

Chapter 6

Mid-twentieth Century Logging and the Beginnings of Modern Resource Management

After World War II, bulldozers, tractors, and trucks replaced the steam railroads. This new technology again expanded the land that could be profitably logged and resulted in the building of many roads into the forests. Clear-cutting was generally the preferred method, and state tax laws encouraged the cutting of 70% or more of the trees in a stand so as to remove standing timber from the tax rolls. The increased soil disturbance and lack of successful growth of redwoods from seeds sometimes encouraged the growth of other associated species such as Douglas-fir and hemlock, so companies sometimes supplemented the anticipated regeneration from stump sprouting by planting redwood seedlings.

The logging industry was extremely important in the redwood region in the 1950s and 1960s, particularly in Del Norte and Humboldt Counties. In 1953, for example, the six largest timber operators paid over 40% of the taxes in Del Norte County, while about half of Humboldt County private-sector employees who had unemployment insurance in the 1950s worked in the timber/lumber industry. In the 1950s, moreover, the per-capita income in Humboldt County was comparable to the rest of California. (Hackett, 2006)

From the mid-1930s to the 1960s, selective logging was tried in the redwood region. With selective logging, a portion of the stand, usually between 50% and 75%, is left for future growth and reseedling, and it was facilitated by the development of logging tractors developed during this time. Since selective logging opens up the forest canopy, there is accelerated growth (or **release**) of the remaining trees. I have seen a section from a log that started to grow about 200 years ago. It took 137 years to reach a radius of less than 4 inches. At that point, the trees around the 8 inch diameter tree were cut, releasing the tree for faster growth. In the next 71 years, the tree grew 24 inches in radius. Its growth rate went from about 3/100 inch per year to about 34/100 inches; the released tree was growing about 11 times as fast as the **suppressed** tree.

Selective logging was tried, but was problematic in the north because strong storm winds tended to blow down the exposed remaining trees in some areas. Selective logging tended to convert some stands to brush and other types of trees such as hemlock and grand fir, at least in the short term. Repeated entry into the forest sometimes caused damage to the remaining trees and soil. For these and other reasons, including economics, selective logging has been replaced by clear-cutting in most areas, especially in the northern regions. However, in *A Review of Redwood Harvesting: Another Look – 1990*, Lowell cautioned that different techniques should be used in different areas.

A major storm in 1959 blew down many redwoods in Humboldt and Del Norte Counties, especially in areas that had been selectively logged. This led to approval of increased clear-cutting. Leaving seed trees was found to be unsuitable for the timber companies because of the tendency of the seed trees to be knocked down by the wind, because

ongoing seed production from the seed tree produced uneven aged stands, and because of the high mortality of germinating seeds due to fungal attack. Planting of seedlings increased, especially where sprouting was inadequate to provide well-stocked stands.

As mentioned above, different harvesting techniques seem to work best in different areas. In the Santa Cruz area, Big Creek Lumber Company often uses selective logging techniques on lands that were first cut a hundred years ago. They are now harvesting logs that are larger than those from the first one or two young-growth cuttings, indicating that the thinning of the forest, coupled with more time, is increasing log size. Whereas 40 years ago it may have taken 25 or 30 logs to fill a truck, it often takes only 12 or fewer logs to fill a truck today. (See Figures 99, 100, and 101.)

(An interesting pair of booklets has been produced by the California Department of Forestry and Fire Protection: *A Review of Harvesting Redwood*, by Verne Osburn and Phillip Lowell, 1972, and *A Review of Redwood Harvesting: Another Look ---1990*, by Phillip Lowell. Both provide before and after pictures of sites that have been logged. They clearly show the ability of the coast redwood to regrow in areas that appear to have been devastated by logging.)

As old-growth forests were harvested, second- and third-growth forests were maturing to a harvestable size, and timber companies began harvesting the young growth stands. New laws and regulations required lumber companies to replant more trees, reduce damage to the land, and provide more protection for streams and wildlife. At the same time, the companies were developing different attitudes and practices.

The face of the timber industry was changing from exploitative logging to management of not only timber, but soil, wildlife, water, and other resources. Management for sustainable growth became the objective. Goals have changed from simply cutting and selling wood to the preservation of land as forest, restoration of redwood forests, and connecting forest landscapes for forest and wildlife health.

Chapter 7

Conservation Concerns and Efforts

The giant Sequoia redwoods of the Sierra (*Sequoiadendron giganteum*) were the first to be protected. Their range was, and is, much more limited than the coast redwood, and they were heavily exploited during the gold rush. The Lincoln-Mariposa grove received protection in 1864, and in 1890, groves in Sequoia-Kings Canyon and Yosemite received protection.

In 1885, California's State Board of Forestry (now the California Board of Forestry and Fire Protection) was created to both regulate and assist the lumber industry. Most of its efforts centered on fire prevention and how to deal with slash. This was the first state forest regulatory body in the nation, and its creation was partly due to concern about the redwoods.

Public concern about the coast redwoods continued to grow, especially in the San Francisco Bay Area. In 1901, Big Basin State Park was created, largely through the efforts of the Sempervirens Club (now the Sempervirens Fund), led by Andrew P. Hill. To the 2,500 acres purchased by the state were added 1,300 acres donated by lumberman Henry Middleton. In 1902, William and Elizabeth Kent purchased Muir Woods, in Marin County, to protect the old-growth redwoods there from being logged. In 1908, they donated the area to the nation and it became Muir Woods National Monument. These parks were created in the area that had been first heavily impacted by coast redwood logging, which was also an area where they could be easily visited by urbanites from San Francisco and San Jose. The effort to protect the redwoods was one of the rallying cries of the national preservation movement of the early twentieth century. (Figure 93.)

In the early 1900s, preservationists in the north coast counties tried to get the federal government to purchase redwood lands for a national park, but the government failed to act. During World War I, logging of the redwoods increased, and preservationists became more concerned. In 1918, the Save-the-Redwoods League was formed with the purpose of protecting both the coast redwoods and giant Sequoias. Using private donations, the League purchased redwood lands and contributed them to the State Parks System. (Figure 94.)



Figure 93. An expedition to the Big Basin area of the Santa Cruz Mountains in 1900 resulted in the formation of the Sempervirens Club, which worked for the creation of the world's first redwood park, in 1902. (Now named the Sempervirens Fund, the organization has raised funds to preserve over 20,000 acres in the Santa Cruz Mountain area.) (Photo courtesy of the Sempervirens Fund.)



Figure 94. Founded in 1918, the Save-the-Redwoods League has used more than \$100 million to purchase over 130,000 acres of redwood land for California State Parks, Redwood National Park, Sequoia National Park, and other parks and preserves. (Photo courtesy of the Save-the-Redwoods League.)

There were several instances in which lumber companies refrained from logging prize parcels until the state or private organizations could raise the money to purchase them for parks. This is even more significant when one considers that the companies continued to pay taxes on the land and to provide fire protection and insurance. In the 1920s and 1930s, with support of the League, the federal government did some studies of the feasibility of a national park, but legislative action to establish a national park was not taken.

In the mid-1940s, a number of forestry bills were passed by the state legislature. In 1945, the Forest Practices Act established four Forest Districts, including one for the coast redwood region. The 1945 Forest Practice Act, however, was essentially toothless. It relied on education and persuasion to try to get the timber industry to regulate itself...with voluntary compliance. Fire protection statutes were sometimes used to try to get the industry to improve its management, but little was done besides sending letters (Arvola, 1976).

In the early 1950s, logging permit systems and other statutes were enacted, providing some tools for regulation of the industry, but they mostly applied to publicly owned land. In the mid- and late-1950s, the Forest Practices Act was further strengthened and clarified. At the same time, laws to protect streams and fish resources began to be enacted. In the mid-1950s, the Sierra Club and other environmental organizations began to criticize the law because of its lack of effective regulation of the timber industry.

In the 1940s-1960s, timber owners were taxed on the amount of standing timber, which encouraged them to cut the trees, especially the larger ones. (Since the 1970s, taxes have been based on the amount of wood harvested.)

When considering and discussing the logging of the redwoods (or any other type of tree) it is important to keep in mind that most logging is done to fill a demand for lumber. If people weren't buying the wood, the companies wouldn't be cutting it. We all use wood products in many ways. In some cases, using wood is environmentally preferable because wood is renewable, recyclable, decomposable, and a vigorously growing young forest provides many environmental benefits. (See Chapter 9.)

It is also important to keep in mind that different people have different interests and priorities, and that society's values change over time. In the 1800s, redwoods were logged with little regard for the environment. Some refer to the early practices as "mining" the forests – cut down and get out. Today, redwood logging companies are heavily regulated and many also have learned the importance of minimizing environmental damage to their land by practicing sustained yield management. In the 1700s and 1800s, the vast expanses of redwood forest must have seemed limitless to many, especially when logging was done with a hand axe. Today's increased population and modern technology have "shrunk" the world so that the remaining stands of protected redwoods seem to many to be inadequate.

A preservationist, a logger, a home builder, a park department employee, and a county tax collector might all view the same stand of redwood trees very differently. Today, much of the redwood lumber goes to building decks and fences, and almost all of it comes from young-growth forests. A hundred years ago, in 1906, the redwood lumber came from old-growth forests and went to rebuilding San Francisco and other cities devastated by the 1906 earthquake. Decisions about resource management are a complex balancing act of social, environmental, economic, aesthetic, and spiritual values.

In some cases, a "not in my back yard" sort of attitude exists. Whereas California was recently self-sufficient in meeting its lumber needs, California now imports 70-80% of the wood consumed here. (The redwood that we use here comes from California, but efforts to grow coast redwood commercially began in New Zealand in 1901, and commercial-growth experiments are being conducted elsewhere.) In Oregon, clear-cuts of up to 120 acres are allowed, and Washington allows clear-cuts of up to 240 acres. California's regulations limit clear-cuts to 40 acres, and most are limited to 30 acres or

less. Is it preferable to import clear-cut pine or Douglas-fir from Oregon or Washington for use in California? Is it acceptable to cut young-growth redwood but not old-growth? Many people who oppose the logging of redwoods also use redwood lumber to build their decks and fences and panel their offices. Some people get upset when they can see the clear-cuts along a roadside, but say nothing when the logging is out of sight.

From the perspective of the timber industry, redwoods on private land are a crop to be harvested and regrown in an ongoing, sustainable way. Crops of carrots and corn are harvested after a season; crops of redwood trees are harvested in cycles that are decades long. While a corn field or carrot patch doesn't usually provide habitat for wildlife, a growing redwood stand provides habitat and other benefits. Unlike some alternatives, redwoods are a renewable resource. Furthermore, there are land ownership questions. Why should land owners be prevented from running a business and making a profit from timber on land that they own? What about a private land owner who has grown trees for 30 or more years, anticipating harvesting them, only to have the regulations change?

A young growth forest is not, of course, the same as an old-growth forest, and the logging of redwoods, whether young growth or old-growth, impacts many more species than just the trees being harvested. While a backyard garden may regrow in a few months, a tract of clear-cut redwood trees covers up to 30 acres, will usually be covered with a variety of new growth within a few years, and after some decades will regrow a forest of large trees, providing wildlife habitat in the meantime. The harvesting of the redwoods is heavily regulated, and a stand of healthy redwood trees provides wildlife habitat and other environmental benefits. On the other hand, cutting of the forest to make way for houses, roads, and other development eliminates wildlife habitat and results in other environmental problems, such as runoff and pesticide pollution.

Teaching idea



If you can obtain old high school science text books, it is interesting to compare what is written about conservation, ecology, the environment, etc. in different eras. Students can try looking up such words as conservation, ecology, ecosystem, land management, etc. When I went to high school in the early 1960s, our biology text discussed conservation as contour plowing and fire prevention, and the term "ecology" wasn't even used in the book. By the mid-1970s, high school texts had expanded "ecology" to include many other issues. Today, in the early twenty-first century, texts may discuss global environmental issues such as global warming, but emphasis on standards often precludes much emphasis on ecology and the environment.

Older encyclopedias can be interesting for students to explore, too. The 1962 World Book Encyclopedia, for example, includes an article on "Conservation," authored by J. Russell Whitaker. In that article there are sub-headings for "kinds of conservation," including soil, water, forest, mineral, wildlife, and human conservation. The 2002 World

Book Encyclopedia "Conservation" article, by Daniel Simberloff, includes subheadings for soil, water, forest, and mineral, but has added biodiversity, ocean, grazing lands, energy, and urban. The 1962 edition classifies the coast redwood as in the pine family, while the 2002 classifies it in the Taxodiaceae family.

Criticism of the logging industry continued in the 1960s, especially with regards to protection of fish habitat and breeding grounds. In 1963, a study was begun in the redwood region to assess the damage caused by the 1954 -1955 flooding in the Rockefeller Grove in Humboldt Redwoods State Park (Barbour *et al.*, 2001). As a result of that study, the California Department of Parks and Recreation acquired additional land along Bull Creek.

Another disastrous flood hit the redwood region in December 1964—the second "once in a hundred years" flood to hit in a decade. In November, rainfall in Eureka was 160% of normal. The rain melted snow packs in the Siskiyou and Trinity mountain ranges, and in coastal Oregon. The ground was too saturated to absorb more water, and creeks became hundred-foot-wide rivers carrying trees and boulders downstream. Unfortunately, the storm coincided with high tides, which contributed to the flooding. The Eel River carried a million cubic feet of water per second – 40 times the average flow of the Sacramento River and three-fourths that of the Mississippi (Nixon, 1966). Highways and bridges were washed out as water levels rose over ninety feet in some places. (Figure 95.)

See the activity "The Root of the Matter" in Section IV.

Critics of redwood logging claimed that the floods were worsened by clear-cut logging practices (Nixon, 1963). Timber industry supporters pointed out that huge floods had repeatedly hit the region before significant logging had occurred in the area, and that some flooding would probably have occurred even without logging. Streamflow data from the U.S. Geological Survey shows that, after 1964, streamflow rates were only slightly elevated as compared to before 1964.

Teaching Idea



Streamflow data can be obtained from the U.S.G.S. for hundreds of measurement sites throughout California. The data for the Eel River at Scotia, for example, goes back to 1911. The data can be downloaded in both numerical table format and as a graph. Students can learn to read the tables and graphs, and discuss the implications of the data. Go to:
< <http://waterdata.usgs.gov/nwis/peak> > (note the lack of "www")

See the activity "Flood Math" in Section IV.



Figure 95. The Eel River flood of 1964. (Photo courtesy of Pacific Lumber Company.)

Flooding is a natural occurrence in the redwood forest; it brings nutrients to the trees that live in the bottomland of the streams and kills some competing plants. The 1964 flood deposited 36 inches of silt in some areas. A soil pit dug at Bull Creek Flat showed an accumulation of thirty feet of silt from about fifteen floods over a thousand year period. Critics of the timber industry claimed that, although flooding is natural, the logging significantly worsened the impact on the streams and human communities.

Studies of the Redwood Creek basin in Humboldt County have shown that, following logging and the building of hundreds of miles of logging roads, repeated flooding between 1955 and 1975 led to extensive sedimentation and bank erosion. As of 1996, the stream still had not recovered (Ozaki, 1996). Another study, in the Caspar Creek basin in Mendocino County, showed that in the winter following the construction of logging roads, streams sometimes had increased sediment loads of 300-400%, and that for several winters after logging, the sediment loads increased 100-500%, returning to pre-logging levels in 6-7 years after the logging was completed. In general, the flow of

water in the streams didn't seem to have been affected, but sediment load did. These studies were done in areas where 90-year-old second growth stands were logged between 1971 and 1991 (Zimmer *et al.*, 1996).

Determining the cause of increased sediment loads in streams is not easy, though. Comparing sediments before and after logging is complicated by such things as landslides that may or may not be related to logging and variations in weather. At the Jackson Demonstration State Forest in Mendocino County, there has been an ongoing study in the Caspar Creek watershed since 1962. In that study, they are comparing different logging techniques and their impacts on the streams. Those studies (Lewis, 1998) indicate that:

- 1) While all methods of logging increased sediment loads in streams, old methods such as building roads near streams, yarding by tractor, and not protecting streams produced 2.4-3.7 times as much increase in suspended sediments as modern practices produced.
- 2) Much of the increased sediment load was due to increased runoff during storms, which would be expected to decrease as the forest grows back.
- 3) Old logging roads ("legacy" roads) continue to be a factor in producing landslides and, therefore, increased sediment loads, for many years after the logging has ceased. Roads located on upper slopes didn't seem to be a "significant source of sediment reaching the channels."

Another finding of the Caspar Creek Watershed study has been that salmonid (trout and salmon) abundance declined after logging but returned to pre-disturbance levels after only 2 years (Caspar Creek Experimental Watershed, 2006).

Throughout most of California and the nation, it was the preservationists' message about the 1964 floods that was heard. The flooding further focused public attention on the clear-cut logging practiced in many redwood drainages, and public outcry increased. One lumber company, following its normal harvest plans, clear-cut alongside the major highway in the region, Highway 101, the "Redwood Highway," which further fueled public concern.

Although the establishment of a Redwood National Park was proposed by the first Secretary of the Interior, Carol Schurz, in 1879, it wasn't until the early 1960s that public concern and outcry about redwood logging created enough support to make it happen. In 1963, the National Geographic Society funded a survey to locate the remaining old-growth redwoods and suggest the location for a Redwood National Park. The survey showed that only about 15% of the original two million acres of virgin redwoods were uncut. Of those 300,000 uncut acres of redwood forest, about 50,000 were already in state parks (Rasp, 1989).

Discovery of the three largest known trees, in the "Tall Trees Grove," along Redwood Creek, in Humboldt County, further fueled the public demand for a Redwood National

Park. Needless to say, various stakeholders had vastly differing ideas of how much land should be included in the proposed park. The timber industry promoted the idea that most of the park should be made up of land already protected in Jedediah Smith, Del Norte Coast, and Prairie Creek Redwoods State Parks. Many of the citizens of Humboldt and Del Norte Counties opposed the creation of a national park, not only because of the logging or other related jobs lost due to the designation of timber land as park land, but also because of the taxes that would have been received from the timber sales. Those taxes, it was maintained, were needed to support city governments, schools, and fire districts. Some claimed that the creation of a national park would bring about a new "Appalachia" Ronald Reagan opposed the creation of a redwood national park and supposedly said, "If you've seen one redwood, you've seen them all." (I have been unable to confirm that he actually said that, but, in a speech to the Western Wood Products Association on Sept. 12, 1965, he did say "A tree is a tree. How many more do you need to look at?" (Snopes, accessed June,2006)).

Teaching Idea



*If possible, obtain a copy of the July, 1964, National Geographic Magazine (Vol. 26, No.1). * It includes articles by Melville Grosvenor and Paul Zahl about the discovery of the Tall Trees Grove. Have the students read and discuss the article.*

- *Discuss the meaning of the term "hyperbole."*
- *Discuss the photograph on pages 2-4, which shows logging just across Redwood Creek from the grove.*

The article includes a map showing the ranges of the coast redwood and giant sequoia, the measurement of a tree's circumference/diameter, various redwood forest organisms, sprouting from a fallen tree, logging operations, growth rings, and many other aspects of the coast redwood's human and natural history.

(The same issue has an article on the 1964 Alaskan earthquake, which caused a tsunami in Crescent City.)

** Libraries, flea markets, and used book stores often have old National Geographic Magazines, as do students' parents and grandparents. A parent might be willing to take on the task of finding a copy of this issue.*

Park advocates, on the other hand, maintained that money lost from the lumber industry would be made up by increased tourism. Loggers could be retrained to work in the tourist industry. More park employees would be needed. The federal government would provide economic aid to the counties to compensate for lost tax money. The federal government would also pay for the land.

The National Geographic study recommended a Redwood National Park of 53,600 acres. The Sierra Club promoted a 90,000-acre national park in the 280 square mile Redwood Creek watershed. It was not until 1966 that President Johnson sent a bill to Congress, and the creation of the park was not authorized until 1968. The final

authorization was for a Redwood National Park of about 55,000 acres, with about 28,000 coming from private owners, including about 11,000 acres of virgin redwood forest. In order to close the deal, federally owned forest was traded to lumber companies in order to lower the cost and also reduce opposition. Today, the Redwood National and State Parks in northern Humboldt and Del Norte Counties are managed cooperatively by the California Department of Parks and Recreation and the National Park Service (Barbour *et al.*, 2001).

In spite of the optimistic hopes of the park advocates, personal income in Humboldt County has not kept pace with the rest of the state. A factor in the reduced personal income in the redwood region has been a shift from well-paying wood product manufacturing jobs to lower paying service industry jobs. As timberland was protected in parks, it was hoped that tourism would replace some of the jobs lost in the timber industry. Not only do tourism/service jobs not pay as well as timber industry jobs, but they have not materialized as was once hoped.

According to Hackett (2005), environmental regulations have played a role in job losses in the lumber industry, but other factors, such as mill consolidation, have played a greater role.

Teaching Idea



It is interesting to look at magazine articles about the redwoods and the proposed park from the mid-1960s. Local libraries, bookstores, or online sources may have old issues of National Geographic, Saturday Evening Post, Life, Time, or Newsweek. The April 22, 1967, Saturday Evening Post, for example, has an article titled "The Battle of the Redwoods," which does a good job of presenting both sides of the controversy.

If you can obtain the actual magazines, many students will enjoy looking not only at the Redwood National Park articles, but also at the fashions and other advertisements. The Post issue referenced above, for example, has 8 full-page automobile ads, only one of which (Volkswagon) mentions mileage. The tobacco and alcohol advertisements are also interesting.

The Interim Professional Report of the National Park Service, published in 1964, also makes interesting reading. See Hartzog in the Works Cited section.

The original national park boundary extended only nine miles upstream from the Tall Trees Grove. In the 1970s, the Redwood Creek watershed above the park was intensively logged. About 36,000 acres were clear-cut, and 300 miles of roads and 3,000 miles of skid trails crisscrossed the landscape above Redwood Creek. By the mid-1970s, less than 25% of the old-growth redwoods remained in the Redwood Creek watershed. Erosion from the logging operations was said to threaten the park trees along Redwood Creek as thousands of cubic yards of soil eroded. (Redwood, 1997?)

Amid much controversy, in 1978, President Jimmy Carter signed a law adding 48,000 acres to the national park (Rasp, 1989).

About half of the world's remaining old-growth redwoods now are in Redwood National Park and the three state parks associated with it. When the other parks and reserves are included, about 95% of the remaining old-growth is protected. The parks also contain thousands of acres of second-growth forest land. Millions of dollars have been spent to try to rehabilitate the logged areas of the parks and to reduce erosion and fire danger.

Throughout the second half of the 1960s, the Forest Practices Act was further modified and somewhat strengthened, and the Department of Fish and Game continued to press for more involvement in the regulation of logging practices because of their impact on streams.

In 1982, writing in the book *Logging Practices*, Steve Conway noted that:

"Although the preservationists are relatively few, they have been able to arouse the public merely by focusing attention on industry's mistakes. They look at the burns, poorly stocked lands, ugly clear-cuts, erosion, and misplaced forest roads and point an accusing finger. It does not matter who is actually to blame – the logger, a governmental agency, or a careless tourist – the entire wood products industry gets the blame. This is a contention that is easy for much of the public and many legislators in urban and non-timber-producing areas to accept.

The environmentalist and preservationist have a point; the industry has not been doing the best job possible. Yet as a result of the hard-hitting attacks begun during the sixties and continuing into the present, industry leaders have begun to solve some of the problems. At times the solutions are painful, requiring industry to accept the full responsibility for some glaring errors of judgment. However, there are numerous examples of how the overall effect of these attacks has been good for both the public and the industry."

In the early 1970s, the Forest Practices Act was significantly strengthened, largely due to public concern about logging in redwood forests near urban areas. Even though the laws became more strict and inspections more frequent, compliance with the laws steadily increased from 80% compliance in 1950, to 96% in 1975, the last year for which my source (Arvola, 1976) provides data.

An important event occurred in 1970. In 1969, the Bayside Timber Company had sought to begin logging redwoods in San Mateo County. The County imposed such restrictive rules that Bayside sought relief from the courts. The courts eventually ruled not only that San Mateo's restrictions were unconstitutional, but that the 1940s-era Forest Practices Act itself was unconstitutional because it called for self-regulation. For a while, the timber companies were essentially unregulated. Fortunately, these companies acted with restraint (Barbour *et al.*, 2001).

In 1973, the Z'berg-Nejedly Forest Practices Act became law, further regulating logging practices. Over the next couple of years, various agencies worked to try to establish new forest practices and laws. In 1975, it was determined that the Forest Practice Act fell within the realm of the California Environmental Quality Act of 1970, and that Environmental Impact Reports would be required for logging operations. In the mid-1970s, Governor Edmund G. Brown, Jr. directed several state agencies, including the State Board of Forestry, Department of Fish and Game, and the State and Regional Water Resources Control Boards, to work together to develop effective rules and regulations. Meanwhile, California's population continued to grow, further increasing demand for wood, wood products, recreational areas, and living space. Policies and laws were, and are, often influenced by the political climate as well as by science (Barbour *et al.*, 2001).

The original 1945 Forest Practices Act was implemented in 1947 with the first edition of the Forest Practices Rules. Published in pocket-sized booklets, the 1947 rules were the equivalent of about fourteen 8.5" x 11" pages of 10-point type. The Z'berg-Nejedly Forest Practices Act of 1973 made significant changes and added much more protection. By 1980, the rules were the equivalent of about twenty standard pages. The current (2005) Z'berg-Nejedly Forest Practice Act would take over one hundred standard pages to print. (Source: email from a Legislative Analyst with the California Department of Forestry and Fire Protection.) Of course, as the volume of the Forest Practices Act has grown, so, too, have the difficulties and costs of complying with the various regulations.

It is easy to see that compliance with new laws has required a major change in thinking and planning in the forest products industry, and has added greater expense to the timber management process. One study, reported by Thompson and Dicus (2005), indicates that the average annual per acre cost of preparing a Timber Harvest Plan rose from \$0 prior to 1974 to about \$100 in 1992 to over \$600 per acre in 2004. Not only is this a huge increase, but it occurred in a very short time.

As it is now interpreted, the California Forest Practices Act allows the logging of old-growth redwoods, but not if it will affect endangered species. Even though 95% of the remaining old-growth redwood is protected in various county, state, and national parks and reserves, whether to log or protect the remaining privately owned old-growth forests remains an issue. (Of about 1.3 million acres of privately owned redwood forests, nearly 0.77 million are owned by the lumber industry and almost 0.54 million are owned by private landowners.)

Much of the second-growth timber is over a hundred years old, and it has developed some characteristics of "old-growth" forests, including trees of considerable size. Harvesting of those older second-growth forests is sometimes contentious.

As our understanding of natural systems has increased, the emphasis in forest protection has changed. In the 1920s, the emphasis of the conservationists was on

protecting stands of trees. By the 1960s, the importance of protecting watersheds was understood. Now, we are beginning to look to protection and management of whole ecosystems, seeking to encourage development of forests with old-growth characteristics even as areas are logged, and trying to find ways to include connecting forested areas between preserves to provide corridors for animal movement. More attention is also being paid to areas that may not be as visually appealing as a stand of big trees but may be ecologically important to many species for a variety of reasons.

Another major battle was fought in the redwood region in the 1980s and 1990s. Pacific Lumber Company (PALCO) is a major redwood logging company, started in the 1860s when its founders bought 6000 acres of redwood forest along the Eel River for \$1.25 per acre. The company continued to grow and became one of the largest redwood logging companies in the world. It became the largest employer in Humboldt County, even having a "company town," Scotia. For years PALCO had practiced sustained yield forestry, including selective logging and limited clear-cutting. Many environmentalists viewed PALCO as a relatively "good" company in terms of logging practices and willingness to donate or sell old-growth land. By the 1980s, the price of redwood had increased to the point that a single large old-growth tree might produce \$100,000 worth of wood. PALCO's forests of valuable old-growth redwood and the low price of its stock made it attractive to investor Charles Hurwitz's Maxxam Corporation, which purchased the company in 1986 (Barbour *et al.*, 2001).

PALCO soon significantly increased the harvesting rates of the trees. One of the areas to be logged included the headwaters of Salmon Creek and the Little South Fork of the Elk River. This area became known as the "Headwaters Grove," and the proposed logging sparked a battle that pitted Earth First, the Environmental Protection Information Center, the Sierra Club, and other groups against Maxxam (Barbour *et al.*, 2001).

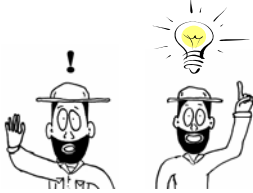
More than 20 lawsuits were filed against Maxxam, and the Headwaters battle resulted in some requirements for increased scrutiny of proposed logging operations by state regulatory agencies. Protection of endangered species such as the marbled murrelet was a major contention in the Headwaters Grove area. The preservationists' goal in the Headwaters was not just to protect a stand of trees. Objectives also included protection of endangered species, wildlife corridors, and streams. Also of major concern were timber harvests on adjacent properties. With the battle for the Headwaters Forest, the focus was on protection of a large redwood forest ecosystem, not just the trees (Barbour *et al.*, 2001).

Battles in the courts and in the forest waged for years. Preservationists wanted to establish a 60,000 acre Headwaters Forest Preserve. Eventually, a deal was reached to protect about 10,000 acres, at a cost of \$380,000,000, or \$38,000 per acre (Barbour *et al.*, 2001).

The "Headwaters Battle" saw some environmental activism evolve to environmental extremism. Activists blocked roads, climbed and sat in trees, and held protest marches. Lumber company equipment was vandalized. Spikes were driven into trees. "Spiked"

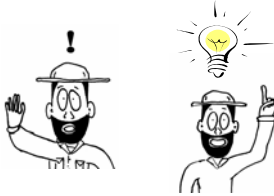
trees are dangerous to cut and mill. Some called these extreme tactics "ecoterrorism." While most environmental activists sought to make their case peacefully, the ecoterrorists made headlines.

Teaching Idea



If you choose to discuss extreme tactics with students, do so with caution. Merely discussing such tactics can be seen as endorsing them.

Teaching Idea



The Lorax, by "Dr. Seuss," is a story about greed and abuse of natural resources. Some teachers have used it in classrooms to promote preservation of resources and to paint the logging industry as "bad guys." When done in communities in which many of the parents are employed in the logging industry, this has, of course, caused problems.

If you want to use The Lorax, be aware of, and sensitive to, possible conflicts with the local community, including the students' families. It is important to keep in mind that we all use resources. While nobody is in favor of pollution or waste of resources, we all produce some pollution and use our share of resources. The Lorax can be useful in teaching the difference between "wants" and "needs." Indeed, the story focuses on the destruction of the environment to make "thneeds," which are things that people don't really need. The book and movie also end with the positive notion that individuals can help protect the environment through personal choices. They can also be useful in teaching about the complexity of decisions about resource use and management.

Older students may be able to understand the use of emotion to make a point in The Lorax, especially the movie version. Discussion could include separation of fact from insinuation, critical thinking vs. emotional response, and generalities vs. specifics.

Teaching Idea



The Man Who Planted Trees, by Jean Giono is an interesting story about a man who planted trees and restored a forest.

The conservation movement in the redwoods has evolved over the years. Early efforts focused on purchasing land for such parks as Big Basin and Muir Woods so that they could be visited and enjoyed by people seeking recreation. As logging continued and

accelerated through the 1950s, so, too, did efforts to protect the remaining stands of pristine forest. Groups such as the Save-the-Redwoods League and the Sempervirens Fund have raised millions of dollars to purchase redwood forest land, which was subsequently donated to the California Department of Parks and Recreation. They also pressured state and national governments to both purchase additional lands and to regulate logging on the remaining prime potential park land. Sometimes redwood landowners were cooperative in saving the lands, even donating or selling the lands at discount prices. Sometimes they hastily logged the lands prior to their being purchased, or threatened to do so in what some saw as an apparent effort to drive up the price. Modern conservation and preservation efforts focus on cooperation and collaboration among environmental groups, landowners, and governmental entities.

Teaching Idea



Have students either send for brochures about the parks in the redwood region, or use the Internet to find out about them. Many forest product companies also have information that they are happy to provide. Students can then prepare posters and/or give oral presentations.

Students can also find out about such organizations as the Sempervirens Fund and the Save-the-Redwoods League.

See Appendix III for addresses.

The actions taken to manage private, commercial, and park lands have also evolved over the years. Early logging practices resulted in erosion, damage to wildlife habitat and other problems; modern forest management strives not only to avoid such problems but to help damaged forest land heal. Early preservation efforts have protected some redwood groves from the chainsaw only to see the trees threatened by human-induced damage such as soil compaction, paving over, introduction of non-native species, by natural plant community succession as fire and flood have been kept out of the forest. Modern park management strives to allow humans to enjoy the parks while seeking ways to protect the groves from both human and natural impacts.