop tree size is 38" DBH. Total volume harvestable is shown in Table 76 "Estimate of Volume in Board Feet /Per Stand Type /Per Acre Available for Harvest This Entry Based on Yearly Growth Rate" and the percent removal by diameter class is shown in Tables 78 and 78A "Silvicultural Prescription for Harvesting RW II". These figures are founded on the most current Continuous Forest Inventory (CFI) information available and shall be updated accordingly. The percent removal is also tempered by concern for avoiding excessive residual stand damage. Harvesting as proposed in this Sub-Unit will reduce the number of trees per acre >38" DBH by only 20%, leaving approximately 8 trees per acre >38" DBH following the first entry. The trees remaining in the stand will have increased sun and water resources and will capitalize on this by increasing radial growth to attain larger stature, especially those larger diameter trees in the overstory.

Although large size classes are present in the whole RW II stand type, and the Tranquility Flats Sub-Unit in particular (partly due to past management), structural characteristics indicative of late succession forests such as trees with special habitat elements, snags, and downed logs are not prevalent. All investigation and inventory of this stand leads to the conclusion that it is a second growth managed stand, with a dearth of LSF attributes. As stated previously, all of RW II is predominantly even-aged as it has been selectively harvested once since regenerating approximately 100 years ago. Site tree measurements taken at Continuous Forest Inventory plots in 1997 confirm that the dominant trees are approximately 100 years old. Due to the comprehensive Wildlife Tree and Snag Retention Guidelines, which are incorporated in the prescriptions and marking guidelines for each unit, the occurrence of desirable wildlife attributes are anticipated to increase over time throughout the Sub-unit, which includes approximately 8 acres in Watercourse and Lake Protection Zones.

A Big Tree Management prescription, similar to that proposed in this plan, was carried out in the last harvest (1994) in the interest of innovation and research to demonstrate how forest attributes including productivity are affected by retaining more big trees per acre over time. As a result of that harvest, a new cohort is present in the stand, although still mostly in the understory. The continuation of this style of management on the Ranch will be informative for land managers in the redwood region where the Big Tree Management approach is not frequently practiced.

South Fork (Little Creek) Unit

Similar to the North Fork Unit, the South Fork Unit is comprised predominantly of second growth redwoods resulting from the clearcuts that generally occurred across the Santa Cruz Mountains at the turn of the century. Along with second growth redwoods, Douglas-fir and variety of different hardwood species also occupy this site including, tan oak, coast live oak, California bay, big-leaf maple, California buckeye, and California nutmeg. This stand is

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characterized as a typical managed stand in the Santa Cruz Mountains. The stand has been harvested once in the late 1980's, since the clearcut, and a new age class can be seen taking position in the stand with the remaining portion of the stand predominantly even-aged although reasonably well distributed throughout diameter classes.

Satellite Stands Unit

The Satellite Stands Unit exhibits very similar characteristics in respect to the North and South Fork Units as it relates to species. The real difference comes in the variable nature of manageable stand frequency in these areas. The stands are more open with higher components of Douglas-fir and hardwoods. Site is lower in these areas with low site III and site IV more predominant. Defect is higher in these stands with increased exposure to the elements and a Douglas-fir split product harvest in the 50's and 60's that left significant damage to the stand and successional species change in some areas to hardwoods. This stand was selectively harvested in 2004 and many young sprouts remain successful as the intent is to move this stand into a selective management regime.

Forest Stratification

Recognizing the differences and similarities in timber characteristics within each management unit discussed above, the forest was stratified into seven different stand types too identify more clearly where characteristics across this managed landscape fit together. The basis used for this stratification assessment focused on density, site, productivity, age, and species composition. The task of stratification was completed through aerial photos, inventory data from forest sampling, and field checks by the RPF and botanical consultant Dr. Grey Hayes. The seven different stand types are listed and defined below:

1. RW III – Site III redwood. Stand comprised of at least 50% redwoods that are intermixed with Douglas-fir and various hardwood species.
2. RW II – Site II redwood. Stand comprised of at least 50% redwoods that are intermixed with Douglas-fir and various hardwood species.
3. RW IV – Site IV redwood. Stands that are comprised of at least 50% redwood intermixed with dougals-fir and various hardwood species. Singled out as a separate stand due site quality, density, and diameter distribution of redwoods.
4. DF – Site III Douglas-fir. Stands that our comprised of at least 50% Douglas-fir intermixed with various hardwood species.
5. DF_HW – Site III Douglas-fir and hardwood. Stands that are comprised of at least 50% hardwood with a significant component of Douglas-fir and little or no redwood.
6. MPP – Monterey Pine Plantation. These are plantations of New Zealand stock pine planted on the ranch approximately 20-30 years ago.
7. Smith Stand – Site III redwood and Douglas-fir. This area was typed out separately due to a significant amount of large diameter trees. This stand also has special management, due to designation as High Conservation Value Forest (HCVF) for FSC certification

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Inventory System

In order to understand the timber characteristics of the stand types in even greater detail, Swanton Pacific Ranch utilizes two different inventory methods:

1. Continuous Forest Inventory (C.F.I.), Bonner 1997 (14 plots), Andersen 2003 (79 plots)
2. Cluster plots, Haupt 2006 (47 plots), and Gilbert and McClung 2007 (36 plots)

The C.F.I. is a very intense sampling method that provides for re-measurement of the forest every 10 years. This system utilizes a fixed 1/5 acre circular plot on a 500' x 500' grid system that yields an approximate 2-3% sample. The cluster plots are less intensive but are utilized to bolster sampling size for silvicultural prescriptions of harvesting and timber inventories. Cluster plots also utilize a fixed 1/5 acre circular plot but, on a 250' x 250' grid system. The amount of cluster plots that were measured varied dependent on where more detailed stand information was needed. C.F.I plots average a 2-3% sample size, including cluster plots increases the sample size to 3-6% with RW II at a high of 12%. Data measurements in the two different inventories are provided below:

1. C.F.I.

- a. All conifers down to 2 inch DBH class
- b. Tree heights for all conifers down to 2 inch DBH class
- c. Distance and bearing for each tree down to 2 inch DBH class
- d. Nested 1/10th acre regeneration survey for conifer seedlings less than 2 inch DBH and stump sprouting
- e. Crown class for all conifers down to 2 inch DBH class
- f. Height to crown base (live crown ratio) for all conifers down to 2 inch DBH class
- g. Damage and disease
- h. Breast height age for one dominant or co-dominant conifer per plot
- i. Radial growth for four conifers in each plot representing dominant, co-dominant, intermediate, and suppressed trees
- j. All hardwoods are measured to 2 inch DBH class
- k. Snags are entered into the tree inventory section if they fit the following criteria:
 - i. Conifer: 15 inch DBH and 10 feet tall
 - ii. Hardwood: 7 inch DBH and 10 feet tall
1. Snags not meeting this criteria were tallied in a snag tally column
- l. Species specific hardwood cover estimated and expressed in percent
- m. Species specific herbaceous vegetative ground cover estimate expressed as a percent

2. Cluster Plots:

- a. All conifers down to 2 inch DBH class
- b. Tree heights for 15% of all conifers in a well distributed range of diameters throughout the plot
- c. Nested 1/10th acre regeneration survey for conifer seedlings less than 2 inch DBH and stump sprouting
- d. Hardwood basal area

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Summary of Inventory Sample Size

Table 1: Percent Sample Size by Unit

Stand	Unit acres	# of plots	% sample size
RW III	231	76	6.6
RW II	31	19	12.3
RW IV	71	11	3.1
DF	90	24	5.3
DF HW	192	33	3.4
MPP	52	7	2.7
Smith Stand	34	6	3.5
Total	701	176	5.0

Statistical Summary

Table 2: Board Feet Per Acre Between Plots

Stand	S.E. %	Unit acres	% of total area	# of plots	% sample size
RW III	6.7	231	33.0	76	6.6
RW II	11.2	31	4.4	19	12.3
RW IV	16.4	71	10.1	11	3.1
DF	19.9	90	12.8	24	5.3
DF HW	17.2	192	27.4	33	3.4
MPP	27.4	52	7.4	7	2.7
Smith Stand	18.5	34	4.9	6	3.5
		701	100.00	176	

a. Species composition;

The NTMP area is approximately 701 acres that is medium to well-stocked second growth redwood forest mixed with Douglas-fir and hardwoods. In general redwood is prominent in the draw bottoms to mid-slope, becoming less dominant on the upper slopes where Douglas-fir and hardwood presence increases. Species composition was derived from C.F.I. plots from 1997 and 2003, and is demonstrated by stand, considering trees per acre down to a 2 inch DBH class. The following Tables 3-9 refer to species composition for all species including hardwoods per stand type:

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Table 3: RW III: Species Composition

Species	TPA	Percent
Redwood	110.2	50.0%
Douglas-fir	15.0	6.8%
Tan Oak	87.1	39.5%
Coast Live Oak	0.4	0.2%
California Bay	2.3	1.0%
Pacific Madrone	0.2	0.1%
Red Alder	2.7	1.2%
Big Leaf Maple	0.4	0.2%
Knob Cone Pine	0.2	0.1%
California Nutmeg	1.7	0.8%
	220.2	100.0%

Table 4: RW II: Species Composition

**RW II: Species
Composition**

Species	TPA	Percent
Redwood	60.0	70.6%
Tan Oak	25.0	29.4%
	85.0	100.0%

Table 5: RW IV: Species Composition

Species	TPA	Percent
Redwood	212.3	74.2%
Douglas-fir	20.0	7%
Tan Oak	9.5	3.3%
California Buckeye	28.6	10.0%
Coast Live Oak	9.1	3.20%
California Bay	4.5	1.60%
Pacific Madrone	0.5	0.20%
Shreve's Oak	1.4	0.50%
	285.9	100.0%

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Table 6: DF: Species Composition

Species	TPA	Percent
Douglas-fir	71.8	50.6%
Tan Oak	10.3	7.2%
Coast Live Oak	35.8	25.2%
California Bay	12.4	8.7%
Pacific Madrone	5.3	3.7%
Non-native Monterey Pine	1.6	1.1%
Knob Cone Pine	0.8	0.6%
California Nutmeg	0.5	0.4%
Shreve's Oak	3.4	2.4%
	141.8	100.0%

Table 7: DF HW: Species Composition

Species	TPA	Percent
Douglas-fir	33.2	18.8%
Coast Live Oak	37.8	21.4%
California Bay	31.8	18.0%
Shreve's Oak	29.0	16.4%
California Buckeye	14.8	8.4%
Pacific Madrone	14.0	7.9%
Tan Oak	10.2	5.8%
Redwood	4.4	2.5%
California Nutmeg	1.2	0.7%
Non-native Monterey Pine	0.2	0.1%
	176.6	100.0%

Table 8: MPP: Species Composition

Species	TPA	Percent
Non-native Monterey Pine	88.6	59.3%
California Buckeye	21.4	14.4%
Shreve's Oak	13.6	9.1%
Douglas-fir	9.3	6.2%
Tan Oak	1.4	1.0%
Coast Live Oak	4.3	2.9%
California Bay	5.7	3.8%
Pacific Madrone	3.6	2.4%
California Nutmeg	1.4	1.0%
	149.3	100.0%

Table 9: Smith Stand: Species Composition

Species	TPA	Percent
Redwood	70.0	42.4%
Tan Oak	72.5	43.9%
Douglas-fir	15	9.1%
California Bay	7.5	4.5%
	165.0	100.0%

b. age classes;

The majority of the forest on Swanton Pacific Ranch is approximately 100 years old. New cohorts of conifers can be seen that are 15 to 20 years old in the North Fork and South Fork Management Units from the Pioneer 1989 and Tranquility 1994 THPs. Young coppice regeneration is also strong from areas harvested under the LLC THP in 2004.

It is interesting to note that in the C.F.I. data, where approximately 100-150 breast height age measurements were taken throughout the seven stand types, suggest a cohort around 60 years old in some 20"-30" DBH classes. Speculatively, it is possible that the fire in 1948 allowed for a period of release where 10"-20" DBH class trees released and took stronger crown positions amongst other second growth trees. This variation can be seen amongst C.F.I. plots where trees in the 20"-30" DBH classes may have variations of age between 60 and 100 years.

It is also important to recognize that an old growth component of trees exists in the Smith Stand and a few single specimens in other locations which are identified in the NTMP and are not proposed for harvest.

c. projected growth;

Growth data was collected from C.F.I. plots from Bonner 1997 and Andersen 2003. Four measurements of radial growth were sampled in each plot through a range of crown classes for redwood and Douglas-fir (dominant, co-dominant, intermediate, and suppressed). These measurements were the most recent 10 years of growth and second most recent 10 years of growth, totaling twenty years. The growth data was compiled within each of the seven stand types, grouped into broader diameter classes (e.g. 2"-6", 8"-12", 14"-18", 20"-24", 26"-30", 32"-36", 38"+) and converted to diameter growth. This growth format was utilized for Stand Table Projections to predict growth. The following table demonstrates projected annual growth for redwood and Douglas-fir in the seven different stand types for two, 15 year entry cycles based on Stand Table Projections:

Table 10: Projected Growth for 2007-2022

Stand	Redwood	Douglas-fir	Total per acre
RW III	576.1	431.8	1007.9
RW II	1056.1	55.5	1111.6
RW IV*	568.4	296.3	864.7
DF	N/A	257.8	257.8
DF HW	10.1	214.3	224.4
MPP**	N/A	N/A	
Smith Stand	1691.7	330.0	2021.7

*20 year re-entry cycle

**Growth not projected due to stand removal

Table 11: Projected Growth for 2022-2037

Stand	Redwood	Douglas-fir	Total per acre
RW III	641.1	175.9	817.0
RW II	1081.5	47.5	1129.0
RW IV*	581.4	235.4	816.9
DF	N/A	505.8	505.8
DF HW	153.8	449.2	603.0
MPP**	N/A	N/A	
Smith Stand	2040.5	376.0	2416.6

*20 year re-entry cycle

**Growth not projected due to stand removal

d. present stocking level and; e. present volume per acre;

For better clarity and continuity, present stocking level and present volume per acre are discussed together and stand and stock tables are provided together.

Present Stocking Levels

Present stocking levels were determined through the culmination of the four data sets referred to under “Inventory System” above (Bonner 1997, Anderson 2003, Haupt 2006, Gilbert and McClung 2007). Data sets were combined to better achieve the guidelines set by CDF to achieve more intensive sampling and better statistics. Although the fluctuation in years creates some difficulties in estimation of present stocking levels, the value of C.F.I. is tremendous for future management. C.F.I. measurement cycles occur every ten years on Swanton Pacific Ranch and the process of re-measuring the North and South Fork Management Units are underway. The Satellite Management Unit will be re-measured in 2013. This type of monitoring provides a “time stamped” record for the forest that allows Swanton Pacific Ranch to track change and adjust.

In order to present all data sets in 2007 older data sets had to be grown to match. Growth tables were created from C.F.I. plots for redwood and Douglas-fir for each of the seven stand types. This data was then applied to each individual tree to grow it to the present 2007 stand on a plot by plot basis. It assumed no mortality for data that was grown from 97', 03', 06' to 07'. Visual inspection of the Swanton forests suggests mortality is very low. In addition, 23 of the 1997 plots were re-measured in 2003 and then cross referenced to determine if mortality from 1997 to 2003 was evident. The result suggested that very little, if any, mortality had occurred in this time period.

Present Volume Per Acre

Present volume per acre is calculated in board feet utilizing redwood and Douglas-fir local volume equations created for Swanton Pacific Ranch:

1. Redwood = $((0.0079443282) * (DBH^{3.35}))$
2. Douglas-fir = $((0.060563504) * (DBH^{2.857668}))$
3. Monterey Pine = $((0.019874) * (DBH^{2.666079}) * 12)$

Hardwood Equations:

1. Coast Live Oak = $(0.0425422 * DBH^{2.4661}) * 3$
2. California Buckeye = $(0.0425422 * DBH^{2.4661}) * 3$
3. California Bay = $(0.025226093 * DBH^{2.68372}) * 3$
4. Red Alder = $(0.071769513 * DBH^{2.3552783}) * 3$
5. Tan Oak = $(0.071769513 * DBH^{2.3552783}) * 3$
6. Pacific Madrone = $(0.06767745 * DBH^{2.347353}) * 3$
7. Big Leaf Maple = $(0.030690219 * DBH^{2.58675}) * 3$

The following tables provide an estimate of present stocking levels and present volume per acre for the seven stands in Board Feet (BF) for conifers only (Tables 12-18) and present volume per acre for hardwoods (Tables 19-25). California Nutmeg is considered, solely by the ranch, a protected species and although a conifer, its volume is supplied in the hardwood tables:

Table 12: RW III Stand and Stock Tables

Stand Table: RW III			Stock Table: RW III		Stand Table: RW III			Stock Table: RW III	
2007 Redwood Trees			2007 Redwood		2007 Douglas-fir			2007 Douglas-fir	
Per Acre			Volume per acre		Trees Per Acre			Volume per acre	
DBH	RW/TPA	BA	DBH	Vol. (BF)	DBH	DF/TPA	BA	DBH	Vol.(BF)
2	22.80	0.50	2	1.85	2	1.87	0.04	2	0.82
4	12.60	1.10	4	10.41	4	1.13	0.10	4	3.61
6	7.40	1.45	6	23.77	6	0.47	0.09	6	4.73
8	4.00	1.40	8	33.69	8	0.60	0.21	8	13.84
10	4.47	2.44	10	79.44	10	0.47	0.25	10	20.37
12	6.53	5.13	12	214.02	12	0.67	0.52	12	48.98
14	6.53	6.98	14	358.69	14	1.00	1.07	14	114.15
16	4.33	6.05	16	372.12	16	0.80	1.12	16	133.74
18	6.67	11.78	18	849.43	18	0.47	0.82	18	109.24
20	5.13	11.20	20	930.91	20	0.33	0.73	20	105.44
22	6.27	16.54	22	1563.90	22	0.20	0.53	22	83.07
24	5.27	16.55	24	1759.14	24	0.47	1.47	24	248.54
26	3.40	12.54	26	1484.90	26	0.33	1.23	26	223.16
28	3.67	15.68	28	2052.62	28	0.33	1.43	28	275.80
30	3.80	18.65	30	2680.38	30	0.40	1.96	30	403.08
32	2.47	13.78	32	2159.83	32	0.27	1.49	32	323.15
34	2.00	12.61	34	2145.56	34	0.40	2.52	34	576.41
36	1.53	10.84	36	1992.08	36	0.60	4.24	36	1018.02
38	1.13	8.93	38	1764.78	38	0.27	2.10	38	528.05
40	0.53	4.65	40	986.18	40	0.27	2.33	40	611.41
42	0.47	4.49	42	1016.13	42	0.33	3.21	42	878.61
44	0.47	4.93	44	1187.49	44	0.20	2.11	44	602.12
46	0.20	2.31	46	590.64	46	0.07	0.77	46	227.89
48	0.20	2.51	48	681.15	48	0.00	0.00	48	0.00
50	0.20	2.73	50	780.97	50	0.00	0.00	50	0.00
52	0.13	1.97	52	593.75	52	0.07	0.98	52	323.51
54	0.07	1.06	54	336.89	Trees/ac	12.0	27.5	DF/BF/ac	6877.74
56	0.00	0.00	56	0.00				Acres	231
58	0.00	0.00	58	0.00				Total	1588758
60	0.07	1.31	60	479.48	RW/BF/ac	27790			
62	0.00	0.00	62	0.00	DF/BF/ac	6878			
64	0.00	0.00	64	0.00	RW II/BF/ac	34668			
66	0.07	1.58	66	659.84					
Trees/ac	112	200.1	RW/BF/ac	27790	RW	6419504			
			Acres	231	DF	1588758			
			Total	6419504	RW III Total	8008262			

Table 13: RW II Stand and Stock Tables

Stand Table: RW II			Stock Table: RW II		Stand Table: RW II			Stock Table: RW II	
Redwood Trees			2007 Redwood		Douglas-fir			2007 Douglas-fir	
Per Acre			Volume Per Acre		Trees Per Acre			Volume Per Acre	
DBH	RW/TPA	BA	DBH	Vol. (BF)	DBH	DF/TPA	BA	DBH	Vol. (BF)
2	9.47	0.21	2	0.77	2	0.56	0.01	2	0.24
4	4.21	0.37	4	3.48	4	0.56	0.05	4	1.77
6	2.11	0.41	6	6.76	6	0.28	0.05	6	2.82
8	2.11	0.73	8	17.73	8	0.28	0.10	8	6.41
10	2.11	1.15	10	37.44	10	0.00	0.00	10	0.00
12	5.00	3.93	12	163.79	12	0.00	0.00	12	0.00
14	5.79	6.19	14	317.85	14	0.28	0.30	14	31.71
16	4.21	5.88	16	361.57	16	0.28	0.39	16	46.44
18	2.89	5.12	18	368.83	18	0.28	0.49	18	65.02
20	4.21	9.19	20	763.56	20	0.00	0.00	20	0.00
22	4.21	11.12	22	1050.77	22	0.00	0.00	22	0.00
24	2.89	9.09	24	966.88	24	0.28	0.87	24	147.94
26	5.79	21.35	26	2528.47	26	0.28	1.02	26	185.97
28	3.68	15.75	28	2062.44	28	0.00	0.00	28	0.00
30	3.95	19.38	30	2784.33	30	0.00	0.00	30	0.00
32	1.58	8.82	32	1382.54	32	0.28	1.55	32	336.61
34	1.58	9.96	34	1693.87	34	0.00	0.00	34	0.00
36	3.16	22.32	36	4102.69	36	0.28	1.96	36	471.31
38	1.32	10.36	38	2048.89	38	0.00	0.00	38	0.00
40	2.63	22.97	40	4866.03	40	0.00	0.00	40	0.00
42	0.79	7.60	42	1719.02	42	0.28	2.67	42	732.18
44	0.53	5.56	44	1339.28	Trees/ac	3.9	9.5	DF/BF/ac	2028
46	1.32	15.19	46	3885.82				Acres	31
48	0.79	9.92	48	2688.77				Total	62881
50	0.79	10.77	50	3082.79					
52	0.26	3.88	52	1171.88				RW/BF/ac	46301
54	0.53	8.37	54	2659.64				DF/BF/ac	2028
56	0.00	0.00	56	0.00				Tot. BF/ac	48329
58	0.00	0.00	58	0.00					
60	0.00	0.00	60	0.00				RW	1435324
62	0.53	11.04	62	4224.89				DF	62881
Trees/ac	78	257	RW/BF/ac	46301				RW II Total	1498205
			Acres	31					
			Total	1435324					

Table 14: RW IV Stand and Stock Tables

Stand Table: RW IV				Stock Table: RW IV			
2004 Redwood				2004 Redwood			
Trees Per Acre				Volume Per Acre			
DBH	RW/TPA	Basal Area	Vol. (BF)	DBH	DF/TPA	Basal Area	Vol. (BF)
2	30.00	0.65	2.4	2	1.36	0.03	0.6
4	35.91	3.13	29.7	4	0.91	0.08	2.9
6	22.73	4.46	73.0	6	0.91	0.18	9.2
8	20.91	7.30	176.1	8	0.45	0.16	10.5
10	17.73	9.67	315.3	10	2.73	1.49	119.0
12	15.00	11.78	491.4	12	1.36	1.07	100.2
14	9.66	10.33	530.3	14	0.86	0.92	98.6
16	6.95	9.71	597.2	16	0.43	0.60	72.2
18	6.18	10.92	787.7	18	0.00	0.00	0.0
20	6.18	13.49	1121.0	20	0.86	1.88	273.2
22	3.09	8.16	771.4	22	0.00	0.00	0.0
24	5.41	16.99	1806.7	24	0.86	2.71	460.0
26	3.18	11.73	1389.6	26	0.39	1.42	258.7
28	2.55	10.89	1425.0	28	1.93	8.26	1598.4
30	1.91	9.37	1346.6	30	1.55	7.59	1557.4
32	2.23	12.44	1950.2	32	0.77	4.32	936.4
34	1.59	10.03	1706.7	34	0.73	4.59	1048.0
36	1.59	11.25	2066.9	36	0.73	5.14	1234.0
38	0.23	1.79	353.9	38	0.36	2.86	720.1
40	0.23	1.98	420.2	40	0.36	3.17	833.7
42	0.68	6.56	1484.6	42	0.36	3.50	958.5
44	0.45	4.80	1156.6	Trees/ac	17.93	49.98	10291.4
46	0.00	0.00	0.0			Acres	71
48	0.45	5.71	1548.1			DF/BF/ac	730688
50	0.00	0.00	0.0				
52	0.23	3.35	1012.1		RW/BF/ac	22563	
Trees/ac	195.1	196.51	22562.7		DF/BF/ac	10291	
		Acres	71		Tot. BF/ac	32854	
		RW/BF/ac	1601949				
					RW	1601949	
					DF	730688	
					RW IV Tot.	2332638	

*RW IV was harvested in 2004 in the Lower Little Creek THP (LLC THP), so this stand was grown only one year from Anderson 2003 data and then it was cut to replicate the LLC THP harvest to demonstrate an estimate of the present stocking level.

Table 15: DF Stand and Stock Tables

Stand Table: DF			Stock Table: DF	
2007 Douglas-fir			2007 Douglas-fir	
Trees Per Acre			Volume Per Acre	
DBH	DF/TPA	BA	DBH	Vol. (BF)
2	5.63	0.12	2	2.47
4	12.08	1.05	4	38.45
6	11.88	2.33	6	120.38
8	9.58	3.35	8	221.03
10	5.63	3.07	10	245.47
12	4.38	3.44	12	321.46
14	4.58	4.90	14	523.17
16	3.13	4.36	16	522.44
18	2.71	4.79	18	633.96
20	2.50	5.45	20	790.79
22	2.29	6.05	22	951.83
24	2.50	7.85	24	1331.49
26	2.08	7.68	26	1394.74
28	1.25	5.35	28	1034.23
30	3.33	16.36	30	3359.01
32	0.83	4.65	32	1009.83
34	1.67	10.51	34	2401.70
36	0.63	4.42	36	1060.44
38	0.21	1.64	38	412.54
40	0.21	1.82	40	477.67
42	0.00	0.00	42	0.00
44	0.21	2.20	44	627.21
46	0.21	2.40	46	712.16
48	0.00	0.00	48	0.00
50	0.21	2.84	50	903.78
52	0.00	0.00	52	0.00
54	0.21	3.31	54	1126.10
56	0.00	0.00	56	0.00
58	0.00	0.00	58	0.00
60	0.00	0.00	60	0.00
62	0.00	0.00	62	0.00
64	0.21	4.65	64	1829.92
Trees/ac	78.13	114.61	DF/BF/ac	22052.29
			Acres	90
			Total	1984706

Table 16: DF HW Stand and Stock Tables

Stand Table: DF HW			Stock Table: DF HW		Stand Table: DF HW			Stock Table: DF HW	
2007 Redwood			2007 Redwood		2007 Douglas-fir			2007 Douglas-fir	
Trees Per Acre			Volume Per Acre		Trees Per Acre			Volume per acre	
DBH	RW/TPA	BA	DBH	Vol.(BF)	DBH	DF/TPA	BA	DBH	Vol. (BF)
2	3.75	0.08	2	0.30	2	5.47	0.12	2	2.40
4	4.22	0.37	4	3.48	4	4.53	0.40	4	14.42
6	1.09	0.21	6	3.51	6	4.38	0.86	6	44.35
8	0.47	0.16	8	3.95	8	3.28	1.15	8	75.68
10	0.78	0.43	10	13.89	10	2.34	1.28	10	102.28
12	0.31	0.25	12	10.24	12	2.03	1.60	12	149.25
14	0.31	0.33	14	17.16	14	1.72	1.84	14	196.19
16	0.31	0.44	16	26.84	16	1.41	1.96	16	235.10
18	0.47	0.83	18	59.73	18	1.41	2.49	18	329.17
20	0.31	0.68	20	56.67	20	1.25	2.73	20	395.40
22	0.47	1.24	22	116.98	22	1.41	3.71	22	584.08
24	0.31	0.98	24	104.38	24	1.25	3.93	24	665.74
26	0.78	2.88	26	341.20	26	0.78	2.88	26	523.03
28	0.94	4.01	28	524.82	28	0.63	2.67	28	517.12
30	0.16	0.77	30	110.21	30	0.78	3.84	30	787.27
32	0.63	3.49	32	547.25	32	0.78	4.36	32	946.72
34	0.63	3.94	34	670.49	34	1.09	6.90	34	1576.11
36	0.47	3.31	36	608.99	36	0.16	1.10	36	265.11
38	0.00	0.00	38	0.00	38	0.63	4.92	38	1237.62
40	0.16	1.36	40	288.92	40	0.00	0.00	40	0.00
42	0.31	3.01	42	680.44	42	0.16	1.50	42	411.85
44	0.00	0.00	44	0.00	44	0.00	0.00	44	0.00
46	0.31	3.61	46	922.88	46	0.16	1.80	46	534.12
48	0.31	3.93	48	1064.30	48	0.00	0.00	48	0.00
Trees/ac	17.5	36.31	RW/BF/ac	6176.64	50	0.16	2.13	50	677.83
			Acres	192	52	0.00	0.00	52	0.00
RW/BF/ac	6176.64		Total	1185916	54	0.00	0.00	54	0.00
DF/BF/ac	11306.75				56	0.00	0.00	56	0.00
Tot. BF/ac	17483.40				58	0.16	2.87	58	1035.91
					Trees/ac	35.94	57.03	DF/BF/ac	11306.75
RW	1185916							Acres	192
DF	2170897							Total	2170897
DF HW Tot	3356812								

Table 17: MPP Stand and Stock Tables

Stand Table: MPP			Stock Table: MPP			Stand Table: MPP			Stock Table: MPP	
2007 Monterey Pine			2007 Monterey Pine			2007 Douglas-fir			2007 Douglas-fir	
Trees Per Acre			Volume Per Acre			Trees Per Acre			Volume Per Acre	
DBH	MPP/TPA	BA	DBH	Cu.ft	Vol.(BF)	DBH	DF/TPA	BA	DBH	Vol.(BF)
2	0.0	0.0	2	0.0	0.0	2	0.0	0.0	2	0.0
4	2.1	0.2	4	1.7	20.6	4	2.1	0.2	4	6.8
6	10.0	2.0	6	23.6	283.2	6	0.7	0.1	6	7.2
8	9.3	3.2	8	47.2	566.2	8	0.0	0.0	8	0.0
10	9.3	5.1	10	85.5	1026.5	10	0.0	0.0	10	0.0
12	15.0	11.8	12	224.7	2696.1	12	0.0	0.0	12	0.0
14	9.3	9.9	14	209.8	2517.4	14	0.7	0.8	14	81.5
16	16.4	22.9	16	529.9	6358.4	16	0.0	0.0	16	0.0
18	9.3	16.4	18	410.0	4919.7	18	0.0	0.0	18	0.0
20	3.6	7.8	20	208.8	2505.9	20	0.0	0.0	20	0.0
22	1.4	3.8	22	107.7	1292.3	22	0.7	1.9	22	296.7
24	0.0	0.0	24	0.0	0.0	24	0.0	0.0	24	0.0
26	0.7	2.6	26	84.1	1008.7	26	0.7	2.6	26	478.2
28	0.0	0.0	28	0.0	0.0	28	0.0	0.0	28	0.0
30	0.0	0.0	30	0.0	0.0	30	2.1	10.5	30	2159.4
32	1.4	8.0	32	292.4	3509.3	32	0.0	0.0	32	0.0
Trees/ac	87.9	93.69	MPP/BF/ac		26704.3	34	0.0	0.0	34	0.0
			Acres		52	36	0.0	0.0	36	0.0
			Total		1388621	38	0.0	0.0	38	0.0
MPP/ac	26704.3					40	0.7	6.2	40	1637.7
DF/ac	8992.0					42	0.7	6.9	42	1882.7
Tot./BF/ac	35696.2					44	0.0	0.0	44	0.0
						46	0.7	8.2	46	2441.7
MPP	1388621					Trees/ac	9.29	37.48	DF/ac	8992.0
DF	467584								Acres	52
MPP Tot.	1856205								Total	467584

Table 18: Smith Stand and Stock Tables

Stand Table: Smith			Stock Table: Smith		Stand Table: Smith			Stock Table: Smith	
2007 Redwood Trees			2007 Redwood		2007 Douglas-fir			2007 Douglas-fir	
Per Acre			Volume Per Acre		Trees Per Acre			Volume per acre	
DBH	RW/TPA	BA	DBH	Vol. (BF)	DBH	DF/TPA	BA	DBH	Vol.(BF)
2	8.33	0.18	2	0.68	2	0.83	0.02	2	0.37
4	5.00	0.44	4	4.13	4	0.00	0.00	4	0.00
6	8.33	1.64	6	26.77	6	0.00	0.00	6	0.00
8	5.83	2.04	8	49.13	8	1.67	0.58	8	38.44
10	4.17	2.27	10	74.10	10	0.00	0.00	10	0.00
12	1.67	1.31	12	54.60	12	0.83	0.65	12	61.23
14	3.33	3.56	14	183.01	14	0.00	0.00	14	0.00
16	5.83	8.15	16	500.93	16	0.00	0.00	16	0.00
18	1.67	2.95	18	212.36	18	0.83	1.47	18	195.07
20	3.33	7.27	20	604.49	20	0.00	0.00	20	0.00
22	4.17	11.00	22	1039.83	22	0.83	2.20	22	346.12
24	4.17	13.09	24	1391.73	24	0.00	0.00	24	0.00
26	0.83	3.07	26	363.95	26	0.00	0.00	26	0.00
28	1.67	7.13	28	933.01	28	0.83	3.56	28	689.49
30	0.83	4.09	30	587.80	30	1.67	8.18	30	1679.51
32	3.33	18.62	32	2918.69	32	0.83	4.65	32	1009.83
34	1.67	10.51	34	1787.97	34	0.83	5.25	34	1200.85
36	0.00	0.00	36	0.00	36	0.00	0.00	36	0.00
38	0.83	6.56	38	1297.63	38	0.00	0.00	38	0.00
40	0.83	7.27	40	1540.91	40	0.83	7.27	40	1910.67
42	1.67	16.04	42	3629.03	42	0.00	0.00	42	0.00
44	0.00	0.00	44	0.00	44	0.00	0.00	44	0.00
46	0.00	0.00	46	0.00	46	0.00	0.00	46	0.00
48	0.83	10.47	48	2838.14	48	0.00	0.00	48	0.00
50	1.67	22.73	50	6508.12	50	0.00	0.00	50	0.00
52	0.83	12.29	52	3710.97	52	0.00	0.00	52	0.00
54	0.00	0.00	54	0.00	54	0.00	0.00	54	0.00
56	2.50	42.76	56	14270.10	56	0.00	0.00	56	0.00
58	0.00	0.00	58	0.00	58	0.00	0.00	58	0.00
60	0.83	16.36	60	5993.53	60	0.00	0.00	60	0.00
62	0.00	0.00	62	0.00	62	0.83	17.47	62	6684.83
64	1.67	37.24	64	14880.20	64	0.83	18.62	64	7319.69
66	0.83	19.80	66	8247.99	66	0.00	0.00	66	0.00
68	0.00	0.00	68	0.00	68	0.83	21.02	68	8704.26
70	0.00	0.00	70	0.00	Trees/ac	12.5	91.0	DF/BF/ac	29840
72	0.00	0.00	72	0.00				Acres	34
74	0.83	24.89	74	12100.47				Total	1014572
Trees/ac	77.5	313.7	RW/BF/ac	85750					
			Acres	34					
RW/BF/ac	85750		Total	2915509					
DF/BF/ac	29840								
Tot.BF/ac	115591								
RW	2915509								
DF	1014572								
Smith Total	3930080								

2007 Summary of Gross Vol. in BF Per Acre/Per Management Unit						
Table 19: North Fork Management Unit						
	RW III	RW II	DF	DF HW	Smith Stand	Total
Redwood	27790.1	46300.8	0.0	6176.6	85750.3	
Douglas-fir	6877.7	2028.4	22052.3	11306.8	29840.3	
Acres	67.0	31.0	4.0	55.0	34.0	191.0
Total BF	2322742.7	1498204.6	88209.2	961586.8	3930080.1	8800823.3
Management unit average (BF) per acre						46077.6
Acre reduction from WLPZ, ELZ, and roads						27.3
Adjusted gross volume (BF) management unit						7542443.8
Table 20: South Fork Management Unit						
	RW III	DF	DF HW	Total		
Redwood	27790.1	0.0	6176.6			
Douglas-fir	6877.7	22052.3	11306.8			
Acres	71.0	7.0	6.0	84.0		
Total BF	2461413.9	154366.0	104900.4	2720680.3		
Management unit average (BF) per acre						32389.1
Acre reduction from WLPZ, ELZ, and roads						6.3
Adjusted gross volume (BF) management unit						2515981.5
Table 21: Satellite Stands						
	RW III	RW IV	DF	DF HW	MPP	Total
Redwood	27790.1	22562.7	0.0	6176.6	0.0	
Douglas-fir	6877.7	10291.4	22052.3	11306.8	8992.0	
M. Pine	0.0	0.0	0.0	0.0	26704.3	
Acres	93.0	71.0	79.0	131.0	52.0	426.0
Total BF	3224105.5	2332637.7	1742130.8	2290325.0	1856204.8	11445403.8
Management unit average (BF) per acre						26867.1
Acre reduction from WLPZ, ELZ, and roads						40.1
Adjusted gross volume (BF) management unit						10369105.9
Table 22:						
Forest Wide Estimate						
Acres		701				
Per acre		32763.06				
Total Board Feet		22966907				
Adjusted Forest Wide Estimate						
Acres		627.31				
Total Board Feet		20427531				
Total volume loss, in Board Feet due to WLPZ, ELZ, and roads						2539376.1
Expressed as a percent						11.1

*Recognizing that the MPP stands will ultimately be removed and that very little management is proposed for the Smith Stand, a more realistic assessment of manageable volume is provided in this second set of tables (Tables 23-26 above), with the MPP and Smith Stand types excluded.

2007 Summary of Gross Vol. in BF Per Acre/Per Management Unit						
with Smith Stand and MPP stand removed						
Table 23: North Fork Management Unit						
	RW III	RW II	DF	DF HW	Smith Stand	Total
Redwood	27790.1	46300.8	0.0	6176.6	85750.3	
Douglas-fir	6877.7	2028.4	22052.3	11306.8	29840.3	
Acres	67.0	31.0	4.0	55.0	34.0	157.0
Total BF	2322742.7	1498204.6	88209.2	961586.8	0.0	4870743.2
Management unit average (BF) per acre						31023.8
Acre reduction from WLPZ, ELZ, and roads						27.3
Adjusted gross volume (BF) management unit						4023482.1
Table 24: South Fork Management Unit						
	RW III	DF	DF HW	Total		
Redwood	27790.1	0.0	6176.6			
Douglas-fir	6877.7	22052.3	11306.8			
Acres	71.0	7.0	6.0	84.0		
Total BF	2461413.9	154366.0	104900.4	2720680.3		
Management unit average (BF) per acre						32389.1
Acre reduction from WLPZ, ELZ, and roads						6.3
Adjusted gross volume (BF) management unit						2515981.5
Table 25: Satellite Stands						
	RW III	RW IV	DF	DF HW	MPP	Total
Redwood	27790.1	22562.7	0.0	6176.6	0.0	
Douglas-fir	6877.7	10291.4	22052.3	11306.8	8992.0	
M. Pine	0.0	0.0	0.0	0.0	26704.3	
Acres	93.0	71.0	79.0	131.0	52.0	374.0
Total BF	3224105.5	2332637.7	1742130.8	2290325.0	0.0	9589198.9
Management unit average (BF) per acre						25639.569
Acre reduction from WLPZ, ELZ, and roads						40.06
Adjusted gross volume (BF) management unit						8562077.8
Table 26:						
Forest Wide Estimate						
Acres		615				
Per acre		27935.971				
Total Board Feet		17180622				
Adjusted Forest Wide Estimate						
Acres		541.31				
Total Board Feet		15101541				
Total volume loss, in Board Feet due to WLPZ, ELZ, and roads						2079081.1
Expressed as a percent						12.1

Table 27: RW III Hardwoods in Board Feet Per Acre

Species	BF/Acre
Big leaf Maple	38.2
California Buckeye	38.2
California Bay	1040.8
California Nutmeg	654.2
Coast Live Oak	640.0
Pacific Madrone	86.9
Red Alder	745.5
Shreve's Oak	72.8
Tan Oak	4624.2
Total BF/Acre	7940.8

Table 28: RW II Hardwoods in Board Feet Per Acre

Species	BF/Acre
Tan Oak	5430.2
Total BF/Acre	5430.2

Table 29: RW IV Hardwoods in Board Feet Per Acre

Species	BF/Acre
California Buckeye	686.5
California Bay	62.6
Coast Live Oak	224.8
Pacific Madrone	91.5
Shreve's Oak	195.0
Tan Oak	453.8
Total BF/Acre	1714.2

Table 30: DF Hardwoods in Board Feet Per Acre

Species	BF/Acre
California Bay	207.2
California Nutmeg	34.9
Coast Live Oak	2262.6
Pacific Madrone	169.7
Shreve's Oak	38.5
Tan Oak	617.9
Total BF/Acre	3330.8

Table 31: DF HW Hardwoods in Board Feet Per Acre

Species	BF/Acre
California Buckeye	95.7
California Bay	925.7
California Nutmeg	376.1
Coast Live Oak	4433.9
Pacific Madrone	391.9
Shreve's Oak	1408.1
Tan Oak	452.5
Total BF/Acre	8083.9

Table 32: MPP Hardwoods in Board Feet Per Acre

Species	BF/Acre
California Buckeye	371.4
California Bay	835.1
California Nutmeg	647.4
Coast Live Oak	1796.6
Pacific Madrone	386.6
Shreve's Oak	1426.7
Tan Oak	13.7
Total BF/Acre	5477.5

Table 33: Smith Stand Hardwoods in Board Feet Per Acre

Species	BF/Acre
California Bay	164.7
Tan Oak	5548.4
Total BF/Acre	5713.1311

Table 34: Summary of Total Volume of Hardwoods in Board Feet by Stand Type							
	RW III	RW II	RW IV	DF	DF HW	MPP	Smith Stand
Total BF/Acre	7940.8	5430.2	1714.2	3330.8	8083.9	5477.5	5713.1
Acres Per Unit	231	31	71	90	192	54	34
Total BF/Per Stand	1834324.8	168336.2	121708.2	299772.0	1552108.8	295785.0	194246.5

Table 35: Summary of Total Volume of Hardwoods in Board Feet by Management Unit								
	RW III	RW II	RW IV	DF	DF HW	MPP	Smith Stand	Total
North Fork	532033.6	168336.2	0.0	13323.2	444614.5	0.0	194246.5	1352554.0
South Fork	563796.8	0.0	0.0	23315.6	48503.4	0.0	0.0	635615.8
Satellite	738494.4	0.0	121708.2	263133.2	1058990.9	284830.0	0.0	2467156.7

f. size class distribution;

The tables below display size class distributions for each of the seven stand types for redwood and Douglas-fir (2007). Tables show trees per acre, board feet per acre, and percent total volume by size class.

Table 36: RW III Redwood Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	42.8	36.0	0.1
8"-12"	15.0	327.1	1.2
14"-18"	17.5	1580.2	5.7
20"-24"	16.7	4254.0	15.3
26"-30"	10.9	6217.9	22.4
32"-36"	6.0	6297.5	22.7
38" +	3.5	9077.3	32.7
Total	112.4	27790.1	100

Table 37: RW III Douglas-fir Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	3.47	9.2	0.1
8"-12"	1.73	83.2	1.2
14"-18"	2.27	357.1	5.2
20"-24"	1.00	437.1	6.4
26"-30"	1.07	902.0	13.1
32"-36"	1.27	1917.6	27.9
38" +	1.20	3171.6	46.1
Total	12.0	6877.7	100

Table 38: RW II Redwood Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	15.8	11.0	0.02
8"-12"	9.2	219.0	0.47
14"-18"	12.9	1048.3	2.26
20"-24"	11.3	2781.2	6.01
26"-30"	13.4	7375.2	15.93
32"-36"	6.3	7179.1	15.51
38" +	9.5	27687.0	59.80
Total	78.4	46300.8	100

Table 39: RW II Redwood Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	1.39	4.8	0.2
8"-12"	0.28	6.4	0.3
14"-18"	0.83	143.2	7.1
20"-24"	0.28	147.9	7.3
26"-30"	0.28	186.0	9.2
32"-36"	0.56	807.9	39.8
38" +	0.28	732.2	36.1
Total	3.9	2028.4	100

Table 40: RW IV Redwood Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	88.6	105.1	0.47
8"-12"	53.6	982.7	4.36
14"-18"	22.8	1915.2	8.49
20"-24"	14.7	3699.1	16.39
26"-30"	7.6	4161.2	18.44
32"-36"	5.4	5723.8	25.37
38" +	2.3	5975.6	26.48
Total	195.1	22562.7	100

Table 41: RW IV Douglas-fir Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	3.18	12.7	0.1
8"-12"	4.55	229.7	2.2
14"-18"	1.30	170.8	1.7
20"-24"	1.73	733.2	7.1
26"-30"	3.86	3414.4	33.2
32"-36"	2.23	3218.4	31.3
38" +	1.09	2512.3	24.4
Total	17.9	10291.4	100

Table 42: DF Douglas-fir Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	29.58	161.3	0.7
8"-12"	19.58	788.0	3.6
14"-18"	10.42	1679.6	7.6
20"-24"	7.29	3074.1	13.9
26"-30"	6.67	5788.0	26.2
32"-36"	3.13	4472.0	20.3
38" +	1.46	6089.4	27.6
Total	78.1	22052.3	100

Table 43: DF HW Redwood Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	9.1	7.3	0.12
8"-12"	1.6	28.1	0.45
14"-18"	1.1	103.7	1.68
20"-24"	1.1	278.0	4.50
26"-30"	1.9	976.2	15.81
32"-36"	1.7	1826.7	29.57
38" +	1.1	2956.5	47.87
Total	17.5	6176.6	100

Table 44: DF HW Douglas-fir Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	14.38	61.2	0.5
8"-12"	7.66	327.2	2.9
14"-18"	4.53	760.5	6.7
20"-24"	3.91	1645.2	14.6
26"-30"	2.19	1827.4	16.2
32"-36"	2.03	2787.9	24.7
38" +	1.25	3897.3	34.5
Total	35.9	11306.8	100

Table 45: MPP Non-native Monterey Pine Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	12.1	303.8	1.14
8"-12"	33.6	4288.9	16.06
14"-18"	35.0	13795.4	51.66
20"-24"	5.0	3798.2	14.22
26"-30"	0.7	1008.7	3.78
32"-36"	1.4	3509.3	13.14
38" +	0.0	0.0	0.00
Total	87.9	26704.3	100

Table 46: MPP Douglas-fir Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	2.86	14.1	0.2
8"-12"	0.00	0.0	0.0
14"-18"	0.71	81.5	0.9
20"-24"	0.71	296.7	3.3
26"-30"	2.86	2637.6	29.3
32"-36"	0.00	0.0	0.0
38" +	2.14	5962.2	66.3
Total	9.3	8992.0	100

Table 47: Smith Stand Redwood Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	21.7	31.6	0.04
8"-12"	11.7	177.8	0.21
14"-18"	10.8	896.3	1.05
20"-24"	11.7	3036.0	3.54
26"-30"	3.3	1884.8	2.20
32"-36"	5.0	4706.7	5.49
38" +	13.3	75017.1	87.48
Total	77.5	85750.3	100

Table 48: Smith Stand Douglas-fir Size Class Distribution

DBH Class	TPA	Volume	% Total MBF
2"-6"	0.83	0.4	0.0
8"-12"	2.50	99.7	0.3
14"-18"	0.83	195.1	0.7
20"-24"	0.83	346.1	1.2
26"-30"	2.50	2369.0	7.9
32"-36"	1.67	2210.7	7.4
38" +	3.33	24619.4	82.5
Total	12.5	29840.3	100

g. stand management history;

See Section III, Fire History and Harvest History.

h. potential pest or protection problems.

See Section II, Item 15.

42. Provide a description by management unit(s) of the proposed management objectives, including a discussion of projected timber volumes and sizes available for timber harvesting in Section III, as per 14 CCR 1090.5 (h).

Management Objectives

The overall management objectives for the Ranch timberlands are listed below and are the reasons for development of this NTMP.

1. Maintain health and integrity of forest resource, inclusive of all native flora and fauna, and preserve its function in the watershed.
2. Continue to manage the property as a demonstration, educational, and research forest facility for the University.
3. Maintain forest certification with the Forest Stewardship Council.
4. Continue stand transition from even-aged composition to uneven-aged composition.
5. Maintain species composition with emphasis on increasing conifer stocking levels. Enhance natural regeneration levels through planting, as deemed necessary.

6. Maintain economic viability of management activities through periodic selective harvests.
7. Maintain condition of tractor trails, roads, and landings so as to minimize the necessity of new construction.
8. Maintain access throughout the property to better facilitate interim management activities and educational activities.
9. Minimize effects of surface erosion on roads, landings and tractor trails.
10. Enhance and maintain visual aesthetics of the forest.
11. Illustrate a high standard in the logging and clean up associated with harvest entries.
12. Preserve and promote the ethic of land stewardship in all management activities and decisions.

Specific management activities in each Management Unit to achieve these objectives are based on the specific conditions in each Unit. These conditions are grouped according to stratified Stand Types. Future management activities will proceed according to the schedule outlined under Item 43(a) in the SYA. General descriptions of each Management Unit and yarding access are provided above in Item 16, Harvesting Practices. Harvesting activities will proceed according to the detailed prescriptions per Stand Type. Areas of Stand Types in each Unit are as follows:

Table 48.5: Acres of Stand Type per Unit

	North Fork Unit	South Fork Unit	Satellite Stands Unit
RW III	67	71	93
RW II	31	0	0
RW IV	0	0	71
RW Smith	34	0	0
DF	4	7	79
DF HW	55	6	131
MPP	0	0	52

Projected Timber Volumes

Projected timber volumes for six of the seven timber types are provided in Tables 49-70, following the discussions on stand projection, growth tables, in growth and mortality, and sizes available for harvest.

Stand Projection

Stand projection analysis was utilized to determine the results of harvesting the seven different stand types over 2 rotations based on 15 year re-entry periods. The RW IV stand type was projected for two rotations on 20 year re-entry periods due to lower quality site conditions. No projections for MPP were made because the stand is non-native and will ultimately be removed over time and replaced with other conifer species. Once the MPP stand is converted and stocked

with trees that are free to grow, an assessment of growth projections shall be amended into the NTMP for these stands.

Growth Tables

The growth tables that were discussed above, in the present stocking and present volume section, were also utilized for stand projection. Initially, growth tables were generated for each stand type, however even with the amount of growth measured in C.F.I. it was difficult to create thirteen different tables that were without data deficiencies. In these cases, data from other stands types nearby were used to fill in gaps between diameter classes and in some cases a growth table was transferred from one stand type to another. Data and data tables were only transferred from stand type to stand type where conditions were similar.

In-Growth and Mortality

The three management units have each been harvested in the past according to single-tree selection silviculture and future management of these units will be carried out in a similar manner. Multiple rounds of Continuous Forest Inventory have revealed an influx of young trees that regenerate around cut stumps as a result of each harvest. This in-growth in lower diameter classes (2"-12" DBH classes) is assumed to repeat after each entry due to comparable management. Therefore, the stand table projection analysis shows an influx of the same proportion of trees in the 2"-12" DBH classes after each entry.

Procedure: During the first phase of each stand table projection the number of trees in the 2"-12" DBH classes is given based on inventory gathered on plots in each stand type that were managed in a similar style in the past. Each stand is then cut and no trees in the 2"-12" DBH class are scheduled for removal. Only trees moving from the 2"-12" DBH classes into the 14" and above DBH classes are reported in the post-harvest TPA column as tracked trees carried-over from the pre-harvest stand (the mortality assumptions are described below). To account for regeneration and a reliable estimate of trees that will be present in the post-harvest stand, managed according to single-tree selection silviculture, the 2"-12" DBH classes are repopulated post-harvest with the same number of trees in the 2"-12" DBH classes as used in the original stand table projection.

In other words, the 2"-12" DBH classes in column (B) in the beginning of each stand projection (e.g. 2007-2022 or 2004 – 2024 for RW IV) are carried over to the final TPA for the next stand projection (e.g. 2022-2037 or 2024-2044 for RW IV.)

The movement ratio for trees growing up from one diameter class to the next is represented for trees in each diameter class individually. The ratio has been calculated based on reliable projections in the Society of American Foresters, Forestry Handbook, where the ratio equals the diameter growth over a 15 year period, divided by 2, multiplied by 100. Mortality is insignificant in trees present in the 14" and greater diameter classes; therefore all trees over 14" that are not slated for removal, are projected forward in the stand table projection.

Mortality is visually observed on the Ranch to have the greatest effect in the 2"-12" DBH classes. Younger trees are suppressed by larger trees and in these smaller diameter classes and mortality is more prevalent, whereas in the larger diameter classes trees can maintain relative crown position, and can procure sufficient resources to stay alive. The most prevalent tree species on the Ranch, redwood, is not susceptible to many diseases and insect attacks that carry a great mortality risk. This low-mortality assumption is considered in the stand projection analysis by transitioning only those trees that pass the 14" diameter class threshold during the growth period into the final TPA. All other trees below 14" essentially "start over" in the final TPA by inserting the original distribution of trees in the 2"-12" DBH classes from the pre-harvest stand. This is based on the assumption that regeneration stays the same from harvest entry to harvest entry. The data used to determine the amount of regeneration to expect was collected following similar single-tree selection harvesting. This mortality assumption is a conservative estimate and shall be re-assessed over time as inventory is collected in conjunction with future entries.

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Table 49: RW III Stand Table Projection for Redwood, 15 yrs. Growth from 2007-2022

DBH Class	Number of RW III trees	Avg. 15 yr. DBH Incr. 2007/ inches	Movement ratio	% of trees moving				# of trees moving				DBH class	RW III TPA in yr. 2022	RW III Volume in BF Per acre in 2022	2022 Cut TPA	2022 Cut Volume BF/ac	2022 Post Harvest TPA	2022 Post Harvest BF/ac
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes							
2	22.60	1.89	95		0.05	0.95			1.14	21.66		2	1.14	0.1	0.0	0.0	22.80	1.8
4	12.60	1.89	95		0.05	0.95			0.63	11.97		4	22.29	18.4	0.0	0.0	12.60	10.4
6	7.40	1.89	95		0.05	0.95			0.37	7.03		6	12.34	39.6	0.0	0.0	7.40	23.8
8	4.00	2.98	149		0.51	0.49		0.49		2.04	1.96	8	7.03	59.2	0.0	0.0	4.00	33.7
10	4.47	2.98	149		0.51	0.49		0.49		2.28	2.19	10	2.04	36.3	0.0	0.0	4.47	79.4
12	6.53	2.98	149		0.51	0.49		0.49		3.33	3.20	12	4.24	138.8	0.0	0.0	6.53	214.0
14	5.23	2.81	141		0.59	0.41		0.41		3.08	2.14	14	5.52	303.1	1.1	60.6	4.4	242.5
16	3.47	2.81	141		0.59	0.41		0.41		2.05	1.42	16	6.29	539.7	1.3	107.9	5.0	431.8
18	5.33	2.81	141		0.59	0.41		0.41		3.15	2.19	18	4.19	533.6	0.8	106.7	3.4	426.9
20	2.68	3.36	168		0.32	0.68		0.68		1.31	2.79	20	4.57	828.4	0.9	165.7	3.7	662.7
22	5.01	3.36	168		0.32	0.68		0.68		1.60	3.41	22	3.50	873.7	0.7	174.7	2.8	686.9
24	4.21	3.36	168		0.32	0.68		0.68		1.35	2.87	24	4.40	1468.6	0.9	293.7	3.5	1174.9
26	2.24	4.09	205		0.95	0.05		0.05		2.13	0.11	26	4.76	2077.7	1.6	885.6	3.2	1392.1
28	2.42	4.09	205		0.95	0.05		0.05		2.30	0.12	28	2.87	1603.9	0.9	529.3	1.9	1074.6
30	2.51	4.09	205		0.95	0.05		0.05		2.38	0.13	30	2.13	1603.7	0.7	496.2	1.4	1007.5
32	1.63	4.04	202		0.98	0.02		0.02		1.60	0.03	32	2.41	2111.3	0.8	696.7	1.6	1414.5
34	1.32	4.04	202		0.98	0.02		0.02		1.29	0.03	34	2.50	2665.8	0.8	886.3	1.7	1793.5
36	1.01	4.04	202		0.98	0.02		0.02		0.99	0.02	36	1.72	2235.7	0.6	737.8	1.2	1497.9
38	0.68	4.92	246		0.54	0.46		0.46		0.37	0.31	38	1.33	2055.0	0.7	1032.5	0.7	1032.5
40	0.32	4.92	246		0.54	0.46		0.46		0.17	0.15	40	1.02	1862.7	0.4	753.1	0.6	1129.6
42	0.28	4.92	246		0.54	0.46		0.46		0.15	0.13	42	0.38	843.6	0.2	337.4	0.2	506.2
44	0.28	4.92	246		0.54	0.46		0.46		0.15	0.13	44	0.49	1235.7	0.2	494.3	0.3	741.4
46	0.12	4.92	246		0.54	0.46		0.46		0.05	0.05	46	0.30	352.5	0.1	352.5	0.2	528.7
48	0.12	4.92	246		0.54	0.46		0.46		0.06	0.06	48	0.28	953.6	0.1	361.4	0.2	572.2
50	0.12	4.92	246		0.54	0.46		0.46		0.06	0.06	50	0.19	756.0	0.1	302.4	0.1	453.6
52	0.08	4.92	246		0.54	0.46		0.46		0.04	0.04	52	0.12	534.4	0.0	213.8	0.1	320.6
54	0.04	4.92	246		0.54	0.46		0.46		0.02	0.02	54	0.12	606.4	0.0	242.6	0.1	363.8
56	0.00	4.92	246		0.54	0.46		0.46		0.00	0.00	56	0.10	551.7	0.0	224.7	0.1	337.0
58	0.00	4.92	246		0.54	0.46		0.46		0.00	0.00	58	0.06	374.9	0.0	150.0	0.0	225.0
60	0.04	4.92	246		0.54	0.46		0.46		0.02	0.02	60	0.02	132.3	0.0	52.9	0.0	79.4
62	0.00	4.92	246		0.54	0.46		0.46		0.00	0.00	62	0.00	0.0	0.0	0.0	0.0	0.0
64	0.00	4.92	246		0.54	0.46		0.46		0.00	0.00	64	0.02	192.8	0.0	77.1	0.0	116.7
66	0.04	4.92	246		0.54	0.46		0.46		0.02	0.02	66	0.02	182.1	0.0	72.8	0.0	109.3
												68	0.00	0.0	0.0	0.0	0.0	0.0
												70	0.02	260.4	0.0	104.1	0.0	156.2
												72	0.02	243.7	0.0	97.5	0.0	146.2

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Table 50: RW III Stand Table Projection for Redwood, 15 yrs. Growth from 2022-2037

DBH Class	Number of RW III trees	Avg. 15 yr. DBH incr. 2022 inches	Movement ratio	% of trees moving						# of trees moving			DBH class	RW IV TPA in yr. 2037	RW IV Volume in BF Per acre in 2037
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes				
2	2280	1.89	95	0.05	0.95			1.14	21.66				2	1.14	22.8
4	1260	1.89	95	0.05	0.95			0.63	11.97				4	22.29	12.6
6	740	1.89	95	0.05	0.95			0.37	7.03				6	12.34	7.4
8	400	2.98	149		0.51	0.49			2.04	1.96			8	7.03	4.0
10	447	2.98	149		0.51	0.49			2.28	2.19			10	2.04	4.5
12	653	2.98	149		0.51	0.49			3.33	3.20			12	4.24	6.5
14	800	2.81	141		0.59	0.41			0.47	0.33			14	5.52	303.1
16	503	2.81	141		0.59	0.41			2.97	2.06			16	3.67	315.4
18	180	2.81	141		0.59	0.41			1.06	0.74			18	3.29	419.8
20	365	3.36	168		0.32	0.68			1.17	2.48			20	3.12	566.4
22	280	3.36	168		0.32	0.68			0.90	1.90			22	1.91	476.0
24	352	3.36	168		0.32	0.68			1.13	2.39			24	3.38	1129.3
26	380	4.09	205			0.95	0.05			3.61	0.19		26	3.03	1323.1
28	189	4.09	205			0.95	0.05			1.80	0.09		28	2.39	1339.0
30	141	4.09	205			0.95	0.05			1.34	0.07		30	3.61	2546.4
32	159	4.04	202			0.98	0.02			1.56	0.03		32	1.99	1739.3
34	165	4.04	202			0.98	0.02			1.62	0.03		34	1.43	1635.4
36	114	4.04	202			0.98	0.02			1.11	0.02		36	1.63	2117.6
38	88	4.92	246			0.54	0.46			0.47	0.40		38	1.65	2571.1
40	61	4.92	246			0.54	0.46			0.33	0.28		40	1.15	2119.2
42	23	4.92	246			0.54	0.46			0.13	0.11		42	0.50	1078.6
44	29	4.92	246			0.54	0.46			0.16	0.13		44	0.73	1864.0
46	18	4.92	246			0.54	0.46			0.10	0.08		46	0.41	1200.6
48	17	4.92	246			0.54	0.46			0.09	0.08		48	0.26	900.0
50	12	4.92	246			0.54	0.46			0.06	0.06		50	0.23	900.9
52	7	4.92	246			0.54	0.46			0.04	0.03		52	0.17	770.7
54	7	4.92	246			0.54	0.46			0.04	0.03		54	0.14	707.5
56	6	4.92	246			0.54	0.46			0.03	0.03		56	0.09	526.9
58	4	4.92	246			0.54	0.46			0.02	0.02		58	0.07	462.2
60	1	4.92	246			0.54	0.46			0.01	0.01		60	0.07	467.5
62	0	4.92	246			0.54	0.46			0.00	0.00		62	0.05	369.9
64	1	4.92	246			0.54	0.46			0.01	0.01		64	0.02	197.1
66	1	4.92	246			0.54	0.46			0.01	0.01		66	0.01	50.3
68	0	4.92	246			0.54	0.46			0.00	0.00		68	0.01	76.6
70	1	4.92	246			0.54	0.46			0.01	0.01		70	0.01	143.7
72	1	4.92	246			0.54	0.46			0.01	0.01		72	0.01	67.3
													74	0.01	101.6
													76	0.01	189.3
													78	0.01	88.0
														89.39	28721.6

Table 51: RW III Stand Table Projection for Douglas-fir, 15 yrs. Growth from 2007-2022

DBH Class	Number of DF trees	Avg. 15 yr. DBH incr. 2007/inches	Movement ratio	% of trees moving				# of trees moving				DBH class	IDF 2022 TPA in yr. 2022	DF 2022 Volume per Acre In BF	2022 Cut TPA	2022 Cut Volume BF/ac	2022 Post Harvest TPA	2022 Post Harvest BF/ac	
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes								
2	2	1.87	3.17	159		0.41	0.59			0.77	1.10	2	0.00	0.0	0.0	0.0	1.87	0.8	
4	4	1.13	3.17	159		0.41	0.59			0.46	0.67	4	0.77	2.4	0.0	0.0	1.13	3.6	
6	6	0.47	3.17	159		0.41	0.59			0.19	0.28	6	1.57	15.9	0.0	0.0	0.47	4.7	
8	8	0.80	5.09	255			0.45	0.55			0.27	0.33	8	0.86	19.8	0.0	0.60	13.8	
10	10	0.47	5.09	255			0.45	0.55			0.21	0.26	10	0.28	12.0	0.0	0.47	20.4	
12	12	0.67	5.09	255			0.45	0.55			0.30	0.37	12	0.27	19.8	0.0	0.67	49.0	
14	14	1.00	5.72	286			0.24	0.86			0.24	0.86	14	0.54	61.6	0.1	12.3	49.3	
16	16	0.80	5.72	286			0.24	0.86			0.19	0.69	16	0.56	93.1	0.1	18.6	74.5	
18	18	0.47	5.72	286			0.24	0.86			0.11	0.40	18	0.61	142.0	0.1	28.4	113.6	
20	20	0.33	3.96	198		0.02	0.98			0.01	0.33	20	1.05	332.8	0.2	66.6	0.84	266.2	
22	22	0.20	3.96	198		0.02	0.98			0.00	0.20	22	0.81	335.0	0.2	67.0	0.65	268.0	
24	24	0.47	3.96	198		0.02	0.98			0.01	0.46	24	0.73	389.9	0.1	78.0	0.59	311.9	
26	26	0.33	4.46	223			0.77	0.23			0.26	0.08	26	0.21	137.5	0.1	45.4	0.14	92.1
28	28	0.33	4.46	223			0.77	0.23			0.26	0.08	28	0.46	378.4	0.2	124.9	0.31	253.5
30	30	0.40	4.46	223			0.77	0.23			0.31	0.09	30	0.26	258.6	0.1	85.4	0.17	173.3
32	32	0.27	3.46	173		0.27	0.73			0.07	0.19	32	0.33	403.9	0.1	133.3	0.22	270.6	
34	34	0.40	3.46	173		0.27	0.73			0.11	0.29	34	0.46	658.1	0.2	217.2	0.31	440.9	
36	36	0.60	3.46	173		0.27	0.73			0.16	0.44	36	0.39	669.6	0.1	221.0	0.26	448.7	
38	38	0.27	3.47	174		0.26	0.74			0.07	0.20	38	0.45	899.0	0.2	359.6	0.27	539.4	
40	40	0.27	3.47	174		0.27	0.74			0.07	0.20	40	0.51	1163.2	0.2	465.3	0.30	697.9	
42	42	0.33	3.47	174		0.26	0.74			0.09	0.25	42	0.27	702.9	0.1	261.2	0.16	421.7	
44	44	0.20	3.47	174		0.26	0.74			0.05	0.15	44	0.28	855.0	0.1	342.0	0.17	513.0	
46	46	0.07	3.47	174		0.26	0.74			0.02	0.05	46	0.30	1021.0	0.1	408.4	0.18	612.6	
48	48	0.00	3.47	174		0.26	0.74			0.00	0.00	48	0.17	638.3	0.1	255.3	0.10	383.0	
50	50	0.00	3.47	174		0.26	0.74			0.00	0.00	50	0.05	214.0	0.0	85.6	0.03	128.4	
52	52	0.07	3.47	174		0.26	0.74			0.02	0.05	52	0.00	0.0	0.0	0.0	0.00	0.0	
												54	0.02	93.7	0.0	37.5	0.01	56.2	
												56	0.05	295.9	0.0	118.3	0.03	177.5	
													12.11	9813.4	2.3	3451.1	11.3	6384.7	

Table 52: RW III Stand Table Projection for Douglas-fir, 15 yrs. Growth from 2022-2037

DBH Class	Number of DF trees	Avg. 15 yr. DBH incr. 2022 inches	Movement ratio	% of trees moving				# of trees moving			DBH class	DF TPA in yr. 2037	2037 Volume per Acre in BF
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes		
2	159	1.87	3.17			0.41	0.59			0.77	1.10	2	1.87
4	159	1.13	3.17			0.41	0.59			0.46	0.67	4	1.13
6	159	0.47	3.17			0.41	0.59			0.19	0.28	6	0.47
8	255	0.60	5.09				0.45	0.55			0.27	8	0.60
10	255	0.47	5.09				0.45	0.55			0.21	10	0.47
12	255	0.67	5.09				0.45	0.55			0.30	12	0.67
14	286	0.43	5.72				0.24	0.86			0.10	14	0.54
16	286	0.45	5.72				0.24	0.86			0.11	16	0.56
18	286	0.49	5.72				0.24	0.86			0.12	18	0.47
20	198	0.84	3.96			0.02	0.98		0.02	0.82		20	0.48
22	198	0.65	3.96			0.02	0.98		0.01	0.63		22	0.52
24	198	0.59	3.96			0.02	0.98		0.01	0.57		24	1.26
26	223	0.14	4.46				0.77	0.23		0.11	0.03	26	0.64
28	223	0.31	4.46				0.77	0.23		0.24	0.07	28	0.57
30	223	0.17	4.46				0.77	0.23		0.13	0.04	30	0.11
32	173	0.22	3.46			0.27	0.73		0.06	0.16		32	0.27
34	173	0.31	3.46			0.27	0.73		0.08	0.22		34	0.26
36	173	0.26	3.46			0.27	0.73		0.07	0.19		36	0.29
38	174	0.27	3.47			0.26	0.74		0.07	0.20		38	0.29
40	174	0.30	3.47			0.26	0.74		0.08	0.23		40	0.26
42	174	0.16	3.47			0.26	0.74		0.04	0.12		42	0.28
44	174	0.17	3.47			0.26	0.74		0.04	0.13		44	0.27
46	174	0.18	3.47			0.26	0.74		0.05	0.13		46	0.16
48	174	0.10	3.47			0.26	0.74		0.03	0.07		48	0.17
50	174	0.03	3.47			0.26	0.74		0.01	0.02		50	0.16
52	174	0.00	3.47			0.26	0.74		0.00	0.00		52	0.08
54	174	0.01	3.47			0.26	0.74		0.00	0.01		54	0.02
56	174	0.03	3.47			0.26	0.74		0.01	0.02		56	0.00
												58	0.02
												60	0.02
													12.90
													9023.8

Table 53: RW II Stand Table Projection for Redwood, 15 yrs. Growth from 2007-2022

DBH Class	Number of RW II trees in 2007	Avg. 15 yr. DBH incr. inches	Movement ratio	% of trees moving				# of trees moving				DBH class 2022	RW II 2022 TPA in yr.	RW II 2022 Volume in BF	
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes				
2	9.47	4.77	239				0.61	0.39			5.78	3.69	2	0.00	0.0
4	4.21	4.77	239				0.61	0.39			2.57	1.64	4	0.00	0.0
6	2.37	4.77	239				0.61	0.39			1.44	0.92	6	5.78	18.6
8	2.11	2.98	149		0.51	0.49			1.07	1.03			8	6.26	52.7
10	1.84	2.98	149		0.51	0.49			0.94	0.90			10	4.16	74.0
12	4.47	2.98	149		0.51	0.49			2.28	2.19			12	2.89	94.8
14	3.82	2.81	141		0.59	0.41			2.25	1.57			14	3.18	174.6
16	2.78	2.81	141		0.59	0.41			1.64	1.14			16	4.45	381.8
18	1.91	2.81	141		0.59	0.41			1.13	0.78			18	3.21	408.5
20	2.78	3.36	168		0.32	0.68			0.89	1.89			20	2.27	411.0
22	2.78	3.36	168		0.32	0.68			0.89	1.89			22	1.67	417.4
24	1.91	3.36	168		0.32	0.68			0.61	1.30			24	2.78	928.2
26	3.82	4.09	205				0.95	0.05		3.63	0.19	0.19	26	2.50	1092.3
28	2.43	4.09	205				0.95	0.05		2.31	0.12	0.12	28	1.30	727.3
30	2.61	4.09	205				0.95	0.05		2.48	0.13	0.13	30	3.63	2560.5
32	1.04	4.04	202				0.98	0.02		1.02	0.02	0.02	32	2.50	2189.9
34	1.04	4.04	202				0.98	0.02		1.02	0.02	0.02	34	2.60	2785.6
36	2.08	4.04	202				0.98	0.02		2.04	0.04	0.04	36	1.15	1496.0
38	1.05	4.92	246				0.54	0.46		0.57	0.48	0.48	38	1.04	1622.7
40	2.11	4.92	246				0.54	0.46		1.14	0.97	0.97	40	2.06	3815.4
42	0.63	4.92	246				0.54	0.46		0.34	0.29	0.29	42	0.61	1328.5
44	0.42	4.92	246				0.54	0.46		0.23	0.19	0.19	44	1.62	4125.0
46	1.05	4.92	246				0.54	0.46		0.57	0.48	0.48	46	1.31	3867.2
48	0.63	4.92	246				0.54	0.46		0.34	0.29	0.29	48	0.52	1763.8
50	0.63	4.92	246				0.54	0.46		0.34	0.29	0.29	50	0.76	2975.9
52	0.21	4.92	246				0.54	0.46		0.11	0.10	0.10	52	0.83	3675.0
54	0.42	4.92	246				0.54	0.46		0.23	0.19	0.19	54	0.63	3191.6
56	0.00	4.92	246				0.54	0.46		0.00	0.00	0.00	56	0.40	2307.3
58	0.00	4.92	246				0.54	0.46		0.00	0.00	0.00	58	0.32	2081.5
60	0.00	4.92	246				0.54	0.46		0.00	0.00	0.00	60	0.19	1393.0
62	0.42	4.92	246				0.54	0.46		0.23	0.19	0.19	62	0.00	0.0
													64	0.00	0.0
													66	0.23	2250.4
													68	0.19	2118.6
															50329.3

Table 54: RW II Stand Table Projection for Redwood, 15 yrs. Growth from 2022-2037

DBH Class	Number of RW II trees	Avg. 15 yr. DBH incr. inches	Movement ratio	% of trees moving										# of trees moving			DBH class 2037	RW II 2037 TPA in yr. Acre in BF	RW II 2037 Volume in BF			
				0 Classes			1 Classes			2 Classes			3 Classes			0 Classes				1 Classes	2 Classes	3 Classes
				2022	inches																	
2	9.47	4.77	239						0.61	0.39						5.78	3.69	2	0.00	0.0		
4	4.21	4.77	239						0.61	0.39						2.57	1.64	4	0.00	0.0		
6	2.11	4.77	239						0.61	0.39						1.28	0.82	6	5.78	18.6		
8	2.11	2.98	149				0.51	0.49							1.07	1.03		8	6.26	52.7		
10	2.11	2.98	149				0.51	0.49							1.07	1.03		10	4.00	71.1		
12	5.00	2.98	149				0.51	0.49							2.55	2.45		12	2.93	95.9		
14	2.10	2.81	141				0.59	0.41							1.24	0.86		14	3.58	196.6		
16	2.93	2.81	141				0.59	0.41							1.73	1.20		16	3.69	316.9		
18	2.12	2.81	141				0.59	0.41							1.25	0.87		18	2.59	330.4		
20	1.50	3.36	168				0.32	0.68							0.48	1.02		20	2.45	444.6		
22	1.10	3.36	168				0.32	0.68							0.35	0.75		22	1.35	336.0		
24	1.83	3.36	168				0.32	0.68							0.59	1.25		24	1.37	457.8		
26	1.65	4.09	205						0.95	0.05						1.57	0.08	26	1.34	584.2		
28	0.86	4.09	205						0.95	0.05						0.81	0.04	28	1.25	698.2		
30	2.40	4.09	205						0.95	0.05						2.28	0.12	30	1.57	1106.1		
32	1.65	4.04	202						0.98	0.02						1.62	0.03	32	0.90	785.5		
34	1.71	4.04	202						0.98	0.02						1.68	0.03	34	2.32	2487.7		
36	0.76	4.04	202						0.98	0.02						0.74	0.02	36	1.74	2257.3		
38	0.83	4.92	246						0.54	0.46						0.45	0.38	38	1.71	2666.6		
40	1.65	4.92	246						0.54	0.46						0.89	0.76	40	0.78	1440.6		
42	0.49	4.92	246						0.54	0.46						0.26	0.22	42	0.47	1013.3		
44	1.30	4.92	246						0.54	0.46						0.70	0.60	44	1.27	3244.1		
46	1.05	4.92	246						0.54	0.46						0.57	0.48	46	1.02	3020.8		
48	0.41	4.92	246						0.54	0.46						0.22	0.19	48	0.92	3149.7		
50	0.61	4.92	246						0.54	0.46						0.33	0.28	50	1.16	4538.4		
52	0.66	4.92	246						0.54	0.46						0.36	0.30	52	0.71	3142.2		
54	0.51	4.92	246						0.54	0.46						0.27	0.23	54	0.52	2626.8		
56	0.32	4.92	246						0.54	0.46						0.17	0.15	56	0.64	3635.8		
58	0.26	4.92	246						0.54	0.46						0.14	0.12	58	0.58	3701.4		
60	0.15	4.92	246						0.54	0.46						0.08	0.07	60	0.41	2927.5		
62	0.00	4.92	246						0.54	0.46						0.00	0.00	62	0.29	2318.4		
64	0.00	4.92	246						0.54	0.46						0.00	0.00	64	0.20	1812.2		
66	0.18	4.92	246						0.54	0.46						0.10	0.08	66	0.07	705.5		
68	0.15	4.92	246						0.54	0.46						0.08	0.07	68	0.00	0.0		
																		70	0.10	1184.0		
																		72	0.17	2216.8		
																		74	0.07	1035.0		
																				54618.7		

Table 55: RW II Stand Table Projection for Douglas-fir, 15 yrs. Growth from 2007-2022

DBH Class	Number of DF trees in 2007	Avg.15 yr. DBH incr. inches	Movement ratio	% of trees moving				# of trees moving				DBH class	DF TPA in yr. 2022	DF Volume in BF Acre in BF
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes			
2	0.56	2.67	134		0.66	0.34			0.37	0.19		2	0.00	0.0
4	0.56	2.67	134		0.66	0.34			0.37	0.19		4	0.37	1.2
6	0.28	2.67	134		0.66	0.34			0.18	0.09		6	0.56	5.6
8	0.28	3.97	199		0.61	0.99			0.00	0.28		8	0.37	8.6
10	0.00	3.97	199		0.01	0.99			0.00	0.00		10	0.10	4.2
12	0.00	3.97	199		0.01	0.99			0.00	0.00		12	0.28	20.2
14	0.18	4.30	215			0.85	0.15			0.16	0.03	14	0.00	0.0
16	0.18	4.30	215			0.85	0.15			0.16	0.03	16	0.00	0.0
18	0.18	4.30	215			0.85	0.15			0.16	0.03	18	0.16	36.5
20	0.00	3.2	160		0.40	0.60			0.00	0.00		20	0.18	58.0
22	0.00	3.2	160		0.40	0.60			0.00	0.00		22	0.18	76.1
24	0.18	3.2	160		0.40	0.60			0.07	0.11		24	0.03	14.6
26	0.18	3.48	174		0.26	0.74			0.05	0.14		26	0.07	49.1
28	0.00	3.48	174		0.26	0.74			0.00	0.00		28	0.16	130.5
30	0.00	3.48	174		0.26	0.74			0.00	0.00		30	0.14	136.7
32	0.18	2.72	136		0.64	0.36			0.12	0.07		32	0.00	0.0
34	0.00	2.72	136		0.64	0.36			0.00	0.00		34	0.12	169.1
36	0.18	2.72	136		0.64	0.36			0.12	0.07		36	0.07	112.0
38	0.00	2.74	137		0.63	0.37			0.00	0.00		38	0.12	232.3
40	0.00	2.74	137		0.63	0.37			0.00	0.00		40	0.07	151.3
42	0.22	2.74	137		0.63	0.37			0.14	0.08		42	0.00	0.0
												44	0.14	421.5
												46	0.08	281.1
														1908.6

Table 56: RW II Stand Table Projection for Douglas-fir, 15 yrs. Growth from 2022-2037

DBH Class	Number of DF trees in 2007	Avg. 15 yr. DBH incr. inches	Movement ratio	% of trees moving				# of trees moving				DBH class	DF TPA in yr. 2022	DF Volume in BF Acre in BF
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes			
2	56	2.67	134			0.66	0.34			0.37	0.19	2	0.00	0.0
4	56	2.67	134			0.66	0.34			0.37	0.19	4	0.37	1.2
6	28	2.67	134			0.66	0.34			0.18	0.09	6	0.56	5.6
8	28	3.97	199			0.01	0.99			0.00	0.28	8	0.37	8.6
10	0.00	3.97	199			0.01	0.99			0.00	0.00	10	0.10	4.2
12	0.00	3.97	199			0.01	0.99			0.00	0.00	12	0.28	20.2
14	0.00	4.30	215				0.85	0.15			0.00	14	0.00	0.0
16	0.00	4.30	215				0.85	0.15			0.00	16	0.00	0.0
18	0.10	4.30	215				0.85	0.15			0.09	18	0.00	0.0
20	0.12	3.2	160			0.40	0.60			0.05	0.07	20	0.00	0.0
22	0.12	3.2	160			0.40	0.60			0.05	0.07	22	0.14	56.4
24	0.02	3.2	160			0.40	0.60			0.01	0.01	24	0.14	72.7
26	0.05	3.48	174			0.26	0.74			0.01	0.04	26	0.08	53.5
28	0.10	3.48	174			0.26	0.74			0.03	0.08	28	0.02	19.4
30	0.09	3.48	174			0.26	0.74			0.02	0.07	30	0.06	63.4
32	0.00	2.72	136			0.64	0.36			0.00	0.00	32	0.10	121.5
34	0.08	2.72	136			0.64	0.36			0.05	0.03	34	0.07	95.5
36	0.04	2.72	136			0.64	0.36			0.03	0.02	36	0.05	84.1
38	0.09	2.74	137			0.63	0.37			0.06	0.03	38	0.06	110.4
40	0.05	2.74	137			0.63	0.37			0.03	0.02	40	0.07	171.5
42	0.00	2.74	137			0.63	0.37			0.00	0.00	42	0.07	179.2
44	0.11	2.74	137			0.63	0.37			0.07	0.04	44	0.02	58.8
46	0.07	2.74	137			0.63	0.37			0.04	0.02	46	0.07	241.2
												48	0.08	320.0
												50	0.02	105.6
														1793.0

Table 57: RW IV Stand Table Projection for Redwood, 20 yrs. Growth from 2004-2024

DBH Class	Number of RW IV trees in 2004	Avg. 20 yr. DBH incr. inches	Movement ratio	% of trees moving			# of trees moving			DBH class	RW IV TPA in yr. 2024	RW IV Volume in BF Per acre in 2024	2024 Cut TPA	2024 Cut Volume BF/ac	2024 Post Harvest TPA	2024 Post Harvest BF/ac
				0 Classes	1 Classes	2 Classes	0 Classes	1 Classes	2 Classes							
2	30.00	2.20	110		0.90	0.10		27.00	3.00	2	0.00	0.0	0.0	0.0	30.00	2.4
4	36.91	2.20	110		0.90	0.10		32.32	3.59	4	27.00	22.3	0.0	0.0	35.91	29.7
6	22.73	2.20	110		0.90	0.10		20.45	2.27	6	36.32	113.5	0.0	0.0	22.73	73.0
8	20.91	2.89	145		0.55	0.45		11.50	9.41	8	24.05	202.5	0.0	0.0	20.91	176.1
10	17.73	2.89	145		0.55	0.45		9.75	7.98	10	13.77	244.9	0.0	0.0	17.73	315.3
12	15.00	2.89	145		0.55	0.45		8.25	6.75	12	19.16	627.6	0.0	0.0	15.00	491.4
14	9.66	3.95	198		0.02	0.98		0.19	9.47	14	16.23	890.9	2.4	133.6	13.8	757.3
16	6.95	3.95	198		0.02	0.98		0.14	6.82	16	6.94	596.2	1.0	89.4	5.9	506.8
18	6.18	3.95	198		0.02	0.98		0.12	6.06	18	9.61	1223.8	1.4	183.6	8.2	1040.2
20	6.18	2.71	136		0.64	0.36		3.96	2.23	20	6.94	1258.4	1.0	188.8	5.9	1069.6
22	3.09	2.71	136		0.64	0.36		1.98	1.11	22	10.01	2499.2	1.5	374.9	8.5	2124.3
24	5.41	2.71	136		0.64	0.36		3.46	1.95	24	4.20	1404.1	0.6	210.6	3.6	1193.5
26	3.18	2.62	131		0.69	0.31		2.20	0.99	26	4.57	1997.9	1.4	599.4	3.2	1398.5
28	2.55	2.62	131		0.69	0.31		1.76	0.79	28	4.14	2319.1	1.2	695.7	2.9	1623.4
30	1.91	2.62	131		0.69	0.31		1.32	0.59	30	2.74	1934.6	0.8	560.4	1.9	1354.2
32	2.23	3.84	192		0.08	0.92		0.18	2.05	32	2.11	1844.3	0.6	553.3	1.5	1291.0
34	1.59	3.84	192		0.08	0.92		0.13	1.46	34	0.77	826.0	0.2	247.8	0.5	578.2
36	1.59	3.84	192		0.08	0.92		0.13	1.46	36	2.18	2627.5	0.7	848.2	1.5	1979.2
38	0.23	3.92	196		0.04	0.96		0.01	0.22	38	1.59	2477.3	0.8	1238.6	0.8	1238.6
40	0.23	3.92	196		0.04	0.96		0.01	0.22	40	1.47	2723.2	0.7	1361.6	0.7	1361.6
42	0.68	3.92	196		0.04	0.96		0.03	0.65	42	0.23	494.9	0.1	247.4	0.1	247.4
44	0.45	3.92	196		0.04	0.96		0.02	0.44	44	0.25	624.6	0.1	312.3	0.1	312.3
46	0.00	3.92	196		0.04	0.96		0.00	0.00	46	0.67	1986.7	0.3	993.4	0.3	993.4
48	0.45	3.92	196		0.04	0.96		0.02	0.44	48	0.44	1486.2	0.2	743.1	0.2	743.1
50	0.00	3.92	196		0.04	0.96		0.00	0.00	50	0.02	71.0	0.0	36.5	0.0	36.5
52	0.23	3.92	196		0.04	0.96		0.01	0.22	52	0.44	1943.2	0.2	971.6	0.2	971.6
										54	0.01	45.9	0.0	23.0	0.0	23.0
										56	0.22	1245.4	0.1	622.7	0.1	622.7
											195.07	33931.3	15.7	11254.9	202.3	22553.4

Table 58: RW IV Stand Table Projection for Redwood, 20 yrs. Growth from 2024-2044

DBH Class	Number of RW IV trees in 2024	Avg. 20 yr. DBH incr. inches	Movement ratio	% of trees moving			# of trees moving			DBH class	RW II		Volume in BF
											TPA in yr. 2044	Acre in BF	
				0 Classes	1 Classes	2 Classes	0 Classes	1 Classes	2 Classes				
2	30.00	2.20	110		0.90	0.10			27.00	3.00	2	0.00	0.0
4	35.91	2.20	110		0.90	0.10			32.32	3.59	4	27.00	22.3
6	22.73	2.20	110		0.90	0.10			20.45	2.27	6	35.32	113.5
8	20.91	2.89	145		0.55	0.45			11.50	9.41	8	24.05	202.5
10	17.73	2.89	145		0.55	0.45			9.75	7.98	10	13.77	244.9
12	15.00	2.89	145		0.55	0.45			8.25	6.75	12	19.16	627.6
14	13.79	3.95	198		0.02	0.98			0.28	13.52	14	16.23	890.9
16	5.90	3.95	198		0.02	0.98			0.12	5.78	16	7.03	603.3
18	8.16	3.95	198		0.02	0.98			0.16	8.00	18	13.64	1737.3
20	5.90	2.71	136		0.64	0.36			3.77	2.12	20	5.95	1078.5
22	8.51	2.71	136		0.64	0.36			5.45	3.06	22	11.78	2938.8
24	3.57	2.71	136		0.64	0.36			2.29	1.29	24	7.57	2528.9
26	3.20	2.62	131		0.69	0.31			2.21	0.99	26	5.35	2337.1
28	2.90	2.62	131		0.69	0.31			2.00	0.90	28	3.50	1957.0
30	1.92	2.62	131		0.69	0.31			1.32	0.60	30	2.99	2111.6
32	1.47	3.84	192		0.08	0.92			0.12	1.36	32	2.22	1947.1
34	0.54	3.84	192		0.08	0.92			0.04	0.50	34	0.71	765.0
36	1.52	3.84	192		0.08	0.92			0.12	1.40	36	1.40	1818.4
38	0.80	3.92	196		0.04	0.96			0.03	0.76	38	0.62	961.9
40	0.74	3.92	196		0.04	0.96			0.03	0.71	40	1.43	2650.5
42	0.11	3.92	196		0.04	0.96			0.00	0.11	42	0.79	1726.9
44	0.12	3.92	196		0.04	0.96			0.00	0.12	44	0.71	1810.4
46	0.34	3.92	196		0.04	0.96			0.01	0.32	46	0.11	336.7
48	0.22	3.92	196		0.04	0.96			0.01	0.21	48	0.13	447.1
50	0.01	3.92	196		0.04	0.96			0.00	0.01	50	0.33	1295.0
52	0.22	3.92	196		0.04	0.96			0.01	0.21	52	0.21	934.4
54	0.00	3.92	196		0.04	0.96			0.00	0.00	54	0.02	88.2
56	0.11	3.92	196		0.04	0.96			0.00	0.10	56	0.21	1196.6
											58	0.01	56.0
											60	0.10	753.2
												202.34	34181.5

Table 59: RW IV Stand Table Projection for Douglas-fir, 20 yrs. Growth from 2004-2024

DBH Class	Number of DF trees	Avg. 20 yr. DBH incr. 2004 inches	Movement ratio	% of trees moving				# of trees moving				DBH class	DF TPA in yr. 2024	DF 2024 Volume per Acre in BF	2024 Cnt TPA	2024 Cnt Volume BF/ac	2024 Post Harvest TPA	2024 Post Harvest BF/ac	
				0 Classes	1 Classes	2 Classes	3 Classes	4 Classes	0 Classes	1 Classes	2 Classes								3 Classes
2	184	1.4	3.68		0.16	0.16	0.84				0.22	1.15		0.00	0.0	0.0	1.4	0.6	
4	184	0.9	3.68		0.16	0.16	0.84				0.15	0.76		0.22	0.0	0.0	0.9	2.9	
6	184	0.9	3.68		0.16	0.16	0.84				0.15	0.76		1.29	0.0	0.0	0.9	9.2	
8	311	0.5	6.22					0.89	0.11				0.40	0.91	0.0	0.0	0.9	21.0	
10	311	2.7	6.22					0.89	0.11				2.43	0.76	0.0	0.0	0.7	119.0	
12	311	1.4	6.22					0.89	0.11				1.21	0.00	0.0	0.0	1.4	100.2	
14	368	0.9	7.15					0.42	0.58				0.36	0.50	0.2	23.1	0.2	23.1	
16	368	0.4	7.15					0.42	0.58				0.18	0.25	1.2	207.1	1.2	207.1	
18	368	0.0	7.15					0.42	0.58				0.00	0.00	0.8	177.2	0.8	177.2	
20	236	0.9	4.72				0.67	0.36				0.58	0.31	0.51	0.3	81.1	0.3	81.1	
22	236	0.0	4.72				0.67	0.36				0.00	0.00	0.68	0.3	141.7	0.3	141.7	
24	236	0.9	4.72				0.67	0.36				0.58	0.31	0.83	0.4	220.8	0.4	220.8	
26	272	0.4	5.44				0.28	0.72				0.11	0.28	0.31	0.2	104.1	0.2	104.1	
28	272	1.9	5.44				0.28	0.72				0.54	1.39	0.68	0.3	239.4	0.3	239.4	
30	272	1.5	5.44				0.28	0.72				0.43	1.11	0.42	0.2	211.2	0.2	211.2	
32	210	0.8	4.2				0.90	0.10				0.70	0.08	0.82	0.4	496.3	0.4	496.3	
34	210	0.7	4.2				0.90	0.10				0.65	0.07	1.82	0.9	1313.9	0.9	1313.9	
36	210	0.7	4.2				0.90	0.10				0.65	0.07	1.81	0.9	1534.0	0.9	1534.0	
38	210	0.4	4.2				0.90	0.10				0.33	0.04	0.73	0.4	724.6	0.4	724.6	
40	210	0.4	4.2				0.90	0.10				0.33	0.04	0.73	0.4	833.7	0.4	833.7	
42	210	0.4	4.2				0.90	0.10				0.33	0.04	0.40	0.2	527.2	0.2	527.2	
														44	0.36	1094.8	0.2	547.4	
														46	0.36	1243.0	0.2	621.5	
														48	0.04	140.4	0.0	70.2	
														17.98	16216.6	7.4	8074.3	15.6	8327.2

Table 60: RW IV Stand Table Projection for Douglas-fir, 20 yrs. Growth from 2024-2044

DBH Class	Number of DBF trees 2024	Avg. 20 yr. DBH incr. inches	Movement ratio	% of trees moving					# of trees moving				DBH class	DF TPA in yr. 2044	DF Volume in BF Acre in BF
				0 Classes	1 Classes	2 Classes	3 Classes	4 Classes	0 Classes	1 Classes	2 Classes	3 Classes	4 Classes		
2	1.4	3.68	184			0.16	0.84				0.22	1.15		2	1.4
4	0.9	3.68	184			0.16	0.84				0.15	0.76		4	0.9
6	0.9	3.68	184			0.16	0.84				0.15	0.76		6	0.9
8	0.9	6.22	311					0.89	0.11				0.81	8	0.9
10	2.7	6.22	311					0.89	0.11				2.43	10	2.7
12	1.4	6.22	311					0.89	0.11				1.21	12	1.4
14	0.2	7.15	358					0.42	0.58				0.08	14	0.8
16	1.2	7.15	358					0.42	0.58				0.52	16	2.5
18	0.8	7.15	358					0.42	0.58				0.32	18	1.5
20	0.3	4.72	236				0.67	0.36				0.17	0.09	20	0.2
22	0.3	4.72	236				0.67	0.36				0.23	0.12	22	0.6
24	0.4	4.72	236				0.67	0.36				0.28	0.15	24	1.2
26	0.2	5.44	272				0.28	0.72				0.04	0.11	26	0.8
28	0.3	5.44	272				0.28	0.72				0.08	0.21	28	0.4
30	0.2	5.44	272				0.28	0.72				0.06	0.15	30	0.2
32	0.4	4.2	210				0.90	0.10				0.37	0.04	32	0.2
34	0.9	4.2	210				0.90	0.10				0.82	0.09	34	0.3
36	0.9	4.2	210				0.90	0.10				0.81	0.09	36	0.5
38	0.4	4.2	210				0.90	0.10				0.33	0.04	38	0.9
40	0.4	4.2	210				0.90	0.10				0.33	0.04	40	0.9
42	0.2	4.2	210				0.90	0.10				0.18	0.02	42	0.4
44	0.2	4.2	210				0.90	0.10				0.16	0.02	44	0.4
46	0.2	4.2	210				0.90	0.10				0.16	0.02	46	0.2
48	0.0	4.2	210				0.90	0.10				0.02	0.00	48	0.2
														50	0.2
														52	0.0
														54	0.0
														20.6	13036.1

Table 61: DF Stand Table Projection for Douglas-fir, 15 yrs. Growth from 2007-2022

DBH Class	Number of DF trees	Avg. 15 yr. DBH incr. 2007 inches	Movement ratio	% of trees moving			# of trees moving			DBH class	DF TPA in yr. 2022	DF Volume per Acre in BF	2022 Cut TPA	2022 Cur Volume BF/ac	2022 Post Harvest TPA	2022 Post Harvest BF/ac
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes					
2	563	3.87	194	0.06	0.94			0.34	5.29			0.0	0.0	0.0	5.63	2.5
4	12.08	3.87	194	0.06	0.94			0.73	11.36			0.34	1.1	0.0	12.08	38.4
6	11.88	3.87	194	0.06	0.94			0.71	11.16			6.01	60.9	0.0	11.88	120.4
8	9.68	4.28	214		0.86	0.14			8.24	1.34		12.07	278.4	0.0	9.68	221.0
10	5.63	4.28	214		0.86	0.14			4.84	0.79		11.16	487.1	0.0	5.63	245.5
12	4.38	4.28	214		0.86	0.14			3.76	0.61		8.24	605.6	0.0	4.38	321.5
14	3.67	3.82	191	0.09	0.91			0.33	3.34			6.18	705.3	1.2	4.94	564.3
16	2.50	3.82	191	0.09	0.91			0.23	2.28			4.88	815.8	1.0	163.2	662.7
18	2.17	3.82	191	0.09	0.91			0.20	1.97			4.17	977.1	0.8	195.4	781.7
20	2.00	2.70	135	0.65	0.35			1.30	0.70			2.47	781.3	0.5	156.3	625.0
22	1.83	2.70	135	0.65	0.35			1.19	0.64			3.27	1358.9	0.7	271.8	262
24	2.00	2.70	135	0.65	0.35			1.30	0.70			1.89	1007.5	0.4	201.5	151
26	1.46	3.62	181	0.09	0.81			0.13	1.18			1.94	1299.9	0.6	390.0	909.9
28	0.88	3.62	181	0.09	0.81			0.08	0.71			0.83	687.8	0.2	206.3	481.4
30	2.33	3.62	181	0.09	0.81			0.21	1.89			1.26	1269.7	0.4	380.9	888.8
32	0.58	3.50	175	0.25	0.75			0.15	0.44			0.92	1113.3	0.3	334.0	779.3
34	1.00	3.50	175	0.25	0.75			0.25	0.75			2.04	2933.7	0.6	880.1	2053.6
36	0.38	3.50	175	0.25	0.75			0.09	0.28			0.69	1166.5	0.3	466.6	699.9
38	0.13	3.68	184	0.16	0.84			0.02	0.11			0.84	1670.8	0.3	668.3	1002.5
40	0.13	3.68	184	0.16	0.84			0.02	0.11			0.30	690.7	0.1	276.3	414.4
42	0.00	3.68	184	0.16	0.84			0.00	0.00			0.13	329.5	0.1	131.8	197.7
44	0.13	3.68	184	0.16	0.84			0.02	0.11			0.11	316.1	0.0	126.4	189.7
46	0.13	3.68	184	0.16	0.84			0.02	0.11			0.02	68.4	0.0	27.3	41.0
48	0.00	3.68	184	0.16	0.84			0.00	0.00			0.13	482.6	0.1	193.0	289.5
50	0.13	3.68	184	0.16	0.84			0.02	0.11			0.11	455.5	0.0	182.2	273.3
52	0.00	3.68	184	0.16	0.84			0.00	0.00			0.02	97.1	0.0	38.8	58.2
54	0.13	3.68	184	0.16	0.84			0.02	0.11			0.11	567.6	0.0	227.0	340.5
56	0.00	3.68	184	0.16	0.84			0.00	0.00			0.02	119.9	0.0	48.0	72.0
58	0.00	3.68	184	0.16	0.84			0.00	0.00			0.11	696.1	0.0	278.5	417.7
60	0.00	3.68	184	0.16	0.84			0.00	0.00			0.00	0.0	0.0	0.0	0.0
62	0.00	3.68	184	0.16	0.84			0.00	0.00			0.00	0.0	0.0	0.0	0.0
64	0.13	3.68	184	0.16	0.84			0.02	0.11			0.00	191.8	0.0	76.7	115.1
												0.11	1096.7	0.0	438.7	658.0
												70.24	19107.9	7.6	5210.3	15348.6

Table 62: DF Stand Table Projection for Douglas-fir, 15 yrs. Growth from 2022-2037

DBH Class	Number of DF trees	Avg. 15 yr. DBH incr. 2022 inches	Movement ratio	% of trees moving				# of trees moving				DBH class	DF TPA in yr. 2037	DF 2037 Volume per Acre in BF
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes			
2	5.63	3.87	194		0.06	0.94				0.34	5.29		2	0.00
4	12.08	3.87	194		0.06	0.94				0.73	11.36		4	0.34
6	11.88	3.87	194		0.06	0.94				0.71	11.16		6	6.01
8	9.58	4.28	214			0.86	0.14				8.24	1.34	8	12.07
10	5.63	4.28	214			0.86	0.14				4.84	0.79	10	11.16
12	4.38	4.28	214			0.86	0.14				3.76	0.61	12	8.24
14	4.94	3.82	191		0.09	0.91				0.44	4.50		14	6.18
16	3.90	3.82	191		0.09	0.91				0.35	3.55		16	4.99
18	3.34	3.82	191		0.09	0.91				0.30	3.04		18	5.46
20	1.98	2.70	135		0.65	0.35				1.28	0.69		20	3.85
22	2.62	2.70	135		0.65	0.35				1.70	0.92		22	4.32
24	1.51	2.70	135		0.65	0.35				0.98	0.53		24	2.39
26	1.36	3.62	181		0.09	0.81				0.12	1.10		26	1.90
28	0.58	3.62	181		0.09	0.81				0.05	0.47		28	0.65
30	0.88	3.62	181		0.09	0.81				0.08	0.71		30	1.15
32	0.64	3.50	175		0.25	0.75				0.16	0.48		32	0.55
34	1.43	3.50	175		0.25	0.75				0.36	1.07		34	0.88
36	0.41	3.50	175		0.25	0.75				0.10	0.31		36	0.84
38	0.51	3.68	184		0.16	0.84				0.08	0.43		38	1.17
40	0.18	3.68	184		0.16	0.84				0.03	0.15		40	0.39
42	0.08	3.68	184		0.16	0.84				0.01	0.06		42	0.45
44	0.06	3.68	184		0.16	0.84				0.01	0.05		44	0.16
46	0.01	3.68	184		0.16	0.84				0.00	0.01		46	0.07
48	0.08	3.68	184		0.16	0.84				0.01	0.06		48	0.05
50	0.06	3.68	184		0.16	0.84				0.01	0.05		50	0.02
52	0.01	3.68	184		0.16	0.84				0.00	0.01		52	0.07
54	0.06	3.68	184		0.16	0.84				0.01	0.05		54	0.05
56	0.01	3.68	184		0.16	0.84				0.00	0.01		56	0.02
58	0.06	3.68	184		0.16	0.84				0.01	0.05		58	0.05
60	0.00	3.68	184		0.16	0.84				0.00	0.00		60	0.02
62	0.00	3.68	184		0.16	0.84				0.00	0.00		62	0.05
64	0.00	3.68	184		0.16	0.84				0.00	0.00		64	0.00
66	0.01	3.68	184		0.16	0.84				0.00	0.01		66	0.00
68	0.06	3.68	184		0.16	0.84				0.01	0.05		68	0.00
													70	0.02
													72	0.05
													73.68	22936.2

Table 63: DF HW Stand Table Projection for Redwood, 15 yrs. Growth from 2007-2022

DBH Class	Number of RW trees	Avg. 15 yr. DBH incr. 2007	Movement ratio	% of trees moving												# of trees moving			DBH class	RW TPA in yr. 2022	RW Volume in BF Per acre in 2022	2022 Cut TPA	2022 Curt Volume BF/ac	2022 Post Harvest TPA	2022 Post Harvest BF/ac
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes														
2	375	1.89	95	0.05	0.95			0.19	3.56			2	0.19	0.0	0.0	0.0	0.0	0.0	3.75	0.3					
4	422	1.89	95	0.05	0.95			0.21	4.01			4	3.77	3.1	0.0	0.0	0.0	4.22	3.5						
6	1.09	1.89	95	0.05	0.95			0.05	1.04			6	4.06	13.1	0.0	0.0	0.0	1.09	3.5						
8	0.47	2.98	149		0.51	0.49			0.24	0.23		8	1.04	8.8	0.0	0.0	0.47	3.9							
10	0.78	2.98	149		0.51	0.49			0.40	0.38		10	0.24	4.3	0.0	0.0	0.78	13.9							
12	0.31	2.98	149		0.51	0.49			0.16	0.15		12	0.63	20.6	0.0	0.0	0.31	10.2							
14	0.25	2.81	141		0.59	0.41			0.15	0.10		14	0.54	29.8	0.1	6.0	0.43	23.8							
16	0.25	2.81	141		0.59	0.41			0.15	0.10		16	0.30	25.8	0.1	5.2	0.24	20.7							
18	0.38	2.81	141		0.59	0.41			0.22	0.15		18	0.25	31.9	0.1	6.4	0.20	25.5							
20	0.25	3.36	168		0.32	0.68			0.08	0.17		20	0.32	58.7	0.1	11.7	0.26	47.0							
22	0.38	3.36	168		0.32	0.68			0.12	0.26		22	0.23	58.3	0.0	11.7	0.19	46.7							
24	0.25	3.36	168		0.32	0.68			0.08	0.17		24	0.29	96.9	0.1	19.4	0.23	77.5							
26	0.63	4.09	205			0.95	0.05			0.59	0.03	26	0.34	146.3	0.1	48.3	0.27	117.0							
28	0.75	4.09	205			0.95	0.05			0.71	0.04	28	0.17	95.2	0.1	31.4	0.14	76.1							
30	0.13	4.09	205			0.95	0.05			0.12	0.01	30	0.59	418.8	0.2	138.2	0.48	335.0							
32	0.50	4.04	202			0.98	0.02			0.49	0.01	32	0.74	651.2	0.2	214.9	0.60	521.0							
34	0.50	4.04	202			0.98	0.02			0.49	0.01	34	0.16	167.6	0.1	55.3	0.13	134.1							
36	0.36	4.04	202			0.98	0.02			0.37	0.01	36	0.50	644.7	0.2	212.8	0.40	515.8							
38	0.00	4.92	246			0.54	0.46			0.00	0.00	38	0.50	778.6	0.3	389.3	0.40	622.9							
40	0.13	4.92	246			0.54	0.46			0.07	0.06	40	0.38	698.0	0.2	279.2	0.30	558.4							
42	0.25	4.92	246			0.54	0.46			0.14	0.12	42	0.01	16.3	0.0	6.5	0.01	13.1							
44	0.00	4.92	246			0.54	0.46			0.00	0.00	44	0.07	171.8	0.0	68.7	0.05	137.4							
46	0.25	4.92	246			0.54	0.46			0.14	0.12	46	0.19	568.5	0.1	227.4	0.15	454.8							
48	0.25	4.92	246			0.54	0.46			0.14	0.12	48	0.12	391.7	0.0	156.7	0.09	313.3							
												50	0.14	527.2	0.1	210.9	0.11	421.7							
												52	0.25	1113.3	0.1	445.3	0.20	890.6							
												54	0.12	581.1	0.0	232.5	0.09	464.9							
													15.63	5099.8	1.8	1888.9	15.2	4075.4							

Table 64: DF HW Stand Table Projection for Redwood, 15 yrs. Growth from 2022-2037

DBH Class	Number of RW III trees	Avg. 15 yr. DBH incr. inches	Movement ratio	% of trees moving				# of trees moving				DBH class	RW TPA in yr. 2037	RW Volume in BF Per acre in 2037	
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes				
2	3.75	1.89	95	0.05	0.95				0.19	3.56		2	0.19	22.8	
4	4.22	1.89	95	0.05	0.95				0.21	4.01		4	3.77	12.6	
6	1.09	1.89	95	0.05	0.95				0.05	1.04		6	4.06	7.4	
8	0.47	2.98	149		0.51	0.49				0.24	0.23	8	1.04	4.0	
10	0.78	2.98	149		0.51	0.49				0.40	0.38	10	0.24	4.5	
12	0.31	2.98	149		0.51	0.49				0.16	0.15	12	0.63	6.5	
14	0.43	2.81	141		0.59	0.41				0.26	0.18	14	0.54	29.8	
16	0.24	2.81	141		0.59	0.41				0.14	0.10	16	0.41	35.1	
18	0.20	2.81	141		0.59	0.41				0.12	0.08	18	0.32	40.7	
20	0.26	3.36	168		0.32	0.68				0.08	0.18	20	0.22	39.3	
22	0.19	3.36	168		0.32	0.68				0.06	0.13	22	0.16	41.1	
24	0.23	3.36	168		0.32	0.68				0.07	0.16	24	0.24	78.8	
26	0.27	4.09	205			0.95	0.05				0.25	0.01	26	0.20	88.0
28	0.14	4.09	205			0.95	0.05				0.13	0.01	28	0.16	88.3
30	0.48	4.09	205			0.95	0.05				0.45	0.02	30	0.25	179.6
32	0.60	4.04	202			0.98	0.02				0.58	0.01	32	0.14	124.9
34	0.13	4.04	202			0.98	0.02				0.12	0.00	34	0.46	491.4
36	0.40	4.04	202			0.98	0.02				0.39	0.01	36	0.61	788.4
38	0.40	4.92	246			0.54	0.46				0.22	0.18	38	0.13	209.3
40	0.30	4.92	246			0.54	0.46				0.16	0.14	40	0.39	724.0
42	0.01	4.92	246			0.54	0.46				0.00	0.00	42	0.22	487.6
44	0.05	4.92	246			0.54	0.46				0.03	0.02	44	0.35	883.2
46	0.15	4.92	246			0.54	0.46				0.08	0.07	46	0.14	419.8
48	0.09	4.92	246			0.54	0.46				0.05	0.04	48	0.03	108.7
50	0.11	4.92	246			0.54	0.46				0.06	0.05	50	0.11	421.7
52	0.20	4.92	246			0.54	0.46				0.11	0.09	52	0.12	536.7
54	0.09	4.92	246			0.54	0.46				0.05	0.04	54	0.10	508.6
												56	0.16	900.0	
												58	0.14	909.6	
												60	0.04	304.4	
													15.24	6382.8	

Table 65: DF HW Stand Table Projection for Douglas-fir, 15 yrs. Growth from 2007-2022

DBH Class	Number of DF trees	Avg. 15 yr. DBH incr.	Movement ratio	% of trees moving				# of trees moving				DBH class	DF TPA in yr. 2022	DF 2022 Volume per Acre in BF	2022 Cut TPA	2022 Cut Volume BF/ac	2022 Post Harvest TPA	2022 Post Harvest BF/ac			
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes										
2	2	5.47	3.17					0.41	0.59			2.24	3.23	2	0.00	0.0	0.0	5.47	2.4		
4	4	4.53	3.17					0.41	0.59			1.86	2.67	4	2.24	7.1	0.0	4.53	14.4		
6	6	4.38	3.17					0.41	0.59			1.79	2.58	6	5.09	51.5	0.0	4.38	44.3		
8	8	3.28	5.09						0.45	0.55			1.48	1.80	8	4.47	103.0	0.0	3.28	75.7	
10	10	2.34	5.09						0.45	0.55			1.05	1.29	10	2.58	112.6	0.0	2.34	102.3	
12	12	2.03	5.08						0.45	0.55			0.91	1.12	12	1.48	108.5	0.0	2.03	149.3	
14	14	1.63	5.72						0.24	0.86			0.39	1.40	14	2.86	326.4	0.1	16.3	310.1	
16	16	1.34	5.72						0.24	0.86			0.32	1.15	16	2.20	368.3	0.1	18.4	349.9	
18	18	1.34	5.72						0.24	0.86			0.32	1.15	18	1.51	363.2	0.1	17.7	335.6	
20	20	1.19	3.96					0.02	0.98			0.02	1.16	20	1.72	545.6	0.1	27.3	1.64	518.3	
22	22	1.34	3.96					0.02	0.98			0.03	1.31	22	1.49	620.2	0.1	31.0	1.42	589.2	
24	24	1.19	3.96					0.02	0.98			0.02	1.16	24	2.34	1245.9	0.1	62.3	2.22	1183.6	
26	26	0.63	4.46						0.77	0.23			0.48	0.14	26	1.33	892.4	0.3	178.5	1.07	713.9
28	28	0.50	4.46						0.77	0.23			0.39	0.12	28	1.16	962.9	0.2	192.6	0.93	770.3
30	30	0.63	4.46						0.77	0.23			0.48	0.14	30	0.48	485.0	0.1	97.0	0.39	388.0
32	32	0.63	3.46					0.27	0.73			0.17	0.46	32	0.53	640.7	0.1	128.1	0.42	512.6	
34	34	0.88	3.46					0.27	0.73			0.24	0.64	34	0.77	1102.4	0.2	220.5	0.61	881.9	
36	36	0.13	3.46					0.27	0.73			0.03	0.09	36	0.84	1418.9	0.2	283.8	0.67	1135.1	
38	38	0.50	3.47					0.26	0.74			0.13	0.37	38	0.67	1331.7	0.1	266.3	0.54	1065.3	
40	40	0.00	3.47					0.26	0.74			0.00	0.00	40	0.22	507.3	0.0	101.5	0.18	405.8	
42	42	0.13	3.47					0.26	0.74			0.03	0.09	42	0.37	975.3	0.1	195.1	0.30	780.2	
44	44	0.00	3.47					0.26	0.74			0.00	0.00	44	0.03	97.8	0.0	19.6	0.03	78.3	
46	46	0.13	3.47					0.26	0.74			0.03	0.09	46	0.09	316.2	0.0	63.2	0.07	253.0	
48	48	0.00	3.47					0.26	0.74			0.00	0.00	48	0.03	125.5	0.0	25.1	0.03	100.4	
50	50	0.13	3.47					0.26	0.74			0.03	0.09	50	0.09	401.3	0.0	80.3	0.07	321.0	
52	52	0.00	3.47					0.26	0.74			0.00	0.00	52	0.03	157.7	0.0	31.5	0.03	126.2	
54	54	0.00	3.47					0.26	0.74			0.00	0.00	54	0.09	500.0	0.0	100.0	0.07	400.0	
56	56	0.00	3.47					0.26	0.74			0.00	0.00	56	0.00	0.0	0.0	0.0	0.00	0.0	
58	58	0.13	3.47					0.26	0.74			0.03	0.09	58	0.00	0.0	0.0	0.0	0.00	0.0	
														60	0.03	237.4	0.0	47.5	0.03	189.9	
														62	0.09	742.0	0.0	148.4	0.07	593.6	
															34.85	12698.5	1.9	1944.2	39.1	12390.6	

Table 66: DF HW Stand Table Projection for Douglas-fir, 15 yrs. Growth from 2022-2037

DBH Class	Number of DF trees	Avg. 15 yr. DBH incr. inches	Movement ratio	% of trees moving				# of trees moving				DBH class	DF TPA in yr. 2037	2037 Volume per Acre in BF	
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes				
2	5.47	3.17	159			0.41	0.59			2.24	3.23	2	0.00	0.0	
4	4.53	3.17	159			0.41	0.59			1.86	2.67	4	2.24	7.1	
6	4.38	3.17	159			0.41	0.59			1.79	2.58	6	5.08	51.5	
8	3.28	5.09	255				0.45	0.55			1.48	1.80	8	4.47	103.0
10	2.34	5.09	255				0.45	0.55			1.05	1.29	10	2.58	112.6
12	2.03	5.09	255				0.45	0.55			0.91	1.12	12	1.48	108.5
14	2.72	5.72	286				0.24	0.86			0.65	2.34	14	2.86	326.4
16	2.09	5.72	286				0.24	0.86			0.50	1.80	16	2.20	368.3
18	1.43	5.72	286				0.24	0.86			0.34	1.23	18	1.77	414.1
20	1.64	3.96	198			0.02	0.98			0.03	1.61	20	2.84	897.8	
22	1.42	3.96	198			0.02	0.98			0.03	1.39	22	2.18	904.1	
24	2.22	3.96	198			0.02	0.98			0.04	2.18	24	2.87	1527.0	
26	1.07	4.46	223				0.77	0.23			0.82	0.25	26	1.43	960.5
28	0.93	4.46	223				0.77	0.23			0.72	0.21	28	2.18	1802.0
30	0.39	4.46	223				0.77	0.23			0.30	0.09	30	0.82	827.4
32	0.42	3.46	173			0.27	0.73			0.11	0.31	32	0.96	1165.9	
34	0.61	3.46	173			0.27	0.73			0.17	0.45	34	0.62	900.3	
36	0.67	3.46	173			0.27	0.73			0.18	0.49	36	0.56	954.5	
38	0.54	3.47	174			0.26	0.74			0.14	0.40	38	0.63	1242.4	
40	0.18	3.47	174			0.26	0.74			0.05	0.13	40	0.63	1440.5	
42	0.30	3.47	174			0.26	0.74			0.08	0.22	42	0.44	1170.7	
44	0.03	3.47	174			0.26	0.74			0.01	0.02	44	0.21	626.0	
46	0.07	3.47	174			0.26	0.74			0.02	0.05	46	0.23	771.9	
48	0.03	3.47	174			0.26	0.74			0.01	0.02	48	0.04	148.6	
50	0.07	3.47	174			0.26	0.74			0.02	0.05	50	0.06	266.9	
52	0.03	3.47	174			0.26	0.74			0.01	0.02	52	0.04	186.7	
54	0.07	3.47	174			0.26	0.74			0.02	0.05	54	0.06	332.5	
56	0.00	3.47	174			0.26	0.74			0.00	0.00	56	0.04	230.8	
58	0.00	3.47	174			0.26	0.74			0.00	0.00	58	0.05	363.0	
60	0.03	3.47	174			0.26	0.74			0.01	0.02	60	0.00	0.0	
62	0.07	3.47	174			0.26	0.74			0.02	0.05	62	0.01	54.2	
												64	0.04	338.0	
												66	0.05	525.2	
													39.68	19128.7	

Table 67: Smith Stand Table Projection for Redwood, 15 yrs. From 2007-2022

DBH Class	Number of trees	Avg. 15 yr. DBH in ch. 2007 inches	Movement ratio	% of trees moving				# of trees moving				DBH class	RW IV TPA in yr. 2022	RW IV Volume in BF Per acre in 2022	2022 Cut TPA	2022 Cut Volume BF/ac	2022 Post Harvest TPA	2022 Post Harvest BF/ac								
				0 Classes				1 Classes											2 Classes				3 Classes			
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes								0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes
2	833	1.89	95	0.05	0.95			0.42	7.92			2	0.42	0.0	0.0	0.0	8.33	0.7								
4	500	1.89	95	0.05	0.95			0.25	4.75			4	8.17	6.7	0.0	0.0	5.00	4.1								
6	833	1.89	95	0.05	0.95			0.42	7.92			6	5.17	16.6	0.0	0.0	8.33	26.8								
8	583	2.98	149	0.51	0.49			2.98	2.86	2.86		8	7.92	66.7	0.0	0.0	5.83	49.1								
10	417	2.98	149	0.51	0.49			2.13	2.04	2.13		10	2.98	52.9	0.0	0.0	4.17	74.1								
12	1.67	2.98	149	0.51	0.49			0.85	0.82	0.85		12	4.98	163.2	0.0	0.0	1.67	54.6								
14	1.00	2.81	141	0.59	0.41			0.59	0.41	0.59		14	2.89	158.8	0.9	47.6	2.0	111.1								
16	0.00	2.81	141	0.59	0.41			0.00	0.00	0.00		16	1.41	120.8	0.4	36.2	1.0	84.6								
18	0.50	2.81	141	0.59	0.41			0.30	0.21	0.30		18	0.41	52.2	0.1	15.7	0.3	36.6								
20	1.00	3.36	168	0.32	0.68			0.32	0.68	0.32		20	0.30	53.5	0.1	16.0	0.2	37.4								
22	1.25	3.36	168	0.32	0.68			0.40	0.85	0.40		22	0.53	131.0	0.2	39.3	0.4	91.7								
24	1.25	3.36	168	0.32	0.68			0.40	0.85	0.40		24	1.08	360.7	0.3	108.2	0.8	252.5								
26	0.17	4.09	205	0.95	0.05			0.16	0.01	0.16		26	1.25	545.9	0.3	109.2	0.9	382.1								
28	0.33	4.09	205	0.95	0.05			0.32	0.02	0.32		28	0.85	475.8	0.2	95.2	0.7	380.7								
30	0.17	4.09	205	0.95	0.05			0.16	0.01	0.16		30	0.16	111.7	0.0	22.3	0.1	89.3								
32	0.67	4.04	202	0.98	0.02			0.65	0.01	0.65		32	0.33	284.6	0.1	56.9	0.3	227.7								
34	0.33	4.04	202	0.98	0.02			0.33	0.01	0.33		34	0.18	187.7	0.0	37.5	0.1	150.2								
36	0.00	4.04	202	0.98	0.02			0.00	0.00	0.00		36	0.66	859.6	0.1	171.9	0.5	687.7								
38	0.83	4.92	246	0.54	0.46			0.45	0.38	0.45		38	0.34	529.4	0.0	0.0	0.3	529.4								
40	0.83	4.92	246	0.54	0.46			0.45	0.38	0.45		40	0.01	12.3	0.0	0.0	0.0	12.3								
42	1.67	4.92	246	0.54	0.46			0.90	0.77	0.90		42	0.45	979.8	0.0	0.0	0.5	979.8								
44	0.00	4.92	246	0.54	0.46			0.00	0.00	0.00		44	0.83	2120.5	0.0	0.0	0.8	2120.5								
46	0.00	4.92	246	0.54	0.46			0.00	0.00	0.00		46	1.28	3790.0	0.0	0.0	1.3	3790.0								
48	0.83	4.92	246	0.54	0.46			0.45	0.38	0.45		48	0.77	2611.1	0.0	0.0	0.8	2611.1								
50	1.67	4.92	246	0.54	0.46			0.90	0.77	0.90		50	0.00	0.0	0.0	0.0	0.0	0.0								
52	0.83	4.92	246	0.54	0.46			0.45	0.38	0.45		52	0.38	2003.9	0.0	0.0	0.5	2003.9								
54	0.00	4.92	246	0.54	0.46			0.00	0.00	0.00		54	1.28	6485.1	0.0	0.0	1.3	6485.1								
56	2.50	4.92	246	0.54	0.46			1.35	1.15	1.35		56	1.22	6944.8	0.0	0.0	1.2	6944.8								
58	0.00	4.92	246	0.54	0.46			0.00	0.00	0.00		58	0.38	2461.0	0.0	0.0	0.4	2461.0								
60	0.83	4.92	246	0.54	0.46			0.45	0.38	0.45		60	1.35	9709.5	0.0	0.0	1.4	9709.5								
62	0.00	4.92	246	0.54	0.46			0.00	0.00	0.00		62	1.15	9231.4	0.0	0.0	1.2	9231.4								
64	1.67	4.92	246	0.54	0.46			0.90	0.77	0.90		64	0.45	4017.7	0.0	0.0	0.5	4017.7								
66	0.83	4.92	246	0.54	0.46			0.45	0.38	0.45		66	0.38	3794.1	0.0	0.0	0.4	3794.1								
68	0.00	4.92	246	0.54	0.46			0.00	0.00	0.00		68	0.90	9844.7	0.0	0.0	0.9	9844.7								
70	0.00	4.92	246	0.54	0.46			0.00	0.00	0.00		70	1.22	14665.8	0.0	0.0	1.2	14665.8								
72	0.00	4.92	246	0.54	0.46			0.00	0.00	0.00		72	0.38	5078.1	0.0	0.0	0.4	5078.1								
74	0.83	4.92	246	0.54	0.46			0.45	0.38	0.45		74	0.00	0.0	0.0	0.0	0.0	0.0								
												76	0.00	0.0	0.0	0.0	0.0	0.0								
												78	0.45	7794.5	0.0	0.0	0.5	7794.5								
												80	0.38	7227.5	0.0	0.0	0.4	7227.5								
													53.33	102049.8	2.7	756.2	54.3	102042.3								

Table 69: Smith Stand Table Projection for Douglas-fir, 15 yrs. From 2007-2022

DBH Class	Number of DF trees	Avg. 15 yr. DBH incr.	Movement ratio	% of trees moving				# of trees moving			DBH Class	DF TPA in yr. 2022	DF 2022 Volume per Acre in BF	2022 Cut Volume BF/ac	2022 Post Harvest TPA	2022 Post Harvest BF/ac
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes					
2	0.83	3.17	159			0.41	0.59		0.34	0.49		2	0.00	0.0	0.0	0.83
4	0.00	3.17	159			0.41	0.59		0.00	0.00		4	0.34	1.1	0.0	0.00
6	0.00	3.17	159			0.41	0.59		0.00	0.00		6	0.49	5.0	0.0	0.00
8	1.67	5.09	255				0.45	0.55		0.75	0.92	8	0.00	0.0	0.0	1.67
10	0.00	5.09	255				0.45	0.55		0.00	0.00	10	0.00	0.0	0.0	0.00
12	0.83	5.09	255				0.45	0.55		0.36	0.46	12	0.75	55.1	0.0	0.83
14	0.00	5.72	286				0.24	0.86		0.00	0.00	14	0.92	104.6	0.3	0.64
16	0.00	5.72	286				0.24	0.86		0.00	0.00	16	0.36	62.7	0.1	0.26
18	0.25	5.72	286				0.24	0.86		0.06	0.22	18	0.46	107.3	0.1	0.32
20	0.00	3.96	198			0.02	0.98		0.00	0.00		20	0.00	0.0	0.0	0.00
22	0.25	3.96	198			0.02	0.98		0.01	0.25		22	0.06	24.9	0.0	0.04
24	0.00	3.96	198			0.02	0.98		0.00	0.00		24	0.22	117.2	0.1	0.15
26	0.00	4.46	223				0.77	0.23		0.00	0.00	26	0.25	164.0	0.1	0.17
28	0.17	4.46	223				0.77	0.23		0.13	0.04	28	0.00	0.0	0.0	0.00
30	0.33	4.46	223				0.77	0.23		0.26	0.08	30	0.00	0.0	0.0	0.00
32	0.17	3.46	173			0.27	0.73		0.05	0.12		32	0.13	155.5	0.0	0.10
34	0.17	3.46	173			0.27	0.73		0.05	0.12		34	0.34	489.9	0.1	0.27
36	0.00	3.46	173			0.27	0.73		0.00	0.00		36	0.24	412.9	0.0	0.19
38	0.00	3.47	174			0.26	0.74		0.00	0.00		38	0.12	240.9	0.0	0.12
40	0.83	3.47	174			0.26	0.74		0.22	0.62		40	0.00	0.0	0.0	0.00
42	0.00	3.47	174			0.26	0.74		0.00	0.00		42	0.22	571.1	0.0	0.22
44	0.00	3.47	174			0.26	0.74		0.00	0.00		44	0.62	1856.5	0.0	0.62
46	0.00	3.47	174			0.26	0.74		0.00	0.00		46	0.00	0.0	0.0	0.00
48	0.00	3.47	174			0.26	0.74		0.00	0.00		48	0.00	0.0	0.0	0.00
50	0.00	3.47	174			0.26	0.74		0.00	0.00		50	0.00	0.0	0.0	0.00
52	0.00	3.47	174			0.26	0.74		0.00	0.00		52	0.00	0.0	0.0	0.00
54	0.00	3.47	174			0.26	0.74		0.00	0.00		54	0.00	0.0	0.0	0.00
56	0.00	3.47	174			0.26	0.74		0.00	0.00		56	0.00	0.0	0.0	0.00
58	0.00	3.47	174			0.26	0.74		0.00	0.00		58	0.00	0.0	0.0	0.00
60	0.00	3.47	174			0.26	0.74		0.00	0.00		60	0.00	0.0	0.0	0.00
62	0.83	3.47	174			0.26	0.74		0.22	0.62		62	0.00	0.0	0.0	0.00
64	0.83	3.47	174			0.26	0.74		0.22	0.62		64	0.22	1903.1	0.0	0.22
66	0.00	3.47	174			0.26	0.74		0.00	0.00		66	0.83	7992.5	0.0	0.83
68	0.83	3.47	174			0.26	0.74		0.22	0.62		68	0.62	6441.2	0.0	0.62
												70	0.22	2458.6	0.0	0.22
												72	0.62	7584.0	0.0	0.62
												8.03	30748.2	0.8	385.9	30401.1

Table 70: Smith Stand Table Projection for Douglas-fir, 15 yrs. From 2022-2037

DBH Class	Number of DF trees	Avg. 15 yr. DBH incr. inches	Movement ratio	% of trees moving				# of trees moving				DBH class	DF TPA in yr. 2037	DF 2037 Volume per Acre in BF
				0 Classes	1 Classes	2 Classes	3 Classes	0 Classes	1 Classes	2 Classes	3 Classes			
2	0.83	3.17	159		0.41	0.59			0.34	0.49		2	0.00	0.0
4	0.00	3.17	159		0.41	0.59			0.00	0.00		4	0.34	1.1
6	0.00	3.17	159		0.41	0.59			0.00	0.00		6	0.49	5.0
8	1.67	5.09	255			0.45	0.55			0.75	0.92	8	0.00	0.0
10	0.00	5.09	255			0.45	0.55			0.00	0.00	10	0.00	0.0
12	0.83	5.09	255			0.45	0.55			0.38	0.46	12	0.75	55.1
14	0.64	5.72	286			0.24	0.86			0.15	0.55	14	0.92	104.6
16	0.26	5.72	286			0.24	0.86			0.06	0.23	16	0.38	62.7
18	0.32	5.72	286			0.24	0.86			0.08	0.28	18	0.61	143.3
20	0.00	3.96	198		0.02	0.98			0.00	0.00		20	0.61	194.5
22	0.04	3.96	198		0.02	0.98			0.00	0.04		22	0.30	125.7
24	0.15	3.96	198		0.02	0.98			0.00	0.15		24	0.28	147.4
26	0.17	4.46	223			0.77	0.23			0.13	0.04	26	0.04	29.6
28	0.00	4.46	223			0.77	0.23			0.00	0.00	28	0.15	124.9
30	0.00	4.46	223			0.77	0.23			0.00	0.00	30	0.13	133.1
32	0.10	3.46	173		0.27	0.73			0.03	0.07		32	0.04	47.8
34	0.27	3.46	173		0.27	0.73			0.07	0.20		34	0.03	39.9
36	0.19	3.46	173		0.27	0.73			0.05	0.14		36	0.15	251.8
38	0.12	3.47	174		0.26	0.74			0.03	0.09		38	0.25	497.3
40	0.00	3.47	174		0.26	0.74			0.00	0.00		40	0.17	398.4
42	0.22	3.47	174		0.26	0.74			0.06	0.16		42	0.09	237.3
44	0.62	3.47	174		0.26	0.74			0.16	0.46		44	0.06	169.6
46	0.00	3.47	174		0.26	0.74			0.00	0.00		46	0.32	1096.2
48	0.00	3.47	174		0.26	0.74			0.00	0.00		48	0.46	1761.7
50	0.00	3.47	174		0.26	0.74			0.00	0.00		50	0.00	0.0
52	0.00	3.47	174		0.26	0.74			0.00	0.00		52	0.00	0.0
54	0.00	3.47	174		0.26	0.74			0.00	0.00		54	0.00	0.0
56	0.00	3.47	174		0.26	0.74			0.00	0.00		56	0.00	0.0
58	0.00	3.47	174		0.26	0.74			0.00	0.00		58	0.00	0.0
60	0.00	3.47	174		0.26	0.74			0.00	0.00		60	0.00	0.0
62	0.00	3.47	174		0.26	0.74			0.00	0.00		62	0.00	0.0
64	0.22	3.47	174		0.26	0.74			0.06	0.16		64	0.00	0.0
66	0.83	3.47	174		0.26	0.74			0.22	0.62		66	0.06	540.3
68	0.62	3.47	174		0.26	0.74			0.16	0.46		68	0.38	3937.8
70	0.22	3.47	174		0.26	0.74			0.06	0.16		70	0.78	8816.8
72	0.62	3.47	174		0.26	0.74			0.16	0.46		72	0.51	6305.0
												74	0.32	4264.9
												76	0.46	6549.9
													9.07	36041.6

Sizes Available for Harvest

Sizes available for harvest will generally be in diameter classes greater than 32" DBH. Diameters below this size class will also be thinned to encourage greater movement of these trees through diameter classes to achieve crops trees of reasonable size exceeding 32" DBH. Each entry will harvest approximately 30% of the standing volume and be guided by the results of the C.F.I. system that is re-measured every 10 years. Updates to the sustainability analysis will be amended to the NTMP as necessary if significant deviations from this general standard are needed or realized. The stands are balanced related to stocking per acre and predominantly represent the future desired conditions of the stands.

The intent of the information in this section is to provide a picture of stands that can be reasonably managed, excluding MPP and the Smith Stand. The Monterey pine plantation and Smith Stand have low volume available for removal and are therefore excluded from the assessments of harvestable volume give a more realistic number for management planning. The MPP is scheduled for gradual removal, ultimately to be re-stocked with conifers. The Smith Stand will experience minor harvesting because of its status as a High Conservation Value Forest (HCVF) under Forest Stewardship Council (FSC) certification. More information on the Smith Stand is provided in Section II, Item 43 (b), which describes the practices required in this stand to maintain its numerous values. The following tables show sizes available for harvest for RW III, RW II, RW IV, DF, and DF HW:

Table 71: RW III Estimate of Sizes Available for Harvest

RW III: 2007 Redwood Estimate of Sizes Available for Harvest Per Acre			RW III: 2007 Douglas-fir Estimate of Sizes Available for Harvest Per Acre		
DBH	RW/TPA	ln %	DBH	DF/TPA	ln %
2	0.00	0.00	2	0.00	0.00
4	0.00	0.00	4	0.00	0.00
6	0.00	0.00	6	0.00	0.00
8	0.00	0.00	8	0.00	0.00
10	0.00	0.00	10	0.00	0.00
12	0.00	0.00	12	0.00	0.00
14	1.31	9.34	14	0.20	5.85
16	0.87	6.20	16	0.16	4.68
18	1.33	9.53	18	0.09	2.73
20	1.03	7.34	20	0.07	1.95
22	1.25	8.96	22	0.04	1.17
24	1.05	7.53	24	0.09	2.73
26	1.16	8.26	26	0.11	3.31
28	1.25	8.91	28	0.11	3.31
30	1.29	9.24	30	0.14	3.98
32	0.84	6.00	32	0.09	2.65
34	0.68	4.86	34	0.14	3.98
36	0.52	3.73	36	0.20	5.96
38	0.45	3.24	38	0.11	3.12
40	0.21	1.53	40	0.27	7.80
42	0.19	1.33	42	0.27	7.80
44	0.19	1.33	44	0.27	7.80
46	0.08	0.57	46	0.27	7.80
48	0.08	0.57	48	0.27	7.80
50	0.08	0.57	50	0.27	7.80
52	0.05	0.38	52	0.27	7.80
54	0.03	0.19	Trees/ac	3.4	100.00
56	0.00	0.00			
58	0.00	0.00			
60	0.03	0.19			
62	0.00	0.00			
64	0.00	0.00			
66	0.03	0.19			
Trees/ac	14	100			

Table 72: RW II Estimate of Sizes Available for Harvest

RW II: 2007 Redwood Estimate of Sizes Available for Harvest Per Acre			RW II: 2007 Douglas-fir Estimate of Sizes Available for Harvest Per Acre		
DBH	RW/TPA	In %	DBH	DF/TPA	In %
2	0.00	0.00	2	0.00	0.00
4	0.00	0.00	4	0.00	0.00
6	0.00	0.00	6	0.00	0.00
8	0.00	0.00	8	0.00	0.00
10	0.00	0.00	10	0.00	0.00
12	0.00	0.00	12	0.00	0.00
14	1.97	11.69	14	0.00	0.00
16	1.43	8.50	16	0.06	2.83
18	0.98	5.85	18	0.06	2.83
20	1.43	8.50	20	0.06	2.83
22	1.43	8.50	22	0.00	0.00
24	0.98	5.85	24	0.00	0.00
26	1.97	11.69	26	0.09	4.82
28	1.25	7.44	28	0.09	4.82
30	1.34	7.97	30	0.00	0.00
32	0.54	3.19	32	0.00	0.00
34	0.54	3.19	34	0.09	4.82
36	1.07	6.38	36	0.00	0.00
38	0.26	1.56	38	0.09	4.82
40	0.53	3.13	40	0.00	0.00
42	0.16	0.94	42	0.00	0.00
44	0.11	0.63	44	0.09	4.82
46	0.26	1.56	46	1.32	67.42
48	0.16	0.94	48	0.00	0.00
50	0.16	0.94	50	0.00	0.00
52	0.05	0.31	52	0.00	0.00
54	0.11	0.63	Trees/ac	2.0	100
56	0.00	0.00			
58	0.00	0.00			
60	0.00	0.00			
62	0.11	0.63			
Trees/ac	1.89	100			

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Table 73: RW IV Estimate of Sizes Available for Harvest

RW IV: 2007 Redwood			RW IV: 2007 Douglas-fir		
Estimate of Sizes Available			Estimate of Sizes Available		
for Harvest Per Acre			for Harvest Per Acre		
DBH	RW/TPA	In %	DBH	DF/TPA	In %
2	0.00	0.00	2	0.00	0.00
4	0.00	0.00	4	0.00	0.00
6	0.00	0.00	6	0.00	0.00
8	0.00	0.00	8	0.00	0.00
10	0.00	0.00	10	0.00	0.00
12	0.00	0.00	12	0.00	0.00
14	1.45	13.18	14	0.04	3.27
16	1.04	9.49	16	0.02	1.64
18	0.93	8.44	18	0.00	0.00
20	0.93	8.44	20	0.04	3.27
22	0.46	4.22	22	0.00	0.00
24	0.81	7.38	24	0.04	3.27
26	0.95	8.69	26	0.06	4.40
28	0.76	6.95	28	0.29	21.98
30	0.57	5.21	30	0.23	17.58
32	0.67	6.08	32	0.12	8.79
34	0.48	4.34	34	0.11	8.27
36	0.80	7.24	36	0.15	11.03
38	0.11	1.03	38	0.07	5.46
40	0.11	1.03	40	0.07	5.52
42	0.34	3.10	42	0.07	5.52
44	0.23	2.07	Trees/ac	1.3	100.00
46	0.00	0.00			
48	0.23	2.07			
50	0.00	0.00			
52	0.11	1.03			
Trees/ac	11	100			

Table 74: DF Estimate of Sizes Available for Harvest

DF: 2007 Redwood		
Estimate of Sizes Available		
for Harvest Per Acre		
DBH	RW/TPA	ln %
2	0.00	0.00
4	0.00	0.00
6	0.00	0.00
8	0.00	0.00
10	0.00	0.00
12	0.00	0.00
14	0.92	12.72
16	0.63	8.67
18	0.54	7.51
20	0.50	6.94
22	0.46	6.36
24	0.50	6.94
26	0.63	8.67
28	0.38	5.20
30	1.00	13.87
32	0.25	3.47
34	0.67	9.25
36	0.25	3.47
38	0.08	1.16
40	0.08	1.16
42	0.00	0.00
44	0.08	1.16
46	0.08	1.16
48	0.00	0.00
50	0.08	1.16
52	0.00	0.00
54	0.08	1.16
56	0.00	0.00
58	0.00	0.00
60	0.00	0.00
62	0.00	0.00
Trees/ac	7	100

Table 75: DF HW Estimate of Sizes Available for Harvest

DF HW: 2007 Redwood Estimate of Sizes Available for Harvest Per Acre			DF HW: 2007 Douglas-fir Estimate of Sizes Available for Harvest Per Acre		
DBH	RW/TPA	In %	DBH	DF/TPA	In %
2	0.00	0.00	2	0.00	0.00
4	0.00	0.00	4	0.00	0.00
6	0.00	0.00	6	0.00	0.00
8	0.00	0.00	8	0.00	0.00
10	0.00	0.00	10	0.00	0.00
12	0.00	0.00	12	0.00	0.00
14	0.06	4.55	14	0.09	5.79
16	0.06	4.55	16	0.07	4.74
18	0.09	6.82	18	0.07	4.74
20	0.06	4.55	20	0.06	4.21
22	0.09	6.82	22	0.07	4.74
24	0.06	4.55	24	0.06	4.21
26	0.16	11.36	26	0.16	10.53
28	0.19	13.64	28	0.13	8.42
30	0.03	2.27	30	0.16	10.53
32	0.13	9.09	32	0.16	10.53
34	0.13	9.09	34	0.22	14.74
36	0.09	6.82	36	0.03	2.11
38	0.00	0.00	38	0.13	8.42
40	0.03	2.27	40	0.00	0.00
42	0.06	4.55	42	0.03	2.11
44	0.00	0.00	44	0.00	0.00
46	0.06	4.55	46	0.03	2.11
48	0.06	4.55	48	0.00	0.00
Trees/ac	1	100	50	0.03	2.11
			52	0.00	0.00
			Trees/ac	1.5	100.00

Table 76 displays an estimate of percent growth rates by stand, and volume (in board feet) available for harvest this entry. The intent of the table is to describe reasonable rates of harvest that maintain a significant capital of trees in various diameters that will, over time, maintain the many values that selective harvesting provides. This is only a snapshot-in-time estimate that will likely vary in due course through new stand inventories occurring every 10 years through C.F.I. Volume removal estimates, in the following table, were created by utilizing an amortizing calculator, from an Excel spreadsheet, on a 15 year re-entry period based on yearly percent growth.

Table 76: 2007 Estimate of Volume in Board Feet (BF)/Per Stand Type/Per Acre Available for Harvest this Entry Based on Yearly Growth Rate

2007	RW III	RW II	RW IV	DF	DF HW
Redwood	27790.1	46300.8	22562.7	0.0	6176.6
Douglas-fir	6877.7	2028.4	10291.4	22052.3	11306.8
Per Acre/Volume	34667.8	48329.2	32854.1	22052.3	17483.4
BF/Per Ac./Per yr. Growth	1007.9	1111.6	864.7	257.8	224.4
% Growth Rates	2.9	2.3	2.6	1.2	1.3
Volume Available for Harvest Per stand/ Per Acre	11811.8	13495.0	10527.9	3360.3	2923.5

43. Provide a description by management unit(s) of proposed activities to achieve the management objectives, include in Section III, as per 14 CCR 1090.5 (I):

a. projected frequencies of harvest;

Projected frequencies of harvest for the Swanton Pacific Ranch NTMP are modeled for every 15 years, with the exception of the RW IV stand type which is modeled for every 20 years. It is expected that the first entry harvest within this NTMP shall occur for each management unit in the following years:

1. North Fork of Little Creek: 2008
2. South Fork of Little Creek: 2011
3. Satellite Units: 2024

Helicopter yarding is expected to occur in portions of these management units approximately every 15-20 years for approximately 2-3 weeks.

Monterey Pine Plantation (MPP) and hardwood harvesting for group selection may or may not occur in conjunction with conifer harvests. It is also expected that intermediate treatments for hardwoods may occur outside of conifer harvesting activities as well.

b. silvicultural prescriptions for harvesting;

The following tables provide a more specific course of action for harvesting prescriptions. However, it should be recognized that these tables are meant to act solely as an estimate and guide for what is proposed for removal. In many cases, a high degree of variability exists throughout the different stand types and these prescriptions should be treated with this in mind. Selection of trees for harvesting shall also consider elimination of poorer growing trees while providing for stocking, spacing, release potential, aesthetics, and wildlife habitat, as described in Section II under Item 14.

Table 77: RW III Silvicultural Prescription for Harvesting

Percent Cut: Redwood		
DBH Class	Percent remaining	Percent removed
2.0-12.0	0%	0%
14.0-24.0	80%	20%
26.0-36.0	66%	34%
38.0+	60%	40%

Table 78: RW II Silvicultural Prescription for Harvesting

Percent Cut: Redwood		
DBH Class	Percent remaining	Percent removed
2.0-12.0	0%	0%
14.0-24.0	66%	34%
26.0-36.0	66%	34%
38.0+	80%	20%

Table 78A: RW II Silvicultural Prescription for Harvesting

Percent Cut: Douglas-fir		
DBH Class	Percent remaining	Percent removed
2.0-12.0	0%	0%
14.0-24.0	66%	34%
26.0-36.0	66%	34%
38.0+	80%	20%

Table 79: RW IV Silvicultural Prescription for Harvesting

Percent Cut: Redwood		
DBH Class	Percent remaining	Percent removed
2.0-12.0	0%	0%
14.0-24.0	85%	15%
26.0-32.0	70%	30%
34.0+	50%	50%

Table 80: RW IV Silvicultural Prescription for Harvesting

Percent Cut: Douglas-fir		
DBH Class	Percent remaining	Percent removed
2.0-12.0	0%	0%
14.0-24.0	95%	5%
26.0-32.0	85%	15%
34.0+	80%	20%

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Table 81: DF Silvicultural Prescription for Harvesting

Percent Cut: Douglas-fir		
DBH Class	Percent remaining	Percent removed
2.0-12.0	0%	0%
14.0-24.0	80%	20%
26.0-32.0	70%	30%
34.0+	60%	40%

Table 82: DF HW Silvicultural Prescription for Harvesting

Percent Cut: Redwood		
DBH Class	Percent remaining	Percent removed
2.0-12.0	0%	0%
14.0-24.0	80%	20%
26.0-32.0	80%	20%
34.0+	80%	20%

Table 83: DF HW Silvicultural Prescription for Harvesting

Percent Cut: Douglas-fir		
DBH Class	Percent remaining	Percent removed
2.0-12.0	0%	0%
14.0-24.0	95%	5%
26.0-32.0	80%	20%
34.0+	80%	20%

Table 84: Smith Stand Silvicultural Prescription for Harvesting

Percent Cut: Redwood		
DBH Class	Percent Remaining	Percent Removed
2.0-12.0	0%	0%
14.0-24.0	70%	30%
26.0-36.0	80%	20%
38.0+	100%	0%

Smith Stand:

Although a general prescription is provided for the Smith Stand, more important guidance comes from FSC which requires that any activity in the Smith Stand adhere to the following:

Type II old growth redwood is previously entered stands of old growth. These stands can have harvesting in them; however, none of the old trees will be harvested or negatively impacted during operations. Thinning from below to reduce competition and to remove

fuel ladders is permitted. Equipment should remain away from old growth trees to prevent root damage and soil compaction. Large downed woody debris and standing snags are left to provide diversity.

Other guidelines in Section II are provided to identify use of skid trails only where flagged, snag retention, and retention of downed woody debris greater than 24" DBH in the Smith Stand.

FSC has an annual audit of forest operations where this location will be inspected if any harvesting activities occur in the Smith Stand or nearby. If these guidelines are not adhered to, loss of certification as well as CDF enforcement action could occur. The harvestable volume from the Smith Stand is incorporated in the gross volume summary in Tables 19-22. Due to the limited nature of harvest activities allowable in this area, the harvestable volume from the Smith Stand has been removed from the gross volume summary in Tables 23-26 to provide a more accurate estimate of manageable volume for general management purposes.

c. type of yarding systems to be used for each area/unit;

All of the management units will predominantly utilize ground based operations and skyline cable yarding. It is also expected that portions of each management unit will be helicopter yarded.

d. anticipated interim management activities which may result in rule compliance questions (i.e., erosion control maintenance).

See Sections II and III, Items 14, 18, 23, and 30.

44. Provide the period of time over which growth will be balanced with harvest in Section III, as per 14 CCR 1090.5 (j).

Because stands are balanced related to stocking per acre and predominantly represent the future desired conditions of the seven stands, growth is balanced with harvest now. Adjustments may be made over time depending on the analysis resulting from C.F.I. inventories in the future.

45. Provide a description of the cumulative effects analysis with supporting information, including impact of projected harvesting over the life of the NTMP, per 14 CCR 1090.5 (v). Include mitigation measures, if any, and instructions to LTO in Section II and the analysis in Section III, as per 14 CCR 1090.5 (v).

See Section IV (Cumulative Impacts Assessment)

46. Maps and drawings. Include as per 14 CCR 1090.5 (x) and as needed; insert in Sections II and/or III, as appropriate.

The C.F.I Map and Timber Type map have been provided in Section II.

47. ☒ Yes ☐ No A copy of the forest practice regulations in effect at the time of submission is enclosed, as per 14 CCR 1090.5 (w). If no, the plan is incomplete: an explanation of how a copy of the regulations will be maintained by the timberland owner must be included.

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