

APPRAISAL OF

**6,631 Acres
With Significant
Old Growth and Ancient Redwood Forest**

Prepared for

**Pacific Lumber Company
Scotia, California**

Valuation Date: October 31, 2003

Report Date: October 31, 2003

By

**Bill Mundy, Ph.D, CRE, MAI
MUNDY ASSOCIATES LLC**

MUNDY ASSOCIATES LLC

1825 QUEEN ANNE AVENUE NORTH
SEATTLE, WASHINGTON 98109
PHONE 206-623-2935 FAX 206-623-2985
HTTP://WWW.MUNDYASSOC.COM

October 31, 2003

Mr. Robert Manne
President and CEO
Pacific Lumber Company
125 Main Street
PO Box 37
Scotia, CA 95565

Re: Highest and Best Use and Valuation Analysis of 6,631 Acres of MMCA Property

Dear Mr. Manne:

As requested in our letter of engagement, dated November 11, 2002, we have performed a highest and best use analysis and complete appraisal of the 6,631 acre-property that falls under the ownership umbrella of MAXXAM Group Inc. and is operated and managed by Pacific Lumber Company and Scotia Pacific, located a short distance south of Eureka, California. The property rights appraised include the fee simple estate. The effective date of valuation is October 31, 2003.

In performing this appraisal, we have examined various land use options for the property, and conclude the highest and best use for the property is to either develop it as a Forest and Ranch Preservation Community or to preserve it as an old growth and ancient forest area inhabited by a broad section of threatened and endangered species.

We have used numerous techniques in analyzing the highest and best use and value of the property; they are discussed in various sections of this report. This Complete Appraisal is presented in the form of a Summary Report, prepared in conformance with the Uniform Standards of Appraisal Practice as promulgated by the Appraisal Standards Board and in conformance with the Code of Ethics of the Appraisal Institute, a professional organization of which I am a member (MAI #5439). Your attention is directed to the report's Assumptions and Limiting Conditions.

Mr. Robert Manne
President and CEO
Pacific Lumber Company
125 Main Street
PO Box 37
Scotia, CA 95565

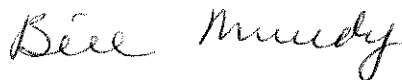
Based on the information and analysis presented herein, our opinion of the value representing highest and best uses for the property is as follows:

\$332.0 million

It has been a pleasure preparing this highest and best use and valuation analysis for you. If you have any questions regarding the conclusions or contents contained herein, please do not hesitate to call.

Sincerely,

MUNDY ASSOCIATES LLC



Bill Mundy, Ph.D., CRE, MAI
Principal Investigator
State of California License # AG018541

John A. Kilpatrick, Ph.D.
Reviewer



Victoria Adams
Senior Analyst

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ASSUMPTIONS AND LIMITING CONDITIONS

1. The legal description used in this report is both general (sections, townships, ranges) and specific (based on figures and acreages) which are assumed to be correct. No formal survey or metes and bounds description is available.
2. The appraiser has made no survey of the property and no responsibility is assumed in connection with such matters. Sketches in this report are included only to assist the reader in visualizing the property.
3. No responsibility is assumed for matters of legal nature affecting title to the property nor is an opinion of title rendered. The title is assumed good and merchantable. To our knowledge no title report has been prepared for the subject property.
4. Information and data furnished by others is assumed true, correct, and reliable. When such information and data appears to be dubious and when it is critical to the analysis, a reasonable effort has been made to verify all such information; however, the appraiser assumes no responsibility for its accuracy.
5. All mortgages, liens, encumbrances, leases, and servitudes have been disregarded unless so specified within the report. The property is analyzed as though under responsible ownership and competent management.
6. It is assumed that there are no hidden or unapparent conditions of the property, subsoil, or structures that would render it more or less valuable. No responsibility is assumed for such conditions or for engineering work, which may be required to discover them.
7. It is assumed that there is full compliance with all applicable federal, state, and local environmental regulations and laws unless non-compliance is stated, defined, and considered in this report.
8. It is assumed that all applicable zoning and use regulations and restrictions have been complied with, unless nonconformity has been stated, defined, and considered in this report.
9. It is assumed that all required licenses, consents, or other legislative or administrative authority from any local, state, or national government or private entity or organization have been or can be obtained or renewed for any use on which the value estimate contained in this report is based.
10. It is assumed that the utilization of the land and improvements is within boundaries or property lines of the property described and that there is no encroachment or trespass unless noted within this report.
11. We are not expert in determining the presence or absence of hazardous substances, defined as all hazardous or toxic materials, wastes, pollutants, or contaminants (including, but not limited to, asbestos, PCBs, or other raw materials or chemicals) used in construction or otherwise present on the property. We assume no responsibility for the studies or analyses, which would be required to determine the presence or absence of such substances or for loss as a result of the presence of such substances.

GENERAL LIMITING CONDITIONS

1. The appraiser will not be required to give testimony or appear in court because of having made this analysis, with reference to the property in question, unless arrangements have been previously made.
2. Possession of this report, or a copy thereof, does not carry with it the right of publication. It may not be used for any purpose by any person other than the party to whom it is addressed without the written consent of Mundy Associates LLC. Any person other than Mundy Associates LLC or the client who obtains and/or uses this report or its contents for any purpose not authorized by Mundy Associates LLC or the client is hereby forewarned that all legal means to redress may be employed against him.
3. The distribution of the total valuation in this report between land and improvements, if any, applies only under the reported highest and best use of the property. The allocations of value for land and improvements must not be used in conjunction with any other appraisal and are invalid if so used.
4. No environmental impact studies were either requested or made in conjunction with this analysis other than as noted, and Mundy Associates LLC hereby reserves the right to alter, amend, revise, or rescind any of the value opinions based on any subsequent environmental impact studies, research, and/or investigation.
5. Neither all nor part of the contents of this report, or copy thereof, shall be conveyed to the public through advertising, public relations, news, sales, or any other media without written consent and approval of Mundy and Associates.
6. No part of this study may be used as a part of or referred to in a public or private stock offering.
7. Acceptance of and/or use of this report constitutes acceptance of the foregoing General Assumptions and General Limiting Conditions.
8. The compensation for research services is dependent only on delivery of this report, and is not contingent on the estimates provided.

SUMMARY OF PERTINENT INFORMATION

PROPERTY APPRAISED:	The property analyzed consists of six blocks of land located south southeast of Eureka, east of Fortuna, and east of Scotia, California, located in the area between Township One North and Township Four North, and Range One East and Two East.
LEGAL DESCRIPTION:	Because of the size of the property analyzed and its dispersed nature, a specific legal description for the properties is not possible. However, in the body of the report, each parcel is identified in a figure that shows the sections in which it is located.
OWNERSHIP:	The property falls underneath the ownership of the MAXXAM Group and is operated and managed by Pacific Lumber Company and Scotia Pacific
SIZE:	The property appraised includes 6,631 acres in six separate blocks of land.
ZONING:	Zoning TPZ (Timberland Protection Zone). Some areas with AE (Agricultural Exclusive Zone).
PURPOSE OF THE APPRAISAL	Perform a highest and best use and valuation analysis culminating in an estimate of the market value for the 6,631 acres.
USE OF THE APPRAISAL:	This appraisal is provided to the MAXXAM Group for their exclusive use, as well as designees of the MAXXAM Group.
DATE OF PROPERTY INSPECTION	December 10-12, 2002 and October 20-22, 2003.
HIGHEST AND BEST USE	Forest and Ranch Preservation Community or preservation as old growth and ancient forest and threatened and endangered species habitat area.
ESTIMATE OF VALUE:	\$332.0 million
REPORT/APPRAISAL TYPE:	Complete appraisal in summary report format.
VALUE DATE:	October 31, 2003
REPORT DATE:	October 31, 2003

INTRODUCTION

Identification of Subject Property

See Figure 1 (Subject Property) for a map of the subject property that shows the six blocks of land that comprise the 6,631 acres that has been analyzed by Mundy Associates LLC.

Legal Description

A specific legal description for the 6,631 acres is not available as the property has not been surveyed and the property lines for the property, by and large, follow topographical features or other boundaries (i.e. headwaters tract boundary) rather than section lines. In a subsequent section of this report, each individual block of land is identified and discussed, including the sections, townships and ranges that it falls within. In addition, the property is shown in map form.

Property Sales History

All tracts that are the subject of this analysis have been in Pacific Lumber Company or Scotia Pacific ownership for, at a minimum, the last twenty years. No recent transactions of the properties being analyzed have occurred.

Statement of Ownership

The property falls under the ownership umbrella of MAXXAM Group, Inc. and is operated and managed by Pacific Lumber Company and Scotia Pacific.

Purpose and Intended Use of the Appraisal

This appraisal was prepared for the MAXXAM Group, Inc. for the purposes of estimating the highest and best use and market value of the 6,631-acre property. The intended users of the report include the owners and their assigns. The purpose for the estimate of market value is to be used as part of a decision making process regarding the eventual retention or disposition of the subject lands.

Report and Compliance

This is a Summary Report of a Complete Appraisal. It has been prepared in conformance with the Uniform Standards of Professional Appraisal Practice (USPAP) and Conduct of the Appraisal Institute.

Competency of the Appraiser

The appraisers' specific qualifications are included in the Appendices of this report. These qualifications serve as evidence of the competence for completion of this appraisal assignment in compliance with the competency provision contained within USPAP, as promulgated by the Appraisal Standards Board of the Appraisal Foundation. Specifically, Bill Mundy has over thirty years and Vicki Adams has over fifteen years experience appraising forest, ranch, and environmentally sensitive properties throughout the Western United States.

Real Property Interests Appraised

The property rights appraised include those pertaining to fee simple ownership, including those of the subsurface estate. Fee simple ownership is defined by the Appraisal Institute as "Absolute ownership unencumbered by any other interest or estate, subject only to the limitations of eminent domain, police power, and escheat."¹

Definition of Market Value

For the purpose of this analysis, we have applied the following definition of market value, often referred to as the Federal Definition:

The most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus.

Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:

- 1. Buyer and seller are typically motivated;*
- 2. Both parties are well informed or well advised, and acting in what they consider their own best interests;*
- 3. A reasonable time is allowed for exposure in the open market;*
- 4. Payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and*

*The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.*²

Scope of Analysis

The scope of this analysis included an inspection of the property and research into its physical characteristics and natural resources. Several different potential uses for the property were examined in determining the Highest and Best Use. Market and income/expense data were gathered from the local region and throughout the western states. The sales comparison, cost, income, contingent value, and conjoint measurement approaches were utilized where appropriate.

Research Participants

The principle investigator was Bill Mundy, PhD, MAI, CRE. He was assisted by senior analysts John Carruthers, Vicki Adams and Kaethe Fulton, research analysts Kerry Mulvaney and Kim Ramirez, and personal assistant Melissa Enger. The report was

¹ *The Appraisal of Real Estate*, (Chicago: The Appraisal Institute, 2001), 68.

² *The Appraisal of Real Estate* 12th ed., (Chicago: The Appraisal Institute, 2002); Office of Thrift and Supervision, 12CFR 564.2(f), 1989; Office of the Comptroller of the Currency, 12CFR 34.42(f), 1989.

reviewed by John Kilpatrick, PhD., and John Carruthers, PhD. Survey research was under the responsibility of Mike Mulhern PhD.

Property Inspection

The property was inspected on December 10-12, 2002 and again on October 20-22, 2003.

Date of Value

October 31, 2003 is the valuation date.

Date of Report

The report is dated October 31, 2003.

REGIONAL HISTORY AND SOCIOECONOMIC ANALYSIS

The State of California

California occupies over 155,000 square miles,³ contains 58 counties, and has a population of over 35 million people,⁴ or about 12% of the United States' population, making it the largest state in the nation. The state's recent growth is tracked in Figure 2 (State of California Population Growth, 1990 – 2001), which covers the 1990 – 2001 time period. Over the next decade, the population of California is projected to reach nearly 40 million; by the year 2025, it is expected to grow to nearly 50 million people.⁵ Further, with 12 million jobs in over 740,000 business establishments in 1998, the state accounts for over 10% of all employment in the country.⁶ California's personal income earnings represent nearly 8% of the United States total and, measured on a per capita basis, are 3.5% higher than the national average. Trends in the state's unemployment and labor force participation rates—which move in opposite directions—between 1990 and 2001 are shown in Figure 3 (Unemployment and Labor Force Participation Rates for the State of California).

In 2000, California's population was 60% White, 10% Black, 1% Native American, and 16% Asian; fully one third of all residents—some of whom also fall into another racial group—classified themselves as Hispanic or Latino. This compares to the country as a whole, which was 75% White, 12% Black, .8% Native American, and 4% Asian, with 13% classifying themselves as Hispanic. Approximately a third of all Asians and Hispanics in the United States live in California, making it one of the most diverse states nationwide. The median age in the state is 33.3 years, and there are slightly more women living there than men, which is typical of the of the population distribution as a whole.

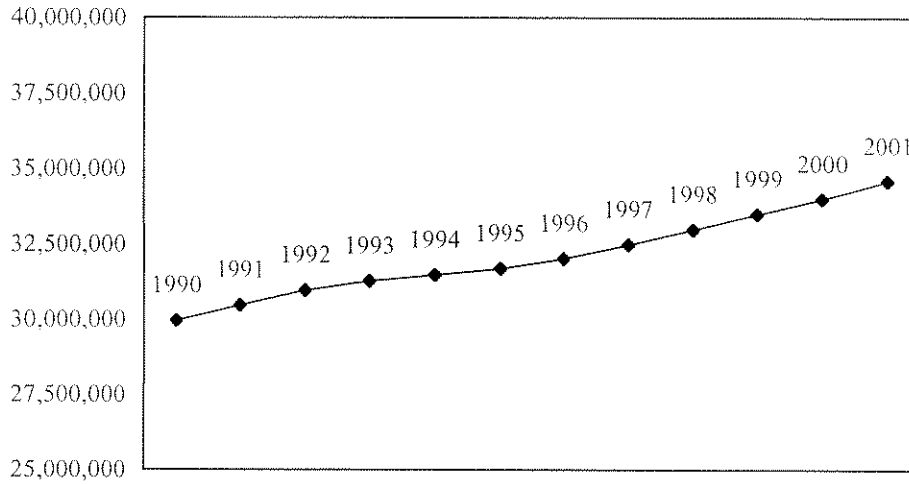
³ United States Census Bureau. 2002. *County and City Databook: 2000*. Washington D.C.: United States Government Printing Office.

⁴ United States Census Bureau. 2003. <http://cire.census.gov/popest/data/states/tables/ST-EST2002-01.php>.

⁵ United States Census Bureau: <http://www.census.gov/population/projections/state/stpjpap.txt>.

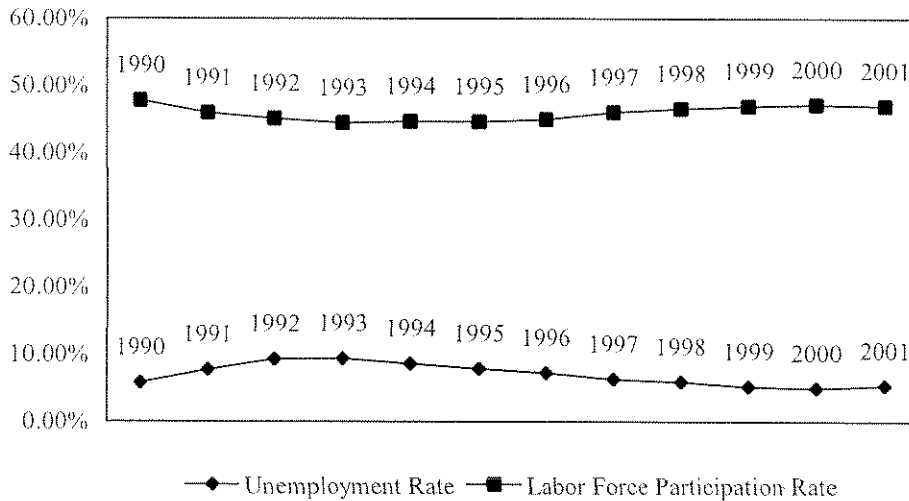
⁶ United States Census Bureau. 2002. *County and City Databook: 2000*. Washington D.C.: United States Government Printing Office.

Figure 2
State of California Population Growth, 1990 – 2001



Source: Bureau of Economic Analysis, Mundy Associates LLC.

Figure 3
Unemployment and Labor Force Participation Rates for the State of California



Source: Bureau of Economic Analysis, Mundy Associates LLC.

What emerges, is a portrait of an economic juggernaut gauged in terms of both its overall size and inertia. Moreover, California is widely recognized as one of the most dynamic states in the country, as evidenced by its rapid growth and socioeconomic diversity. Because of its large geographic size, the state may be divided into numerous separable regions, dominated by the Los Angeles, San Diego, and San Francisco metropolitan areas.⁷ There are also substantive differences among the southern and northern and eastern, central, and western areas of California. Viewed in this context, Humboldt

⁷ Fulton, William. 1999. *The Guide to California Planning*. Point Arena, CA: Solano Press Books.

County lies within the orbit of the San Francisco metropolitan area, but is far enough removed that it is better known for its beautiful natural environment, which showcases long, scenic beaches and large stands of redwood trees.

Humboldt County

History

Humboldt County, located in northwest California, is the southern gateway to the Pacific Northwest. It is bounded on the north by Del Norte County; on the east by Siskiyou and Trinity counties; on the south by Mendocino County; and on the west by the Pacific Ocean. The county covers 3,600 square miles, 80 percent of which is forestlands, protected redwoods, and recreation areas. It was created in 1853 by carving out the western portion of neighboring Trinity County and named after naturalist and explorer Baron Alexander Von Humboldt.

Prior to the arrival of outsiders, indigenous peoples populated the area. The Wiyot, Yurok, Hupa, Karok, Chilula, Whilkut, and the southern Athabascans, including the Mattole and Nongatl, built communities based on their religious and cultural beliefs. In 1806, a group of sea otter hunters from Alaska discovered Humboldt Bay. By the spring of 1850, the first ships arrived in Humboldt and Trinidad bays carrying men with gold fever. Eureka, Union (Arcata), and Trinidad were first settled as points of arrival and as supply centers for the gold mining districts on the Klamath, Salmon and Trinity rivers. As the quest for gold waned, economic development shifted to the area's other resources—timber, salmon, and land.

This shift attracted a wide variety of people from many different countries and led to permanent settlements in Humboldt County. The Chinese came to mine on the Klamath and Salmon rivers, to work in the fish canneries on the lower Eel River, and later to build railroads; the Americans and Italians fished commercially; the Canadians came to work in Humboldt County's forests, developing logging and milling operations; the Swiss-Italian immigrants came to work on the dairy farms established in the latter part of the nineteenth century and soon found themselves as owner/operators; and, finally, the Portuguese came to work in both the dairy and timber industries.

This occupational and demographic configuration lasted through the Second World War. After the war, the United States experienced a dramatic increase in household income resulting in a nation-wide housing boom. That, in turn, caused lumber production in Humboldt County to nearly double from 1949 to its peak, which was reached in 1959. At that time, the timber industry employed one out of every two workers in Humboldt County—accounting for more income than the rest of the county combined. By the early 1960s, however, the economy began shifting away from a resource-based economy to a more diversified economy including services, government, retail, and manufacturing. Today, Humboldt County continues its transition from a more resource-extractive economy toward a more sustainable diversified economy.

Population and Employment Trends

Humboldt County grew by a rate of 6.2% between 1990 and 2000 (down from 9.8% between 1980 and 1990) and was home to 127,159 people in 2002, or just .4% of the State of California's total population.⁸ Compared to the State of California, Humboldt is somewhat less racially diverse: about 85% of the people living there are White, 1% are Black, 6% are Asian, 1.6% are Native American, and 30% Hispanic. The median age of the county is 36.3 years (3 years older than the state as a whole), and it has 2% more women than men.

The largest cities in Humboldt County are Eureka, Arcata, and Fortuna, with 2002 populations of 26,050, 16,900, and 10,750 respectively.⁹ Consistent with its small population, earned income in Humboldt accounts for only about .3% of all earned income in California; its 1998 per capita income (about \$23,500 in 2000 dollars) is just 78% of the state average and 81% of the national average. This is at least partly due to the comparatively low cost of living in the county: for example, in 2000, the median housing value and median rent there were \$133,500 and \$537, compared to \$211,500 and \$737 for California as a whole.¹⁰

Recent population change is illustrated in Figure 4 (Humboldt County Population Growth, 1990 – 2001), which shows the county's trend between 1990 and 2001, and Figure 5 (Comparison of Population Growth Rates, State of California and Humboldt County), which compares its annual growth rate to that of the state for the same timeframe. Humboldt's growth tracked California's closely until 1996, when employment growth slowed significantly and the county began losing jobs in the manufacturing and retail sectors. Between 2000 and 2001, the county realized a slight recovery, growing at a rate of about .25%—up from about –.25% the two previous years.¹¹ Figure 6 (Unemployment and Labor Force Participation Rates for Humboldt County) illustrates trends in the state's unemployment and labor force participation rates between 1990 and 2001.

In 2000, Humboldt had 68,043 jobs distributed among about 4,000 places of work, most of which were in either the government (11,784), retail trade (12,993), or service (21,340) sectors.¹² Table 1 (Earnings by Major Sector, State of California and Humboldt County, 2000) illustrates that the county was more specialized in agricultural services and retail trade than the State of California, as measured by the percentage of total non-farm earnings made from private business establishments in the two sectors. Meanwhile, earnings were comparatively less concentrated in finance insurance and real estate

⁸ United States Census Bureau. 2002. *County and City Databook: 2000*. Washington D.C.: United States Government Printing Office. And United States Census Bureau 2002.

http://factfinder.census.gov/bf/lang=en_vt_name=DEC_2000_SF1_U_GCTPH1_ST2_geo_id=04000US06.html.

⁹ State of California. 2003. County Snapshot: Humboldt County 2002. Available online at:

<http://www.calmis.ca.gov/file/COSnaps/humboSNAP.pdf>.

¹⁰ United States Census Bureau. 2003. American FactFinder. Available online at:

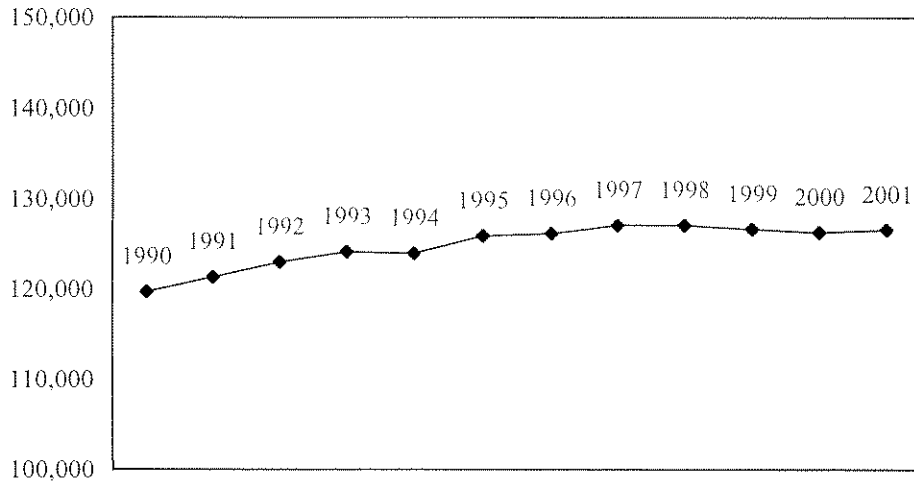
<http://factfinder.census.gov/servlet/BasicFactsServlet>.

¹¹ United States Bureau of Economic Analysis, Regional Economic Information System, available online at:

<http://www.bea.doc.gov/bea/regional/reis/>.

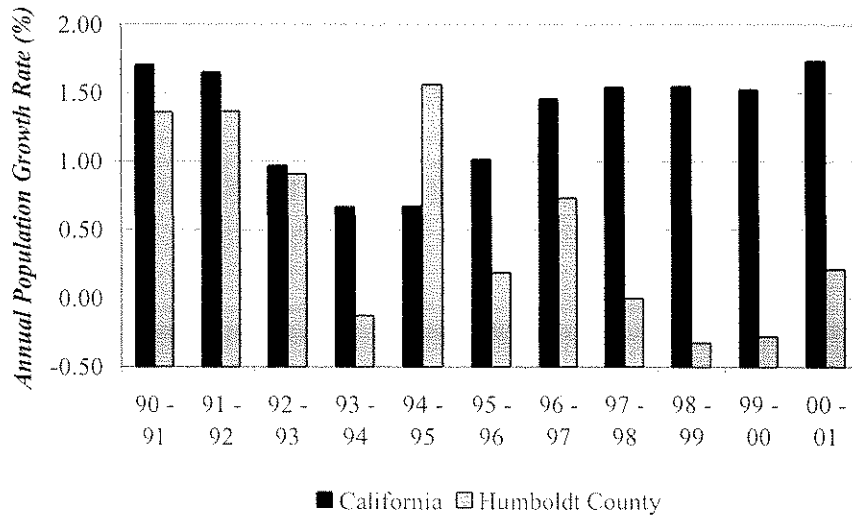
¹² *Ibid.*

Figure 4
Humboldt County Population Growth, 1990 – 2001



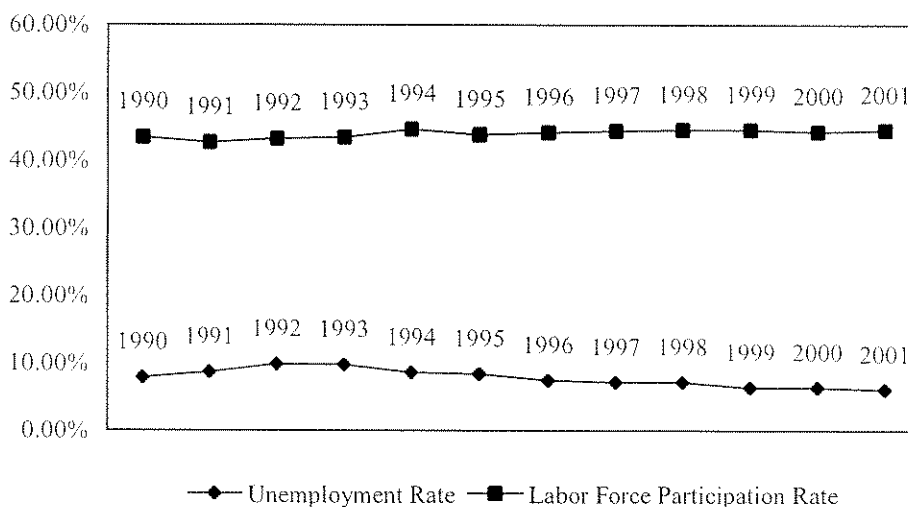
Source: Bureau of Economic Analysis, Mundy Associates LLC.

Figure 5
Comparison of Population Growth Rates, State of California and Humboldt County



Source: Bureau of Economic Analysis, Mundy Associates LLC.

Figure 6
Unemployment and Labor Force Participation Rates for Humboldt County



Source: Bureau of Economic Analysis, Mundy Associates LLC.

Table 1
Earnings by Major Sector, State of California and Humboldt County, 2000

Industry Sector	California:		Humboldt County:	
	Dollars	% of Total Dollars	Dollars	% of Total
Total Private Non-farm Earnings	\$69,309,850,000	n/a	\$1,388,074,000	n/a
<i>Agriculture</i>	\$812,600,000	1.17%	\$47,281,000	3.41%
<i>Construction</i>	\$4,675,975,000	6.75%	\$107,756,000	7.76%
<i>Manufacturing</i>	\$12,904,275,000	18.62%	\$248,257,000	17.88%
<i>Transportation and Public Utilities</i>	\$4,957,250,000	7.15%	\$112,168,000	8.08%
<i>Retail Trade</i>	\$7,064,775,000	10.19%	\$234,851,000	16.92%
<i>FIRE</i>	\$7,080,925,000	10.22%	\$107,412,000	7.74%
<i>Services</i>	\$26,817,600,000	38.69%	\$477,054,000	34.37%

Source: Bureau of Economic Analysis, Mundy Associates LLC.

(FIRE) and services. The remaining two sectors — construction and transportation and public utilities — were more or less even. 14.7% of all non-farm personal income in Humboldt County was earned in public sector (government) jobs, compared to 10.8% in California as a whole.¹³

Embedded within these percentages, is a shift away from jobs in resource-based industries towards jobs in the hospitality and education industries. Together, the government, retail trade, and service sectors—the latter of which includes education services—are expected to account for 90% of Humboldt County’s projected increase in employment over the next several years, based on a forecast covering the 1999 – 2006

¹³ Ibid.

timeframe. By the end of the period, it is anticipated that the three sectors combined will gain 3,000 out of a total of 3,300 jobs.¹⁴

The important role that services play in Humboldt County's economy lies in the significant proportion—8.8%, or about 6,100 jobs, in 2000—of its total employment that is generated by travel. In 2001, over \$293 million was spent on tourism-related activities in the county, translating into \$84.7 million in earnings, \$5 million in local taxes, and \$13.2 million in state taxes. Destination spending, or total travel spending less airfare, in Humboldt County increased by an annual average of 2.9% between 1992 and 2001, a figure that adds up to \$65 million difference over the nine-year timeframe.

Transportation

There are two major highways in Humboldt County. The first is Highway 101 that connects the county to the north to Interstate 5 via Highway 199 and to the south along the coast to Ukiah and San Francisco. Most of the highway is a fast, four-lane freeway and the rest is a fast two-lane road. The second major highway is Highway 299 that connects Humboldt County east to Redding where it connects to Interstate 5, providing access to Sacramento and other areas south and north. The first five miles of the highway from Highway 101 is four-lane freeway. The rest of the highway is scenic and winding. Other highways in the county include State Highway 96, connecting the area to communities in the Klamath River canyon and Yreka. It is long, narrow, and winding, but there is little traffic. State Highway 36 connects Humboldt County south of Eureka to Red Bluff and the Central Valley via Interstate 5. It is long and winding, with very little traffic. State Highway 169 connects communities in the Hoopa Indian Reservation to State Highway 96.

The county airport located in McKinleyville is the only commercial/commuter airport in Humboldt County. United Express and Horizon Air provide daily service to San Francisco, Sacramento, Portland, Seattle, and Redding. There are various other general aviation airports scattered around the county. The Port of Humboldt is located in Eureka, 225 nautical miles north of San Francisco. Its channel depth is 35 feet and it can accommodate ships up to 50,000 tons and 700 feet. It is served by the Northcoast Rail Authority. Its exports include wood chips, paper pulp, lumber, and whole logs. Its imports are New Zealand logs, chemicals, and petroleum products. Finally, the North Coast Railroad connects the county to the Bay Area. There are numerous spurs to lumber and ship yards within Humboldt County.

Timber

Coastal redwood, a species confined to California and southern Oregon, is a tremendous natural resource, and has been logged for over 150 years.¹⁵ Called the California's "second mother load," the wood was abundant — an acre of mature trees yields up to

¹⁴ State of California. 2003. County Snapshot: Humboldt County 2002. Available online at: <http://www.calmis.ca.gov/file/COSnaps/humboSNAP.pdf>.

¹⁵ Except where otherwise noted, this discussion is drawn from Barbour, M. 2001. *Coast Redwood: A Natural and Cultural History*. Los Olivos, CA: Cachuma Press.

250,000 board feet of lumber* — easy to work with, resistant to deterioration, and can be used to make everything from buildings to water pipes. Today, however, the supply of redwoods has become depleted, with over 95% of the original forest having been harvested at least once. Only approximately 75,000 remaining acres within a strip 450 miles long qualifies as old growth, and most of this is owned by public agencies and conservation organizations. See Appendix I (Redwood Forest Distribution Map).

Although redwood has been harvested for centuries, beginning with Native American tribes who used it to build housing, canoes, and other necessities, the era of modern logging did not truly begin until the late 1800s. Prior to that time, the harvest of redwoods was limited to relatively younger and smaller trees, due to the difficulty of felling and transporting the older ones. Redwoods were utilized mainly on a small-scale basis and demand fluctuated dramatically with economic downturns, which commonly caused smaller timber operations to go out of business. By the turn of the 20th Century, improved technology facilitated more efficient logging and enabled rapid and widespread harvesting of old growth and virgin redwood trees.

The oldest redwood logging operations occur in Sonoma and Marin Counties, due to their proximity to San Francisco and its port; Humboldt Bay became the focal point of California's second major redwood harvesting region because of the easy transport that it facilitated. Demand for redwoods surged during the reconstruction period after San Francisco's 1906 earthquake, which caused much of the city to burn. From that point on, the logging of redwoods accelerated, but their supply seemed virtually endless: in 1925, after a hundred years of sustained harvest, at least two-thirds of all old growth trees were still left.

After a period of dwindling demand during the Great Depression, World War II and the subsequent G.I. Bill-sponsored boom of housing construction increased demand to unprecedented levels. For example, in Humboldt County alone, the number of sawmills processing coast redwood more than tripled between 1945 and 1948. Between 1950 and 1953, the volume of redwood produced by California's sawmills also tripled to reach 1 billion board feet of lumber per year. Subsequent years placed even greater pressures on redwoods as the state continued its sustained growth and as the industry expanded to foreign markets such as Japan. During this time period — from the early 1960s to the mid 1970s—redwood production remained at approximately 1 billion board feet per year until the 1990s, by the end of which production had tapered to less than 500 million board feet per year.

As an outcome of this extensive harvesting, very little old growth redwood remains in private ownership. A recent report written by Lawrence Fox, a Professor of Forestry at Humboldt State University, estimates that there are only about 207,000 acres of old growth redwood forest left, more than half of which is in public ownership.¹⁶ In 1986, there were an estimated 14.4 billion board feet of old growth forest remaining, with just

* Approximately 22,000 board feet of lumber are used to produce a 2,000 square foot new wood framed single family residence. Therefore, one acre of trees could be converted into 125 homes.

¹⁶ Fox, Lawrence. 1996. Current Status and Distribution of Coast Redwood. In *The Proceedings of the Conference on Coast Redwood Forest Ecology and Management*, June 18 – 20, Arcata, California.

3.5 billion board feet in private ownership; by 1996, only 2 billion board feet (or 14%) of this was left. Since that time, the Pacific Lumber Company has transferred some 3,000 acres of old growth redwood forest—contained in the Elk Head Springs, Grizzly, and Headwaters groves — into federal and state ownership, leaving even less of it in private hands. The largest contiguous stand of old growth redwoods is the Rockefeller Forest, located in Humboldt Redwoods State Park. This park, which is California's largest redwood park, is 52,000 acres in size, including 17,000 acres of pristine ancient forest.¹⁷

Real Estate Implications

The exchange of old growth forests from private to public ownership represents a significant step in Humboldt County's transition from a resource-based to a service based economy that was described above. As fewer tracts of land are made available for logging and more are set aside for conservation and recreational purposes, the very nature of the of the county's economic base is changing—and so too, is its real estate market.

University of Montana Economics Professor Thomas Power writes about the socioeconomic challenges for regions facing such transitions in his book *Lost Landscapes and Failed Economies*.¹⁸ A central theme in Power's analysis is the deceptive nature of resource-based economies: as they wane, people often feel that "good" jobs are being sacrificed for the sake of environmental preservation. To the contrary, the book argues that regions' long-term prosperity may in fact *depend* on the preservation of the very landscapes previously valued only for their natural resources. As the United States economy continues its transition towards service and information intensive industries, regions become winners and losers based on their relative desirability as places to live. In short, the natural environment is becoming an increasingly important determinant of where people and firms choose to locate.

For example, empirical research consistently finds evidence of consumer utility based on the relative quality of environmental amenities via their capitalization into land markets (Freeman 1993;¹⁹ Bockstael et al. 1995;²⁰ Geoghegan et al. 1997;²¹ Bastian et al. 2002;²² Geoghegan 2002;²³ Sengupta and Osgood 2003²⁴). In addition to affecting property values, the natural environment has a direct influence on where people chose to live and recreate and, therefore, on what land gets developed to accommodate consumer demand (Irwin and Bockstael 2002,²⁵ Hite et al. 2003;²⁶ Monroe and York 2003²⁷). This is

¹⁷ For information on Humboldt Redwoods State Park, see: <http://www.humboldtreedwoods.org/>.

¹⁸ Power, T. 1996. *Lost Landscapes and Failed Economies*. Washington DC: Island Press.

¹⁹ Freeman, A. 1993. *The Measurement of Environmental and Resource Values: Theory and Methods*. Washington DC: Resources for the Future.

²⁰ Bockstael, N., R. Costanza, I. Strand, W. Boynton, K. Bell, and L. Wainger (1995). Ecological Economic Modeling and Valuation of Ecosystems. *Journal of Ecological Economics*, 14: 143-159.

²¹ Geoghegan J., L. Wainger, and N. Bockstael 1997. Spatial Landscape Indices in a Hedonic Framework: An Ecological Economics Analysis Using GIS. *Ecological Economics*, 23: 251 – 264.

²² Bastian, C., D. McLeod, M. Germino, W. Reiners, and B. Blasko. 2002. Environmental Amenities and Agricultural Land Values: A Hedonic Model Using Geographic Information Systems Data. *Ecological Economics*, 40: 337 – 349.

²³ Geoghegan, J. 2002. The Value of Open Spaces in Residential Land Use. *Land Use Policy*, 19: 91 – 98.

²⁴ Sengupta, S. and D. Osgood. 2003. The Value of Remoteness: A Hedonic Estimation of Ranchette Prices. *Ecological Economics*, 44: 91-103.

²⁵ Irwin, E. and N. Bockstael. 2002. Interacting Agents, Spatial Externalities, and the Evolution of Residential Land Use Patterns. *Journal of Economic Geography*, 2: 31 – 54.

particularly true of places with warm, dry climates, attractive topography, and good access to water.

The relative importance of this for Humboldt County is illustrated in Table 2 (Top 10 High Amenity Counties in the United States), which shows the top 10 high amenity counties in the continental United States, based on the Economic Research Service's natural amenities scale.²⁸ All of the top 10 counties are located in California, and Humboldt County ranks second out of over 3,000 nationally. Among the key factors that place the county in this position are its mild climate and rugged topography. These amenities act as what economists call "compensating differentials," meaning that they act directly upon the costs that people are willing to incur (including, in many instances, foregone wages) to live in attractive places. In other words, they compensate people for their living expenses. Although the cost of living in Humboldt County remains below that of California as a whole, it is important to realize that the effect is highly relative to the location in question.

Table 2
Top 10 High Amenity Counties in the United States

County Name*	January:		July:			
	Mean Temperature	Mean Hours of Sunlight	Mean Temperature	Mean Relative Humidity	Topography Code	Percent Water Area
Ventura	53.8	224	65.2	68	21	16.41
Humboldt	47.3	168	56.3	60	21	11.84
Santa Barbara	53.2	224	66.6	68	21	27.74
Mendocino	47.9	168	56.5	60	20	9.52
Del Norte	46.8	168	58.3	60	21	18.05
San Francisco	50.9	171	58.5	74	16	75.00
Los Angeles	54.5	224	68.5	68	21	14.57
San Diego	55.2	224	69.6	68	21	7.10
Monterey	50.0	171	61.9	74	21	11.91
Orange	54.2	224	71.7	68	16	16.69

Source: Economic Research Service, Mundy Associates LLC.
Available online at: <http://www.ers.usda.gov/emphases/rural/data/amenities/>.
* Listed by rank with Ventura County ranking highest.

The effect that the natural environment — and, by extension, the preservation of redwoods and other attractions — has on Humboldt County's real estate market is demonstrated in Table 3 (Housing Market Characteristics, Humboldt County, 1990 – 2000). First, the table illustrates that, despite the addition of nearly 500 new homes to the housing market per year over the decade of the 1990s, the occupancy rate increased by

²⁶ Hite, D., B. Sohngen, and J. Templeton. 2003. Zoning, Development Timing, and Agricultural Land Use at the Suburban Fringe: A Competing Risks Approach. *Agricultural and Resource Economics Review*, 32: 145 – 157.

²⁷ Monroe, D. and A. York. 2003. Jobs, Houses, and Trees: Changing Regional Structure, Local Land Use Patterns, and Forest Cover in Southern Indiana. *Growth and Change*, 34: 299 – 320.

²⁸ The ERS is a division of the United States Department of Agriculture.

nearly 1%, suggesting that construction failed to keep up with demand. Second, homeownership has also increased in the county by 3,001 units, or 2.09% Third, people are paying a greater proportion of their incomes in both the homeownership and rental markets. In 1990, approximately 23% of all homeowners paid less than 20% of their income to their mortgages; by 2000, this number had fallen by 4%; in the rental market, the proportion of income paid stayed about the same at the low end of the spectrum. At the high end, however, the percentage of owners and renters paying greater than 35% of their incomes to housing costs increased by approximately 2.5% and 2% respectively. In short, the table reveals an upward shift in the relative costs people incur to live in Humboldt County—an outcome entirely consistent with the theory of compensating differentials.

Table 3
Housing Market Characteristics, Humboldt County, 1990 - 2000

	1990:		2000:		Change 1990 – 2000:	
	<i>Number</i>	<i>% of Total</i>	<i>Number</i>	<i>% of Total</i>	<i>Number</i>	<i>% of Total</i>
Total Housing Units	51,134		55,912		4,778	
<i>Occupied Housing Units</i>	46,420	90.78%	51,238	91.64%	4,818	0.86%
<i>Owner Occupied Units</i>	19,636	38.40%	22,637	40.49%	3,001	2.09%
< 20%	11,938	23.35%	10,822	19.36%	-1,116	-3.99%
20% – 24%	2,608	5.10%	3,106	5.56%	498	0.45%
25% - 29%	1,536	3.00%	2,077	3.71%	541	0.71%
30% - 24%	1,018	1.99%	1,515	2.71%	497	0.72%
35% or more	2,419	4.73%	4,023	7.20%	1,604	2.46%
<i>Renter Occupied Units</i>	19,344	37.83%	21,023	37.60%	1,679	-0.23%
< 20%	4,605	9.01%	4,731	8.46%	126	-0.54%
20% – 24%	2,072	4.05%	2,424	4.34%	352	0.28%
25% - 29%	2,084	4.08%	1,924	3.44%	-160	-0.63%
30% - 24%	1,575	3.08%	1,766	3.16%	191	0.08%
35% or more	7,017	13.72%	8,875	15.87%	1,858	2.15%
<i>Seasonal Units</i>	1,846	3.61%	1,750	3.42%	-96	-.19%

Source: United States Census Bureau: <http://factfinder.census.gov/servlet/BasicFactsServlet>, Mundy Associates, LLC.

Finally, further circumstantial evidence of the importance of Humboldt County's natural environment lies in the conversion of seasonal to year-round occupancy residences. Instead of growing with the housing stock as a whole, the number of seasonal homes has fallen slightly: in 1990, there were 1,846 and in 2000, there were 1,750, a net loss of 96 units. This suggests that, even if just marginally, fewer people are coming to Humboldt for part of the year only. Given other housing market indicators, it is highly likely that the county is evolving as a place of year-round residences.

DESCRIPTION OF THE SUBJECT PROPERTY AND ITS IMPROVEMENTS

The property that is being valued consists of six blocks of land located within a large, approximately 200,000 acre-Pacific Lumber Company and Scotia Pacific holding. The name and size of each tract of land is shown in Table 4 (Subject Properties, Name and Acreage). These lands are either adjacent to other Pacific Lumber Company and Scotia Pacific holdings or state or federal ownerships. They total 6,631 acres. The lands are all located in the Northern California Coastal Mountain Range and because of the old growth and virgin timber, provide habitat to many unusual, threatened and endangered species of flora and fauna. Some of the most noteworthy species found on these properties include the Marbled Murrelet, Spotted Owl, Pacific Fisher, Bald Eagle, Methusela's Beard, Howell's Montia, Maple-leaved Chickerbloom, Steelhead and Chinook Salmon, as well as considerable archaeological resources.

Table 4
Subject Properties, Name and Acreage

Name	Acreage
Allen Creek and Road Three	2,293
Bell-Lawrence – Booth's Run	1,418
Cooper Mill	704
Headwaters Old Growth Buffer	28
Reserve Old Growth	<u>30</u>
	762
Elkhead Residual	350
Lower North Fork Elk	451
Lower North Fork Elk Old Growth Buffer	<u>43</u>
	494
Shaw Gift and Road Nine Complex	<u>1,313</u>
	6,631

Another unique characteristic of the property is the old growth (trees that are more than 100 years old) and virgin (never harvested, and trees ranging from 500 to 1,000 years old) Redwood forests, located on and adjacent to them. The size of the old growth and virgin Redwoods typically ranges from 10 to 18 feet in diameter. Based on our research, we believe this is the largest acreage and quantity of old growth and virgin Redwood forest still in private ownership. The quantity of old growth and virgin timber found within each parcel is shown in the "Parcel Specific Characteristics" section of this report.

The properties contain numerous streams, rivers, scenic viewsheds and wildlife habitat. Photographs of these areas are also included in the parcel specific part of the analysis.

General Characteristics

The following sections discuss characteristics that apply, in general, to all six of the blocks of land that are being analyzed.

Pacific Lumber Company/ Scotia History

Pacific Lumber Company was established in 1863 when 6,000 acres of land were acquired in Scotia, which was then Forestville. By 1914, the acreage under Pacific Lumber Company ownership had increased to 65,000 acres. The original 6,000-acre acquisition was made by Alexander MacPherson and Henry Wetherbee of Albion Lumber Company in Mendocino County.

In 1884 the first employee bunkhouse was built in Scotia, serving as the foundation for the development of the company owned town. Today, the town of Scotia is a registered historic landmark. The town includes a neighborhood shopping center, school, post office, museum, bank, hotel (the Scotia Inn), athletic complex, and a broad range of housing, as well as the offices and mill, and a power company, all owned by Pacific Lumber Company.²⁹

In 1885, Pacific Lumber Company (PALCO) built a rail line from Alton to Scotia, and in 1887 began shipping lumber by schooner from Humboldt Bay, principally to San Francisco. In 1901, shipping was expanded to an international basis including ports in Japan and Hawaii. The shipping line was disbanded in 1916.

In 1928, PALCO and the Save the Redwoods League entered into an agreement to save virgin and old growth forest areas. Negotiations continued until 1931 when PALCO sold 9,400 acres to the State of California which was to become the Humboldt Redwoods State Park and included the Founders Grove and Rockefeller Forest. Over the years, this park has been expanded to some 25,000 acres.

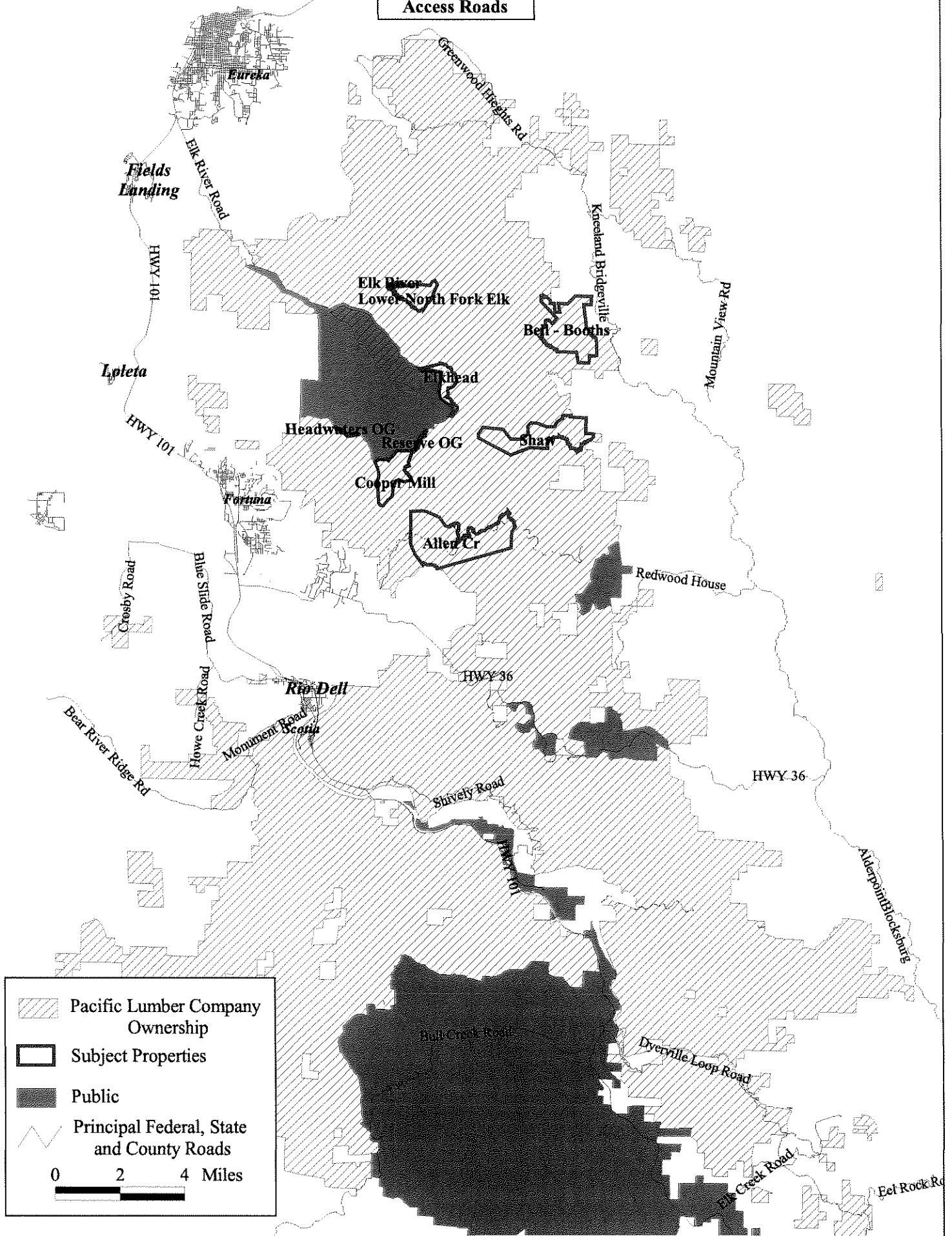
In 1975, Pacific Lumber Company was listed on the New York Stock Exchange. In 1992, the Northern Spotted Owl Management Plan was adopted with the assistance of the US Fish and Wildlife Service. Shortly thereafter, in 1996, the "Headwaters Agreement" was reached in principle that involved the sale of some 7,500 acres to the US government. In March 1999, the headwaters transaction was consummated. Then in 2001, an additional 1,200 acres was sold to the State of California.

Location and Access

The location of the six blocks of land being analyzed, and various means of accessing those properties is shown in Figure 7 (Access Roads). US Highway 101 runs along the Pacific coast, through the Eureka, Fortuna and Scotia areas and provides unusually good access to PALCO lands as well as the subject properties in particular. While none of the subject properties lie adjacent to US 101, many are within close proximity to it and can easily be accessed by state and/or county paved roads, and in certain other cases, the company maintained gravel roads.

²⁹ Pacific Lumber Company is used in a generic sense to include all ownership entities falling under the MAXXAM umbrella in Humboldt county.

**Figure 7
Access Roads**



Area

The subject property is located within the land ownership base of Pacific Lumber Company and Scotia Pacific. One of the six blocks of land are located adjacent to state or federal ownerships.

Topographically, the area is rolling to steep; groundcover consists of numerous varieties of flora, most related to coniferous forest. Within the area are two main river systems (the Eel and Van Dusen) and numerous creeks. There are a wide variety of birds, plants, fish, and animal life, including many threatened and endangered species.

A unique characteristic of this forest property is the proximity it has to urban facilities (Eureka, Fortuna and Scotia) as well as very good transportation facilities. These include county roads; US Highway 101; commercial air travel at the Arcata/Eureka airport; a local airport in Fortuna; and one located approximately ten miles southeast of Eureka at an elevation of 2,750 feet featuring a US Forest Service Fire Fighter location at an elevation above the Pacific Coast fog line. Another strong amenity to the area is the Pacific Ocean and Humboldt Bay, which is only eight miles west of the Lower North Fork Elk property, one of six properties comprised in this analysis.

Climate

Humboldt County is an area of moderate temperatures and considerable precipitation. Temperatures along the coast vary only 10 degrees from summer to winter, although a greater range is found over inland areas. Temperatures of 32 degrees or lower are experienced nearly every winter throughout the area, and colder temperatures are common in the interior. Maximum readings for the year often do not exceed 80 on the coast, while 100 degree plus readings occur frequently in the mountain valleys

In most years, rainfall is experienced each month of the year, although amounts are negligible from June through August. Seasonal totals average more than 40 inches in the driest area, and exceed 100 inches in the zones of heavy precipitation. Because of the moisture and moderate temperature the average relative humidity is high. Largely as a result of the proximity of the cool Pacific Ocean, the adjoining coastal area has one of the coolest, most stable temperature regimes to be found anywhere. With increasing distance from the ocean, the marine influence is less pronounced, and inland areas experience wider variations of temperature and lower humidity.

July mean maximum readings are in the cool 60s throughout an area ranging from 15 to 30 miles in width along the coast. About 90 percent of the seasonal total rainfall falls in the seven months from October through April. Most of this is associated with storm fronts that move in from the Pacific Ocean. There are some thundershowers in the mountains during the summer, but they are infrequent.

The climate has several impacts on local economic development. In the winter months when the rain is its heaviest, employment is at its lowest. Fog is also present along the

coastline for much of the year. This often delays passenger flights at the Arcata-Eureka Airport.³⁰

Geology and Soils

The California Coastal area was formed during the middle Jurassic, ending some 24 million years ago in the Miocene. The area dates back approximately 65 million years, and the temperature over this period of time has been relatively constant. The oldest rocks in the Humboldt area are from the Franciscan Complex, and these rocks are oil producing and were discovered in various surface seeps in approximately 1865.

The Eel River Basin consists principally of the following formations:

- The Pullen Formation: mainly diatomaceous siltstone and mudstone;
- Eel River Formation: dark gray to black mudstones, siltstones and sandstones;
- Rio Dell Formation: marine siltstone with some claystone and very fine poorly sorted sandstone;
- Scotia Bluffs Formation: Fine and medium grained sandstones with some pebbly conglomerate and siltstone, In addition, mega fossils are found in this formation;
- Carlotta Formation: coarse conglomerates, poorly sorted Sandstones, bedded in massive blue-gray siltstone and blue-gray mudstone. Redwood logs are often found in this formation.

Additional information on the geology of the area is found in Appendix A (Humboldt Bay Area Geology).

Hazardous and toxic materials

In our conversations with resource managers at Pacific Lumber Company, questions were posed regarding the presence or absence of hazardous and toxic materials. For the six blocks of land there have been no environmental studies (i.e. Level 1 Environmental Analysis) conducted. There was a mill just outside the south boundary of the Cooper Mill MMCA unit property. There is a reasonable probability that there may be soil contamination associated with the old mill site. However, this is outside of the boundary of the Cooper Mill property being analyzed and, in addition, no environmental studies have been made of the old Cooper Mill site to determine if there are or are not various types of hazardous or toxic material associated with the site. This appraisal assumes there are no hazardous or toxic materials on the subject property that would adversely affect their value.

Utilities

There are no utilities available to any of the properties being valued.

Easements and Encumbrances

There are no known Easements and Encumbrances associated with the subject properties. This valuation analysis assumes that there are no easements nor encumbrances which would adversely affect the value of the property. No title report on the six properties has been provided.

³⁰ Source: <http://www.co.humboldt.ca.us/portal/about.asp>

Zoning

All of the six properties are zoned TPZ (Timberland Production Zone). There is a possibility that some of the properties may also have an AE (Agriculture Exclusive) associated with them. The AE Zone would apply to high elevation grazing lands. Our inspection of the subject properties did not reveal any of these types of lands. A copy of the AE and TPZ zoning rules and regulations are included in Appendix B (Zoning.)

Taxes and Assessments

Taxes applicable to the subject property are of two types; a yield tax levied when timber is harvested and a timberland tax. The yield tax is based on a Harvest Values Schedule provided by the California State Board of Equalization as is based on the type of timber, volume per log, the timber value area, and a number of adjustments. The tax rate is 2.9%.

The land tax is based on the productivity of the land and for the Redwood region is as follows:

	Assessed Value
Site Class	Per Acre
I	\$279
II	\$227
III	\$198
IV	\$172
V	\$ 54

The tax rate is 1.02%.

Vegetation³¹

Redwood Stands

Redwood stands are distributed in an irregular strip along the coast of California from the extreme southwestern corner of Oregon extending about 450 miles south to Monterey County. The strip is 5 to 35 miles wide in a region of fog and high soil moisture content that ranges from sea level to 3,500 feet in elevation. Redwood is generally found in association with Douglas fir, western hemlock, California bay, madrone, and tanoak with an under-story of California huckleberry, various ferns, rhododendrons, western azaleas, and wood-sorrel. Prior to 1850, the redwood forest covered approximately 2,170,000 acres and is estimated to have contained more than 100 billion board feet of timber. In 1980, California still contained approximately 1.6 million acres of forested land with redwood trees (Green, 1985). Mature trees range from 200 to 240 feet tall and are often 10 to 15 feet in diameter. The largest trees may reach a height of 350 feet, 17 feet in diameter, and may be approximately 1,800 years old. Mature redwood is fire resistant, generally free of fungal disease, and not normally attractive to insects. Redwood stands support a variety of populations of birds, mammals, amphibians, and reptiles. Mature trees effectively block well over 90 percent of

³¹ Source: Pacific Lumber Company, Draft Habitat Conservation Plan, 1998.

the light striking them, creating a heavily shaded growing environment for under-story species. Annual rainfall during the wet season ranges from 35 to 100 inches per year while in the dry summer weather redwoods rely heavily on condensation from fog.

Redwoods currently grow throughout their natural range, but large areas that once supported redwood have been converted to urban and agricultural uses. Approximately eight percent of the remaining forest area is considered old-growth redwood, 65 percent is predominantly younger redwood stands, and 13 percent Douglas fir and hardwoods with redwood as an associated tree. The remaining 14 percent consists of minor tree species and non-forest vegetation. More than 130 years of timber harvest and related activities have changed the forest composition by shifting the age class distribution from primarily old growth to younger immature stands. The age of most stands of trees is less than 130 years old with a large percentage less than 50 years old. Young redwood stands have fewer associated tree species than old-growth stands. The remaining old-growth stands are widely separated, often by extensive areas of highly fragmented forest (Fox, 1996). Humboldt Redwoods State Park, approximately 17 miles south of the Headwaters Grove area, and Redwood National Park, approximately 30 miles to the north, are the closest areas to PALCO property with large old-growth redwood forests.

Generally, the most productive and largest redwood stands grow on the moist alluvial floodplains and terraces in association with other shade-tolerant tree and shrub species such as western hemlock, Sitka spruce, grand fir, occasional western red cedar, tanoak, red alder, rhododendrons, azaleas, sword fern, deer fern, salmonberry, California huckleberry, red huckleberry, fireweed, oceanspray, poison oak, thimbleberry, casara, ceanothus, and oxalis (Mayer and Laudenslayer, 1988). Fires are infrequent and rarely occur more often than every 500 years. However, when a forest of this type does burn, the typical fire intensity is relatively low, and the fire only damages thin-barked or low growing species, leaving the taller, thick-barked species such as redwood and Douglas fir as the dominant trees. Only shade tolerant species such as redwood, western hemlock, and western red cedar regenerate under these conditions.

Redwoods are vigorous sprouters, unlike other conifer associates. Sprouts eventually form the dominant canopy after disturbances such as timber harvest. Redwood also regenerates well by seed (Mayer and Laudenslayer, 1988). Inland redwood stands generally grow on steeper slopes and are a mixture of Douglas fir, redwood, tanoak, and madrone. The stands become less vigorous at higher elevations and with increased distance from the ocean. Fires are more frequent and in some areas occur every 30 to 50 years. The fires are hotter and damage more trees. The residual stands are more open, hotter, and dryer. They provide a harsher regeneration environment. Shade-tolerant western hemlock and red cedar do not regenerate successfully in these conditions, and the resulting stands are dominated by Douglas fir, tanoak, and madrone, with redwood as a minor species (Twight, 1993; Barbour and Billings, 1988).

Douglas fir Stands

The Douglas fir forest is a complex mosaic of stands resulting from geologic, topographic, and successional variations. Redwood usually represents some percentage of Douglas fir stands. Typically, these stands include a lower understory of dense, sclerophyllous, broad-leaved evergreen trees (tanoak and madrone) which are often over 100 feet tall, with an irregular, higher over-story of taller conifer. Douglas fir, the major species, can reach heights of nearly 300 feet and diameters of 15 feet with an average of five to seven feet (Marcot, 1979; Sawyer, 1980; Thornburgh, 1982; Franklin et al., 1981 in Mayer and Laudenslayer, 1988). A small number of pole and sapling trees occur throughout these stands. On wet sites, shrub layers are well developed, often covering 100 percent of the area. Herbaceous plants can cover up to 10 percent of the ground. The shrub and herbaceous layers are poorly developed in dryer areas. The diversity of tree size typically increases with stand age, as does spacing (Franklin et al., 1981). Young stands are usually dense and uniform. As trees age, many die, creating gaps in the over-story, large snags, and down logs. These gaps in the over-story are quickly filled with tanoak and madrone. This process can take from 80 to over 250 years (McArdle, 1961; Lang, 1980; Franklin et al., 1981). This plant community occurs at moderate elevations in juxtaposition with other plant communities, including redwood, hardwood-conifer, and hardwood. Topography is usually rugged, deeply dissected terrain and steep slopes (Franklin and Dyrness, 1973, in Mayer and Laudenslayer, 1988).

As in the case with redwood, Douglas fir trees currently grow throughout their natural range, but large areas that once supported Douglas fir forests have been converted to urban and agricultural uses. Despite the fact that much of the remaining Douglas fir forest has been converted to managed stands (FEMAT, 1993) there are still much older Douglas fir stands remaining in the region.

On BLM lands in the Arcata Resource Area, there are approximately 20,000 acres of Douglas fir dominated stands with an average dbh of greater than 24 inches and a canopy closure of greater than 60 percent. All of this acreage is in reserved allocations under the Northwest Forest Plan. About 4,216 acres of these stands are scattered within various tributary watersheds of the Mattole River (Personal communications; S. Hawks, BLM Arcata Resource Area, September 9, 1998; Paul Roush, BLM Arcata Resource Area, September 9, 1998). On the Six Rivers National Forest, in Del Norte, Humboldt, and western Trinity counties, approximately 208,710 acres of late successional timber types containing Douglas fir occur in late successional reserve management allocations or wilderness status under the Northwest Forest Plan (Personal communication, Jeff Mattison, Six Rivers National Forest, September 9, 1998). These stands consisted of multi-layered conditions and a total canopy closure greater than or equal to 70 percent from overstory trees greater than or equal to 21 inches dbh which comprises at least 40 percent of the total canopy closure. Additional acreage containing this vegetative series occurs in unmapped riparian reserves, occupied marbled

murrelet stands, and 100-acre late successional reserves which would be unavailable for timber harvest.

Hardwood Conifer or Mixed Evergreen Forest

The hardwood-conifer plant community often occurs as a mosaic of small stands of conifers interspersed with small stands of broad-leaved hardwoods. These include tanoak, Oregon white oak, madrone, red alder, California black oak, golden chinquapin, and canyon live oak. Conifers include Douglas fir, western red cedar, western hemlock, ponderosa pine, sugar pine, and knobcone pine (Kuchler, 1977; McDonald, 1980; Parker and Matyas, 1981, in Mayer and Laudenslayer, 1988). Between one-third and two-thirds of the trees are hardwoods (Anderson et al., 1976 in Mayer and Laudenslayer, 1988). This is a very diverse plant community that usually forms dense stands with little understory vegetation. Typically, conifers are up to 200 feet high, and hardwoods range from 30 to 100 feet (Cheatham and Haller, 1975, in Mayer and Laudenslayer, 1988). This community generally occurs on coarse, well-drained mesic soils in steep, mountainous terrain (Munz and Kech, 1970 in Mayer and Laudenslayer, 1988). Secondary succession is vigorous following fire or harvest. Hardwoods and shrubs regenerate together by sprouting from the root crowns. Hardwood trees normally mature in 60 to 90 years (Mayer and Laudenslayer, 1988).

Hardwood

The Hardwood plant community, sometimes considered part of the mixed evergreen forest, is composed of hardwoods with poorly developed shrub and herbaceous layers. On better sites, trees or small clumps of trees are usually spaced 10 to 13 feet apart, while on poor sites they may average over 30 feet apart. Crowns seldom overlap. Trees range from only about 30 feet to nearly 100 feet tall with full crowns. Snags and down logs generally are sparse. Canyon live oak often forms pure stands on steep canyon slopes and rocky ridgetops. In other areas it forms a mixed stand with knobcone pie, gray pine, white oak, and coast live oak. At higher elevations, there is often a scattered overstory of pine. In the middle elevations, Douglas fir, madrone, California laurel, and black oak often occur. Understory vegetation is mostly scattered shrubs (manzanita, mountain-mahogany, and poison oak) and a few forbs. This is a very stable plant community with many tree species that mature slowly, often living more than 300 years, and which sprout vigorously from the root crown if the aboveground portions are killed by fire or cut (Mayer and Laudenslayer, 1988).

Montane Riparian or Deciduous Riparian

Montane riparian plant communities generally occur as narrow dense groves of deciduous trees up to 100 feet tall. They are often diverse in both species and structure. Black cottonwood is a dominant tree, along with big-leaf maple in some areas. Dogwood and boxelder are also common. Montane riparian communities tend to maintain a mosaic of stages which vary as a result of periodic flooding.

They are often damaged by debris, sedimentation, or the uprooting of entire plants which are redeposited further downstream. Riparian areas are associated with montane lakes, ponds, seeps, bogs, and meadows, as well as rivers, streams, and springs (Mayer and Laudenslayer, 1988).

Valley Foothill Riparian or Forested Wetland

Most trees in this plant community are deciduous, generally black cottonwood. Canopy height in mature riparian forest is nearly 100 feet, and canopy cover varies from 20 to 80 percent. Alder, boxelder, and Oregon ash are typical subcanopy trees. The understory is usually very dense, with wild grape, wild rose, California blackberry, blue elderberry, poison oak, buttonbrush, and willows. The herbaceous layer is sparse, except in openings. It generally includes sedges, rushes, grasses, miner's lettuce, Douglas sagewort, poison hemlock, and hoary nettle. Valley foothill riparian communities are often found on alluvial fans and slightly dissected terraces in floodplains (Mayer and Laudenslayer, 1988).

Perennial Grassland or Prairie

With the exception of coastal prairies under maritime influence, grasslands in the Project Area are either relic perennial grasslands now dominated by annual grasses, or grasslands created by timber harvest or fire followed by grazing. These annual grasslands are open areas whose structure depends largely on weather patterns and livestock grazing. Fall rains cause the germination of annual plant seeds. Plants grow slowly during the winter months. In spring, when temperatures rise, plant growth is rapid, especially in years with heavy spring rains. If grazing is light, large amounts of standing dead plant material persists through the summer. If spring grazing is heavy, summer annual forbs, such as tarweed and turkey mullein, are common. Introduced annual grasses include wild oats, soft chess, ripgut brome, red brome, wild barley, and foxtail fescue. Common forbs include broadleaf filaree, redstem filaree, turkey mullein, true clovers, bur clover, popcorn flower, and California poppy. Perennial grasses found in moist, lightly grazed relic prairie areas include purpose needlegrass and Idaho fescue. The nonnative annuals prevent the reestablishment of native perennials over large areas and now comprise the climax communities on natural perennial grasslands (Mayer and Laudenslayer, 1988). Areas that have been converted to grasslands through human activity can be distinguished from natural grasslands by their forest-type soil structures. The establishment of grasses on sites formerly supporting Douglas fir may prevent succession back to the original forest cover (Mayer and Laudenslayer, 1988).

Wet Meadow

Wet meadows generally have a layer of herbaceous plants. Shrub and tree layers are usually absent or very sparse. Wet meadows have a great variety of plant species. Common genera include *Agrostis*, *Carex*, *Danthonia*, *Juncus*, *Salix*, and

Scirpus. Important grass and grass-like species include thin grass, abruptbeak sedge, beaked sedge, Nebraska sedge, tufted hairgrass, spikerush, Baltic rush, Nevada rush, iris-leaf rush, pullup muhly, and paniced bulrush. Important forbs include Anderson aster, Jeffrey shootingstar, trailing Saint-Johnswort, hairy pepperwort, primrose monkeyflower, western cowban, American bistort, cow's clover, and small white violet. Willow and bilberry are the only shrubs commonly found. Wet meadows occur where water is at or near the surface for most of the growing season. They usually occur as ecotones between fresh emergent wetlands and perennial grasslands. Where wet meadows merge with fresh emergent wetlands, slight differences in water depth control the species composition (Mayer and Laudenslayer, 1988).

Fresh Emergent Wetland

Fresh emergent wetlands are characterized by hydrophytes. Dominant vegetation is generally perennial monocots up to 6.5 feet tall. All emergent wetlands are frequently flooded and have vegetation which grows in anaerobic conditions. On the upper margins of fresh emergent wetlands, saturated or periodically flooded soils support several moist-soil plant species, including big-leaf sedge, Baltic rush, and redroot nutgrass. On wetter sites, common cattail, tube bulrush, river bulrush, and arrowhead are dominant. These wetlands occur in association with both terrestrial and aquatic habitats, including riverine, lacustrine, and wet meadows. They can occur on any exposure and slope where there is a basin or depression with saturated soils. However, they are most common on level to gently rolling topography. They often follow contours and reflect the relative depth and duration of flooding. If the bottom of the wetland is very uneven, wetland vegetation may be patchy (Mayer and Laudenslayer, 1988).

Invasive and Noxious Weeds

Invasive and noxious weeds, such as Scotch broom (*Cytisus scoparius*), pampas grass (*Cortaderia jubata*), and tansy ragwort (*Senecio jacobaea*) are common in the region. These plants thrive in open areas with disturbed soil. They often spread into new areas along roads and logging skid roads. When the forest overstory is removed through timber harvest, these weeds may out-compete native plants, reducing native plant biodiversity in the understory. The risk of noxious weed infestation increases with the amount of road building and clearcutting.

Rare and Uncommon Flora

Rare plants contribute to the biological diversity of the redwood forest ecosystem. The ESA generally prohibits federal agencies from taking actions which would jeopardize the continued existence of plants listed or proposed to be listed by FWS. CEQA requires consideration and avoidance of effects on significant plants, which are defined as those designated as threatened or endangered by FWS, as

threatened, endangered, or rare by CDFG, or any species included on the California Native Plant Society (CNPS) Lists 1A, 1B, or 2.

The numbers and distribution of rare plants in the redwood ecosystem reflect, in part, the diversity of substrata, microclimates, and land uses. Because of their patchy distribution, occurrence of many rare plants can only be ascertained by field surveys conducted at the appropriate time of year, by qualified personnel, and at sufficient sampling detail to include the relatively small patches of potential habitat that might be distributed across the survey area. The area affected by the proposed SYP/HCP and land acquisitions comprises over 200,000 acres, very little of which has been thoroughly surveyed for rare flora.

Records of historic and contemporary sightings of rare plants are maintained by FWS, CDFG, and CNPS.

Plant species included on the HCP List B are included on table 3.9-4, along with their rarity status and general habitat. Table 3.9-4 includes all plant species which are rare, threatened or endangered and which are known to grow on habitats which might occur on PALCO or Elk River Timber Company lands.

FWS identified five listed or proposed threatened or endangered plant species that might be affected by the proposed action: *Lathyrus biflorus* (Candidate), *Erysimum menziesii* (Endangered), *Lilium occidentale* (Endangered), and *Thlaspi montanum var. californicum* (Proposed endangered) (letter from Bruce Halstead, FWS, dated April 14, 1998). *E. menziesii* and *L. carnosum* are not included because the coastal dune and beach habitats on which these two species occur are not found on PALCO or Elk River Timber Company lands.

No threatened, endangered, candidate or proposed plant species have been reported on PALCO or Elk River Timber Company properties, but occurrences of rare plants on these lands have not been surveyed. Six of the species have been reported from hydrologic units that contain PALCO property that would be subject to the HCP. *Calamagrostis foliosa* has been reported from the Mattole Delta unit; *Carex leptalea* and *Lilium occidentale* from the Elk River unit; *Monardella villosa ssp. globosa* from the Lower Eel River unit; and *Sidalcea malviflora ssp. patula* from the Van Duzen unit. *Sidalcea malachroides* has been reported from ten hydrologic units that contain PALCO HCP lands (CDFG NDDB). *Lilium occidentale* is listed by FWS and California as Endangered; *Calamagrostis foliosa* is listed by California as Rare. The other six species are included on CNPS Lists 1B or 2.

A variety of habitats found on the PALCO and Elk River Timber Company properties support rare flora. Broadly defined, habitats supporting plants include coastal prairie, chaparral, cismontane woodland, broadleafed upland forest, coniferous forest and wetlands. Some species typically associate with serpentine substrate; others associate with marshes and wet meadows. For a number of the

species, however, habitats encompass a broad category of physical conditions or are not well documented.

Fish and Wildlife

The fish and wildlife found on each individual MMCA is discussed in the site specific section which follows. We obtained this list from the *Pacific Lumber Company Habitat Conservation Plan: Covered Species and Other California Wildlife Species of Special Concern, or Sensitive Species, Which Occur on PALCO Lands, and Are Considered When Planning Timber Harvest or Other Activities, December 3, 2002*. The following is a listing by species that are found, in general, throughout the Pacific Lumber Company lands, and within the subject blocks of land in particular:

Fish

- Coho Salmon
- Chinook Salmon
- Coastal Cutthroat Trout
- Steelhead

Amphibians

- Red-legged Frog
- Tailed Frog
- Southern Torrent Salamander
- Foothill Yellow-legged Frog

Reptiles

- Northwestern Pond Turtle

Birds

- Bald Eagle
- American Peregrine Falcon
- Marbled Murrelet
- Northern Spotted Owl
- Western Snowy Plover
- Bank Swallow
- Voxes Swift
- Northern Goshawk
- Cooper's Hawk
- Sharp-shinned Hawk
- Osprey
- Great Blue Heron
- Great Egret
- Willow Flycatcher

Mammals

- Pacific Fisher
- California Red Tree Vole
- Humboldt Marten
- Townsend's Big-eared Bat