San Fernando Valley State College

THE DEVELOPMENT OF
THE LUMBERING INDUSTRY
IN SOUTHERN CALIFORNIA

A thesis submitted in partial satisfaction of the
requirements for the degree of Master of Arts in
Geography
by
Gerald Clark Brothen

September, 1967
The thesis of Gerald Clark Brothen is approved:

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                        Committee Chairman

San Fernando Valley State College

September, 1967
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ABSTRACT

THE DEVELOPMENT OF
THE LUMBERING INDUSTRY
IN SOUTHERN CALIFORNIA

by

Gerald Clark Brothen

Master of Arts in Geography

September, 1967

Lumbering has been carried out in the coniferous forests of Southern California since the late 1700's, primarily in the Yellow Pine Forest (5,000 to 8,000 feet) of the San Bernardino Mountains. There have been definite periods of lumbering. The size of the operations has generally increased, and the lumbering methods used have been greatly improved. From the Spanish-Mexican Period through the Brookings Period (1770's - middle 1910's), lumbering operations developed from small hand-cutting operations to large steam-powered mills. In the Small Mill Period (middle 1910's - early 1950's), the size of the operations declined sharply. The mills of this period were steam-powered at first, and later electrically powered. During the Recent Period, a large operation, using modern lumbering methods and facilities, has dominated the lumbering industry of the region.

The Southern California lumbering industry has been especially important during the Spanish-Mexican, Mormon, and Recent Periods. In the Spanish-Mexican and Mormon Periods, it produced most of the lumber
that was used in the region. During the Recent Period, the lumbering industry has been revitalized because of the need to save the forests from possible bark beetle devastation.
CHAPTER I
INTRODUCTION

The lumbering industry of Southern California has been almost totally neglected by economists, geographers, and historians. Possible reasons for this lack of interest include: (1) the small size of the Southern California lumbering industry as compared with that of Northern California and the Pacific Northwest, (2) lack of evidence of early operations, (3) lack of knowledge of the Southern California forests and of their ability to support lumbering, and (4) the erroneous notion that the formation of national forests was accompanied by a cessation, not just a reduction, of lumbering within those forests. Because of the lack of interest in this industry, the accounts of it have generally been brief and infrequent. As a result, there is little appreciation of the fact that lumbering has been important in Southern California for nearly 200 years.

The purpose of this study is to describe the development of the lumbering industry in Southern California, and thus to dispel some misconceptions concerning it and to answer some of the questions raised about it. The misconceptions have generally been about the importance of the lumbering industry in the region. Some of the questions raised about this industry have been concerned with length of existence, location, purpose, size, lumbering methods, and species of trees logged. The first part of this paper presents a description
of the location, physiography, climate, hydrology, and vegetation of
the forested lands and adjoining areas in the mountains. Subsequent
chapters describe the major periods in the development of the lumber-
ing industry in Southern California. These periods, the Spanish-
Mexican, the Mormon, the Post-Mormon, the Brookings, the Small Mill,
and the Recent, are based on the size of the operations, and in some
instances on specific groups of people that have dominated the indus-
try during certain years. For each of these periods the important
operations are described by: (1) location, (2) purpose, (3) size of
operation and methods used, and (4) species of trees cut.

Before discussing lumbering in Southern California, certain
basic terms should be defined. For the purpose of this study, South-
ern California includes Los Angeles, Orange, Riverside, San Bernar-
dino, San Diego, Santa Barbara, and Ventura Counties. All of these
counties have forested lands containing similar species of trees, and
many of these forested lands are of commercial quality*. Imperial
County is excluded because it has no forested land. Outside of this
region, the nearest lumbering is carried out in the southern Sierra
Nevada Mountains in Kern and Tulare Counties.

A distinction must also be made between the terms "national
forest" and "forested area or forested land". The national forests
in Southern California are large areas of primarily mountainous land

*Forested land of commercial quality is land that is producing
or physically capable of producing crops of industrial wood, and is
not withdrawn from timber utilization by statute or administrative
regulation (Oswald, 1966: 13).
that have been set aside by the federal government to provide water, recreation, game, and other resources for the adjacent urban areas. Not all of these federal lands are tree covered. The forested areas or lands, on the other hand, are essentially tree-covered areas which are limited to the higher elevations and which may or may not fall within the boundaries of the national forests; the trees that make up these forests are primarily coniferous (cone-bearing).

Published information on lumbering in Southern California is limited. Histories of California, such as Volumes 18-24 of The Works of Hubert Howe Bancroft, make no mention of lumbering in this area. Government publications are informative only on recent lumbering. Similarly, newspapers, such as the Los Angeles Times and the San Diego Union, have very little on historical lumbering. They do, however, cover some aspects of the last twenty years of lumbering in Southern California. To compensate for this lack of readily available historical material on the subject, a very careful search was made in the main libraries of the cities of Los Angeles, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura. In these collections, isolated fragments of local histories and descriptive works were found that provide some information on the development of lumbering in those areas. Especially valuable in the preparation of this paper were A Brief Story of Santa Barbara by Edward S. Spaulding, California Government and Forestry by C. Raymond Clar, Century Annals of San Bernardino County by Luther A. Ingersoll, Heritage of the Valley by George W. and Helen P. Beattie, Narrow Gauge Nostalgia by George B. Turner, San Bernardino, a Pass-Site City by H. F. Raup, and The For-
ests and the People by W. W. Robinson. However, some of these sources are secondary or even tertiary.

Valuable information on both historic and recent lumbering has been obtained from the files and officers in the headquarters of the Angeles, Cleveland, Los Padres, and San Bernardino National Forests in Southern California. Personal interviews have also been carried out with sawmill owners in Southern California. The result of this research has been the uncovering of evidence of a lumbering industry that has existed periodically in Southern California from the late 1700's to the present time.
CHAPTER II

GEOGRAPHIC SETTING

The physical setting of the mountainous areas in Southern California is generally thought to be unfavorable for lumbering activity. In order to dispel this notion, this chapter presents a description of the locations, physiography, climate, hydrology, and vegetation of the forested lands and adjoining areas in the mountains of the region.

Location

The forested areas in Southern California are mostly found in the higher elevations of the national forests. These national forests, the Angeles, the Cleveland, the Los Padres*, and the San Bernardino, encompass the major mountainous areas of the region (see Map 1). These areas comprise two mountain systems, the Transverse Ranges and the Peninsular Ranges. The Transverse Ranges, which extend approximately 230 miles in an east-west direction, include: (1) the San Rafael, Santa Ynez, Sierra Madre, and the Topatopa Mountains and also the Pine Mountain-Frazier Mountain Interior Ranges (Los Padres National Forest), (2) the Liebre, Sierra Pelona, and San Gabriel Mountains (Angeles National Forest), and (3) the San Bernardino Mountains (San Bernardino National Forest) (see Map 2). The Peninsular Ranges, which

*Based on the definition of Southern California, when the Los Padres National Forest is discussed, reference is only to that part found in Los Angeles, Santa Barbara, and Ventura Counties.
NATIONAL FORESTS OF SOUTHERN CALIFORNIA

SCALE
0 10 20 30 40 Miles
extend approximately 110 miles in a northwest-southeast direction, include: (1) the Santa Ana and Laguna Mountains (Cleveland National Forest), and (2) the San Jacinto Mountains (San Bernardino National Forest) (see Map 2). The national forest lands are found in all the Southern California counties and account for a relatively large area within each county (see Table 1).

Physiography

Elevation

Both the Transverse and the Peninsular Ranges in Southern California are characterized by great differences in elevation. In general, the Transverse Ranges increase in elevation from the western portion (Santa Ynez Mountains, with crests to 4,800 feet) to the eastern portion (San Bernardino Mountains, with crests to over 11,000 feet), where the highest mountains in Southern California are found. In the Peninsular Ranges there is a general increase in elevation from the southern (Laguna Mountains, with crests to 6,000 feet) and seaward portions (Santa Ana Mountains, with crests to 5,500 feet) to the northeastern portion (San Jacinto Mountains, with crests to over 10,000 feet) (Durrenberger, 1959: 20-27).

Slopes

The slopes of the Transverse and Peninsular Ranges are moderate to steep. They are especially steep in the San Gabriel, San Bernardino, and San Jacinto Mountains, which are the most rugged and highest mountain ranges in Southern California. Even in the lower ranges, such as the Santa Ynez, Santa Ana, and Laguna Mountains, steep slopes are common. However, some of the upland areas in the San Gabriel, San Ber-
TABLE 1

Acreage by County of National Forests in Southern California

<table>
<thead>
<tr>
<th>National Forest</th>
<th>Angeles</th>
<th>Cleveland</th>
<th>Los Padres</th>
<th>San Bernardino</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles</td>
<td>679,625</td>
<td>0</td>
<td>11,302</td>
<td>0</td>
<td>690,927</td>
</tr>
<tr>
<td>Orange</td>
<td>0</td>
<td>63,875</td>
<td>0</td>
<td>0</td>
<td>63,873</td>
</tr>
<tr>
<td>Riverside</td>
<td>0</td>
<td>90,474</td>
<td>0</td>
<td>267,013</td>
<td>357,487</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>9,706</td>
<td>0</td>
<td>0</td>
<td>545,620</td>
<td>555,326</td>
</tr>
<tr>
<td>San Diego</td>
<td>0</td>
<td>412,606</td>
<td>0</td>
<td>0</td>
<td>412,606</td>
</tr>
<tr>
<td>Santa Barbara</td>
<td>0</td>
<td>0</td>
<td>700,002</td>
<td>0</td>
<td>700,002</td>
</tr>
<tr>
<td>Ventura</td>
<td>1,587</td>
<td>0</td>
<td>608,269</td>
<td>0</td>
<td>609,856</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>690,918</strong></td>
<td><strong>566,953</strong></td>
<td><strong>1,319,573</strong></td>
<td><strong>812,633</strong></td>
<td><strong>13,390,077</strong></td>
</tr>
</tbody>
</table>

nardino, and San Jacinto Mountains have gentle to moderate slopes (Fenneman, 1931: 495-500, and Griffin and Young, 1957: 37-39, and 49-53).

**Geology**

The Transverse Ranges may be divided into two sections. In the section west of the San Gabriel Mountains, sedimentary rocks are most common and folding has occurred more than faulting. The eastern section of the Transverse Ranges (the Liebre, Sierra Pelona, San Gabriel, and the San Bernardino Mountains) is composed of igneous and metamorphic rocks; faulting has been dominant (Jahns, 1954: 17).

Unlike the Transverse Ranges, the Peninsular Ranges have a common geology. In general, the Peninsular Ranges are uplifted fault blocks with sedimentary and metamorphic rocks overlying a granite core (Jahns, 1954: 19).

**Soils**

In general, lithosols are dominant in the mountains of Southern California. These shallow and stony soils have developed over much of the region because of the characteristic steep slopes of the mountains (Lantis, 1963: 165). On steep slopes, due to the rapid runoff and rapid erosion, a thin, coarse soil is generally formed. In the mountains where gentle to moderate slopes do occur, the less rapid runoff and erosion leads to the formation of a deeper and less coarse soil (Strahler, 1966: 201).

There is a difference between the soil types found in the lower portions of the mountains and those found at the higher elevations. In the lower portions of the Transverse and Peninsular Ranges, where
tion on the windward side of the mountain ranges. The windward side of the mountains in Southern California includes the south-facing slopes of the Transverse Ranges and the southwest-facing slopes of the Peninsular Ranges. As the air descends the lee side (Transverse Ranges - north-facing slopes, Peninsular Ranges - northeast-facing slopes) of the mountains, a rainshadow is formed. As a result of this, the north- and northeast-facing slopes of the mountains receive much less precipitation than the south- and southwest-facing slopes.

Most mountainous areas in Southern California receive from twenty inches of precipitation per year at the lower elevations to forty inches at the higher elevations. Some areas receive from forty to fifty inches per year. They include areas just west of Lake Arrowhead (San Bernardino National Forest - San Bernardino Mountains), near Islip Mountain and San Antonio Mountain (Angeles National Forest - San Gabriel Mountains), and near the community of Palomar Mountain (Cleveland National Forest). The lowest amount of precipitation received is approximately twelve inches per year. This occurs at lower elevations on the lee sides of the Sierra Madre Mountains, the Pine Mountain-Frazier Mountain Interior Ranges, and the Liebre, Sierra Pelona, San Gabriel, Santa Ana, San Bernardino, San Jacinto, and Laguna Mountains (Corps of Engineers, 1945: Isohyetal Map).

Hydrology

Because of the climate of Southern California, the amount of stream flow from the Transverse and Peninsular Ranges varies greatly from winter to summer. During the winter, most streams in the region have water in their channels and runoff is rapid due to the steep
slopes of the mountains. The streams which drain the higher mountain areas, where the greatest amount of precipitation occurs, have the greatest volume and duration of flow. Examples of these streams include the San Gabriel and Santa Ana Rivers which drain the higher areas of the San Gabriel and Sen Bernardino Mountains, respectively.

During the summer, most streams in the region have dry channels. The streams which drain the higher mountain areas, where patches of snow sometimes remain through spring into early summer, are the last to become dry (Troxell, 1957).

Vegetation*

In the mountains of Southern California, the vegetation varies from desert types in the lower elevations on the drier lee side of the mountains to conifers in the higher mountain areas. The majority of the vegetation consists of Chaparral. The vegetation is sparse and discontinuous on the steep slopes due to the rapid runoff and rapid erosion. On the gentle to moderate slopes the vegetation is denser due to the decrease in the speed of the runoff and the erosion. Chaparral and areas of Oak Woodland are found in the lower elevations, generally below 4,000 or 5,000 feet. The coniferous forest lands are found above 5,000 feet, mostly within the national forest boundaries. They comprise 525,568 acres (see Table 2), which is approximately fif-

*Information for this section was obtained from: A California Flora by Philip A. Munz, A Manual of the Flowering Plants of California by Willis L. Jepson, Forest Trees of the Pacific Coast by Willard A. Elliot, Forest Trees of the Pacific Slopes by George B. Sudworth, Manual of Southern California Botany by Philip A. Munz, Native Trees of Southern California by P. Victoria Peterson, and Western Forest Trees by James B. Berry.
TABLE 2
Forest Acreage within National Forests of Southern California

<table>
<thead>
<tr>
<th>National Forest</th>
<th>Forested Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angeles</td>
<td>75,000</td>
</tr>
<tr>
<td>Cleveland</td>
<td>28,068</td>
</tr>
<tr>
<td>Los Padres</td>
<td>52,500</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>370,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>525,568</strong></td>
</tr>
</tbody>
</table>

teen percent of the total national forest acreage in Southern California (see Table 1). This figure includes forested areas of both commercial and noncommercial quality.

The vegetation of the Transverse and Peninsular Ranges is grouped into five plant communities. They include the Chaparral, Yellow Pine Forest, Red Fir Forest, Subalpine Forest, and Pinyon-Juniper Woodland Plant Communities (Munz, 1959: 15-18). On the windward side of the mountains are found Chaparral, Yellow Pine Forest, Red Fir Forest, and Subalpine Forest.

The Chaparral consists of a dense, broad-leaved sclerophyll type of vegetation. It is found on dry slopes and ridges below 4,000 or 5,000 feet. In some areas, scattered groups of Coulter pine (Pinus coulteri, Lambert) and bigcone spruce (Pseudotsuga macrocarpa, Mayr) are interspersed with the Chaparral down to the 2,000 or 3,000 feet elevation. Chaparral is still the dominant type of vegetation at these altitudes. In the same elevation range as the Chaparral, areas of Oak Woodland are found along streams.

Above the Chaparral lies the Yellow Pine Forest. It has a range of 5,000 to 8,000 feet and contains most of the forested lands in Southern California. This forest requires at least twenty-five inches of precipitation per year. Usually the lowest amount of precipitation that can support a coniferous forest is twenty inches per year (Highsmith, 1962: 119). North- and northeast-facing slopes that are shaded most of the year and thus have minimum evaporation may be able to support a coniferous forest on fifteen inches of precipitation per year. South- and southwest-facing slopes that receive a large a-
mount of insolation throughout the year and therefore have maximum evaporation may not be able to support a forest even with twenty-five inches of precipitation per year. The types of conifers found in the Yellow Pine Forest include bigcone spruce (*P. macrocarpa*, Mayr), Coulter pine (*P. coulteri*, Lambert), incense cedar (*Libocedrus decurrens*, Torrey), Jeffrey pine (*Pinus jeffreyi*, "Oreg. Com."), sugar pine (*Pinus lambertiana*, Doug.), white fir (*Abies concolor*, Parry), and yellow pine (*Pinus ponderosa*, Lawson). Except for Coulter pine (*P. coulteri*, Lambert) and bigcone spruce (*P. macrocarpa*, Mayr) which only grow to 6,000 feet, all of these conifer types span the entire vertical range. They generally occur in mixture, but sometimes they grow in small pure stands. They occur on all types of soil. Bigcone spruce (*P. macrocarpa*, Mayr), Jeffrey pine (*P. jeffreyi*, "Oreg. Com."), and white fir (*A. concolor*, Parry) are common on dry slopes and in canyons. Coulter pine (*P. coulteri*, Lambert) and yellow pine (*P. ponderosa*, Lawson) grow on both dry and moist slopes and ridges. Sugar pine (*P. lambertiana*, Doug.) grows in moist places in ravines and on flats. Incense cedar (*L. decurrens*, Torrey) grows in moist areas in canyons and on mountain slopes. Most of the lumbering operations that have existed in Southern California have carried out their lumbering in the Yellow Pine Forest. There has been no need for them to go above 8,000 feet to obtain their timber (Neff, 1966: Interview).

Above the Yellow Pine Forest lies the Red Fir Forest*. It has a

*Although the red fir does not grow in Southern California, Munz uses the name to designate the forest between the Yellow Pine and Subalpine Forests.*
range of 8,000 to 9,500 feet, and requires at least thirty-five inches of precipitation per year. The types of conifers found in this forest include Jeffrey pine (P. jeffreyi, "Oreg. Com."), limber pine (Pinus flexilis, James), lodgepole pine (Pinus contorta, Loudon), sugar pine (P. lambertiana, Dougl.), and white fir (A. concolor, Parry). Except for Jeffrey pine (P. jeffreyi, "Oreg. Com."), and sugar pine (P. lambertiana, Dougl.) which only grow to 9,000 feet, all of these conifer types span the entire vertical range. They generally occur in mixture, but sometimes they grow in small pure stands. They occur on all types of soil. Limber pine (P. flexilis, James), like Jeffrey pine (P. jeffreyi, "Oreg. Com."), and white fir (A. concolor, Parry), is common on dry ridges and slopes. As in the Yellow Pine Forest, the sugar pine (P. lambertiana, Dougl.) grows in moist areas in ravines and on flats. The lodgepole pine (P. contorta, Loudon) grows on the borders of mountain meadows and at higher altitudes on slopes and ridges.

The Subalpine Forest is the highest forest association in the mountains of Southern California. Lying above 9,500 feet, it tends to be a much more open stand of trees than either the Yellow Pine or Red Fir Forests. It requires at least thirty inches of precipitation per year. The types of conifers found in this forest include limber pine (P. flexilis, James), lodgepole pine (P. contorta, Loudon), and white fir (A. concolor, Parry). They grow to the treeline, which is usually between 10,000 and 11,000 feet. The soil requirements, growth characteristics (pure or mixed stands), and location (slopes, ridges, etc.) of these conifer types are similar to those described under the
Red Fir Forest.

On the lee side of the Transverse and Peninsular Ranges, due to the lower amounts of precipitation received, the Yellow Pine, Red Fir, and Subalpine Forests are generally located at higher elevations and their vertical ranges are compressed. Otherwise, these three Forests are the same as those described for the windward side of the Transverse and Peninsular Ranges. The most significant difference noted in the vegetation on the lee side of the mountains is the absence of Chaparral. In its place, just above the desert vegetation, is the Pinyon-Juniper Woodland. This vegetation association has a range of 3,500 to 7,500 feet, and requires from twelve to twenty inches of precipitation per year. The types of conifers found in this Woodland include California juniper (*Juniperus Californica*, Carriere) and pinyon pine (*Pinus monophylla*, Torrey). The pinyon pine (*P. monophylla*, Torrey) spans the entire vertical range, while the California juniper (*J. Californica*, Carriere) only grows to 5,000 feet. They generally occur in mixture, but frequently in pure, open stands (espec. pinyon pine). Both species are commonly found on coarse, gravelly soils, on the dry slopes of mountains bordering the desert.

Of the eleven species of conifers that have previously been mentioned, eight have stands extensive enough to warrant estimation of their total volumes. Combining the national forests in Southern California, the most important conifers in the forested areas, listed by species and from the greatest to the least total volume (1,000,000 board feet scale), are: (1) Jeffrey pine (*P. jeffreyi*, "Oreg. Com."), (2) yellow pine (*P. ponderosa*, Lawson), (3) white fir (*A. concolor*,
Parry), (4) sugar pine (P. lambertiana, Dougl.), (5) bigcone spruce
(P. macrocarpa, Mayr), (6) incense cedar (L. decurrens, Torrey), (7) Coulter pine (P. coulteri, Lambert), and (8) lodgepole pine (P. con-
torta, Loudon) (see Table 3). Since this ordering of conifer species
is by volume in board feet, it may approximate a listing of those con-
ifer species based on which have felt the greatest lumbering pressure.

Looking further at Table 3, certain things may be inferred a-
about the lumbering potential of the Southern California forests.
First, the total volume in board feet of the forests in Southern Cali-
ifornia has probably always been a little over four billion board feet.
Until the formation of national forests, most of this forest was a-
vailable for lumbering. Second, it is logical to assume that the for-
ested lands of the San Bernardino National Forest, because of their
volume of almost 2.5 billion board feet, have always had the greatest
lumbering potential of the Southern California forests. Rating the
lumbering potential of the forested lands of the other national for-
est in the same way, the Angeles National Forest is second, the Los
Padres National Forest is third, and the Cleveland National Forest is
fourth.

Summary

The forested lands in Southern California are found above 5,000
feet, mostly within the national forest boundaries. Because of the
physiography and climate of the mountainous areas, the vegetation is
denser on gentle to moderate slopes than on steep slopes, and has a
greater vertical distribution and representation on the windward sides
of the mountains than on the lee sides.
TABLE 3

Volume in Million Board Feet by Species and National Forest

<table>
<thead>
<tr>
<th>National Forest</th>
<th>Type</th>
<th>Jeffrey</th>
<th>Yellow</th>
<th>White</th>
<th>Sugar</th>
<th>Bigcone</th>
<th>Incense</th>
<th>Coulter</th>
<th>Lodgepole</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angeles</td>
<td>Pine</td>
<td>325.9</td>
<td>68.0</td>
<td>124.6</td>
<td>111.1</td>
<td>68.6</td>
<td>Unest.</td>
<td>5.5</td>
<td>Unest.</td>
<td>703.7</td>
</tr>
<tr>
<td>Cleveland</td>
<td>Pine</td>
<td>182.6</td>
<td>Unest.</td>
<td>1.5</td>
<td>0</td>
<td>18.4</td>
<td>1.6</td>
<td>30.0</td>
<td>0</td>
<td>234.1</td>
</tr>
<tr>
<td>Los Padres</td>
<td>Pine</td>
<td>281.7</td>
<td>154.2</td>
<td>88.6</td>
<td>31.0</td>
<td>86.9</td>
<td>Unest.</td>
<td>Unest.</td>
<td>0</td>
<td>642.4</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>Pine</td>
<td>1,043.3</td>
<td>390.1</td>
<td>377.1</td>
<td>296.3</td>
<td>93.3</td>
<td>148.5</td>
<td>109.7</td>
<td>40.9</td>
<td>2,499.2</td>
</tr>
<tr>
<td>Totals</td>
<td>Pine</td>
<td>1,833.5</td>
<td>612.3</td>
<td>591.8</td>
<td>438.4</td>
<td>267.2</td>
<td>150.1</td>
<td>145.2</td>
<td>40.9</td>
<td>14,079.4</td>
</tr>
</tbody>
</table>

The vegetation of the mountainous areas in Southern California is grouped into five plant communities. They include the Chaparral, Yellow Pine Forest, Red Fir Forest, Subalpine Forest, and Pinyon-Juniper Woodland Plant Communities. The Yellow Pine, Red Fir, and Subalpine Forests are found on both the windward and lee sides of the mountains. The Yellow Pine Forest is particularly important because most of the lumbering has been carried out there. Chaparral is only found on the windward side and the Pinyon-Juniper Woodland is only found on the lee side. Excluding the Chaparral, the forested lands in Southern California total over 525,000 acres and contain eleven species of conifers. The total volume in board feet of eight of these species is over four billion board feet. Before the formation of national forests, most of this forest was available for lumbering. Since the forested lands in the San Bernardino National Forest have almost 2.5 billion board feet of timber, they have always had the greatest lumbering potential of the Southern California forests.
CHAPTER III

THE SPANISH-MEXICAN PERIOD, 1770's - 1840's

The Spaniards initiated the first lumbering operations in Southern California. During the late 1700's, they went into the mountains of the region in search of timber needed for construction at the missions and pueblos. The physical environment they encountered in the mountains was basically the same as described in Chapter II. Therefore, the first conifers they logged were probably Coulter pine (P. coulteri, Lambert) and bigcone spruce (P. macrocarpa, Mayr), which are interspersed with Chaparral in some areas down to the 2,000 or 3,000 feet elevation. Since timber was hand cut and transported by either Indians or oxen during the Spanish-Mexican Period, it was probably not until the early 1800's that lumbering was carried out in the lower portions of the Yellow Pine Forest. Map 3 shows the general locations of the lumbering operations of this period.

The first lumbering in Southern California was begun to provide building material for Mission San Diego. From the early 1770's to the 1830's, lumber needed for construction at the mission and for buildings in the San Diego area was obtained from such sources as Cuyamaca Peak, Volcan Mountain, and Corte De Madera (Clar, 1959: 14). Most of this timber was dragged from these mountain areas to San Diego by oxen. There is a documented story that Indians were used in the early 1800's to haul timber from South Cuyamaca Peak to the present site of
SPANISH-MEXICAN PERIOD
LUMBERING AREAS

MAP 3
El Capitan Dam (Clar, 1958: Correspondence). The hauling of timber by Indians was under the direction of Franciscan padres, and usually required two days for each packtrip. At the end of the trail, Indian packers were met by ox teams which dragged the timber the rest of the way to San Diego (Clar, 1958: Correspondence). Charles Kelly of El Cajon, California, who knew one of the Indians involved in this operation, gave the following description of how the Indians carried the timber:

Ten to twenty Indians were assigned to one timber. They worked in opposite pairs bearing a cross-pole under the beam. One end of a cross-pole was inserted into a harness loop in front of each bearer. The loop was part of a rawhide shoulder harness around the Indian's neck. (Clar, 1958: Correspondence).

The second documented lumbering operation in Southern California was concerned with the obtaining of building material for Mission San Gabriel. This occurred in the 1770's. The necessary timber was probably obtained from Ice House Canyon and Little Santa Anita Canyon in the San Gabriel Mountains (Robinson, 1946: 10). Unfortunately little else is known about this operation.

Mission Santa Barbara was the third mission in Southern California to search for a supply of lumber in nearby mountains. Established in 1786, the mission first used lumber fashioned from the straight sycamore and alder trees that grew along the course of a nearby stream. By 1796 this wood had become extremely weak due to rotting and wood-borers (Spaulding, 1964: 27). Therefore, in the late 1790's and early 1800's, additional lumber was needed for reconstruction and also for new construction of buildings at the mission. A good source of timber was found on the north slope of the San Rafael
Range. This location was thirty or forty miles north of the mission (Spaulding, 1964: 27). Edward S. Spaulding, in *A Brief History of Santa Barbara*, described how the timber was transported to the mission:

Tradition also has it that these pines were cut and were carried, a timber at a time, over the very rough, intervening mountains and canyons to the Mission on the shoulders of the Indian converts. At least some of them were dragged by oxen over San Marcos Pass, possibly from Little Pine Mountain. (Spaulding, 1964: 27).

It becomes increasingly evident that as the different missions initiated their lumbering operations, the use of native Indians, as lumberers and beasts of burden, was critical to the success of the operations. Without the Indians, there would probably have been a shortage of construction material at the early missions in Southern California.

Another mission that was constructed with timber taken from the local mountains was Mission San Fernando. The timber was secured in the late 1790's from one of the Tujunga canyons in the San Gabriel Mountains (Robinson, 1946: 10). Unfortunately little else is known about this operation.

In the late 1810's, the forested area of the San Gabriel Mountains was the site of another lumbering operation. This time lumber was needed for construction of the Plaza Church in Los Angeles. To obtain this timber, a crew of mission Indians under the direction of Joseph Chapman was sent up into Millard Canyon in 1818, above the present city of Altadena (Robinson, 1946: 9). A camp was established in this canyon on the west slope of Mount Lowe, and for several months Chapman and his crew felled trees in the area. As the trees were cut,
they were rolled down the slopes and then were hewed into manageable lengths. From here, the logs were hauled to the Plaza Church by ox team (Clar, 1959: 16).

The lumbering associated with the construction of the Plaza Church in Los Angeles was the last notable operation to occur during the Spanish portion of this period. The Mexican era, in Southern California lumbering, began in 1825 when Mexico gained its independence from Spain. From this date until the late 1840's, California was controlled by the government in Mexico City.

Only one notable lumbering operation in this Mexican era is mentioned in the literature. In 1839, Governor Alvarado of California granted Juan Bandini an exclusive twenty year cutting right of timber in the Cajon Pass area. In 1841, Bandini and his crew began cutting trees on the mountain summit at the head of Devil's Canyon. This was the first substantial lumbering operation in yellow pine (P. ponderosa, Lawson) in California (Clar, 1959: 32). C. Raymond Clar, in California Government and Forestry, gave the following description of the transportation of the logs down the mountain:

Logs were snaked down the old Mojave Trail by oxen and slid into Cable Canyon where they were loaded on carretas for further transportation. On the downhill drag the log was placed in a fork made from the crotch of heavy limbs, apparently to prevent the log from rolling. (Clar, 1959: 32).

The carretas mentioned in the previous quotation were long narrow carts. This is the first account mentioned in the literature of the use of a wheeled vehicle to haul timber. Obviously, this was a significant improvement over the previous methods of hauling timber. This operation, which supplied wood to the local ranchoes and settle-
ments, continued until 1843 (Scotties, 1959: 46).

Summary

During the Spanish-Mexican Period, lumbering was carried out in the mountains of Southern California to provide construction material. Since the trees were hand cut and then transported out of the mountains by either Indians or oxen, only the smaller trees could be handled. Therefore, the volume of timber cut annually was probably small and the physical effect on the forests was slight. This period ended with the establishment in the early 1850's, of the larger and more modern Mormon lumbering operations in the San Bernardino Mountains.
CHAPTER IV

THE MORMON PERIOD, EARLY 1850's - EARLY 1860's

The Mormon Period represented a change to more modern lumbering operations. This change was initiated by the establishment of Mormon sawmills in the San Bernardino Mountains, the only area mentioned in the literature where lumbering was carried out during this period. Map 4 shows the general locations of these mills. The Mormon mills, mostly water-powered, were able to handle larger trees and to produce a much larger amount of lumber annually than any of the lumbering operations of the Spanish-Mexican Period. During the Mormon Period, lumber was hauled from the mills down to San Bernardino on large wagons pulled by mules.

When the Mormons settled in the San Bernardino Valley and founded Fort San Bernardino in the early 1850's, they obtained the lumber they needed for construction from the willow, sycamore, alder, and cottonwood trees growing in the Valley and from the Vignes-Sexton water-powered sawmill located near the mouth of Mill Creek Canyon. This mill, built in 1852, was the first one in Southern California. It represented a significant advancement over the lumbering methods used during the Spanish-Mexican Period. Mill Creek was an excellent location for this mill because it furnished a continuous supply of water; it therefore offered advantages for a water-powered mill superior to those in any part of the timber belt in the San Bernardino Moun-
In early May, 1853, work was begun on another water-powered sawmill (the first Mormon mill) on Mill Creek by Lyman, Rich, and Thorpe (Beatties, 1939: 195). This mill was located upstream from the Vignes-Sexton Mill, where the timber was of better quality. It was in operation until 1862, when it was destroyed by the great flood of that year (Beatties, 1939: 195).

During the early years of this period, as the demand for lumber increased and the timber began to disappear from the lower forested areas, the Mormons found it necessary to build a road up what is now Waterman Canyon in order to tap the rich timber resources at higher elevations. Construction on this road, called the Mormon Road, was begun in 1852 and completed in 1853 (Leadabrand, 1964: 19). This sixteen mile road was the first built into the western end of the San Bernardino Mountains. When it was completed, it gave access to Seeley and Huston Flats, which were then two of the finest forested areas in the San Bernardino Mountains (Beatties, 1939: 197).

The completion of the Mormon Road led to the establishment of six sawmills on the mountain range, two run by steam and four by water. The most important were the Seeley, the Crisman, and the Salamander Mills. These three mills were located in the Seeley and Huston Flats area.

The Seeley Mill, built in the summer of 1853, was probably the first one of any importance to operate in the mountains above San Bernardino. It was located at the lower end of Seeley Flat and was run by water power. This mill cut mostly sugar pine (P. lambertiana,
Doug. and incense cedar (L. decurrens, Torrey) from Seeley Flat.

The first lumber from this mill reached San Bernardino in April, 1854 (Beatties, 1939: 209). The Seeley Mill was at a disadvantage as compared with the water-powered mills on Mill Creek, because it could operate only four or five months out of the year. In the higher parts of the San Bernardino Mountains, such as the area where the Seeley Mill was located, the streams freeze over during the winter months and generally dry up during the summer months. The maximum cutting capacity of the mill, with its limited facilities and the scarcity of water, was not more than 2,400 or 2,500 board feet of lumber per day (Beatties, 1939: 210). Nevertheless, this mill operated every season until 1862, when it, like the Lyman, Rich, and Thorpe Mill, was washed away by the great storm of that year.

A second sawmill in this area, the Crisman Mill, was built in the western part of Huston Flat (now Lake Gregory) in 1855. This was the first steam-powered sawmill in the San Bernardino Mountains. As the Beatties reported in Heritage of the Valley, "The mill was a great improvement over the Seeley Mill, since steam power made it independent of running water and it could saw during a much greater portion of the year. Apparently it was able to saw more lumber per day also." (Beatties, 1939: 220-221). This mill was located in Huston Flat until 1865 and later changed location three times (Beatties, 1939: 230).

The third important sawmill located in this area was the Salamander Mill. It was a steam-powered sawmill built on Huston Creek in 1854 (Beatties, 1939: 222). This mill actively cut lumber from 1854 to 1860, even though it was destroyed by fire twice during this period.
To get the lumber from these mills down to San Bernardino, the Mormons hauled it in large wagons down the Mormon Road. Concerning the transporting of this lumber, R. D. Craig, in Lumbering in the San Bernardino Forest Reserve, 1903-04, pointed out: "The grade was so steep that large trees or a number of smaller ones were tied on behind the wagons, tops first, to act as brakes. In spite of the danger and difficulty, large loads were taken down the mountain side in this way." (Craig, 1904: 1).

Summary

The Mormons greatly advanced the lumbering industry in Southern California by establishing sawmills in the mountains above San Bernardino, and by introducing the use of mule drawn wagons for hauling lumber. These mills, which were mostly water-powered, increased the production of lumber in the region. During the 1850's and early 1860's, the mills supplied lumber not only for the construction needs of the Mormons, but also for non-Mormon settlers of Los Angeles and other communities of Southern California (Beatties, 1959: 179). It is not generally known how much lumber this amounted to each year, but H. F. Raup, in San Bernardino, a Pass-Site City, reported that in 1859 the total annual production of the mills in the San Bernardino Mountains was 450,000 board feet (Raup, 1940: 23). Even though this increase in lumber production over the previous period was significant, it is very small when compared to the output of modern lumbering operations. With this relatively small total output and the limited capacities of these mills, the forests were probably not greatly affected by these
operations.

During the great storm of 1862, only a few steam-powered mills that existed in the mountains above San Bernardino survived the floods. Most of the water-powered mills were destroyed. They were later replaced by non-Mormon owned steam-powered mills. Thus ended the Mormon Period.
CHAPTER V

THE POST-MORMON PERIOD, MIDDLE 1860's - 1880's

The replacement of most of the water-powered sawmills in the San Bernardino Mountains by larger, non-Mormon owned, steam-powered sawmills marked the beginning of the Post-Mormon Period in Southern California lumbering. These steam-powered mills had much larger capacities than the smaller water-powered mills, and could cut timber most of the year. Thus, the annual production of lumber was greatly increased over the previous period. While the steam-powered mill was most common during the Post-Mormon Period, water-powered mills and even hand-cutting operations still existed. From the middle 1860's through the 1880's, lumbering was carried out in the forested areas of the San Bernardino Mountains, the San Gabriel Mountains, the San Jacinto Mountains, and the Laguna Mountains (near Julian in San Diego County). Map 5 shows the general locations of these operations.

The first lumbering of this period was begun in 1864 in the San Gabriel Mountains above Sierra Madre. Its size and the lumbering methods used were very similar to the operations of the Spanish-Mexican Period. Benjamin Wilson was in charge of this operation. In 1864 he had a ranch in the Sierra Madre area of the San Gabriel Valley, and at this time lumber was needed for fence posts, pickets, shingles, wine barrels, and other uses on his ranch (Leadbond, 1963: 25). While searching for a source of lumber, Wilson found that the
POST-MORMON PERIOD LUMBERING AREAS

MAP 5
peak just to the north of his ranch had stands of sugar pine (P. lambertiana, Doug. 1.) and incense cedar (L. decurrens, Torrey). In order to reach this timber, he ordered his Mexican and Indian help to build a trail to this peak, down which the timber could be hauled (Robinson, 1946: 32). The trail was started in the Sierra Madre area, taken up Little Santa Anita Canyon, and finally to the pine and cedar stands of the peak. With the trail completed, Wilson's crew began felling trees. After the trees had been felled and the lumber cut into a manageable size, it was transported down the trail to the ranch by pack train (Robinson, 1946: 33). This trail still exists today as the Mount Wilson Trail, and the peak from which the lumber was taken was named Mount Wilson.

In the last half of the 1860's, all of the major lumbering operations in Southern California were located in the San Bernardino Mountains. One of the major operations of this period was the steam-powered James Mill, the first mill with a circular saw in San Bernardino County (Ingersoll, 1904: 159). The San Bernardino Guardian in 1868 gave the following description of the James Mill:

This mill has a muley and a circular saw. It averages, in the working season, about 9,000 feet daily, but can cut easily 12,000. A log of forty inches diameter, scaling 1,000 feet, is soon separated into boards by its rapidly revolving saw. Here quite a number of men are engaged in cutting and hauling logs and working about the mill. (San Bernardino Guardian, August 22, 1868).

Another lumbering operation of the late 1860's was the water-powered Huston Mill. It was located in Huston Flat (now Lake Gregory) and cut in that area for a number of years (Craig, 1904: 2). This mill was equipped with two circular saws and had a capacity of 10,000
board feet per day (*San Bernardino Guardian*, August 22, 1868).

Other sawmills of this half of the 1860's included the Talmadge, Hook, and La Praix Mills. These sawmills were located in the Little Bear Creek Drainage. The Talmadge Mill was water-powered and operated in 1865. Hook's Mill was water-powered and operated in 1869. The La Praix Mill was steam-powered and began operations in 1869 (Craig, 1904: 3). Other than these facts, little else is known about these operations.

In the 1870's lumbering was carried out in the San Bernardino, San Jacinto, and Laguna Mountains. The majority of this activity was in the San Bernardino Mountains. There were four major sawmills operating in the San Bernarindinos during these years, and they produced a substantial amount of lumber. For example, in 1873 they produced 3,000,000 board feet of lumber and 500,000 shingles (Ingersoll, 1904: 159). One of these mills was the previously mentioned La Praix Mill, which continued operations until 1878 (Craig, 1904: 3).

The discovery of gold near Julian in 1870 caused a demand for lumber for the mines and buildings in the area. Sawmills were built to supply this need, and the timber for these mills was obtained from the forested areas in the Laguna and Volcan Mountains. At one time, one large mine had 400 men cutting wood in the area for heating and for cooking stoves (*Los Angeles Times*, April 9, 1953: 7). Unfortunately little else is known about these operations.

In 1876 the San Jacinto Mountains were the source of lumber for the Southern Pacific Railroad. In that year the Southern Pacific started construction of the railroad through San Gorgonio Pass. As
the building continued, timber was needed for railroad ties and firewood. To obtain this timber, M. S. Hall, grading contractor for the Southern Pacific, and a crew of men went into the forested area of the San Jacinto Mountains (Leadabrand, 1965: 9). Russ Leadabrand, in *A Guidebook to the Sunset Ranges of Southern California*, gave a general description of this operation:

Ho (Hall) worked into the area of Indian Creek where, above Lake Fulmor today, stands Hall Creek. He moved a sawmill around and, according to Historian Tom Hughes, ended up with the mill in Snow Creek, with the supply of logs supposed to come down a steep skidway. The operation was not a success although some patient searchers can still find traces of the old skidway. (Leadabrand, 1965: 22).

In the 1880's the majority of the lumbering activity in Southern California was again centered in the San Bernardino Mountains. During the first part of this period there were five major sawmills (mostly steam-powered) in this area (Devil's Canyon). In 1882 the total production of these mills was 4,500,000 board feet of lumber. By 1883 their total production had increased to 6,000,000 board feet (Elliott, 1883: 94).

While the extent of the lumbering in the San Bernardino Mountains during the early 1880's was significant, the last half of this decade was a boom period for lumbering in this area. L. A. Ingersoll, in *Century Annals of San Bernardino County*, described this period:

"During the boom years -- 1886-1889 -- the lumber men (sic) did a thriving business as it was impossible to get lumber out fast enough to supply the demand." (Ingersoll, 1904: 159). In 1887, a typical boom year, there were six or seven sawmills operating in the San Bernardino Mountains. Their total production for the year was approxi-
mately 7,000,000 board feet of lumber (San Bernardino City Directory, 1887: 105). Most of this lumber was used in the local area. Some was shipped to Los Angeles where it competed with lumber from Northern California and the Pacific Northwest (Raup, 1940: 25).

Summary

The steam-powered sawmills built during the Post-Mormon Period were a major advancement over the smaller water-powered mills of the Mormon Period. These steam-powered mills, with greater capacities and able to cut during most of the year, greatly increased the amount of lumber produced in Southern California. A comparison of the annual lumber production in the San Bernardino Mountains during both periods shows that while the Mormon mills only produced 450,000 board feet in 1859, the steam-powered Post-Mormon mills produced 3,000,000 board feet in 1873, increasing this to 7,000,000 board feet in 1887.

The Post-Mormon Period in Southern California lumbering ended with the establishment of the Highland Lumber Company (name changed to Brookings Lumber and Box Company in 1898) in the San Bernardino Mountains in the early 1890's. This operation, one of the largest to ever exist in the region, dominated the lumbering industry in Southern California for over twenty years. This was a major change from the Post-Mormon Period, during which many smaller sawmills comprised the lumbering industry in the region.
CHAPTER VI

THE BROOKINGS PERIOD, EARLY 1890's - MIDDLE 1910's

The Brookings Period represented a change from the multi-mill lumbering industry of the Post-Mormon Period to a one-mill dominated lumbering industry. The major lumbering operation during this period was the Brookings Lumber and Box Company, which was located in the forested area above the city of San Bernardino. A major characteristic of the Brookings Period, not evident during the previous period, was a forest conservation movement. Before this period, timber was often cut in the forests without regard to land ownership or to the results of the lumbering. By the 1890's there was substantial interest in forest conservation in Southern California.

Forest Conservation

Before the 1890's, the right to cut trees in the forest was obtained by squatter claims, land purchases, or homesteading; trees were often cut without regard for the ownership of the land. In 1891 President Harrison was empowered, by an Act of Congress, to create Timberland Reserves in order to protect the water and timber resources which were being depleted in many areas of the country (Vernon, 1956: 374).

In the 1890's forest reserves were established in the mountains of Southern California to protect the timber resource. This government action stopped lumbering without permission on government-owned forested land in the reserves, but it did not stop lumbering on pri-
vately-owned forested land. During these years the greatest amount of lumbering in Southern California was being carried out in the San Bernardino Mountains. Thus, it was the people of the San Bernardino Valley that were most concerned about the exploitation of timber stands in Southern California. In 1904 the San Bernardino Board of Trade sent a Memorial and a Report to Congress, which asked for control of all lumbering on private and public lands in the San Bernardino Forest Reserve. The Board of Trade pointed out that, "Over this entire valley the natural rainfall is so slight that successful horticulture or agriculture is impossible unless the supply of water from overhanging clouds is supplemented by moisture from the water sheds (sic) of the mighty mountain ranges and from the subterranean depths." (San Bernardino Board of Trade, 1904: Report). Therefore, as the Board further pointed out, "it is of the highest importance that the timber on the mountain tops, slopes and watersheds should be preserved and only removed under rules and regulations made and provided by Government authority." (San Bernardino Board of Trade, 1904: Memorial).

Up to 1905, the forest reserves were under the control of three separate and independent departments of the Federal Government; this situation made the control of lumbering in the forests difficult (San Bernardino Board of Trade, 1904: Report). To remedy this situation, administration of the reserves was transferred to the U. S. Department of Agriculture in 1905 (U.S.D.A., 1964: 3). Two years later, in 1907, the words Forest Reserve were removed from these nationally administered forest areas across the country, and they were renamed National
From the early 1890's to the middle 1910's, the major lumbering operations in Southern California were located in the San Bernardino Mountains (see Map 6) and in the Mount Pinos area of Ventura County (see Map 7). Most of this lumbering activity was in the San Bernardino Mountains. During this twenty year period there were a number of sawmills in the San Bernardino Mountains. The largest and most important of these mills was owned by the Brookings Lumber and Box Company.

**Brookings Lumber and Box Company**

One of the largest lumbering operations that ever existed in the San Bernardino Mountains was begun in 1892 by a group of Michigan lumbermen (Turner, 1965: 27). They organized the Highland Lumber Company, and purchased 5,000 forested acres in the City Creek area (Ingersoll, 1904: 751). In addition to the availability of a market for the usual types of lumber products, the growing citrus industry in Southern California provided a very good market for secondary timber products such as shooks from which crates are made. Seeing this potential, the company erected a steam-powered sawmill at an elevation of 5,600 feet in Pike Canyon near Fredalba and constructed a box factory at the base of the mountains in Molino, just east of Highland. To

*By 1925, the present Angeles, Cleveland, and San Bernardino National Forests had been formed. The present Los Padres National Forest was not completely formed until 1936. The development of these national forests to their present size and location was completed in the years following 1907 by land consolidation, land acquisition, and land trading.*
connect the sawmill and the box factory, a ten mile toll road was
built along the City Creek Drainage (Ingersoll, 1904: 614). From Mo-
line, which was a "flag stop" on the Santa Fe Railway, the lumber
products were easily shipped to local markets in the San Bernardino
Valley.

In 1898 the Highland Lumber Company was purchased by J. E.
Brookings. It was then renamed the Brookings Lumber and Box Company.
During the next year, to meet an increasing demand for lumber, Brook-
ings increased his holdings to 8,000 acres by leasing an additional
3,000 acres of timberland from the Government. The total holdings
were small but they represented the last good timber (about 100 mil-
lion board feet) available in the San Bernardino Mountains (Leiberg,
1900: 451).

When Brookings first acquired the Highland Lumber Company, logs
were hauled to the mill at Fredalba by mule team and "Michigan" log
buggies (Turner, 1965: 27). With the increase in the size of the
holdings and the associated increase in lumber output that would fol-
low, this method of hauling logs was economically unfeasible. There-
fore, plans were made to establish a railroad for bringing the logs to
the mill. For economy, it was decided that used equipment and narrow-
gauge track of thirty-six inches would be used. The equipment that
was purchased included three Lima 2-truck Shay locomotives and twenty
flatcars (see Figs. 1 and 2). All of this equipment along with the
tracks was hauled up the City Creek Toll Road. This was a formidable
task because this road had grades of up to twenty-five per cent (Tur-
ner, 1965: 29).
Fig. 1. -- Shay locomotive and derailed logging flatcars at Brockings' Fredalba operation. (Adolf Gutohrlein Collection, circa 1905).

Fig. 2. -- Sawmill, pond, and loaded flatcars at Fredalba. (Adolf Gutohrlein Collection, circa 1910).
The initial track laying was done by men at the lumber camp and by Santa Fe section hands, who were hired when they were available. The first track laid down was five miles in length and started from the millsite. It was completed in 1900. Subsequent track laying was done without the help of railroad labor, and occasional derailments occurred because of the quality of the work (see Fig. 1) (Turner, 1965: 29). During the entire operation, over ten miles of track were put down (Adams, 1961: Appendix). Map 8 shows the location of the tracks in the area.

The Brookings' operation practiced clear cut logging, and it was not until the early 1920's that young pines started to show above the oaks, brush, and old slash on Brookings' cutover lands (Peterson, 1961: 1). This logging was carried out on the company's 8,000 acres of land which were located in the areas of Fredalba, Smiley Park, Running Springs, Arrowbear Lake, Luring Pines, and Shake Creek. In order to handle this timber, the mill at Fredalba sawed 60,000 board feet a day. The average annual output of the Fredalba mill was 10,000,000 board feet. With an operation this large, during peak years 150 men were seasonally employed at the Fredalba mill, and sixty men worked in the Valley at the box factory and on the lumber hauling crews (Ingersoll, 1904: 614).

George Turner, in Narrow Gauge Nostalgia, gave a general description of the whole operation, from the loading of logs onto the flatcars, to their conversion from rough-sawed lumber to finished grades of lumber at the box factory:

After being loaded by steam donkeys (sic) in the woods, the logs
were hauled to the mill at a rakish four miles per hour. The mill pond was created by damming one end of the Pike Canyon and had a capacity for holding a month's production. A rough-sawn lumber storage area was located to the rear of the sawmill and at a slight elevation. From here the lumber was hauled by four and six mule teams to the box factory. (see Figs. 1, 2, 3, and 4). (Turner, 1965: 29).

Turner further said that, "Approximately 60% of the box factory output was in "shook" for citrus crating, being shipped "knocked down" for assembly by the packing houses. The remainder of the lumber was planed as construction material and sold in Brookings' retail lumber yards." (Turner, 1965: 29). These retail yards were located at Highland, Redlands, and San Bernardino (Ingersoll, 1904: 615).

From 1909 to 1912, although Brookings' lumber business was very good and as many as 100 men were employed, the available timber on the company's 8,000 acres was decreasing. As the timber supply started to diminish, Brookings sold some of the railroad equipment that was not needed. By 1912 most of the timber on Brookings' lands had been cut (Turner, 1965: 31).

In 1913, Brookings, aware that the ultimate decline of his Southern California operation was soon to come, acquired large parcels of forested land in Southern Oregon for a potential lumbering operation. George Turner described the final demise of the Fredalba operation:

*Diversion of Company interests to the pending Oregon operations were coupled with the declining availability of timber in their San Bernardino mountain holdings. This resulted in the dismantling of the railroad and closing of the sawmill in 1914. There being no buyer for a sawmill in these surroundings and the moving costs not being warranted, the mill was dynamited for scrap in 1915.* (Turner, 1965: 31).

Thus by 1915, the Brookings Lumber and Box Company, one of the
Fig. 3. — Steam Donkey at work near Arrowbear Lake. (Adolf Gutfhrlein Collection, circa 1905).

Fig. 4. — Mule teams hauling lumber from Redalba down City Creek Toll Road. (Adolf Gutfhrlein Collection, circa 1900).
largest lumbering operations that ever existed in the mountains of Southern California, had become history. Today, one of the few remains of the mill at Fredelba is a large sawdust and scrap pile, about 100 feet high. The other remaining part of the mill is the old rusting smokestack which is lying in deep brush. The only remains of the narrow-gauge railroad is the roadbed. It can still be located in some areas. Also, parts of the roadbed were used to make the Rim of the World Highway.

Columbus Borax and Frazier Borate Mining Companies

During this period, the Mount Pinos area in Ventura County was the only other area in Southern California that had significant lumbering operations. In 1909 two large mining companies, Columbus Borax and Frazier Borate, had sawmills in the Mount Pinos area (Maule, 1966: Interview). One sawmill was situated where the Mount Pinos Campground is now located, and the other was located adjacent to the present McGill Campground. These mills supplied lumber to the mining companies for construction of buildings, mine timbers, bridges, and other material. Of these two companies, the lumbering activities of the Frazier Borate Mining Company are the best documented. From January 22, 1906, to July 31, 1908, it cut 2,800,000 board feet of timber from Mount Pinos (Maule, 1966: Interview). The rights to this timber were obtained through two forest sales by the Santa Barbara Forest Reserve (Maule, 1966: Interview). Unfortunately little else is known about these operations.

Summary

The Brookings Lumber and Box Company dominated the lumbering
industry in Southern California from the early 1890's to the middle 1910's. It was one of the largest lumbering operations that ever existed in the region. Its average annual lumber production was greater than the total production of the Post-Mormon mills during the peak year of 1887. Unique features of this operation included the large size of the timberland holdings and the transportation of logs to the mill by narrow-gauge railroad. During this period, the only other significant lumbering operations were located in the Mount Pinos area of Ventura County.

The forest conservation movement, begun in the early 1890's, was responsible for ending the Brookings Period. As a result of this movement, national forests were formed with restrictions on the logging of government-owned forested land. Therefore, in 1914 when most of the timber on Brookings' lands had been cut, not enough other forested land was available to continue the operation. The mill at Fra-dalba was then closed and the railroad was dismantled.
CHAPTER VI

THE SMALL MILL PERIOD, MIDDLE 1910's - EARLY 1950's

In the forty year period following the Brookings' operation, small sawmills* predominated in the forests of Southern California (Graham, 1966: Interview). Because of the restrictions placed by the government in the early 1900's on the logging of government-owned land, large operations such as Brookings' could no longer exist once they had exhausted their forested lands. There still was enough privately-owned forested land available to keep a number of small mills operating in the forests. Since 77% of the privately-owned forested land in Southern California is in the San Bernardino National Forest (see Table 4), most of the small sawmills were located in that forest.

Very little information is available in the literature on the lumbering operations of this period. Because of this only the San Bernardino Lumber and Box Company and the Pederson Lumber Company can be described. In the late 1910's, the San Bernardino Lumber and Box Company built a box factory in San Bernardino, and two sawmills in the San Bernardino Mountains. One mill was located on Jobs Peak, and the other at what is now the junction of Old Mill Road and the State Highway going to Miller Canyon (see Map 9). Logging was carried out with steam donkey engines like those used in the Brookings' operation (see

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*For the purposes of this paper, a small sawmill is a mill that produces no more than 1,000,000 board feet of lumber per year.
**TABLE 4**

Land Ownership in Acres in National Forests of Southern California

<table>
<thead>
<tr>
<th>National Forest</th>
<th>Public Land (all types)</th>
<th>Private Land (all types)</th>
<th>Commercial Forest Land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angeles</td>
<td>648,806</td>
<td>42,112</td>
<td>44,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3,000</td>
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<tr>
<td>Cleveland</td>
<td>392,524</td>
<td>174,429</td>
<td>8,771</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>Los Padres</td>
<td>1,193,926</td>
<td>125,650</td>
<td>35,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1,000</td>
</tr>
<tr>
<td>San Bernardino</td>
<td>615,351</td>
<td>197,282</td>
<td>114,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>48,000</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>2,850,607</strong></td>
<td><strong>539,473</strong></td>
<td><strong>201,771</strong></td>
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<tr>
<td></td>
<td></td>
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<td><strong>62,000</strong></td>
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The logs were hauled to the mills on solid tired logging trucks. This was the first lumbering operation in Southern California, mentioned in the literature, that used trucks to haul logs and lumber. The use of trucks during this period was a major advancement in the lumbering industry of the region (Nash, 1961: 2-3). Unfortunately little else is known about this operation.

The other important lumbering operation of this period was the Pedersen Lumber Company, owned and operated by V. B. Pedersen*. It was located on a few acres near Fawasaki, which is on the northwest shore of Big Bear Lake (see Map 9). Cutting operations were begun in April, 1924, and continued into the summer of 1966. Even though this operation extended into the period of recent lumbering in Southern California, it is described in this chapter because it was similar to many of the small mills located in the San Bernardino National Forest from the middle 1910's to the early 1950's.

The operation consisted of the sawmill, resaw, and logging and lumber trucks. The mill carriage, that carries the log back and forth through the saws, was high speed and fully automatic. In the early years of operation, the mill was steam-powered. During later years the mill was powered by electricity. Electrical power for sawmills was another major advancement in the lumbering industry of Southern California during this period.

Pedersen operated mostly in the Big Bear Valley area. He was

*Most of the information on the Pedersen Lumber Company was obtained in an interview (January, 1966) with the owner, V. B. Pedersen.
for forester for the Bear Valley Mutual Water Company which controls 3,000 acres. The types of trees generally cut included Coulter pine (P. coulteri, Lambert), Jeffrey pine (P. jeffreyi, "Oreg. Com."), yellow pine (P. ponderosa, Lawson), and sugar pine (P. lambertiana, Dougl.). These trees were usually three feet in diameter or larger.

After the trees had been cut, they were brought to the mill on logging trucks. They were then unloaded, cut into manageable lengths, and debarked. Next the logs were placed, one at a time, on the carriage and run through the large circular saws. Pedersen said that due to the size of these saws, his mill had the capacity to handle any size log found south of the Tehachapi Mountains.

When the logs had been cut into boards, they were dried in stacks around the yard. Pedersen preferred to air dry his lumber rather than dry it in a steam kiln. He thought the open air made a stronger and better quality board. Although it takes much longer to air dry lumber, it is much cheaper.

Through the years the mill produced approximately 500,000 to 600,000 board feet of lumber per year. Generally it took three men to run the mill, but during peak years six men ran it.

There were two reasons why Pedersen's mill was profitable enough to continue operating for over forty years. First, he cut operating costs by selling lumber, both wholesale and retail, directly from his yard to consumers in the Big Bear Lake - Lake Arrowhead areas. Second, he sold special types of processed lumber such as stained paneling, bartops, and a little "greenery" for movies. These products netted Pederson a tremendous profit as compared to the return
from the sale of regular lumber. During the last few years, an increasing amount of the lumber sold from his yard was purchased from outside sources. He could buy certain types of lumber from wholesalers in the San Bernardino Valley cheaper than he could cut and process his own.

Summary

From the middle 1910's to the early 1950's, lumbering operations in Southern California were small because of the lack of enough available forested land to support larger mills. These mills, mostly steam-powered until electricity was introduced in later years, were generally located in the San Bernardino National Forest. The largest amount of privately-owned forested land in Southern California, which was available for lumbering, was located in that forest. The major advancements in the lumbering industry of the region during this period included electrical power for sawmills and use of trucks to transport logs and lumber.

The bark beetle infestation of the coniferous forests in Southern California was responsible for ending the Small Mill Period. Due to this infestation, large areas of government-owned forested land were made available for lumbering. Since no mill in the area had the capacity to handle this amount of timber, larger mills were attracted to the region.
CHAPTER VIII

RECENT LUMBERING IN SOUTHERN CALIFORNIA

Unlike the Small Mill Period, large lumbering operations and logging on government-owned forested land have been characteristic of the Recent Period of lumbering in Southern California. These major changes in the lumbering industry of the region began in the early 1950's. During these years, large areas of government-owned forested land in Southern California were made available for lumbering because of a serious bark beetle infestation of the coniferous forests. This infestation was directly related to a drought that lasted from 1947 to 1964 (see Table 5 and Map 10). Since none of the mills in the region had the capacity to handle this timber, two larger lumbering companies were attracted to the area. These companies included the Big Bear and McKeon Timber Companies. The Big Bear operation has dominated the lumbering industry in Southern California since the early 1950's.

Emergence of a New Type of Lumbering in Southern California

Before the major lumbering operations of this period can be described, certain background information must be presented. This information includes the relationship between the drought period and the bark beetle infestation of the forests, and a description of the bark beetles and their effect on the forests. It also includes a description of the initial methods used to control the bark beetle activity, and a description of a new type of lumbering that was developed to
**TABLE 5**

Annual Precipitation in Inches, 1947-1964,
for Representative Stations in National Forest Areas

<table>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cuyamaca</td>
<td>14.19</td>
<td>31.34</td>
<td>36.62</td>
<td>25.95</td>
<td>44.74</td>
<td>52.64</td>
<td>41.51</td>
<td>21.84</td>
<td>13.35</td>
<td>36.64</td>
<td>29.96</td>
<td>21.94</td>
<td>26.94</td>
<td>14.31</td>
<td>28.86</td>
<td>30.76</td>
<td>34.24</td>
<td>30.13</td>
<td>9.9</td>
<td>35.12</td>
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<td></td>
<td>Ozona</td>
<td>3.84</td>
<td>7.12</td>
<td>5.87</td>
<td>5.84</td>
<td>8.18</td>
<td>21.13</td>
<td>4.08</td>
<td>11.8</td>
<td>11.8</td>
<td>7.96</td>
<td>14.96</td>
<td>21.56</td>
<td>7.23</td>
<td>9.37</td>
<td>6.56</td>
<td>16.57</td>
<td>12.95</td>
<td>11.8</td>
<td>10.24</td>
<td>65</td>
<td>12.28</td>
</tr>
<tr>
<td>SAN BERNARDINO</td>
<td>&quot;Squirrel Inn 2&quot;</td>
<td>14.13</td>
<td>37.95</td>
<td>33.60</td>
<td>21.77</td>
<td>35.09</td>
<td>53.42</td>
<td>61.44</td>
<td>54.13</td>
<td>21.65</td>
<td>27.45</td>
<td>49.32</td>
<td>41.64</td>
<td>54.22</td>
<td>34.63</td>
<td>38.08</td>
<td>34.35</td>
<td>29.97</td>
<td>32.31</td>
<td>53</td>
<td>4.68</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;Big Bear Lake Dam&quot;</td>
<td>21.13</td>
<td>25.57</td>
<td>38.21</td>
<td>21.42</td>
<td>46.09</td>
<td>51.14</td>
<td>13.34</td>
<td>47.30</td>
<td>35.68</td>
<td>22.61</td>
<td>44.94</td>
<td>26.50</td>
<td>51.91</td>
<td>28.51</td>
<td>26.51</td>
<td>32.48</td>
<td>31.64</td>
<td>28.49</td>
<td>31.86</td>
<td>36</td>
<td>36.14</td>
</tr>
</tbody>
</table>

control the infestation.

Drought conditions weaken the trees and make them susceptible to insects (Neff, 1966: Interview). The sturdier trees withstand the attack of the insects by producing pitch which is somewhat toxic to the beetles, and acts as an effective barrier to their penetration. During a prolonged drought most forest trees do not get enough water and therefore cannot produce enough pitch to ward off the insects.

The main species of bark beetles that have attacked the forests in Southern California include: (1) the California five-spined engraver (Ips confusus, Lec.), (2) the California flathead borer (Melanophila californica, Van. D.), (3) the fir engraver (Scolytus ventralis, Lec.), (4) the Jeffrey pine beetle (Dendroctonus jeffreyi, Hopk.), (5) the mountain pine beetle (Dendroctonus monticolae, Hopk.), and (6) the western pine beetle (Dendroctonus brevicomis, Lec.). Each of these bark beetle species attacks certain types of conifers. The California five-spined engraver (I. confusus, Lec.) attacks all species of conifers in the forest, while the fir engraver (S. ventralis, Lec.) affects only white fir (A. concolor, Parry). The California flathead borer (M. californica, Van. D.) and the western pine beetle (D. brevicomis, Lec.) attack Coulter (P. coulteri, Lambort), Jeffrey (P. jeffreyi, "Oreg. Com."), and yellow (P. ponderosa, Lawson) pines. The Joffrey pine beetle (D. jeffreyi, Hopk.) affects only Jeffrey pine (P. jeffreyi, "Oreg. Com."), while the mountain pine beetle (D. monticolae, Hopk.) attacks lodgepole pine (P. contorta, Loudon), sugar pine (P. lambertiana, Doug.), yellow pine (P. ponderosa, Lawson), and other species of pine (Koen, 1952). Although these six species of bark bee-
Bark beetles are able to attack the forests at any elevation, they generally confine their activities to the Yellow Pine Forest which lies below 8,000 feet. One reason for this is that most of the forested lands in Southern California are found below 8,000 feet. Also, the climate above 8,000 feet is generally too rigorous for bark beetle activity (Neff, 1966: Interview).

Bark beetles average about one-fifth of an inch long and are dark-brown to black in color. They kill the trees by attacking the trunk in large numbers (approximately 6,100 beetles are required to kill an average-sized yellow pine) (Whiteside, 1951: 5), boring through the bark and excavating long tunnels in the cambium region (growing layer) of the tree. The trees eventually die from injury to the conductive tissue of the inner bark. During the dry summer months, beetles can kill an average-sized yellow pine (P. ponderosa, Lawson) in about fourteen days (Whiteside, 1951: 5). In a yellow pine (P. ponderosa, Lawson) that has been attacked, a female western pine beetle (D. brevicomis, Lec.) normally excavates a tunnel about twenty-eight inches long and deposits about sixty-five eggs (Whiteside, 1951: 5). In a typical tree about eleven feet of tunnels are made in each square foot of bark by the various pairs of beetles whose tunnels cross each other. The eggs hatch in about a week. The larvae then bore their own short tunnels in the growth layer of the tree, and feed on the proteins and simple sugars found there. As they grow from larvae to pupae, they progressively tunnel from the cambium into the outer bark. Finally, they emerge as adult beetles and seek a new host tree. In this infected tree enough new beetles are normally produced
to kill five other trees of the same size.

In order to determine if an area in the forest has been attacked by bark beetles, the color of the tree foliage is checked first (Whiteside, 1951: 3). For example, infected yellow pines (*P. ponderosa*, Lawson) show a change of foliage color from green, through the yellows to a red, and finally sorrel or reddish brown. From a plane or high vantage point, a ranger or other official can see this color change and can also estimate the extent of the affected area. After this is done, an on-site inspection is made to determine if the color change is due to bark beetles.

When it has been determined that a certain stand of trees is infected, the immediate problem is how to control it. Although birds (especially woodpeckers who devour vast quantities of immature beetles) can help control minor outbreaks, artificial control is almost always needed. This artificial control is separated into direct and indirect control.

In using direct control, the Forest Service follows the infected tree, peels the bark off to get at the beetles, and then kills the insects by either burning the tree and the bark or by treating both with a chemical (lindane or ethylene dibromide). This type of control is successful with minor outbreaks of bark beetles in small areas, such as campgrounds. When a major outbreak occurs over a relatively large area this system is no longer feasible. Dr. Ralph C. Hall, in a U. S. Department of Agriculture paper entitled *Sanitation Treatment for Insect Control*, pointed out the disadvantages of direct control:

The main failings of Direct Control are: high cost of accomplish-
ment (from twenty-five to eighty dollars per tree), near impossi-
bility of finding all the infested trees before the beetles es-
cape, and the fact that the treatment does little to alter any of
the basic conditions which encouraged the outbreak in the first
place. (Hall, 1965: 4).

During the early 1950's, the Forest Service could no longer e-
conomically contain the infestation in most of the forests in Southern
California by direct control. It therefore decided to turn to indi-
rect control of the beetles (Hall, 1965: 10). This indirect control,
or sanitation-salvage logging as it is more commonly called, was first
tried in Southern California in 1955 (Hall, 1965: 10). In this type
of logging, trees in the national forest which are diseased or disease
prone (high risk) are marked by a forest officer. The national forest
then determines the number of board feet available, advertises a tim-
ber sale, and takes bids. The logging company with the highest bid
then moves men and equipment into the area, cuts the trees down, pays
the national forest for them, and removes them for further processing
(see Fig. 5). Removal of the diseased or disease prone trees, usually
only ten or fifteen out of a stand of 100 trees, provides a high de-
gree of protection for the rest of the stand. The work of removing
the trees is carefully done to prevent damage to the watershed and
recreation values of the treated areas (see Fig. 6).

When this program of sanitation-salvage logging was started in
Southern California, some major questions were still to be answered.
One question was, would the general public who used the forest accept
the logging of trees, some very large and old, which they had long re-
garded as reserved for recreation? That is, would they understand the
significance of sanitation-salvage logging? At first people did com-
Fig. 5. — Big Bear Timber Company carrying out sanitation-salvage logging in the San Bernardino National Forest. (U. S. Forest Service, July, 1962).

Fig. 6. — Results of sanitation-salvage logging at Barton Flats in the San Bernardino National Forest. (U. S. Forest Service, March, 1960).
plain, especially conservationists. After they saw the program in operation and were informed that the purpose of this type of logging was to save the trees and keep them healthy, they accepted it (Rosecrans, 1957: 20).

The second question that needed to be answered was, what would be the criteria for removing certain trees as opposed to others? Dr. Ralph D. Hall provided the answer to this question:

Salman devised a system called "risk rating" whereby the current health of a ponderosa pine was evaluated by the degree of decay in the tree's crown regardless of the tree's age, dominance or crown size. This is the method still used today. The relative degree of risk to bark beetle attack is judged by the degree of crown decadence and is divided into four classes of risk:

Risk I. Low risk trees. Trees whose crowns are healthy, with no weakened portions.

Risk II. Moderate risk trees. Trees with predominantly thrifty foliage, but which have a small amount of dead and dying twigs in the upper branches of the crown.

Risk III. High risk trees. Trees with a considerable amount of branch dieback, and the needles are shorter and fewer in number.

Risk IV. Very high risk trees. Trees in advanced stages of decadence with short, sparse foliage; these trees often have active top-killing and/or partial insect infestations or disease. (Hall, 1965: 7).

Using this disease risk scale of trees, the Forest Service marks very high and high risk trees for removal. This sanitation treatment has been very successful in maintaining the health of Southern California timber stands. By using this method, beetle-infested forested areas are decontaminated for ten to fifteen years (Howard, 1955: 15). Map 11 shows the areas of the national forests in Southern California
LOS PADRES NATIONAL FOREST

Mojave Desert

ANGELES NATIONAL FOREST

LOS ANGELES

SAN BERNARDINO NATIONAL FOREST

NATIONAL FOREST LAND
TREATED BY SANITATION TREATMENT
SINCE 1953

SOUTHERN CALIFORNIA

SOURCE: Hall, Dr. Ralph C.
Sanitation Treatment for
Insect Control. San Francisco:
where this sanitation treatment has been used from 1953 to 1964, and the accompanying table shows the acres and the board feet of the trees involved in each sale. This map does not show the Cleveland National Forest because no appreciable sanitation-salvage logging has been carried out in that forest. Mr. John Caragozian, Lands Officer of the Cleveland National Forest, said that they do have the bark beetle problem as in the other three national forests. The problem is that not enough diseased or disease prone timber has been available at any one time to make it profitable for a timber company to log in the area. Therefore, direct control is the only method that is used in the Cleveland National Forest to keep the trees healthy.

The third question that needed to be answered before beginning sanitation treatment was, what timber companies could be interested into setting up operations in Southern California to do sanitation-salvage logging? Several small mills were operating in the forests, but none of them were large enough to do the kind of job that the Forest Service thought was necessary. To attract a modern, large timber company, in 1953 the timber management division of the Forest Service's regional office in San Francisco advertised a major timber sale of 7,000,000 board feet of diseased or disease prone timber in the Barton Flats area of the San Bernardino Mountains. The top bidder for this timber was the Big Bear Timber Company. This company, after being awarded the contract, immediately began construction of a large, well equipped lumber mill near Redlands (see Map 12). The availability of this type of timber also encouraged a smaller timber company, which had been located in Barton Flats, to move down the mountain to
the Redlands area in the early 1950's and expand and modernize. This operation, the McKeen Timber Company, was established just a few miles north of the Big Bear Timber Company (see Map 12).

The following descriptions of the Big Bear and McKeen Timber Companies are more comprehensive than those of earlier lumbering operations. This is due to the availability of a greater amount of information concerning these timber companies, and their importance in the Recent Period of lumbering in Southern California.

Big Bear Timber Company*

The Big Bear Timber Company is located just north of Redlands on flood control land (see Map 12 and Fig. 7). This land, totalling forty acres, is leased to Big Bear by the San Bernardino County Flood Control Commission. The operation consists of a sawmill, log pond, debarker, box factory, planing mills, particle board plant, and logging and lumber trucks. It is presently the largest and most modern mill south of the Tehachapi Mountains, and is valued at $2,500,000. It is operated entirely by electricity.

Since its establishment in the early 1950's, Big Bear has produced a substantial amount of lumber every year. In 1954 the mill produced over 15,000,000 board feet of lumber (May, 1960: 7), and production for 1966 was approximately 32,000,000 to 35,000,000 board feet. Along with this increase in lumber production, employment has also risen. In 1954 fewer than 100 men worked there. At present

*The majority of the information on the Big Bear Timber Company was obtained in an interview (March, 1966) with the President, David H. Rogers.
Fig. 7. — Big Bear Timber Company, just north of Redlands. (Author, Dec., 1966).

Fig. 8. — Debarker at Big Bear Timber Company. (Author, Dec., 1966).
there are 210 men employed. One hundred and fifty men are connected with the sawmill (this includes drivers and loggers), and sixty men work in the particle board plant.

Big Bear operates primarily in the Angeles, Los Padres, and San Bernardino National Forests in Southern California, and therefore cuts many species of conifers. The types of trees generally cut include incense cedar (L. decurrens, Torrey), Jeffrey pine (P. jeffreyi, "Oreg. Com."), yellow pine (P. ponderosa, Lawson), sugar pine (P. lambertiana, Dougl.), and white fir (A. concolor, Parry).

Because of the sanitation-salvage type of logging that Big Bear carries out, the pattern that results on the ground is a unique one. The trees are not clear cut or cut in alternating patches as is normal with a logging operation. Big Bear's crew of approximately thirty-five lumberjacks cuts only one or two trees per acre which have been marked for removal by a forest officer. Therefore, the average cut per acre is only about 2,000 board feet. The diameter of the trees cut varies from ten inches to six feet, with twenty-eight inches being the average.

Eighty per cent of the timber that Big Bear cuts is government-owned and is obtained through sales offered by the Forest Service. Most of this timber is sanitation-salvage, but some is fire salvage. The other 20% is privately-owned timber and may or may not be of the sanitation type. When privately-owned timber is cut, the California Division of Forestry requires that a certain number of seed trees be left for natural regeneration of the logged area (Neff, 1966: Interview). The areas where government-owned timber has been cut include
Alamo Mountain (Los Padres N. F.), Barton Flats (San Bernardino N. F.), Big Bear Lake (San Bernardino N. F.), Chilao Flats (Angeles N. F.), Fish Creek Burn (Angeles N. F.), Holcomb Valley (San Bernardino N. F.), Mount Waterman (Angeles N. F.), and Wrightwood (Angeles N. F.). Big Bear has cut privately-owned timber in the Julian area (Cleveland N. F.), on Palomar Mountain (Cleveland N. F.), and in the Upper Santa Ana Drainage (San Bernardino N. F.).

At the actual site to be logged, Big Bear's lumberjacks pair off into two-man crews and "undercut" the marked pines with gasoline-powered chain saws. The fallen trees are then limbed and a scaler, paid by the government, estimates the number of board feet. This determines the price to be paid to the Forest Service. Next, a tractor drags the trees to the logging road where they are loaded onto one of Big Bear's twenty logging trucks by a diesel-powered crane (see Fig. 5). Then the logs are transported to the mill near Redlands. Before the logging crew moves to a new location, the slash is piled and burned. If the cleanup occurs in fire season, the pile is covered with a paper material (asphalt layer between two sheets of heavy paper) which keeps the slash dry until it can be safely burned during the winter.

After the logs have arrived at the mill, they are hoisted onto a conveyor belt. Each log is first cut in half by an automatic saw, and then travels on the belt to the debarker (see Fig. 6). From the debarker the log moves into the sawmill (see Fig. 9), where it is sawed into rough boards by a large band saw. Then, the boards are run through a dip bath to preserve them and to kill any remaining beetles.
Fig. 9. — Sawmill at Big Bear Timber Company. (Author, Dec., 1966).

Fig. 10. — Steam kiln and stacks of lumber being air dried at Big Bear Timber Company. (Author, Dec., 1966).
FIG. 9

FIG. 10
The mill can handle logs up to six feet in diameter.

After the lumber is graded, some of the lower grade is sent to the box factory. The better quality lumber is sent to the planing mills. When the lumber has been processed to serve a certain purpose, it is dried and seasoned either in the open air or in a dry kiln. The best grades of lumber are placed in a dry kiln, which is a steam heated chamber used for the drying and seasoning of cut lumber (see Fig. 10). The other lumber is dried in giant-sized stacks all around the Big Bear yards (see Fig. 10).

The residue left from the processing of the lumber is also used. The bark chips are sold for use in fertilizing operations, and the scrap lumber is run through a series of chippers at the particle board plant. The chips are mixed with sawdust and adhesive agents to make particle board. In the whole operation the only wood debris that is not used is the fine dust created by the big sanders which smooth out the finished product.

When the lumber that is in the dry kiln and the lumber that is stacked around the yard has been seasoned, Big Bear's four lumber trucks transport it to six wholesalers in the Los Angeles area. The lumber is then converted into siding, paneling, doors, sash, moldings, and frames. The lower grade lumber is sold for rafters, joists, sheathing, and boxes.

David Rogers said that Big Bear is able to compete with lumber chipped into Southern California from Northern California and the Pacific Northwest, because it is relatively close to its source of good lumber, and it is also close to Los Angeles. This last point has the
effect of giving Big Bear a freight-cost advantage over Northern California and Pacific Northwest lumbering companies. While the latter have to ship lumber from 600 to 1,200 miles in order to reach Los Angeles, Big Bear only has to haul its lumber seventy or eighty miles.

McKeen Timber Company*

The second largest sawmill to operate in Southern California in recent years was owned by Walt McKeen. In 1947 McKeen built a sawmill in the Barton Flats area of the San Bernardino National Forest. By 1952, he had become tired of shutdowns (winter), hauling gasoline up to Barton Flats, and sending men fifty miles down to the San Bernardino Valley to replace broken or worn parts. In February of that year he moved his mill to a twenty acre site in the San Bernardino Valley near Highland (see Map 12). It was located there from 1952 to 1965.

In August, 1965, fire destroyed six buildings and most of the lumber. In early 1966, McKeen was still doing a little logging in the San Bernardino National Forest with the few men and limited equipment that he had. The logs were sold to the Big Bear Timber Company.

Before the fire, the operation consisted of the sawmill, planer, resaw, dry kiln, and the lumber and logging trucks. The mill was operated entirely by electricity. The entire operation had a value of 300,000 to $350,000.

During the twelve years that the McKeen Timber Company was located near Highland, it produced a substantial amount of lumber. In

*All information on the McKeen Timber Company was obtained in an interview (February, 1965) with the owner, Walt McKeen.
1955, the operation produced 3,000,000 board feet of lumber. Up to August, 1965, lumber production amounted to 3,000,000 to 4,000,000 board feet per year. In order to run an operation of this size, ten to fifteen men were employed at all times. After the fire only two men were employed.

McKeen operated in the Angeles and San Bernardino National Forests. The types of trees that were cut included incense cedar (L. decurrens, Torrey), yellow pine (P. ponderosa, Lawson), and white fir (A. concolor, Parry).

All the logging that the McKeen Timber Company carried out was of the sanitation-salvage type. The pattern that the logging took and the methods used were exactly like Big Bear's. The only difference was that a much smaller number of men was used. The diameter of the trees that were cut varied from twenty inches to seven feet, with three feet being the average.

McKeen cut both government and privately-owned timber. The areas where government-owned timber was cut included Holcomb Valley (San Bernardino N. F.), Idyllwild (San Bernardino N. F.), and the Lake Arrowhead area (San Bernardino N. F.). Privately-owned timber was cut in the areas of Barton Flats (San Bernardino N. F.), Camp Angeles (San Bernardino N. F.), Mill Creek (above Forest Home) (San Bernardino N. F.), and Wrightwood (Angeles N. F.).

Before the mill burned, logs were hauled to the mill by logging trucks. The method of conversion of the logs to lumber was similar to Big Bear's, except that McKeen did not have a box factory or a particle board plant. The mill was equipped with large circular saws.
Some logs, running to six and seven feet in diameter, were too large to be handled by the big saws. Therefore, they were cut in two with powerful, handheld chain saws.

After the lumber was graded and processed for its best use, the high-grade lumber was placed in a dry kiln, and the lower grades were dried in large stacks around the yards. The sawdust, chips, and wastewood left over from the processing of the lumber were sold. The San Bernardino County Smog Control Commission would not allow any of the wood residue to be burned.

The seasoned lumber was sold directly from the mill. Eighty per cent was sold wholesale, mostly to buyers from Los Angeles. The rest was sold retail. The entire output from the mill was sold in Southern California.

As with Big Bear, McKeen was also able to compete in the Los Angeles area with the lumber brought in from Northern California and the Pacific Northwest. The fact that the operation was close to a source of good lumber and close to Los Angeles, had the effect of giving it a freight-cost advantage over Northern California and Pacific Northwest lumbering companies.

Summary

During the Recent Period of lumbering in Southern California, the bark beetle infestation of the local forests has been the basis for a substantial lumbering industry. The major lumbering operations of this period have included the Big Bear and McKeen Timber Companies. Due to the sanitation-salvage type of logging practiced by those companies, for the first time in the history of the lumbering industry in
Southern California, forest conservation has been aided by lumbering. Since the early 1950's, sanitation operations have been so successful that the Forest Service has welcomed the help of lumbering companies, such as Big Bear, in maintaining the health of the forests in the years to come.
Although Southern California is not generally thought of as a lumbering area, the region, with a forested area of more than 525,000 acres, contains eleven major species of conifers with a total volume of over four billion board feet and has supported lumbering operations for almost two hundred years. Most of this timber resource is found in the Yellow Pine Forest (5,000 to 8,000 feet) of the San Bernardino Mountains. There has probably not been a significant change in those conditions during the period covered by this study.

Because of the availability of this timber resource and the demand for it, lumbering has been periodically carried out in the forests of Southern California since the late 1700's. At least some lumbering has been carried out in almost all of the forested areas of the region. Most of this activity has been located in the forests of the San Bernardino Mountains. This has been a continuing industry with definite periods of lumbering. These periods have included the Spanish-Mexican, the Mormon, the Post-Mormon, the Brookings, the Small Mill, and the Recent.

During the Spanish-Mexican Period (1770's - 1840's), lumbering was carried out in the San Rafael, San Gabriel, and San Bernardino Mountains (see Map 3). Other lumbering areas were located in the mountains of San Diego County (see Map 5). In these operations, trees
were hand cut and then transported out of the mountains by either Indians or oxen. Therefore, only the smaller trees could be handled, and the volume of timber cut annually was small. This industry provided lumber needed at the missions, pueblos, and ranchos. During the first part of this period, the types of conifers that were logged probably included Coulter pine (*P. coulteri*, Lambert) and bigcone spruce (*P. macrocarpa*, Mayr). Scattered groups of these conifers grew down to the 2,000 or 3,000 feet elevation in some areas. It was probably not until the early 1800's that lumbering was carried out in the lower portions of the Yellow Pine Forest. Since the Spanish-Mexican Period, the types of conifers most commonly logged have included those found in the Yellow Pine Forest (see pg. 14).

Following the Spanish-Mexican Period, small but important lumbering operations were located in the San Bernardino Mountains (see Map 4). The major advancements of this so-called Mormon Period (early 1850's - early 1860's) involved the use of mule drawn wagons for hauling lumber, and the establishment of water- and steam-powered sawmills. These mills, which were mostly water-powered, increased the amount of lumber produced in the region. In 1859, their total annual lumber production amounted to 450,000 board feet. These mills supplied lumber not only for the construction needs of the Mormons in the San Bernardino Valley, but also for non-Mormon settlers of Los Angeles and other communities of Southern California.

In the Post-Mormon Period (middle 1860's - 1880's), there was a general increase in the size of operations, and a change to non-Mormon ownership. Lumbering was still primarily carried out in the San Ber-
nardino Mountains, but also took place in the San Gabriel, San Jacinto, and Laguna Mountains (see Map 5). A major advancement over the previous period was the increased use of steam to power the mills. The steam-powered mills, with greater capacities and ability to operate during the entire year, greatly increased the amount of lumber produced in Southern California. For example, the total annual lumber production of the mills in the San Bernardino Mountains amounted to 3,000,000 board feet in 1875, and had increased to 7,000,000 board feet by 1887. During the late 1880's, these mills could not produce lumber fast enough to supply the demand in the San Bernardino Valley and surrounding areas.

The Post-Mormon Period was followed by the Brookings Period (early 1890's - middle 1910's). During this period, lumbering activity continued in the San Bernardino Mountains (see Map 6) and was initiated in the Mount Pinos area of Ventura County (see Map 7). Most of this lumbering was carried out in the San Bernardino Mountains by the Brookings Lumber and Box Company. This operation was one of the largest that ever existed in the region. Its average annual lumber production (10,000,000 board feet) was greater than the total production of the Post-Mormon mills during the peak year of 1887. The mill was steam-powered like those of the previous period. Unique features of this operation included the large size of the timberland holdings and the transportation of logs to the mill by narrow-gauge railroad. The lumbering industry of this period supplied lumber to various areas of the region, especially the San Bernardino Valley. Most of this lumber was used for construction, but a significant amount was used by
the citrus industry to make crates.

During the Small Mill Period (middle 1910's - early 1950's), which followed the Brookings Period, most of the lumbering activity continued to be located in the San Bernardino Mountains (see Map 9). Small sawmills predominated because of the lack of enough available forested land to support larger mills. This situation resulted from the formation of national forests in the early 1900's, and the accompanying restrictions placed on the logging of government-owned forested land. During this period, the lumbering industry supplied a limited amount of lumber to consumers in the San Bernardino Mountains and the San Bernardino Valley. The major advancements of this period included electrical power for sawmills, and use of trucks to transport logs and lumber.

During the beginning of the Recent Period of lumbering in Southern California (early 1950's), large areas of government-owned forested land were made available for lumbering because of the bark beetle infestation of the coniferous forests. As a result of this situation, the lumbering industry of Southern California was revitalized. In the early 1950's, two large timber companies set up operations in the San Bernardino Valley (see Map 12). Big Bear, the larger and more important of these two companies, has carried out sanitation-salvage lumbering operations in most of the national forests in Southern California, but primarily in the San Bernardino National Forest. By using modern lumbering methods and facilities, Big Bear produced over 15,000,000 board feet of lumber in 1954, increasing this to over 32,000,000 board feet in 1966. This lumber has been supplied to many
consumers in the greater Los Angeles area. Because of the success of the sanitation-salvage type of logging practiced by Big Bear, the Forest Service has welcomed its help in maintaining the health of the forests in the years to come.
BIBLIOGRAPHY


- Interview with Mr. Charles Kelly of El Cajon, California. Compiled from correspondence transmitted to C. Raymond Clar, Assistant Executive Officer, State Board of Forestry. April, 1958.


Griffin, Paul F., and Young, Robert N. California, the New Empire State: A Regional Geography. San Francisco: Fearon Publishers, 1957.


Los Angeles Times, April 9, 1955, Section 2, pg. 7. Article on early lumbering in the Julian area of San Diego County.


Raup, H. F. *San Bernardino, a Pass-Site City.* Berkeley: University of California Press, 1940.


San Bernardino Board of Trade. *Report of the Committee on Forest and Water.* San Bernardino, 1904 (unpub. ms.).

San Bernardino Forest Reserve. San Bernardino, 1904 (unpub. ms.).

San Bernardino City Directory. Los Angeles, 1887.

San Bernardino Guardian, August 22, 1868. Article on lumbering operations in the San Bernardino Mountains.


Personal Interviews


* Personal interview with Roy Saarni, Forest Resources Officer. December, 1966.*


* Personal interview with Wynne Maule, former Recreation Officer. February, 1966.*

* McKeen Timber Company. Personal interview with Walt McKeen, owner. February, 1966.*


* Rogers, David. President and part owner of the Big Bear Timber Company. Personal interview. February, 1966.*