TIMBER MANAGEMENT PLAN

CAMP CHESEBROUGH

Boy Scout Memorial Foundation of Santa Clara County

Ptsns. of Sections 1, 2, and 12 Township 8 South Range 3 West M.D.B.M.

Michael E. Jani
Forester
RPF#1856
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In 1973, Paul and Lessie Cheseborough gifted to the Boy Scout Memorial Foundation of Santa Clara County, approximately 430 acres in the Santa Cruz Mountains to be developed as a Boy Scout camp. The land was ideally suited for this use in that it was forested, with large flat areas for camping and a relatively well-developed road network. The close proximity to the growing Bay Area also made the Cheseborough property ideal for Scout use. Later, an additional 140 acres was given to the foundation by the Cheseborough's.

Prior to these generous gifts, the land under Cheseborough ownership was used primarily for tree growing and harvesting. The earliest logging of the virgin timber dates back to the turn of the century. In fact, remnants of the original mill can still be found down at the junction of Deep Gulch and Oil Creek.

Under Foundation ownership, improvements have been made to the camp which include a large meeting hall and kitchen and the development of caretakers headquarters, well and water systems and a few remote "walk-in" campground sites. The Camp operates year round, providing a valuable outdoor recreational area for Scouting youth.

PURPOSE OF A LAND MANAGEMENT PLAN

The purpose of this plan is two-fold: one, to provide current and future Foundation directors with guidelines for continued improvements to the land and, two, to provide a document which is easily understood by Scout leaders using the camp in which on-going projects and uses of the forested lands
are described, located and explained in such a way to enable these leaders to train and educate Scouts using the property. This document can be easily amended to include new information or changes in landowner goals.

LAND OWNER OBJECTIVES

IMPROVING THE USEFULNESS OF THE PROPERTY

IMPROVE ACCESS (See Road and Trial Map, Appendix)

Most of the Camp area is well accessed by unimproved, unsurfaced roads. The most recent harvesting along Oil Creek resulted in the construction of a bridge which linked the main Camp road with the previously unimproved, impassible logging trail the length of Oil Creek. As operations continue in the Camp, old roads and landings can be reopened and improved to provide better access for Camp functions and fire protection. Upgrading of existing roads and landings will provide better drainage structures, erosion control facilities and an increase in the number of usable camping areas.

Additional road and landing construction, which may be necessary to facilitate future harvesting of timber, should attempt to compliment recreational uses.

Currently, two major improvements can be made to the Camp's road system. The first entails the reopening of the Red Mountain Ridge Road: Investigation needs to be made to ascertain if this is a legal right of way out to Highway 35. If not, then the road should be reopened to the property boundary and a heavy gate erected to thwart trespass. Four-wheel drive and motorcycle traffic, over the years, has severely damaged the road. Large
gullies exist where lack of adequate erosion control has allowed accumulated winter rainwater to run down long lengths of road. Water-barring, out-sloping of the road surface and trespass control will remedy these problems. Reopening Red Mountain road will provide valuable fire access and allow for the development of more remote campsites.

The second major improvement which ought to be considered is the rocking of the main entrance road down into the headquarter area and main parking area. Currently, during rains, the unsurfaced road, which is used almost daily by the caretaker and family, gets rough, rutted sometimes impassible.

Rocking this section of road would improve wet weather access, and alleviate erosion problems.

All other roads can and should be left as unimproved dirt. This will allow these road to be used periodically for timber harvesting. Road rocking might prohibit the falling and skidding of timber on and nearby these roads or at the very least, expensive road rock would be lost as a result of timbering activities.

DEVELOP THE PROPERTY AS A RECREATIONAL AREA

(See Facilities Map, Appendix)

Continued harvests will provide cleared areas for remote camps. (principally log landing locations not currently is use). Reopened logging trails and roads, with perhaps some newly constructed trails, may link up to create a network of hiking trails between the main facilities, remote facilities and other recreational areas.
Permanent facility development should be contained within the upper reaches of the camp. This will keep road maintenance costs down while allowing for continued timber production from the outlying areas. In the future, should it be necessary to expand the permanent facilities outside the current area, care must be taken in planning to minimize the impacts on the productivity of the forest. Water power and gas lines should be installed underground. New building should be restricted to non-forested areas, (grasslands and marginal hardwood forest lands).

**PRESERVE THE NATIVE VEGETATION**

The mosaic pattern of the different vegetation types is of great value to the camp. The maintenance section of this plan deals with maintaining the health and vigor of the vegetational communities but within those communities, there are certain species and/or individuals that require additional attention.

**MAINTAIN SPECIMEN TREES**

Located all over the property are individual trees of differing species which, by the mere nature of their size, qualify for designation as specimen trees. The locations of these trees should be recorded once located and provisions should be taken to protect their health. An example of what may be considered specimen trees are the large maple and redwoods located near the existing Old Mill Camp site. Currently, no protection is being provided for these trees. In the case of all specimen trees, blockades should be erected at least 15 feet away from the base of the tree to curtail foot and automobile traffic which, left unchecked, will cause extreme soil compaction and the
eventual demise of the tree. In addition, any accidental
scarring of the tree should be sealed up using commercial pruning
tar. Should specimen trees be located in areas designated for
timber thinning or burning, care must be taken to avoid injury to
these trees.

REMOVE EXOTIC TREE SPECIES

Following the timber harvesting done in the 1960's, a small
amount of area was planted with Monterey pine. Though a native
of Santa Cruz county, and touted as a "fast growing" timber tree,
it's been found that the tree really doesn't do well outside a
thin strip along the coast. Probably, the best treatment of
these introduced trees would be their removal. This can be done
by encouraging camp maintenance personnel to cut the pines for
firewood, followed by replanting to Douglas-Fir or Redwood.

MAINTAIN WILDLIFE TREES

Somewhat like specimen trees, wildlife trees should be
singled out and protected both for their aesthetic beauty and
value to various animals (particularly birds) that live in the
forest. Once identified, these trees should be tagged and
located on maps which can then be used by people hiking on the
camp property. Eventually, even trails might be built nearly to
access these trees.

Large Oak Trees

True oaks and tan oaks with large bushy crowns provide
lots of acorns for foraging animals; primarily deer. Wild
pigs are being found on adjacent properties and inevitably
will migrate up into the camp property. They also eat
acorns.

**Virgin Old Growth Redwood**

It's possible that a few redwoods, for some reason, were past up when the area was first clear cut at the turn of the century. These trees provide excellent habitat for many bird species and should be retained if possible.

**Snags**

Dead trees, still standing often times are used by birds for homes or food storage areas. Where snags do not comprise the safety of users or workers in the camp, they should be retained.

**MAINTAIN UNDISTURBED AREAS**

(See Facilities Map, Appendix)

Some areas, though capable of supporting commercial harvesting should be considered for exclusion because they contain other interesting features of value for the camp. One such area is a side canyon off Oil Creek (shown on Map, labeled "Sand Cliffs Area"). This canyon is easily accessible by foot and has dramatic sandstone rock formations which might possible serve for limited mountaineering training.

Another area of interest, located on the neighboring Paul property though only accessible from the Oil Creek Road, is a waterfall. An agreement might be struck with the Paul's which would allow the Scouts access to the falls in exchange for easements for the removal of Paul timber.
ASSURE THE SAFETY OF PERSONS USING THE SITE.

FIRE SAFETY

By far and away the greatest danger facing users of the property is wildfire. The use of the property occurs during the driest months of the year. Fuel buildups generated from old logging practices, the exclusion of natural fires and the overcrowded conditions of the second growth timber stand create very dangerous conditions when coupled with the hot, dry conditions normal for the Santa Cruz Mountains in the summer. Thinning of the timber stand and proper slash treatment will help greatly to decrease the chances of a catastrophic "crown fire". Wildfires, rushing through the tops of unthinned trees will run out of fuel and drop to the ground when entering thinned stands. Slash and debris from the thinning can create more ground fuel; however, when crushed and manually cut low to the ground, it retains a great deal of moisture and decomposes quickly.

Because use of the property entails camp fires and the use of camp stoves and lanterns, care should be taken to minimize the risks of these practices.

Open Fires:

Should be curtailed altogether during times of "High or Extreme" fire hazard. An area should be cleared for at least 20 feet around the fire site. A fire extinguisher should be kept at the site. Fire tools, shovels, McClouds, axes and Pulaskis should be kept in a firebox nearby.

Use of Campstoves and Lanterns:

Basically, the same steps should be followed as for open
Additional steps should include instruction in the proper use and fueling of stoves and lanterns.

Education:
A basic understanding of the fundamentals of fire suppression should be taught to each and every person using the facilities.

Future Development:
All future buildings should have clearing done around them following CDF specifications. Exhaust vents should be kept clear of leaves and needles and should be checked periodically for defects. Future development of the water system should include hydrants, fire hoses and be engineered to insure adequate pressure necessary for fire fighting. Individual campsites, cabin sites and tent site should each include an extinguisher of some fashion as well as a shovel.

Fire Plan:
The property lies at back of a box canyon. The only major access if the existing camp road. Plans should be developed to insure secondary routes out the back of the canyon should primary access routes be cut off by fire. The reopening and improvement of the Red Mountain Road will help to provide this kind of necessary access. In addition, skid trails used for that logging could be kept open and used for emergency, on foot evacuation.

The Foundation should attempt to develop an agreement with neighbors to maintain one such route out of the canyon.

In case of fire, there should be at least one person always present at the facility when in use who knows all available
escape routes and is well educated in fire suppression. Existing fire breaks should be maintained and trails cleared to allow for unimpeded passage.

**Fire Hazard Reduction:**

While thinning will greatly reduce the fire hazard within the timber stands, area of non-timber also have a great deal of fuel buildup which has occurred due to the success of modern-day fire suppression. within these areas, fuel wood gathering will help eliminate some risks, however the volume removed would be difficult and insignificant compared to what is naturally contributed through both growth and mortality.

Attitudes are slowly changing in regards to the value of fire suppression. Hand or mechanical removal of built-up fuels is very costly and can cause significant deterioration of aesthetic values. Because of that, the use of fire, under very controlled conditions, is being promoted for the reduction of fuels. Slow-burning ground fires can kill understory brush and thus dismantle the fuel ladder from understory fuels to the desirable overstory vegetation. Much investigative work is being done and the Foundation should keep the idea of prescribed burning to reduce fire hazards in mind.

**HAZARD TREE REDUCTION**

An attempt should be made to identify and remove hazardous trees from the property. While all trees have the potential to be hazardous, some are obvious and are as follows:

1. **Fork Topped or Multiple Tops:**

   Usually the result of a broken top in the development of the
tree. These tops are branches that turn upward and continue growth as tops. The point of the break is a source of infection and resultant rot that can weaken the tree. Eventually, one or all of the multiple tops become too large for support and break off.

2. Trees with Rot:
Rot eventually weakens a tree to a point where it can no longer stand.

Redwood: Scars, from fire or past logging, at the base allow a passageway into the trees for a brown spot rot.

Douglas fir: Firescars, logging scars or broken off branches allow a passage way for a rot common in Douglas fir in the area (fomes pini). Additionally, the fruiting body or conks of the fungus can be visible on the trunks of the trees as small, dark, semi-circular disks.

Hardwood: Many different types of rots inhabit the hardwood trees in the area. Fire scarring is usually a good indicator that a hardwood has interior rot.

Trees with faulty root systems: Where paths, roads and stream channels have undercut the root systems, trees no longer have the total support necessary and can fall. In redwoods, occasionally, sprouts will have grown on top of the parent stump instead of from the roots. These trees will invariably get to a certain point too large for proper support and peel off the side of the stump. douglas firs are very shallow-rooted trees and when they become too large, the soil too wet and the wind too strong, they blow over easily. Several large firs in the stand
lean heavily and should be considered for removal when feasible.

**Snags:** Snags are dead, standing trees which can become hazardous over time. They also are valuable as bird habitats. Insects attacking the decaying wood are a valuable food source and some types of birds will seek out snag trees for nesting. Where not immediately adjacent to high use areas, snags should be retained.

**DEALING WITH HAZARD TREES**

In the cutting prescription written for thinning commercial timber stands, guidelines are given for the reduction of hazard or defective trees. Additionally in areas of high use outside the commercial forest lands, these trees should be removed and could be taken during a commercial thinning. It should be kept in mind that all hazard trees should be removed prior to the construction of any facilities within their falling radius. Over time, potentially dangerous trees can be removed elsewhere on the property. Small trees around facilities that exhibit dangerous characteristics should be removed immediately while it can be done easily. All fir trees within falling distance of proposed buildings should be removed.

**ENHANCE THE NATURAL BEAUTY OF THE SITE AND GENERAL HEALTH AND GROWTH OF VEGETATION AND TIMBER**

**TIMBERLAND OBJECTIVES**

1. **Provide for the Periodic Selective Harvest of Timber**

   To achieve this goal, the existing even-aged forest must be converted to an all-aged forest whose dominant trees will be comparable in size to those of the present forest. The plan has
been prepared with the assumption that the owner does not wish to reduce tree numbers of significantly alter dominant tree size from the figures characteristic of the forest immediately prior to the initial harvest. Although changing the stocking/tree-size relationship in the stand theoretically might increase timber yields, any increase would be modest and would present a host of mechanical and cultural difficulties.

2. **Improve Stand Conditions**

Growth in the submerchantable size classes may be improved in some cases by removal of deformed stems and thinning overstocked clumps of sprouts and saplings. In the case of immature fir stands, the tree numbers need to be reduced down to every third tree, selecting of the largest and most healthy first. Also pruning of the lower limbs would be beneficial. Such stand improvement work is dependent upon adequate funding for what are economically marginal operations.

3. **Increase Conifer Stocking**

Areas within the existing conifer forest which are understocked should be planted with conifer seedlings. The decision to plant should be based on soil suitability, likely use of the area during succeeding operations, and ability to keep the area relatively free from shrub and hardwood competition. Areas capable of growing conifers which now support brush and hardwoods should be converted to conifer stocking as feasible. Soil suitability, exposure and ability to keep the area free from competition are the limiting factors for extending conifer coverage.
4. **Maintain an Aesthetically Pleasing Forest Environment**

Although some unsightliness is inevitable immediately after harvesting, signs of disturbance are covered by the flush of greenery such as ferns and berries which usually follows within the first several years after cutting. In marking, for harvest, trees should be chosen which will leave a well distributed stand of good appearance. To further enhance forest appearance, trees whose visual prominence or unique scenic qualities give them special value can be designated "specimen" trees and permanently reserved from harvesting.

5. **Maintain an Effective Transportation System**

Design should seek to serve the maximum area consonant with the goal of minimizing road length and overall soil disturbance for any new road construction. Erosion control facilities should be installed and maintained effective throughout each winter by periodic inspection.

6. **Protect Watershed Values**

No operations should be undertaken which threaten the vital watershed function of forest land. All timber management activities must respect the importance of the forest for water supplies and wildlife habitat and the threat to all values posed by fire. Maintenance of continuous forest cover through selective harvesting, use of effective erosion control methods for roads and harvest areas, and an ongoing program of inspection and maintenance are the keys to achieving high water quality standards. Periodic harvesting benefits most forms of wildlife by creating diverse cover and encouraging growth of desirable
browse plants. Management reduces fire hazard by providing an effective road system for fire suppression and by keeping fuels close to ground level with proper slash treatment.

TIMBERLAND MANAGEMENT

**Selection Silviculture**

The logic behind selection silviculture is fairly straightforward. A forest can be harvested periodically if it continuously produces harvestable-sized trees. But a forest cannot continuously produce harvestable-sized trees unless it always has pole-sized trees ready to grow into harvestable-sized trees, and saplings ready to grow into poles, and seedlings and sprouts to grow...In other words, a selection forest must have roughly equal numbers of trees of all sizes if the cycle is to keep growing.

A major difficulty with growing trees of all sizes in the same stand is that the larger trees tend to shade out the smaller ones. To say that a selection forest "needs" harvesting is simply another way of saying that the health of the small trees is being threatened by the increasing shade of the larger ones. Selective harvesting intervenes to accomplish the two things necessary for perpetuating the cycle: increasing the growth of the remaining trees and creating a new generation of sprouts to replace the trees removed.

In the unmanaged forest, trees grow to increasingly larger size only at the expense of the smaller ones. Larger trees require more space, and to make more room, the smaller less competitive trees must die. Mortality is the normal way a forest
reduces the number of trees to provide room for the few to grow larger and larger. Harvesting interrupts this natural process of decreasing stand density through mortality by artificially creating growing space. It would seem to follow that the remaining trees could then grow much larger in size, but this is only true if the stand is to be left undisturbed for a very long time, say 50 to 60 years. It is not true if the initial harvest is intended to commence the cycling pattern of forest growth which is the goal of selection silviculture. If the trees left after harvesting are allowed to grow long enough to achieve a major increase in size, the canopy of tall trees will close over the new sprouts, slow their growth and perhaps even kill them. The forest will then be left with a scraggly understory of stunted, deformed or dead sprouts and saplings which are not likely to grow into healthy trees, even if the next harvest finally produces sufficient light for renewed growth.

If the cycling pattern of forest growth which will permit regular harvesting at fairly short intervals (10 to 20 years) is to begin immediately, then in general, the largest trees left after harvesting cannot be permitted to increase their size indefinitely. The size/spacing relationship present prior to the initial cut pretty well establishes the maximum size at which the dominant trees can be maintained in the cycling forest. It is practically impossible to increase the average size of the dominant trees significantly beyond that present at the time of the initial harvest without disrupting the balanced cycle of growth necessary to achieve the goal of selective harvesting at
fairly regular intervals.

It is important to realize that, as in the relationship between the timing of the initial harvest and maximum tree size, management choices are dictated by the biological necessities of the selection forest. Coupled with this is the non-biological state forest practice rules for the Santa Cruz Mountains which dictate cutting constraints that limit harvesting to 60% of the trees over 18" and 50% of the trees 12" 18", once every 10 years or more. The objective of management is to promote balanced forest growth whereby equal numbers of trees may be harvested from the same area at regular intervals, i.e., growth equals harvest. Therefore, it is the influence on stand growth exerted by various elements of the selection forest, for example, the shading effect of larger trees on smaller ones, and the need to maintain an even distribution of tree sizes, which determines how much and how often to cut.

The purpose of this plan, then, is to provide the owner with guidelines for the biological manipulations needed for redwood selection silviculture. The following Timber Harvesting Prescription gives, with greater precision and applicability than cruise data, the kind of information necessary for sound redwood management.

**Cutting Prescription for Selection Silviculture in Second-Growth Redwood**

**INITIAL CUT** - Entry Cut. 80-110 year old stands

**Goals:**

1) Release leave trees for accelerated growth.
2) Remove enough overstory canopy to promote stump sprouting and to insure vigorous sprout growth for a minimum of ten years.

3) Upgrade stand.

Marking methods to achieve goals

1) **Individual tree marking** transfers the goals of the forest manager to the ground level operations of the fallers. This is most practically done proceeding clump to clump.

2) **Equal spacing of residual trees** with healthy crowns where practical will cause an immediate increases of diameter growth.

3) **Removal of larger most dominant trees** will tend to remove the greatest percent of the crown cover. This, coupled with the equal spacing concept will open the canopy enough so that the stumps from the harvested trees with sprout and those sprouts will grow fairly vigorously until the next harvest.

4) **Upgrading the stand begins with the removal of the most defective trees** within that stand. In marking the defective tree in a clump should be the first to be removed if the material salvaged by its removal will cover the cost of removal. Marking within the clump should then proceed to maximize proper spacing. Oftentimes, some of the largest defective trees will also have widely spreading crowns to compensate, so removal not only upgrades but it can really open up the
stand for sprout growth.

5) **Remove hazard trees.** All hazard trees in proposed development areas should be removed. Elsewhere, fir trees exhibiting unsettled root foundations or that are overtopping redwood stands, should be removed.

**SECOND CUT**

Goals:

1) Continued release of residuals.
2) Removal of trees damaged in initial harvest.
3) Movement to achieve diversity among the diameter classes of harvestable trees. 12"+
4) Continued sprout growth.

Marking methods to achieve goals:

**Timing:** One of the most crucial factors governing the second cut is the ongoing performance of sprout growth from the initial entry cut. Their vigor will determine the timing of the second cut after the 10-year minimum interval has passed. If the sprouts are still continuing to push new leader growth rapidly upward, this would indicate that enough light is coming through the overstory canopy to support growth. If the sprouts appear flattened and leader growth subdued, further overstory needs to be removed.

Once the decision to cut has been made, the following prescription should be followed:

1) Individual tree marking.
2) Special attention spent on thinning overly-thick clumps or portions of clumps.
3) Outward visible defects, particularly those caused by previous harvesting should be used as indicators for removal in merchantable timber.

4) Equal spacing of residual trees will tend to benefit sprout growth.

5) If in a clump-by-clump inspection there appears an overabundance of one diameter class or another, an effort should be made to remove a higher percent in that class in order to evenly distribute all harvestable diameter classes.

CONTINUING CUTS

Goals:

1) Movement of understory sprouts and saplings to harvestable-sized trees.

2) Optimum spacing of crop trees.

3) Reduction in largest crop tree diameter to about 32 inches.

4) Constantly endeavoring to maintain diversity among diameter classes of the harvestable trees.

Marking methods to achieve goals.

1) continuing cuts should be timed to maximize added growth on harvestable residuals without adding undue overstory closure above sprouts.

2) Individual tree marking.

3) #5 second cut.

4) an effort should be made to remove any tree over 32 inches in diameter to allow for the use of smaller,
more lightweight logging equipment. This will result in less soil compaction, smaller skid roads, less soil disturbance and less damage to crop trees in all diameter classes.

Cutting Prescription for Selection Silviculture in Pure Stands of Douglas-fir

Initial Cut - Entry cut 80-110 year old stands.

Goals:
1) Remove old decadent firs from the stand.
2) Create openings large enough to allow for replanting of young disease-free bare root stock.
3) Reduce diameter size and decrease crown cover.

Marking methods to achieve goals.
1) Individual tree selection (same as for redwoods)
2) Group selection - with the fir, group marking (or miniclearcuts of up to ½ acre may be desirable to create planting areas especially in areas where most of the mature trees show signs of decay or decline. In order to comply with forest practice rules, group cutting must slow for "group leavings" of equal numbers of adjacent trees in an area.

SECOND & CONTINUING CUTS
1) Follow same guidelines as entry cuts for pure Douglas-fir stands.

Management Operations

Past harvesting has established an extensive road and skid trail system. As they were designed to serve the property
adequately for all future harvest, they should be considered permanent improvements. Erosion control facilities should receive regular maintenance to assure that they continue to function properly. As the construction work for the most part is now complete, soil disturbance should be minimal on future operations except to provide spur access into the unlogged portion of the property.

Subsequent harvest should be scheduled by following the guidelines in the Timber Harvesting Prescription. Careful monitoring of the vigor of the sprouts initiated by the first cut is the key to setting the timing of the second cut. The Prescription is designed to schedule harvests in response to forest development rather than according to some arbitrary time interval. As continuing cuts establish the desired selection forest structure, however, it is expected that harvesting will be appropriate at fairly regular intervals, probably somewhere between 15 and 25 years.

Timber Stand Improvement

PRE-COMMERCIAL THINNING

Stand conditions can be improved by two types of operations among the smaller trees. The objective of the first is removal of malformed or diseased trees not yet of commercial size. Their removal increases the space available for the growth of healthy trees, and in the case of redwood, often stimulates the initiation of sprouts to take their place. Defective trees of merchantable size should be removed as part of normal harvest operations.
Growth in the smaller size classes can be improved by pre-commercial thinning of too dense stands. Thinning in redwood will generally be done in sprout clumps where competition is often intense. Unthinned thickets of Douglas fir exhibit poor diameter growth and often become diseased. For both species, thinning follows the same principles used in normal selective harvests. Specifying which assure vigorous growth of the leave trees is the primary consideration. Wherever possible, the leave trees should be the dominant or co-dominant members of the group.

Commercial harvesting and pre-commercial thinning can be accomplished simultaneously, usually at a reduction in cost. Scheduling operations in conjunction with a commercial harvest might permit tractor crushing of the debris, salvage of incidental merchantable material and would confined disturbance to the forest, and use of the road system, to a single season. Pre-commercial thinning is biologically beneficial, but the long period between treatment and eventual harvest of the treated trees makes it economically marginal. As a result, application for government cost-sharing funds is recommended to help finance the work.

INCREASING CONIFER STOCKING

The forest, typical of redwood clump culture, consists of irregularly spaced, densely stocked clusters of second-growth redwood. Intervening spaces and portions of the understory often support an oak, occasionally mixed with madrone and brush. Were it not for the relatively open space between the clumps, the redwoods would be overcrowded. The availability of peripheral
light around each cluster permits much denser growth, at favorable rates, than would be possible in an unbroken stand of like density. Consequently, even though the entire area may not be occupied by redwoods, the average number of redwood trees per acre approximates that of a normal forest in most places. In some areas, however, only hardwoods and brush occupy growing space potentially available for conifers.

As the forest is fully stocked, although not exclusively with conifers, planting is not generally needed to improve site utilization. In some areas, though, it may be preferable to increase conifer stocking through the removal of brush and existing hardwoods. Such a change in species mix is generally regarded as highly desirable. This view is inspired primarily by the fact that West Coast hardwoods have in the past been little more than "weeds" in commercial terms. At present, the argument can be made that hardwood stands might best be retained for management in their own right because hardwood values could increase dramatically due to expanded use for fuel, chips and lumber. Even if hardwood management becomes economic, it is extremely unlikely that West Coast hardwoods will ever approach redwood and Douglas fir in value.

Operations which attempt to replace hardwoods with conifers vary primarily in the size of the area they attempt to treat and in the means by which the hardwood influence is reduced. The simplest method is to plant conifers immediately following harvesting in those areas opened up as a result of the felling and skidding of adjacent merchantable trees. Additional small
openings can be created by removing the remaining hardwoods from a predominantly conifer forest in conjunction with or immediately following harvest operations. Inter-planting between conifer groups, usually redwood clumps, should only be done in areas large enough that growth of the planted trees will not cut off the peripheral light needed by trees in rather small, dense groups to conform to the clump nature of existing stocking and make them easier to avoid during subsequent harvests.

Not surprisingly, increasing conifer stocking in an essentially pure hardwood stand is the most difficult and costly of all. And experience in the redwood region indicates that such operations carry no guarantee of success. Treatment of slash, tenacity of hardwood growth due to sprouting, invasion by brush species, over-exposure or under-exposure of the conifer seedlings, and selection of inappropriate areas have all crated problems for such efforts in the past. Recognizing these possible pit-falls, the owner may wish to consider a phased program of careful conifer planting operations, treating only a small area each year.

Generally, to be successful, a nurse crop of overstory trees, which provide partial shade to protect the young seedlings and reduce invasion by competing brush species, must be maintained until the trees are well established. With this guideline, the following program is recommended:

1. Plant areas of good soil. Preferably, they will have some sign that conifers can grow there, such as old stumps or existing seedlings. Mechanical clearing should be
confined to the less steep areas.

2. Reduce the existing hardwood canopy at least 50 percent by removing the smaller and defective trees. Leave dominant trees with full crowns so that crown area will not expand excessively due to release. Preserve the best trees in the event that hardwoods become commercially valuable.

3. Kill hardwood stumps by applying a herbicide to the freshly cut stump (usually within 15 minutes) with a brush or daub.

4. Plant conifers underneath the residual hardwoods on a 9x9 foot spacing. Plant Douglas fir on drier sites, tend toward redwood on moister sites.

5. Keep the planting area as free as possible from shrub and hardwood competition during the establishment phase, three to seven years. Removal by hand, or foliar herbicide application by hand may be necessary.

Assuming that establishment of conifer seedlings is successful, the hardwood overstory will have to be removed. The best time to remove the overstory will vary according to the conditions in the particular stand. Ideally, the residual hardwoods would be removed in conjunction with the first selective harvest of the planted conifers, perhaps 45 to 50 years later. In most cases, however, it is likely that the residual hardwoods will have to be removed sooner because of their interference with conifer growth. In general, the larger the conifers are at the time of hardwood removal, the better.

Availability of funds for additional planting and availability of
a suitable hardwood market may also influence timing of removal operations.

Watershed Protection

A primary function of all watershed lands is to provide storage and filtering capacity for runoff. Timberlands are particularly important maintaining well-timed and high quality water yields. Other uses of the land must be limited to those that do not impair these vital functions.

Selective harvesting reduces the impact of logging on the watershed by minimizing disturbance of the forest canopy. In addition, State and county harvesting regulations have proven effective in protecting soil and water quality. Forester and operation concern and commitment are the best means of assuring resource integrity.

Roads, which many studies have shown to be the principal sources of sediment from logging operations, must be carefully designed to avoid unstable areas and cause minimum ground disturbance. Erosion control facilities must be carefully constructed and then maintained effective throughout the winter rains to adequately control erosion.

Other concerns may develop away from road areas, particularly regarding treatment of slash and debris. Logging debris should be spread and crushed by tractors whenever possible to ensure that soil cannot be dislodged by rainfall and concentrations of water. Slash treatment of this kind yields a variety of benefits. Mulching with debris greatly reduces soil movement and loss due erosion. In addition, once debris is placed
close to the ground, it decomposes and recycles nutrients back into forest growth. This decomposition of potentially dangerous fuels significantly reduces the fire hazard in the stand. The structure of fuels in a selectively cut stand is such that a fire is unlikely to move from the ground into the tree crowns. Even should flames begin to spread upward, the thinned canopy would not carry a fire as easily as unthinned stands.

Complete slash treatment offers important visual benefits as well. While a certain amount of site disturbance and "brownness" are inevitable following harvesting, the lower the debris is placed to the ground, the sooner it will disappear from sight, covered with the new greenness of low-growing forest flora like ferns and berries. This covering then acts to hold moisture in the debris, further increasing the rate of decomposition.

The periodic opening of the timber canopy accomplished by selection management has a positive overall effect on wildlife habitat. The short-term disruption (one or two months every 15 to 20 years) is more than compensated for by the increased growth of desirable browse stimulated by the greater amount of sunlight reaching the forest floor. Deer and a number of smaller animals are more likely to be found in recently harvested redwood stands than in uncut forests which have less variety of cover and less food.

**Controlling Erosion**

To prevent unnecessary damage and expense, a permanent road system must receive regular maintenance, particularly during the rainy season. On both surfaced and dirt roads, all drainage and
erosion control facilities must be checked periodically to assure proper function. Inside ditches must be sufficiently free of dirt and debris that water will not be diverted into unwanted areas. Culvert inlets must be cleaned and outfalls inspected to be sure that water will flow in the desired pattern without causing erosion.

On dirt roads, waterbars should be installed by hand or machine at intervals no greater than 100 feet on grades up to ten percent, and at intervals no greater than 75 feet on grades of ten percent, and at intervals no greater than 75 feet on grades of ten to twenty percent. In cases where strict adherence to these intervals would result in water discharge over erodible fill, or in other undesirable locations, practical considerations should guide waterbar spacing, remembering that the object is to prevent excessive accumulation of water and to dissipate its erosive energy. The accompanying State Forest not on water breaks provides a helpful guide.

Wherever possible, exposed soil should be kept a minimum by mulching bare areas with straw or logging debris, accompanied as necessary by seeding with grass and legumes. Seeding and mulching are particularly good methods for protecting roadfill slopes. In combination with good waterbars, logging debris crushed on skid trails is probably the most effective means of controlling erosion on steeper slopes.

**PROMOTE THE HEALTH OF OTHER VEGETATIONAL COMMUNITIES**

Plant communities in the Santa Cruz Mountains historically incurred periodic fires. Without these, the number of
individuals in these communities has increased to unnaturally high levels. Fires killed individual plants. Fires thwarted invading plants from occupying sites and fires curtailed the build-up of heavy understory fuels.

All plant communities found within the Scout Camp suffer from the lack of naturally occurring fires. In non-timbered types where commercial thinning is unrealistic, the re-introduction of prescribed ground fires should be investigated. In overcrowded hardwood stands, thinning of the trees should occur and the Scouts should consider the use of the thinned wood for fuel to be used within the camp.

In the case of the commercial timber lands, the use of fire would be inadvisable as it would harm the young trees. The heavy build-up of brush and debris in the understory should be cleared for better access and many most easily be done using a bull-dozer on the better ground. In certain areas along Red Mountain Ridge the use of fire would be beneficial to clean up an understory of unhealthy small firs and brush. This would lead to a more open park-like appearance in an area suitable for a remote camp setting.

**PROVIDE PERIODIC INCOME FOR THE FOUNDATION THROUGH HARVESTS.**

Timber harvests provide periodic incomes for the foundation as well as accomplishing all the other biological and managerial benefits already described.

The camp can be best be divided into four logical, harvest units. (See Harvest Unit Map, Appendix) They can be added together, but should not be reduced in size for economic reasons.
The following is a description of each unit. Keep in mind that the volume figures are estimates based on ocular estimates and timber area typing off of aerial photos.

**HARVEST UNITS**

**NOTE:** Volume and growth estimates have been made by ocular estimates, extrapolation from recent harvesting activities and local information. The values presented have not been developed from a timber cruise and should be used only as a rough guide.

**OIL CREEK UNIT - 108 Acres + CAT Logging**

The Oil Creek unit was last selectively harvested in 1989. (See Harvest Plan, Appendix) In that harvest, the unit yielded the following volumes:

<table>
<thead>
<tr>
<th>REDWOOD (volumes in board feet)</th>
<th>DOUGLAS-FIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross 1,074,990 948,290 12%</td>
<td>Gross 376,850 330,140 13%</td>
</tr>
</tbody>
</table>

**RESIDUAL HARVESTABLE VOLUME (Estimated)**

- **Redwood**
  - Gross 715,650 630,660
  - Douglas-Fir Gross 375,850 327,860

Reentry: Current forest practice rules allow for reentry into stands every ten years. The average annual growth rate is probably around 3% so an estimated harvestable volume in ten years will be about 60% of the total harvestable volume plus its growth.

<table>
<thead>
<tr>
<th>Total harvestable volume + growth</th>
<th>819,858</th>
</tr>
</thead>
<tbody>
<tr>
<td>60% yield</td>
<td>491,914</td>
</tr>
</tbody>
</table>

(This rate of cutting probably can be sustained with cuts every ten years or so in this unit)
UPPER CAMP UNIT - 100 Acres (CAT Logging)

This area was last harvested selectively about 24 years ago and should be reentered within the next 5 years. The average volumes/acre are slightly less than what was derived off the Oil Creek Unit because the average merchantable tree height is shorter. Also, Douglas-Fir makes up a slightly higher percentage of the current estimated harvestable volume.

CURRENT HARVESTABLE VOLUMES

<table>
<thead>
<tr>
<th>REDWOOD (volumes in board feet)</th>
<th>DOUGLAS-FIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross</td>
<td>Net</td>
</tr>
<tr>
<td>700,000</td>
<td>616,000</td>
</tr>
</tbody>
</table>

RED MOUNTAIN UNIT (54 Acres CAT, 104 Cable Logging)

This unit is almost entirely Douglas-Fir. Harvesting of this area should be timed to coincide with building booms as Douglas-Fir is primarily used for framing lumber. In addition, a portion of the unit is so steep that cable logging will be necessary as conventional ground skidding machinery (CATS) would cause excessive ground disturbance.

The fir is old second growth. Much of it is limb ridden and of poor quality. The defect will be much greater than the average harvests though this can be reduced if the Scouts seek to either make firewood out of the poorer quality logs or have them chipped for pulp or fuel. Currently, the nearest market for chips is so distant that this alternative isn't economically practical, however, this may change with time.
CURRENT HARVESTABLE VOLUMES:

<table>
<thead>
<tr>
<th>REDWOOD (volumes in board feet)</th>
<th>DOUGLAS-FIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross</td>
<td>Net</td>
</tr>
<tr>
<td>474,000</td>
<td>417,120</td>
</tr>
</tbody>
</table>

VEGETATION TYPES

CONIFEROUS FOREST - Dominated by Douglas-Fir - 168 Acres

Major Components:
- Conifer Species - Douglas fir 60-100%
- Hardwood Species - Tanoak, Madrone

Minor Components:
- Conifer Species - Coast Redwood
- Hardwood Species - Canyon live oak, interior live oak, big leaf maple, California laurel, California buckeye, nutmeg.
- Fern Species - sword fern, chain fern, bracken fern.
- Forbe Species - poison oak, blackberry, oceanothus, baccarris, toyon, lupin.

Successional Dynamics:

An element of guesswork is necessary in the understanding of why in some areas of the camp, Douglas-Fir dominates the Coniferous forest. Clearly, the evergreen forest is moving slowly towards becoming a fir dominated stand. (See Evergreen Succession) The curious development of a near-pure stand of douglas-Fir on the North facing slope East of the bridge on Oil Creek is much more difficult to explain. One would suppose that Redwood would be the dominant conifer species as is found West of the bridge. However, only a few redwoods are scattered on this slope. Probably two factors are involved:

1) When the original clear-cutting was done, the burning that followed was of such low intensity on that hill that the Douglas-Fir was not "burned out" and replaced
by hardwoods and more recent fires have not burned in that area.

2) There may be soil factors involved as well. Either the soil is one which doesn't support good redwood stands or it's a thin soil layer which isn't fertile enough to allow for good redwood growth.

If left unburnt or unlogged, this forest will remain primarily Douglas-Fir. There are signs of decay in the stand and it can be expected to increase over time if those trees are not removed.

**CONIFEROUS FOREST** - Dominated by Coast Redwood - 226 Acres

**Major Components:**
- Conifer Species - Coast Redwood
- Hardwood Species - Tanoak

**Minor Components:**
- Conifer Species - Douglas-Fir
- Hardwood Species - Canyon live oak, interior live oak, madrone, big leaf maple, California laurel, California buckeye, nutmeg.
- Fern Species - sword fern, chain fern, (wood-wardias)
- Forbe Species - Oxalis, ginger

**Successional Dynamics:**

Save for a few isolated pristine (first growth) trees, the major component of this type is comprised of second-generation redwood trees, the result of the initial timber clear-cutting some 90 years ago. The sprouting capabilities of both the redwood and most of the hardwood species allowed for "clones" to re-inhabit the site. Without management of some type and with the continued exclusion of fire, the redwoods would slowly be replaced, perhaps by Douglas-Fir or other hardwood species capable of early growth under more shady conditions. Continued
redwood growth in natural situations depends upon periodic "opening up" on the stand. In pre-white-man days, this was accomplished by fire or flooding, as redwood require bare mineral soil for seed gemination.

GRASSLAND-BRUSHFIELD TYPE - 24 Acres

Major Components:  Grasses - California annual species
        Brush Species - Coyote brush, lupin, poison oak.

Minor Components:  Brush Species - Ceanothus, toyon
        Hardwood Species - Canyon live oak, interior live oak, madrone
        Conifer Species - Douglas-Fir

Successional Dynamics:

The grassland-brushfield type is merely in an earlier stage of successional changes of the hardwood-fir type. Without clearing, either mechanical or by fire, the grassland will slowly give way to brush, the brush to hardwoods and fir, and then eventually pure fir.

CHAPARRAL - (Dry Site Brushlands) - 27 Acres

Major Components:  Brush species - Chamise, manzanita

Minor Components:  Brush Species - Coyote brush, toyon

Successional Dynamics:

Always found on steep, dry shallow solid sites facing south. These brushfields survive periodic burnings and resprout vigorously to reinvade the site. Over time, they decay without fire and build Kumus which allows for slow invasion by hardwood species and fir along the margins.
EVERGREEN HARDWOOD FOREST - 162 Acres

Major Components:
- Conifer Species - Douglas-Fir
- Hardwood Species - Canyon live oak, interior liver oak, bay (California laurel), buckeye

Minor Components:
- Hardwood Species - Madrone, tanoak
- Fern Species - Sword Fern
- Conifer Species - Redwood (where vegetation type interfaces with redwood stands)
- Brush Species - Poison oak, wild blackberries, thimble berry, lilac
- Grass Species - California annual type

Successional Dynamics:

Unlike the redwood forest type, changes in the fir-hardwood stand are not as historically dependable. In grasping for evidence of successional changes that have taken place, one needs to substitute space (vegetational patterns existing today on the property) for time (successional changes that have taken place prior to our time and knowledge of time about the property). As best, this allows for a best guess at what has gone on before, and what will go on in the future.

The presence of grasses throughout the fir-hardwood type would suggest that in previous time, under more open conditions, grass was a more important occupant of the site. In fact, pre-white-man fires as well as settler fires probably created an oak-grassland type of vegetation. Periodic fires, either natural in original or man-made, kept the oaks, fir and other brush species to a minimum and allowed for more grass growth. As fire was excluded, the hardwood species increased and began to dominate the site. In addition, Douglas fir, capable of seed germination in forest litter and growth under shady conditions began its
occupancy of the site. Today's conditions find a good deal of Douglas-Fir coming in underneath the hardwood overstory. Should current management practices continue, Douglas fir and the oak species would more fully dominate the site. As the young fir trees reach the same height as the oaks, their growth will increase dramatically which could lead eventually to a pure fir stand. Only through periodic burning of this vegetation type will the grasses survive. Without fire or mechanical (bulldozing) clearing, the hardwood-fir type will become an impenetrable thicket of heavy fuels, small firs and unhealthy hardwood trees.
APPENDIX
POSSIBLE LAND IMPROVEMENT PROJECTS

Listed in order of importance

OIL CREEK UNIT

Projects: Timber stand improvement, interplanting following harvest, improve trails to sand cliff area and Paul waterfall area.

BIG RED MOUNTAIN UNIT

Projects: Reopen Big Red Mountain road to the property line, install erosion control and construct effective gate. Clear areas designated for remote camp sites. Remove planted Monterey Pines, tractor crush brush and plant openings following harvest. Timber stand improvement following harvests.

UPPER CAMP UNIT

Projects: Reopen and install erosion control on all roads. Remove planted Monterey Pines, tractor crush and/or clear brush in understocked or young fir stands, interplant with a combination of Douglas fir and Coast redwood. Timber stand improvement and interplanting in fully stocked stands following timber harvests. Develop trails following harvesting. Rock road to Camp headquarters and parking area.

GRASSLAND BRUSHFIELD VEGETATION TYPE

Project: Mechanically clear brush and burn. Replant with native grass species.
WATERBREAKS

WATERBREAKS ARE CONSTRUCTED ON ROADS, SKID TRAILS AND LANDINGS TO HELP MINIMIZE THE VOLUME OF WATER FLOWING OVER THESE EXPOSED AREAS AND REMOVE WATER TO PLACES WHERE IT WILL NOT CAUSE EROSION. THESE GUIDELINES, IF UTILIZED, WILL HELP REDUCE EROSION AND MEET THE REQUIREMENTS OF THE FOREST PRACTICE ACT.

Location:

1. Space waterbreaks (W) to prevent concentrations of water volume and to remove runoff water from disturbed and unstable soil areas. Spacing will depend on the appropriate District Forest Practice Rules utilizing the erosion hazard rating guides and slope of the ground, and the following factors.

2. Where possible place the waterbreak to divert all runoff into a natural water course. Water flowing off the waterbreak should be onto rocks, slash, vegetation, duff or other less erodible material. Don't divert water to other skid trails or bare ground especially loose soil.

3. Place waterbreaks above changes in grade to prevent water from flowing down steeper portions of roads or skid trails.

4. Place waterbreaks above intersections of roads, skid trails, and landings to prevent water from flowing down over these disturbed areas.

5. Place waterbreaks so that diverted water will not flow onto lower parallel skid trails or roads.

6. Avoid water accumulations upon landings by careful placement of waterbreaks above landings. Crossditch, waterbreak, or outslope landings to prevent puddling.

7. Runoff water from waterbreaks should not be directed onto fill material unless a down spout or other energy dissipator is provided and the water is drained away from the fill.

8. Avoid placing waterbreaks in swales, gullies, or low areas where the water has no escape. Place waterbreaks above these areas.
Construction:

1. Waterbreaks are generally constructed with a blade equipped tractor, however, hand constructed waterbreaks may be desirable in some locations.

2. Each waterbreak should be cut into the solid soil below dust or loose soil to a depth of at least six inches.

3. Each waterbreak should have a continuous, firm berm of soil built at least six inches above the normal road grade downhill and, parallel to the waterbreak cut.

4. All waterbreaks need to be open at the lower end so water can easily run off — hand shovel work will often be necessary to insure free flow of water out of the waterbreak. Hand shovel work during and after rainfall may also be necessary to maintain effective waterbreaks.

5. The size of the waterbreak should depend on the amount of precipitation, erodibility of soils, and anticipated vehicular traffic. Increases in these factors require larger waterbreaks.

6. Avoid driving tractors over constructed waterbreaks. This may be achieved by beginning waterbreak construction at the bottom and working up the skid trail or road.

Alignment:

1. Alignment is the angle of the waterbreak to the direction across the skid trail or road.

2. Alignment should not be straight across (perpendicular to) the road but angled downward, never more than a 45° angle, to catch and direct runoff water to the waterbreak outlet.

3. Puddling of water behind a waterbreak is not acceptable, the puddle area may become filled with sediment and the waterbreak may fail as continuing runoff flows downhill.

Note: These guidelines should be used together with the erosion control requirements in the District Forest Practice Rules, Sections 933.5, 933.4 and 933.1 of Title 14, California Administrative Code. On access roads that will have vehicle traffic, rolling dips should be used instead of waterbreaks. Guidelines for this feature will be covered in another State Forest Note.