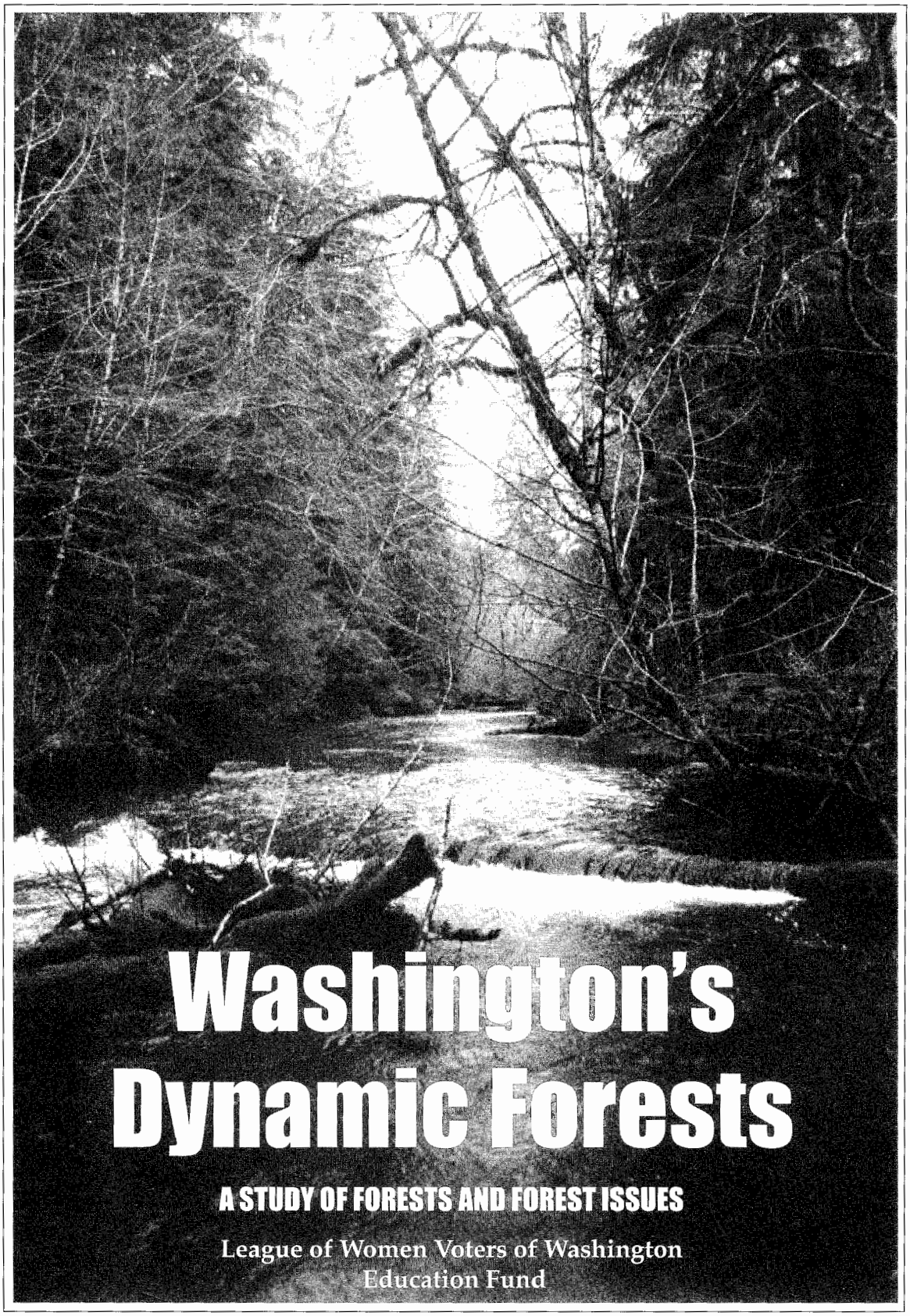

Washington's Dynamic Forests

A STUDY OF FORESTS AND FOREST ISSUES

League of Women Voters of Washington
Education Fund

Established League Positions

League of Women Voters of the United States

Agriculture	Encourage a system of sustainable, regenerative agricultural production that moves toward an environmentally sound agricultural sector, including promoting stewardship to preserve and protect the country's human and natural agricultural resources.
Natural Resources	Natural resources should be managed as interrelated parts of life-supporting ecosystems. Resources should be conserved and protected to assure their future availability. Pollution of these resources should be controlled in order to preserve the physical, chemical and biological integrity of ecosystems and to protect public health.
Resource Management	Resource management policy should promote resource conservation, stewardship and long-range planning, with the responsibility for managing natural resources shared by all levels of government.
Land Use	Supports the management of land as a finite resource and not as a commodity.
Air Quality	Supports measures to reduce transboundary air pollutants, such as ozone and those that cause acid deposition.

League of Women Voters of Washington

Indian Rights	It is the state's responsibility to enhance the salmon resource by protecting and improving the fish habitat and to establish a procedure for retrocession of jurisdiction to the tribes as authorized by federal civil rights legislation. Tribal governments have sole jurisdiction of land use planning of trust land on Indian reservations. State and local governments must cooperate with tribal governments in matters of land use and zoning on fee patent land within reservation boundaries.
Agricultural	Supports a flexible combination of governmental programs to prevent a non-reversible alteration to lands with prime or productive soils.
Water Management	Supports strict enforcement of laws affecting water quality and quantity management in Washington State. Enforcement requires emphasis upon cooperation and coordination among the many agencies as well as funding levels adequate to accomplish effective controls.
Economic Diversification	The quality of the environment should be a prime consideration when making economic decisions. The environment should not be permitted to degrade.

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A. INTRODUCTION

The League of Women Voters of Washington decided to study forestry issues because of our growing awareness of the critical importance of forests, both regionally and globally, in maintaining a healthy environment. At the state level, public policy is defined by the various stakeholders and their perspectives on forest law, policy and practices. Stakeholders include the Native American tribes, the timber industry, small forest land owners, the state trust beneficiaries, state and local governments, developers, conservation/environmental interests and the general public. These stakeholders also shape forest management policy at the federal level. Beyond domestic policy concerns, forest management in the U.S. has impacts on the fate of forests globally, because of the U.S. position in the export/import trade, and in the message our forest policies and practices send abroad about our commitment to the future.

The League of Women Voters, at the national, state and local levels, has strong positions advocating policies that assure sustainability of resources and safeguarding the environment. The League, however, has not specifically addressed forestry policy issues in Washington State, where forests and forestry make up a vital core element of our history, economic life and physical environment. At present, forest policy in our state is subject to heavy scrutiny and perhaps radical change. Several native salmon stocks, severely reduced by past forest practices, urbanization, hydro-electric dams, loss of habitat, overfishing, and competition with hatchery fish, face possible federal listing under the Endangered Species Act.

The role of healthy forests in protecting water supplies, air quality, wildlife habitat and plant diversity is only beginning to be understood. The economic costs of replacing the ecosystem benefits that are lost when forests disappear are clearly astronomical but difficult to calculate. Economists are now beginning to try to quantify these costs. They are acknowledging that costs that were once termed "externalities" need to be internalized in computing the full costs and benefits of extraction and development.

The purpose of this study is to enable the League to take a more active and independent role in the ongoing public dialogue on forests. Our position, while arrived at after consideration of all viewpoints, should not be one that attempts to walk a middle ground between the factions, but one that rests on the accumulated evidence as we see it.

B. THE HISTORY OF WASHINGTON'S FORESTS

"People's attitude toward trees has changed over time. Early settlers valued the land for farming, and trees were an obstacle. Later, trees gained value and were even planted as a crop. Now we are seeing another change. Cleared land is again more valuable, but now for development rather than farming. On the other hand, a growing population is demanding more forested recreation and park land."

Jennifer Belcher, Commissioner of Public Lands

1. Early Years

Prior to the arrival of the Europeans in the Pacific Northwest, the native people of the region depended on the waters and forests for sustenance. Although scholars argue over the extent to which the residents used fire to alter the forest environment, it is generally thought that their impact on the forest ecosystem was minimal.

Archeologists have found that Native American villages were sited mainly at the edge of the forest near the ocean or rivers for access to fishing. Food staples were fish and the camas plant. Redcedar provided raw materials for many other products, including shelter, clothes and transportation. As extracting a large tree was extremely labor intensive, few trees were felled.

Our region's forest cover dates from the retreat of the glaciers approximately 12,000 years ago (Ervin, 1989). When the European settlers arrived in America soon after 1600, it is estimated that forests covered 45 percent of the almost two billion acres in the contiguous 48 states. For the next two hundred years there was minimal stewardship as forests were thought to be limitless. During this period people generally regarded the forests as dark, grim and threatening. Forests were cleared for homes and the planting of crops. Timber was used to build houses, furniture, warehouses, barns and mills, ships, riverboats and barges, carriages and rail cars, bridges and railroad ties, roads and canal locks, household, industrial and agricultural implements and machines. Wood was the major fuel for households and producer of steam for railroads, steamers and factories into the late 1800s. Bark produced tannin and maples produced sugar. Wood was undoubtedly the most important raw material during the first three centuries of the development of this country (Williams, 1989).

In the early 1800s, timber companies began to form. The Northeast was logged, followed by the huge stands of pines in the Great Lakes region and in the Southeast. All of this timber harvesting was unregulated and replanting requirements did not exist. The timber industry was in the top ten manufacturing industries from 1850-1920, including second place in 1850 and 1870, and third in 1860 (Williams, 1989).

2. Railroad Land Grants

In 1850, Congress made the first federal land grants to the states for the purposes of speeding railroad construction and opening up the nation's lands to settlement. The terms of these grants required the states to turn the land over to the railroads, which in turn kept some of the land for track rights-of-way and sold the rest to pay for construction costs.

In 1864, President Lincoln signed into law the Northern Pacific Land Grant Act, which granted 40 million acres directly to the Northern Pacific Railroad Company for the purpose of constructing a railway track from the Great Lakes to Washington. Included in the land grant for the western states was a right-of-way (200 ft. on each side) plus 40 miles on each side of the right-of-way.

Northern Pacific was not allowed to claim any lands previously settled and, in compensation, was allowed to choose property in a strip between 40 and 50 miles from the track, lands referred to as "in lieu" or "indemnity strip" lands. Since Northern Pacific could not claim land containing minerals other than iron or coal, the strip in which it could claim lands was further widened (Figure 1).

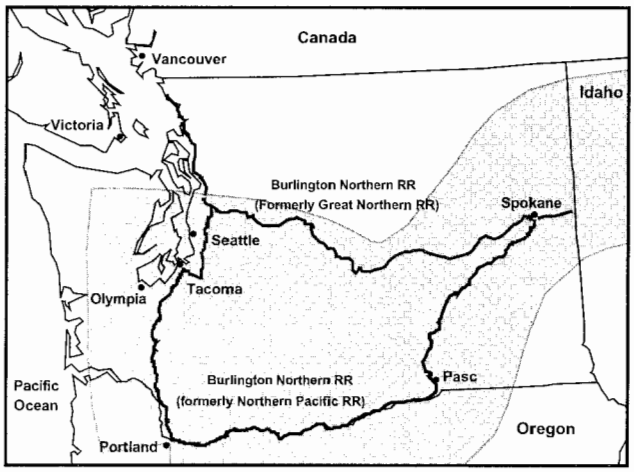


Figure 1. Approximate area of the 1864 land grant to the Northern Pacific Railroad. The swath cut by the land grants covers much of Washington. The swath is schematic and meant to illustrate the maximum area, including in lieu lands, that may have been granted to Northern Pacific Railroad; not all lands were granted. The checkerboard pattern is not to scale. (Adapted from Jensen and Draffan, 1995).

The land was granted in alternating square miles, thus creating the checkerboard appearance of the railroad grant lands. By 1882, Northern Pacific held 7.7 million acres in the future Washington State, including two million acres of commercial timberland (Jensen and Draffan, 1995).

3. Railroad Lands to Timber Companies

Northern Pacific Railroad Company completed the tracks from Lake Superior to Vancouver and Tacoma in 1883. Timber companies continued logging along waterways because it was easier to get timber to ships and transportation by water. With the advent of the rails, transportation of timber across the country was greatly increased. By this time, the large timber companies from the Great Lakes and the Southeast, where most of the commercial forests had been logged, moved to the Northwest where commercial forests stood in great abundance.

Northern Pacific, having completed the tracks, was in possession of millions of acres no longer needed for construction of tracks and rights-of-way. The land grant law required that the railroad sell these excess lands at public auction within five years. Northern Pacific did not do this, but instead began to sell its holdings directly to timber companies. In 1887, Northern Pacific sold 80,000 acres to the St. Paul & Tacoma Lumber Company. In 1897-99, Northern Pacific, which owned the land on which the Mount Rainier Forest Reserve was established, traded it to the federal government for 500,000 acres of timberlands in six states. In 1899, Northern Pacific sold 900,000 acres in Washington to the Weyerhaeuser Company. The completion of the railroads coupled with the sale of railroad land to private timber companies resulted in significant changes in timber operations in Washington State.

4. Beginnings of the Conservation and Preservation Movements

By the end of the nineteenth century, voices began to speak out in opposition to the unchecked cutting of the country's forests and destruction of wildlife. During this period John Muir was active, and the Audubon Society and Sierra Club were formed. Legislation for forest protection was introduced in many sessions of Congress, but failed.

5. National Forests

The first successful legislation to protect forests came in 1891 when Congress authorized the President to set aside areas known as forest reserves. The Pacific Forest Reserve (Mount Rainier) was

the first, with 967,680 acres set aside in 1891-97. In 1897, President Grover Cleveland proclaimed 13 new forest reserves. Three were in Washington:

- Washington Reserve in the Cascades with 3,594,240 acres,
- Olympic Reserve with 2,188,800 acres, and
- an increase in the Mount Rainier Reserve to 2,234,880 (Rakestraw, 1955).

Shortly after the turn of the century, the forest reserves became the national forests, the U.S. Forest Service took over management and President Theodore Roosevelt established 32 national forests covering 17 million acres. Today the U.S. Forest Service manages 155 national forests, covering 186,000,000 acres. In Washington, national forests comprise 8,897,000 acres or 21 percent of our state.

6. National Parks

The state of Washington has three national parks, totaling 1,840,000 acres. Mt. Rainier National Park was established in 1899 and comprises 235,000 acres, obtained by trade with Northern Pacific railroad for 500,000 acres of forested lands of their choice in the Pacific Northwest. North Cascades National Park, established in 1968, has 684,000 acres. Olympic National Park, established in 1938, is the largest of the three with 922,000 acres. As an outstanding example of a temperate rainforest, the United Nations declared the Olympic National Park an International Biosphere Reserve and a World Heritage site.

There are still some areas of "old-growth" forest remaining in Olympic National Park. Timber generally may not be cut within national parks, the only exceptions being for recreational facilities, views, trail clearing or clean up.

7. Timber Companies in Washington

Eleven private timber companies own approximately 4.1 million acres of land in Washington.

Plum Creek Timber, based in Seattle, became a separate entity from Burlington Resources in 1989. Burlington Resources was a subsidiary of Burlington Northern, corporate successor to the Northern Pacific Railroad. Plum Creek started with 450,000 acres in Washington and in 1998 holds 310,000 acres. The company was established as a limited partnership and so was able to take advantage of the 1987 tax code, allowing natural resource extracting limited partnerships to pay no federal income tax. For example, in 1992 it had an effective tax rate of 1.5 percent, 93 percent of which was state tax (Jensen and Draffan, 1995).

The rapid liquidation of old forests has attracted much negative public attention in recent years. Most timber companies have been involved in over-cutting, that is cutting trees faster than natural growth can replace them. Plum Creek Timber has been working to improve its reputation in the 1990s by changing forest practices (Dietrich, 1992). Plum Creek now boasts a "scientific approach," termed environmental forestry, focusing on which stands of trees to leave for future growth and to protect environmental values (Corporate literature - Plum Creek).

Weyerhaeuser, Potlatch and Boise Cascade timber companies were tightly connected through the early 1900s by interlocking directorates. This structure has changed recently to one of more indirect ties, with board members from related families and business associates. All three companies were created by purchase and trade of millions of acres of land in Washington, Oregon, Idaho and Utah from Northern Pacific Railroad when its rail line to the west coast was completed (Jensen and Draffan, 1995).

Much of Weyerhaeuser's land in the Pacific Northwest was purchased in 1877 (and later years) from Northern Pacific Railroad. Later, when the U.S. government took land for the Mt. Rainier National Park, Weyerhaeuser received rights, or "scrip," for their choice of prime timberlands in the Northwest (Jensen and Draffan, 1995).

Boise Cascade was incorporated in 1913 as Boise Payette and later merged with Cascade Lumber to form Boise Cascade. Its land holdings total about 6.1 million acres in Canada and the United States. Boise Cascade owns pulp, paper, plywood, veneer and saw mills and gets most of its revenues and profits from paper products.

Potlatch currently does not own any timberlands in Washington.

Rayonier Inc. began as the Rainier Pulp and Paper Company in Shelton in 1926. Its mill specialized in pulp production from hemlock, considered at that time a weed species. With a generous supply of hemlock, the original owner, E. W. Mills, contracted with DuPont to develop a means of using cellulose from wood fibers to replace cotton in the manufacture of rayon. Eventually, the first mill merged with two others in Shelton, and the name of the company was changed from Rainier to reflect its specialty, rayon. The company currently owns 379,000 acres of timberlands in Washington.

Champion Paper has owned timberlands in Washington since 1986, when they bought St. Regis Paper. Their timberlands lie on both sides of the Cascades. As with many of the other timber companies in Washington, they are proud of their record and believe themselves to be proactive in the aggressive management, not only for the harvest of timber but also for wildlife and fish (Jack Ward, Operations Manager, Champion, personal communication)

Simpson Timber was started in 1890 in Matlock, Washington and bought its first land in 1895. It is now in the fifth generation of family ownership and is one of the few early companies to survive because it retained the ownership of land after it was logged. Their long-term view was to treat forests like a crop. Simpson has substantially increased its holdings throughout the United States and in Canada.

Longview Fibre owns 570,000 acres of forest lands in the Pacific Northwest. One of the pioneers in the tree farm industry, it claims to manage its forest plantations for "sustainable" production. They generally harvest Douglas-fir and hemlock in 50 to 55 year rotations, depending on individual site productivity. Longview Fibre believes its biologists "show leadership in stream

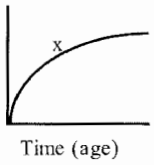
WHAT DOES SUSTAINABLE FORESTRY MEAN?

Sustainablilty can only be discussed if the following four items are defined:

- What item is to be sustained?
- Over what time frame?
- Over what area?
- For whom?

In terms of timber harvests, sustainable yield is generally defined as the annual cut not exceeding the annual or periodic tree growth increments of a forest.

The growth of most commercial tree species can be defined by the following generalized curve:



At point 'x' on the curve, the annual increment in volume increase begins to diminish. This point is generally considered to be an appropriate age to harvest the tree, if maximum productivity is the primary objective. The age at which trees are harvested in even-aged stand management is referred to as the "rotation age."

For the industrial forest land owner, the parameters to define sustainablilty are the following:

- item: timber products
- time: one rotation
- area: the area managed by the forest owner/operator
- for whom: consumers

protection, stream restoration and fish and wildlife habitat protection" (Kurt Copenhagen, Public Affairs Longview Fibre, pers. comm.).

The Hancock Timber Resources Group (HTRG), a member of the John Hancock Mutual Life Insurance Company group, was founded in 1985. They claim to be one of the largest managers of timberland investments in the world and own 229,000 acres of timberlands in Washington. Their lands in Washington are scattered, and logging is done by contractors. Their company literature evidences interest in maintaining good stewardship of their forests and they claim to meet high standards for road construction, stream and soil protection, logging practices and habitat protection for wildlife (HTRG Website; HTRG representatives, pers. comm.).

Crown Pacific also states that it is a leader in forest management and land use. Crown Pacific has 233,000 acres of timberland in Washington. They manage their lands for "maximum growth and yield of forest products" and also for "resource values such as wildlife and fisheries." One of their projects in Washington is the creation of winter rearing habitat for native cutthroat trout, steelhead and salmon on the Sekiu River on the Olympic Peninsula (Crown Pacific Website; Bob Hess, Public and Investor Relations Manager - Crown Pacific, pers. comm.).

Hampton Tree Farms purchased 97,000 acres of forest land from International Paper in April, 1996 (Hampton Tree Farms representative, pers. comm.). International Paper acquired most of its west coast timberlands when it purchased Long Bell Lumber Company in 1956-57, and does not currently own any timberlands in the Northwest (International Paper representative, pers. comm.).

Headquartered in Seattle, Port Blakely Tree Farms has fewer than 100,000 acres of land in Washington, mostly in western Washington. Started in 1864 as a privately owned sawmill firm, it was bought by the Eddy family in 1903. The company left the sawmill business in 1920 to concentrate on improving tree genetics, considering its standing timber a long-term investment. James G. Eddy was first in the world to work on improving tree genetics, and the company has continued to plan for sustainable harvest. According to a company spokesperson, "We are a profit center, and we do clearcut our forests but they are cut on a sustaining, long rotation basis" (Port Blakely, pers. comm.). Port Blakely selectively thins when trees reach 25 to 30 years and clearcuts on a 60 to 80 year rotation.

Timber Company	Acres Owned in Washington
Weyerhaeuser	1,451,000
Boise Cascade	502,236
Rayonier	379,000
Plum Creek	310,000
Champion Paper	297,000
Simpson	286,000
Longview Fibre	240,000
Hancock Timber	229,000
Crown Pacific	233,000
Hampton Tree Farms	97,000
Port Blakely	<100,000

(sources: Company Literature; pers. comm. with company representatives.)

8. State Trust Lands

In 1785, Congress established a policy of granting section 16 of each township to every new state. (There are 36 sections in a township, and each section is 640 acres or 1 square mile). New states

One Township

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

← Six miles →

admitted after 1849 also received section 36 of each township. The state trust lands were granted with the express purpose of the states using them for funding schools, universities and other public purposes. Washington, at the time of statehood in 1889, received 3,200,000 acres. Many other states, mainly the older ones, sold their land grant acres, so that today only 15 of the 30 original land grant states retain any of their original acreage.

Washington sold of some of its trust lands, then following the depression purchased others. Washington currently has 2,800,000 acres of upland trust lands, with an additional 2,100,000 acres of state aquatic trust lands (Murphy and Rudnick, 1997).

The activity on upland trust lands is varied and includes timber production, grazing, agriculture, and coal and minerals extraction. Washington leads all the land grant states in the number of trust land acres devoted to timber, 2,078,000 acres, more than double the second state, Idaho. Washington also leads the other states in the revenue produced from its timber trust lands, with more than 13 times the second state, Oregon. In fact, Washington's revenue from its timber trust lands is the largest amount from any land grant use in any land grant state (Souder and Fairfax, 1998).

A trust is a legal relationship in which the trustee (Washington State) has a fiduciary relationship with the beneficiaries (the public schools and universities of Washington and other public institutions). In that relationship, the Washington State Department of Natural Resources must manage the property for the benefit of the beneficiaries in perpetuity. The law imposes duties of honesty, candor, and full disclosure on the trustee in relationship to the beneficiaries.

9. Tribal Lands

The formal relationship between sovereign Indian Nations (tribes) and the U.S. Federal Government began as soon as the federal government was established. Since then, the relationship has been complex and continuously redefined by changing laws and policies.

The earliest treaties were negotiated between independent tribal governments and England and the United States between 1608 and 1830. Treaties were meant to maintain an era of peace and friendship. It was during this period that the first reservations (called "reserves" in Canada) were established. Additional treaties were negotiated between 1850 and 1871. In Washington, territorial governor Isaac Stevens negotiated six treaties in 1854 and 1855, in which vast areas of the Territory were ceded by the tribes in exchange for the small reserved areas and reserved rights.

As the settlement of the American west by European immigrants intensified, the government's treatment of Indians changed. The years bracketing the turn of the century can be characterized as a period of allotment and attempted assimilation of native peoples. In 1887, the Dawes Act eliminated the traditional communal ownership of land in individual treaties.

Historically, the Bureau of Indian Affairs (BIA) has been responsible for managing tribal forest lands. Since the 1970s, the federal government has recognized the need for tribal governments to have the political authority to provide for the economic and social well being of their members (EPA, 1996). Currently, for most tribes, the BIA implements forest management policies outlined by their tribal governments.

This history is reflected in the lands of the Quinault Indian Reservation. In this triangle of

Tribes that Own or Manage MoreThan 20,000 Acres of Timberlands

Tribe	Commercial Forest (acres)	
Colville	603,000	*
Yakama - Tribal Ownership	443,000	**
Yakama - Allotment	39,000	**
Quinault - Allotment	208,000	***
Quinault - Tribal Ownership	57,000	***
Makah	26,000	*

* BIA - Forestry Program, 1997
** Yakama Indian Nation, pers. comm.
*** Peterson, 1998

land on the west side of the Olympic Peninsula, the Quinault Indian Nation owns just 28 percent of the land (56,702 acres) within reservation boundaries. The remainder, 208,150 acres, is divided among over 2,000 allottees, mainly among members of seven coastal tribes; but timber companies, speculators and members of other tribes also own land on the reservation. The Quinault Indian Nation is made up of several tribes, each of which has unique forest practice regulations.

The management of this land presents a challenge. The multitude of owners makes a uniform and coherent plan difficult to establish. Thousands of acres failed to naturally regenerate due to brush and slash remaining from past harvesting activities. Seedlings cannot compete with the thick brush fields that invaded after clearcut harvesting (Peterson, 1998). Recently, a scientific team undertook a biological and physical watershed analysis to address the degradation. The analysis, led by scientists from the Quinault Indian Nation, the U.S. Forest Service, the National Park Service is near completion and expected to be released shortly (National Forest Service, Quinault Indian Nation, pers. comm.).

C. OUR FORESTS TODAY

1. Overview

Washington's forests are prized for their economic, aesthetic and ecological value. Approximately 50 to 57 percent of the state's 42.5 million acres of land area is covered by forest lands. The majority of the forest lands, about 16.1 million acres, is considered available as timberlands and may be subject to periodic harvest. An additional 2.9 million acres are federal, state or municipal parks or reserves. The remainder, 1.9 million acres, lies in areas that cannot sustain forests sufficiently productive for economic harvests.

Another 3.4 million acres of forested land remains an enigma. In private ownership, this area is reported by the State's Department of Natural Resources (using 1976 USGS Land Use and Land Cover data) as forest lands (Collins, 1996), but has not been included in a 1992 Federal Forest Service Inventory (Bolsinger et al., 1997). The discrepancy could lie in varying definitions of "forest lands" (how many trees constitute a forest?), conversion of land to other uses including urbanization, roads, utility corridors, or differences in scale and methodology of estimating land cover. Note that "forest lands" do not necessarily have trees currently growing on them. A significant proportion of our forest lands is in a state of flux: wildfires, harvesting activities, clearing, natural regeneration and replanting all lead to a dynamic landscape.

The demands placed on those forest lands available for harvest - the lands that are defined by the U.S. Forest Service as unreserved timberlands (public and private ownership timberlands) – are considerable. These productive forests are now

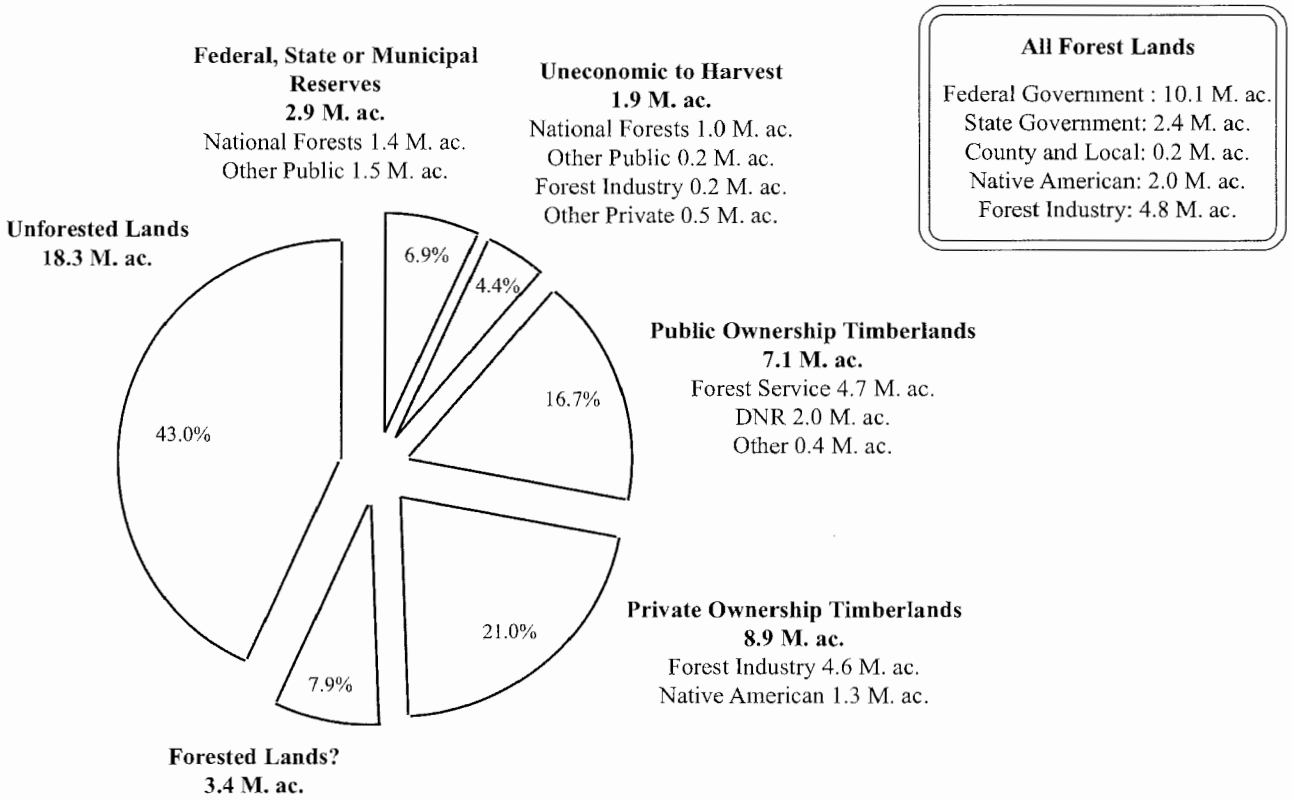


Figure 2. Land ownership for Washington State. Total land base is 42.5 million acres (M. ac.). Bolsinger et al., 1997; Collins, 1996.

expected to provide for a variety of functions in addition to timber production, including recreation, habitat, hydrologic stability and, to an increasing extent, accommodation of urban sprawl. Whether managed by the federal, state, or local governments, or private concerns, forests are being considered differently than they have been in the past. While clearcutting is still taking place, traditional views of stand management are being replaced by ecosystem and watershed management concepts. New forestry and silvicultural practices are being developed in an effort to minimize cumulative harm to the ecosystem. Large patches and buffer areas may be set aside for the protection of bird, wildlife and anadromous salmonid habitat. More attention may be paid to maintaining diversity; "lifeboating" structures such as snags, downed wood and green trees might be left behind after harvesting to offer a bridge to the new, incoming wildlife community.

2. Trends

Harvesting

In Washington, the amount of timber harvested annually from commercial forest lands has varied through the latter part of this century. In general, the volume was steady until 1960, when it began to rise. In the early 1980s, economic conditions caused a sharp decline. The latter part of the 1980s saw a return to the harvest levels of the 1970s. In the 1990s, a decrease in logging of old-growth forests on federal lands brought on by concerns over retaining habitat for a threatened species, the northern spotted owl, led to a decrease in timber harvest.

Age of Washington's Forests

The average age of Washington's forest stands has been decreasing. With the rapid liquidation of old growth forests through the latter part of this century, and the continued harvest of trees when they reach an age of 50 to 80 years, this trend will likely continue. Sustainable harvest principles dictate that the volume of timber harvested from the land should be equal to or less than the volume of timber a forest grows in the same period of time; over a large area, the number of acres stocked with each age class of trees should be equal.

Data from 1988-91 timber inventories conducted by the U.S. Forest Service indicate an alarming trend. On private lands managed by the large timber producers in western Washington, the distribution of tree stand age is skewed toward the younger age classes, especially in comparison to those lands managed by non-commercial private

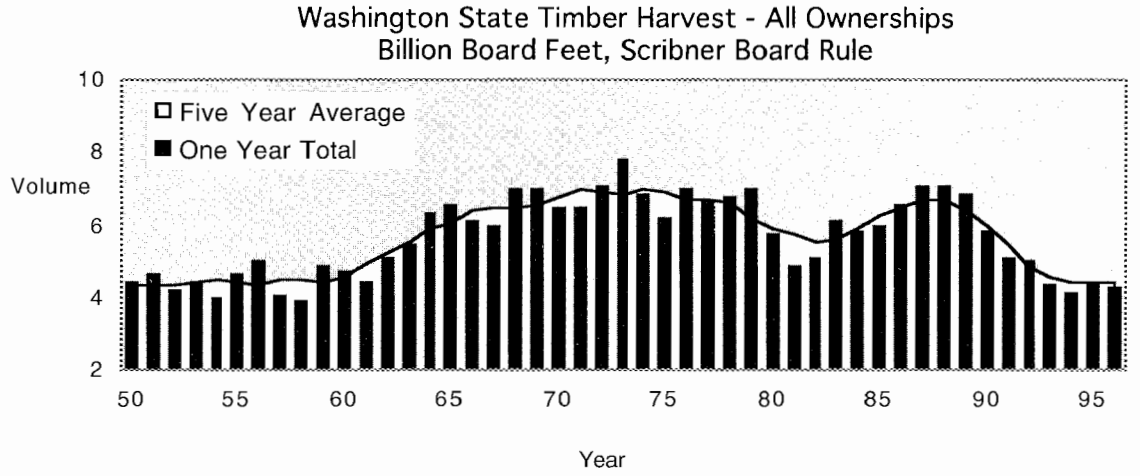


Figure 3. Washington State timber harvest (Larsen, 1997; Larsen pers. comm.).

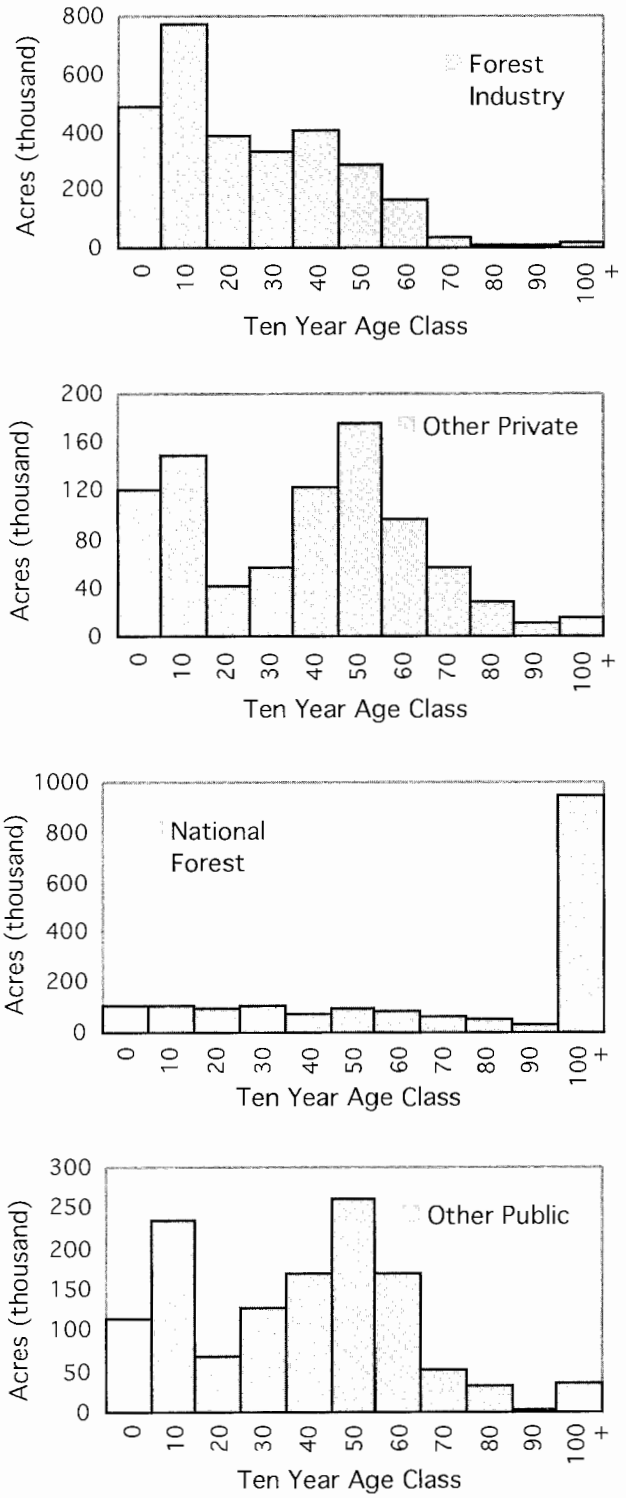


Figure 4. Age distribution of western Washington's forests by ownership. These data are for even-aged, managed stands (Bolsinger et al., 1997). Each age class from 0 to 90 represents a ten year span i.e. 0 (0-10). 100 year age class designates an average stand age of 100 years or older.

land owners. This suggests that, as a whole, the large timber companies are not practicing sustainable harvest techniques. More standing timber has been harvested in the last thirty years than will be available for harvest in the next thirty. In addition, only two percent of stands managed by large timber companies are greater than 100 years old (Bolsinger et al., 1997).

Population Growth and Urbanization

Between 1945 and 1970, approximately 257,000 acres of timberlands were converted to urban use in Washington State (Bolsinger, 1973), at an annual loss of 10,000 acres. In the I-5 corridor between Olympia and the Canadian border (Island, King, Kitsap, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom counties), it is estimated that 159,000 acres of private timberlands were lost between 1979 and 1989, an annual rate of over 15,000 acres. This rate exceeds that for all of Washington between 1945 and 1975, and is not predicted to slow down in the foreseeable future (MacLean and Bolsinger, 1997). Federal census figures for those I-5 counties show a population increase of 23.2 percent between 1980 to 1990. Population growth estimates predict that these nine counties will increase in population by 43.8 percent between 1990 and 2010, and 69.2 percent between 1990 and 2020 (OFM, 1997; OFM, 1995).

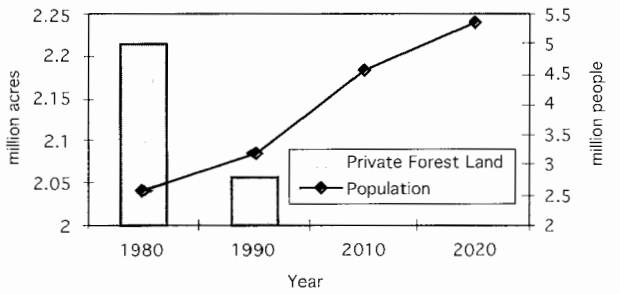


Figure 5. Predicted increase in population growth compared to past decrease in private forest lands in the Puget Sound region (MacLean and Bolsinger, 1997; OFM, 1997; OFM, 1995).

	National Forests		Other Public		Forest Industry		Other Private	
	1967	1991	1967	1991	1967	1991	1967	1991
Sitka spruce	0.5	0.7	2.2	1.9	1.9	2.3	1.6	1.4
Western hemlock	38.4	32.9	40.4	30.0	45.0	37.3	23.4	13.4
Western redcedar	9.2	7.5	12.0	5.9	6.6	6.7	9.9	13.3
Douglas-fir	25.5	28.6	20.7	44.4	24.3	33.3	35.1	34.1
Pacific silver fir	20.8	21.8	14.1	3.5	6.5	2.2	1.8	0.4
Other conifers	4.7	6.6	2.3	0.7	3.0	0.8	0.7	2.8
Hardwoods	0.9	1.9	8.3	13.6	12.7	17.4	27.5	34.6
	100%	100%	100%	100%	100%	100%	100%	100%

Table 1. Changes in diversity of Washington's forests in the Puget Sound and Olympic Peninsula (Bolsinger et al., 1997).

Forest Diversity

Forest lands have undergone many changes in the last century. Forest stands disturbed by fire, wind storms or harvesting in the earlier part of the century were left to regenerate naturally, allowing a mix of native vegetation including many of the species listed in Table 1. For the last few decades, forested lands have been intensively managed by the forest industry and the Department of Natural Resources (Other Public in Figure 4 and Table 1).

State forest regulations require reforestation to occur to specified levels within five years of harvest, including both replanting and natural regeneration. Often, lands are planted solely with nursery-grown seedlings of a commercial tree variety such as Douglas-fir, leading to less diverse forests. In addition to the planted Douglas-fir, hardwood species such as red alder or bigleaf maple thrive under the 40 to 60 year rotations common on intensively managed lands. Data collected by the U.S. Forest Service for the Puget Sound and Olympic Peninsula areas show increases in Douglas-fir and hardwoods, at the expense of less commercially important species. The increase in Douglas-fir and hardwoods, as shown in Table 1, is especially notable on forest lands that are intensively managed for wood production.

Forest Fires

Forest fire prevention technology has improved dramatically over this century and is now at the point where wildfires have decreased by 90 percent. In the 1930s and '40s, it was common for 20 to 50 million acres of forest land across the country to burn in one year. Since the 1960s, that figure has dropped to two to five million acres (Powell et al., 1992).

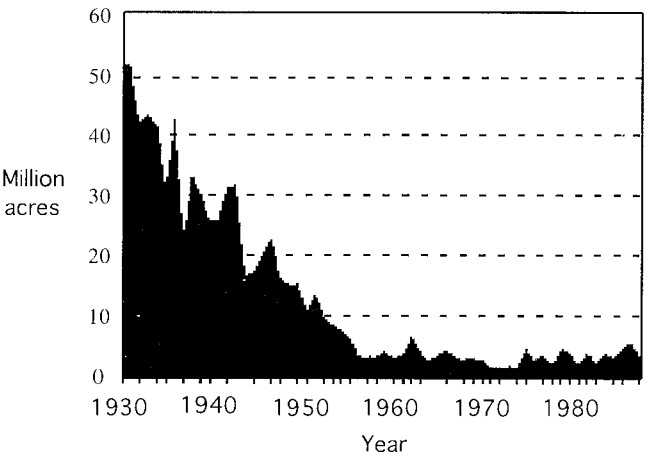


Figure 6. Trends in U.S. forest land burned by wildfires (adapted from Powell et al., 1992).

3. Harvest Practices

Timber harvest practices in various parts of the state vary significantly depending on individual forest characteristics. In eastern Washington, forests developed mixed-aged stand characteristics and are commonly harvested using selective, partial cutting methods.

In western Washington clearcutting remains a central practice of the forest industry on federal, state and private lands. Clearcutting techniques vary from intensive methods, where all vegetation is removed from the land and the soil is heavily disturbed by large machinery, to less intrusive methods where the standing timber is removed to allow the least disturbance possible. In either case, the area is opened up to a dramatic increase in sunlight, allowing species such as alder, Douglas-fir and shrubs to thrive. While rapid natural regeneration is possible throughout much of the state, standard practice is to plant heavy densities of Douglas-fir seedlings to speed the green-up process, consistent with state forest practice regulations. Alder and shrubs, and in some instances naturally regenerated conifers such as hemlock, are controlled by herbicides and cutting.

There are a number of benefits for harvesting by clearcutting. Clearcutting requires a one-time disturbance to the land, rather than multiple entries. It also gives the option of putting roads (a heavy source of erosion and linear disturbance) "to bed" after the initial entry. Foresters have traditionally argued the necessity of clearcutting to allow sunlight down to the forest floor to nourish sun-tolerant Douglas-fir. Heavy soil disturbance, or removal of the top layer and exposure of mineral soil, is also seen as a favorable condition for Douglas-fir. Clearcuts can provide physical barriers against infestation of parasites such as dwarf mistletoe and the mountain pine beetle.

The argument that clearcutting requires fewer roads is persuasive, yet helicopter logging and other alternatives may lessen the need for roads

HARVEST METHODS

UNEVEN-AGED METHODS

Managing forests under uneven-aged conditions requires harvest of some trees of varying ages to remove merchantable trees, create openings for regeneration and release saplings and young trees. Remaining trees provide seeds for the new crop. This can be accomplished with the following methods:

Group Selection: Trees are removed in small groups to create openings in the canopy with a width that is less than twice the height of mature trees.

Single Tree Selection: Individual trees of all size classes are selected for harvest in a uniform fashion throughout the harvest area, creating small openings in the canopy.

Note: Pre-commercial and commercial thinning are not uneven-aged harvest methods. These methods remove immature trees, to concentrate the growing potential on remaining trees, and do not provide openings in the canopy for a new crop of trees.

EVEN-AGED METHODS

Managing forests under even-aged conditions requires the removal of most of the merchantable trees in one or several cuttings. Harvest methods employed in even-aged stand management include the following:

Clearcutting: An entire stand of trees is removed in one timber harvest operation.

Seed Tree: Mature trees from an existing stand are left to provide seed for a new crop. Seed trees are typically removed after the new crop is established.

Shelterwood: Mature trees from an existing stand are used to provide shelter, shade and seeds to nurture a new crop. The mature trees are harvested after the new crop is established. Variations include: **strip shelterwood**, where timber is removed in narrow strips, one to two tree lengths wide; or **uniform shelterwood,** where overstory trees remain placed uniformly throughout the stand to provide shade for the new crop of trees.

and the damage they inflict on the ecosystem. And while heavy soil disturbance seems to favor the growth of Douglas-fir, undergrowth adds to the biodiversity and natural habitat of the forest. Trace amounts of needed minerals come from the hard parts of dead birds and small animals that are encouraged by the undergrowth. The nutrients contribute to the health and growth of the harvestable trees.

The damage caused by clearcutting depends on many factors: slope, elevation, aspect, soil type and type of equipment used. Disadvantages of clearcutting can include soil compaction, disturbance, erosion and aesthetic impact. These are immediately noticeable following clearcutting. Environmental changes such as soil temperature, humidity and light exposure cause damage to the natural balance of nutrients, mycorrhizal fungi and beneficial bacteria, all essential components of a healthy forest. These types of damage are not so obvious. Attempts to restore this balance through fertilization are both costly and largely ineffective, as the significance of the symbiotic relationships among forest nutrient cycles and micro- and macro- species is not well understood.

Clearcutting over a large portion of a watershed can disturb the hydrologic cycle leading to increases in flooding, particularly in the winter and spring months, when the rain-on-snow effect can add to the amount of precipitation entering streams. Clearcutting can also contribute to some forms of mass wasting (creep, debris avalanches, debris flows and debris torrents), as living tree roots provide soil stability and absorb excess water. Location of the harvest unit, however, is more important than the specific harvest method.

While clearcutting is thought to provide suitable conditions for the regeneration of Douglas-fir, the assumption that Douglas-fir only grows well in open sunlight is false, as seedlings grow well in partial shade. Their ultimate growth is in proportion to the amount of sun received. Sunlight may encourage Douglas-fir, but it also encourages the growth of alder and shrubs, which provide natural competition for conifers. Natural regeneration under a canopy of older trees favors the growth of conifers.

In the past, alder has been considered a weed, in competition with Douglas-fir seedlings, and has been removed from most planted forests. It has been shown, however, that alder fixes nitrogen in the soil and lessens the need for chemical fertilizers. Although in early stages of growth alder can shade Douglas-fir and compete for sunlight, recent studies indicate that Douglas-fir benefits from the additional nitrogen provided by the alder roots and grows faster in the presence of alder. There is also evidence that alder protects Douglas-fir from developing root rot.

Ecological damage caused by past harvest practices such as massive clearcutting caused a shift from viewing the forest as a discrete entity to viewing it as part of a larger ecosystem. New research shows that clearcutting practices are not the most efficacious in sustaining the viability of forests as complete ecosystems and that many other practices are economically as well as environmentally viable.

Within the current framework of new forestry and ecoforestry, there is a range of "sustainable" forest practices. Some commercial growers are beginning to harvest only the largest trees, leaving smaller growth and some debris on the forest floor. DNR regulations require some "leave trees" be left standing for seeding and wildlife habitat. An example of ecoforestry practices was observed at the Shepherd Tree Farm in Thurston County. Trees that are the least healthy are selected for harvest, giving healthy trees a better chance to grow.

Equipment used at this tree farm minimizes damage to the forest floor, and natural reseeding is allowed, ensuring that the trees are well-adapted

WHAT A WEAK TREE LOOKS LIKE

1. The trunk is cone shaped rather than columnar shaped.
2. The bark is gray, and without light brown recessed cracks that indicate steady, rapid growth in diameter.
3. The tree crown comprises less than 20% the height of the tree.
4. The tree is smaller in diameter than other trees of comparable age and species.
5. The tree is overtopped by other trees, restricting its access to sunlight. The exception is cedar, which thrives in shade.

(Jean Shaffer, pers. comm.)

to the site. Over the long run such selective harvest will result in more board feet per acre than will clearcutting (Jean Shaffer, pers. comm.). Return on investment, however, is delayed, and that delay is not acceptable to many commercial growers. These environmentally friendly practices are more labor-intensive than clearcutting with large equipment, another reason why they are not readily accepted by commercial timber companies.

Fort Lewis is an example of a large managed forest that has used harvest practices other than clearcutting. For many years, its overseers have managed their forests for military training purposes, maintaining vegetative cover for maneuvers. They have removed weaker trees and left healthy ones. Standing board footage has doubled in the process and about $3.5 million worth of timber per year are harvested, only 30 percent of the estimated sustainable yield on 46,000 acres of forest land. Currently, 27 million board feet are grown annually, while 9 million are cut (Gary McCausland, Forester, Fort Lewis, pers. comm.). Although military training needs originally determined the management choice, the forest is now an example of successful selective harvesting practices.

The Yakama Indian Nation forest lands provide an example of uneven-aged management that is economically productive and ecologically friendly. The 613,000 acres of forest lands have been managed since the early 1950s and yielded $45 million of income in 1996. At the same time, approximately 36 percent of the lands have been set aside as reserves. There is more standing volume today in the forest than there was 50 years ago, and the forest is home to the highest density of spotted owls in Washington. "Uneven-aged selection harvesting is much more labor intensive than just surveying in the boundaries of an even-aged (clearcut) unit and slicking it all off at the cost of all the other resources, but it preserves the Yakama's cultural values of clean water and healthy fish, wildlife, and native vegetation communities" (Eric Hanson, Associate Director, Yakama Indian Nation Wildlife Resource Management). The Yakama Indian Nation, in cooperation with the BIA, manages their lands with the following desires:

- Maintain long-term ecosystem productivity and function.
- Consider all values of the forest during all levels of the decision making process. Although the Yakama Nation depends on the forest for most of its annual income, management decisions will not be based on monetary values alone.
- Maintain a natural appearance in the forest.
- Maintain large diameter trees.
- Maintain stands that contain diversity in species, size class and structure.
- Prohibit the use of pesticides and herbicides.

As habitat concerns take a forefront in resource management, large land owners are entering into contracts with the state and federal government to facilitate land management. Habitat Conservation Plans (HCP) and Landowner Landscape Plans (LLP) are long-term agreements that offer stability and consistency in land management practices to provide benefits to both parties. A positive aspect of the HCP and LLP plans is the commitment to view the effects of forest prac-

tices in a cumulative manner.

One concern that came from the public in the 1980s was the cumulative impact of individual timber cuts on a watershed as a whole. At that time, forest practice rules were written for use on a site-by-site application. As a result of these concerns, a charter for watershed analysis was adopted. According to DNR's publication Forest Practices Illustrated: "Watershed analysis is an assessment of the watershed's resources and the things that affect those resources, and will help the natural resource agencies to better understand the combined effects of forest practices on individual watersheds over time" (DNR, 1997).

Washington State has been divided into over 800 Watershed Administrative Units (WAUs). They

WHAT ARE THE DIFFERENCES BETWEEN WATERSHED ANALYSIS AND WATERSHED PLANNING?

	Watershed Analysis	**Watershed Action Planning**	**Watershed Planning**
Required Under:	WAC 222-22	WAC 400-12	RCW 90.82 (1998)
Monitored/ Administered by:	Department of Natural Resources	Department of Ecology	Department of Ecology
Purpose:	Regulating forest practices in watershed ecosystems. Evaluates the following processes: slope stability, erosion, riparian areas, water flow patterns and stream channel conditions, and their impact on water quality, fish and fish habitat and capital improvements of the state. Designed by a team of scientists who are trained by DNR staff for consistency. Results in the development of watershed specific forest management prescriptions.	Planning and management of nonpoint source pollution from sources including farm practices, storm water and erosion, on-site sewage disposal, forest practices, marinas and boats. Identification and ranking of water quality impacts in the watershed resulting from forest practices, using in part the watershed analysis tools available from DNR, and/or the cooperative evaluation, monitoring and research steering committee with the timber/fish/wildlife agreement, categorized by type of forest practice, geographic area of impact, and land ownership, and ranked according to the severity of threat to beneficial uses and public resources.	Enables locally based water resource management plans. Objectives are to assess the status of water resources in a specific WRIA, to determine how to manage those resources to balance competing demands. Key issues for consideration are water quantity, which must be considered under statute; water quality, which may be considered; and habitat, which may be considered.
Lead Entity:	Can be private company or government entity.	County Governments.	County Governments.
Scale:	Watershed Administrative Units (WAU) .	Watershed Resource Inventory Areas (WRIA) - contains many WAUs.	Watershed Resource Inventory Areas (WRIA) - contains many WAUs.
Public Input:	Public are encouraged to attend the meetings throughout the process. Results are subject to SEPA review.	Public can be involved in developing an action plan. Plan must be given a public review.	Local governments may join with state agencies, tribes and citizens to form "planning units" to develop watershed management plans.

range in size from 10,000 to 50,000 forested acres, and their boundaries are determined by drainage patterns and geography. The goal is to eventually analyze all of the forested WAUs with those at greatest risk given priority.

A watershed analysis is performed by a team of experts from a variety of scientific fields. Further training by the Department of Natural Resources certifies them to conduct the analysis and guarantees that a standard approach will be used in each watershed. Slope stability, erosion, riparian areas, water flow patterns, stream channel conditions and their effects on water quality, fish and fish habitat, and capital improvements of the state are measured. In layman's terms, certified watershed analysis personnel determine the ability of the trees to store water for release in low water flow summer weather, the ability of trees to hold snow, the amount of sediment coming into the stream, and the potential for woody debris in the riparian area.

Based on the analysis, forest managers write "prescriptions" for timber harvest in that watershed. Prescriptions are designed to protect and allow the recovery of public resources: water, fish, and capital improvements, in any one watershed. Each forest practice application will be given a set of prescriptions mandated by specific scientific data for that location. Land owners, timber managers, and the public will all benefit from the advance information, predictability, and most of all the scientific objectivity of the process. At the present, Watershed Analysis prescriptions have only been prepared for a small portion (perhaps six to ten percent) of Washington's forested watersheds because of the limited number of qualified experts and time involved in preparation. The approximately 200 WAUs falling solely on federal lands will be analyzed by the federal government, and they are not included in the previous estimate.

4. Role of the Landowners

A number of the large timber companies in Washington realize that their image and their practices need to change. Among these, Weyerhaeuser, as the largest private timber owner in the state, has begun to alter its practices to meet environmental as well as economic needs. On Weyerhaeuser's South Mt. St. Helen's Tree Farm, although they do clearcut, forest practices in general exceed state and federal standards, leaving wider riparian zones, wider areas around eagle and spotted owl nests, more snags, debris and "leave trees," and reducing considerably the use of fertilizers and herbicides. Road-building methods have been changed to reduce erosion, and culverts are being replaced to allow salmon to migrate more easily (Weyerhaeuser Field Trip, 1998).

Weyerhaeuser is not alone. DNR, Plum Creek, Simpson, Boise Cascade and Rayonier all appear to be giving serious attention to the environmental impact of their harvest practices, while at the same time attempting repair of some past damage on their lands. Many of the industry representatives interviewed in the course of this study agree that regulation is necessary and good as long as it is stable enough to allow for long-range planning.

While the public seems to recognize an obligation on the part of large timberland owners to manage their land responsibly, it is not clear what we expect from our small forest land owners. Certainly many small land owners meet or exceed forest practice regulations, and some practice innovative harvest methods. On the other hand, many small land owners do not take an active role in managing their forest lands and hire foresters or loggers for the task, sometimes with undesired results. Fortunately, disreputable loggers are not numerous. Unfortunately, by changing their business names and moving throughout the state, they are difficult to police.

Forest Practice Procedure for the Average Small Private Forest Landowner (less than 500 acres)

1. Hire a consulting forester.
2. Find out if a watershed analysis has been done in your area from your local DNR office or library. Incorporate this into your plans. Be familiar with your property to verify and make additional analyses.
3. Review existing roads, new ones to be constructed, their use and abandonment when the practice is complete. Plan roads, skid trails and landings that fit your fire prevention, silviculture practices, harvest method and terrain, and that create the least impact on fish, water and wildlife.
4. Develop a written long-range forest management plan using property documents: topographic maps, stream type maps, soil type survey, watershed analysis, aerial photos, plat maps, property lines and harvest area boundaries. Designate riparian zones, wildlife corridors and reserve areas.
5. Arrange for access or easements across neighboring lands.
6. Identify areas that need protection. These include fire breaks, water storage ponds, wetland and riparian management zones and their required leave trees. Leave trees include wildlife reserve trees, green recruitment trees, downed logs, snags and wildlife corridors.
7. Determine if watershed analysis will affect your harvest plans.
8. Considering such economic factors as income needs, taxes, and costs of logging, roads and regeneration, decide how you will cut (clear or selective, wheeled or tracked skidder, cable or aerial) based on the terrain, season, size of timber, salvage and cleanup.
9. Your consulting forester will then submit the required management plan, lay out the timber harvests, market your timber to a mill, find a qualified logger, and control all logs and payments.
10. Draw up written contracts assigning responsibilities and specifying procedures, including post-harvest responsibilities, as well as who controls the logs and who pays whom. Obtain the necessary permits.
11. Cut.
12. Receive monies from timber sale - your income after the forester, logging contractor, loggers, logging truck driver, and mill have received their share. Pay state timber tax (6.5%). Pay B&O tax.
13. Post Harvest. Logging debris (or slash) may be left in place in certain areas if it doesn't present problems. It may also be burned; a permit is required. Make sure the responsibility is clear in your contract. Reforest in the first or second planting season in western Washington, natural seeding in eastern Washington. With natural reseeding, submit the required pre-approved plan; check with the local DNR office. With planting, space 300 to 600 seedlings/acre, evenly spaced, appropriate to site and seed zone. Replant with different species if root rot was found.
14. Check plantation annually and replant if necessary. Protect against animal damage; control competing vegetation. Areas may be fenced to keep animals out, chemicals may be used to control fast-growing plants that may crowd out seedlings. All these practices require advance permitting.
15. Logging area will be inspected by DNR for compliance with all regulations. They will notify you of practices remaining to be done.

D. FOREST POLICY

Public policies toward forests have changed dramatically over the history of the country. Early laws relating to public lands reflected the belief that resources should be given away in order to encourage western movement and resource extraction. Changes in forest-related law and policy have followed the changing public attitudes about the West, our natural resources in general and a newer understanding about the interrelationship between natural systems. Federal and state laws that affect forest management in Washington State are summarized in Table 2 and discussed in the following pages.

1. Federal policy

The policy of the federal government toward forest lands was, until recently, focused on the management of those lands in the public domain. In Washington State these federal lands include national forests, national parks, military reservations, and Bureau of Land Management lands. Federal lands make up 30 percent of Washington's land area.

As discussed previously, the first major piece of federal legislation to affect the ownership of Washington timber lands was the Northern Pacific Land Grant Act of 1864. The resulting pattern of checkerboard land ownership is still evident.

The next important congressional action was the Forest Management Act of 1897, which authorized the Secretary of the Interior to administer already established forest reserves. New reserves could only be set aside for the following purposes: 1) to improve or protect land already reserved; 2) to improve water flow in the area; and 3) to provide for a continuous supply of timber. Although this is the first official forest management policy, to this day there is no uniform or controlling federal statute that defines a clear policy of forest management. As a result, the agencies have discretion in their approach to land management. It is the allocation of funds from Congress and the philosophy of the administration, combined with the traditional focus of the agencies, that determine management priorities.

Gifford Pinchot had a major role in shaping public land policy under Theodore Roosevelt's presidency. In his letter to the president in 1905, Pinchot laid out his definition of conservation and vision of the management purpose of public lands. He stated that national forests existed for "the home builder first of all.....and will always be of value chiefly for the production of timber and wood" (Wilkinson, 1992). This idea of producing timber as a crop justified his successful effort to have the management of the national forests transferred from the Department of the Interior to the Department of Agriculture, where he was the first chief of the U.S. Forest Service.

One of Pinchot's detractors was John Muir, who argued for the preservation of public lands in a natural state as opposed to the "managed use" concept of conservation. This philosophical split has resurfaced several times over the century, most strongly in the debate for the 1964 Wilderness Act and subsequent efforts to expand wilderness designations.

Under Pinchot's management of the U.S. Forest Service, the concept of "multiple use" emerged. Along with timber production, other uses included mining, grazing and reservoirs; Pinchot, however, saw timber production as paramount. Not until the Multiple Use - Sustained Yield Act of 1960 were wildlife and habitat included in the mandate for multiple use, but even then, the purpose was to provide for hunting and recreational needs (Buck, 1996). Although there is a public perception that the federal lands are managed and used by the federal government, the U.S. Forest Ser-

Federal Laws	Implementing Agency	Major provisions
1. 1864 and 1870 Land Grant		The federal laws with the most far reaching effect on the Northwest forests, it granted checker boarded mile-square sections to Northern Pacific Railroads. That ownership has passed down to the major timber industries.
2. Forest Service Organic Act (1905) amended by the 1960 Multiple Use-Sustained Yield Act amended by the 1976 National Forest Management Act	Dept of Agriculture	Created the Forest Service. Shifted goals to multiple use of forests and sustained yield of cuts.
3. 1969 National Environmental Policy Act (NEPA)	Council on Environmental Quality	Requires environmental impact statement on major federal actions; opportunity for public participation and response to comments.
4. Endangered Species Act (1973)	U.S. Fish & Wildlife Service or, in the case of anadromous fish or marine mammals, the National Marine Fisheries Service	Prohibits the "taking" of threatened or endangered species, including the destruction of their habitat.
5. Clean Water Act (1972)	Environmental Protection Agency	Prohibits discharges into waters without a permit. Protects water quality, including temperature and quantity.
State Laws		
1. Forest Practices Act (1974)	Dept of Natural Resources	Requires a permit for the harvest of trees on either public or private land. Rules control forest practices, including requirements to leave uncut trees in stream side buffers.
2. State Environmental Policy Act (SEPA) (1970)	Dept of Ecology	Requires an Environmental Impact Review on all major state or local government actions. Contains a statutory exemption for forest practices unless they are Class IV Special (potential for substantial environmental impact), or Class IV General (land conversions).
3. Growth Management Act (1990)	County Government, with oversight by WA Dept of Community, Trade and Economic Development. Review and Appeal to three Regional Growth Management Hearings Boards.	Requires that participating counties, within their comprehensive plans, classify forest lands and regulate development to assure that the use of adjacent lands shall not interfere with the continued use of forest lands for producing timber. Forest lands within urban growth areas shall not be protected unless development rights have been transferred or purchased.
4. Construction Projects in State Waters (1988)	Dept of Fish and Wildlife	A hydraulics project approval must be obtained from the Dept of Fish and Wildlife prior to any activity which will use, divert, obstruct or change the natural flow or bed of any river or stream or that will remove waters of the state or material from stream beds.

Table 2. Federal and State laws that influence forest policy in Washington State.

vice in fact contracts the sale and cutting of timber to private concerns. It is from this "interface between public ownership and private use of the same lands that the conflicts with federal policy arise and persist" (Buck, 1996).

As the U.S. Forest Service proceeded with their interpretation of "multiple use-sustained yield," other congressional actions began to affect the management of the public forests. In 1969, Congress passed the National Environmental Policy Act (NEPA), which requires an environmental impact review of all federal actions, but does not require that those actions be environmentally protective. NEPA, however, has given the public an opportunity to comment on timber sales on public lands.

The Endangered Species Act (ESA) was passed in 1973, but the full impact of that law on forest practices was not really felt until the mid-1980s with the listing of, first the northern spotted owl and, later, the marbled murrelet as threatened species. More recently the proposed listing of specific salmon runs might further restrict logging near the tributaries of salmon-bearing streams. The broader significance of the ESA, however, is that its reach is beyond public lands. It is one of only two major federal laws that define a policy for all forests, both public and private. Under the ESA, the destruction of the habitat of an endangered species constitutes a "taking" with respect to that species and is illegal.

The other important federal law which applies to forest practices on both public and private lands is the Clean Water Act of 1972 and its subsequent amendments. It also addresses forest practices on both public and private lands and establishes the policy that the waters of the nation shall be protected. It prohibits the contamination of rivers, streams and lakes. Forest practices which pollute by allowing sediment run-off into streams or which raise the water temperature by removing shade trees next to streams, are regulated under this law.

The Forest and Rangeland Renewable Resource Planning Act of 1974 and the National Forest Management Act (FMA) of 1976 further defined the Multiple Use - Sustained Yield Act, adding the mandate to protect game and non-game species as part of the U.S. Forest Service mission (Buck, 1996). The latter act set limits on logging practices; clearcutting, however, was still allowed and timber harvest remained the primary "use" of Forest Service lands. Two provisions of the law were significant to the public. The Forest Service was required to produce a plan for a 10 to 50 year period, and citizens could sue the Service if the plans were considered inadequate. Thus, federal agency decisions were now subject to judicial review. Because the FMA included strong species protection, U.S. Forest Service plans were successfully challenged in court for inadequate protection for the northern spotted owl.

Because of the large acreage of forest lands that are on tribal reservations in Washington State, the federal laws and court decisions, which govern the management of those lands, are of special importance. The relationship of the tribes to the federal government is "government to government" and rests with the various treaties of the last century whereby the tribes surrendered land in exchange for certain "reserved rights." Historically, the management of their forests was under the authority of the Bureau of Indian Affairs (BIA), acting as the trustee for the tribes. That management often resulted in cut-and-run timber harvests (as on the Quinault Indian Nation reservation) which were not in the best interest of the tribes and violated the trust agreement.

In 1975, the Indian Self Determination Act was passed which altered the tribal relationship to the BIA and gave tribal councils a greater say in the management of their resources. Every tribe has forged a different arrangement with the BIA. The management varies from one tribe to another.

There were two major court decisions which altered the protection of the tribes' fisheries resource. In 1974, Judge Boldt *(U.S. v Washington)* reaffirmed the reserved right of the Native Americans to fish in customary places. The Boldt decision allowed tribes to harvest one half of the catch. The decision in Phase II of the same case in 1980, sometimes known as Boldt II, stated that the tribes are entitled to protection of fish habitat. Although that decision was remanded back from the Ninth Circuit Court for lack of specific examples of where degraded habitat resulted in diminished salmon runs, the protection of habitat was incorporated into state policy with the initiation of the Timber, Fish and Wildlife (TFW) negotiations. The tribes continue to have a major role in TFW discussions.

In 1990, the National Indian Forest Resources Management Act was passed by Congress (Public Law 101-630). It required that a Forest Management Plan must be completed before timber can be harvested on tribal lands. This plan must be approved by the Secretary of the Interior, but is developed with the participation of the lands' beneficial owners, the tribes.

Early in President Clinton's administration, a "Forest Summit" was convened in Portland, Oregon, with the purpose of easing the growing controversy which had been characterized as "jobs versus the environment." The result of those discussions was "Option 9," or what was later known as the "President's Forest Plan." In 1995, Congress added the Salvage Logging Rider to an appropriations bill. Unlike the name implied, this legislation allowed logging where it had been curtailed by the ESA. That logging, moreover, by-passed environmental laws. Despite strong opposition from environmental groups, the Rider was signed by President Clinton and remained in place until December 1997, when it expired. Thus the political pendulum continued to swing.

Today, the focus of forest policy is compliance with the federal Endangered Species Act. The ESA prohibits unauthorized "take" of listed species. Take means "to harm, harass, pursue, hunt, shoot, wound, kill, trap, or collect, or attempt to engage in any such conduct." Habitat modification that actually injures or kills a listed species through impairment of essential behavior is considered a take. Anyone who believes that their otherwise lawful activity will result in a "take" of a listed species must obtain an incidental take permit. The application for an incidental take permit must be accompanied by a conservation plan, which is often referred to as a Habitat Conservation Plan (HCP).

The purpose of an incidental take permit and the associated HCP is to provide for the conservation of species and their ecosystems while allowing for a specified level of listed species take. The incidental take permit and HCP provides a landowner with certainty about the kinds of activities than can legally be conducted on his or her land both now and in the future. This assurance can be obtained for 50 to 70 year periods. Many environmentalists, however, have objected to the long time frames, arguing that changes in forest ecosystems, the effects of forest practices, and regional or global climate change cannot be predicted with high confidence.

During the HCP development process, specific measures are identified to minimize and mitigate the impacts of the permitted take. Because the Fish and Wildlife Service and/or the National Marine Fisheries Service issue the incidental take permit, and these agencies must comply with NEPA, an HCP requires either an Environmental Assessment or an Environmental Impact Statement.

In 1997, an ambitious HCP covering 1.6 million acres was written by our state's Department of Natural Resources as the land manager for the state trust land and was negotiated with the federal agencies administering the ESA (U.S. Fish

and Wildlife Service and, with regard to salmon, the National Marine Fisheries Service). Other large landowners have negotiated or are preparing HCPs. The public has an opportunity to review and comment on the Environmental Impact Statement, required under NEPA, prior to the plan being finalized with the federal government. The environmental community, however, has objected that this is not adequate or timely public involvement, as the federal agencies and the landowner have generally reached agreement prior to the NEPA process. Tribal governments have also stated that they have not had meaningful consultation in decision-making related to issuance of incidental take permits

2. State Policy

As described above in section B, at the time of statehood in 1889, the federal government set aside for the state two sections in each township as trust lands (Washington Enabling Act, Section 10). Historically, the mandate for these trust lands has been generally interpreted to require maximizing the return for the beneficiaries - the schools, universities and other public purposes. The mandate, however, also includes the requirement that the trust lands "are to be held in trust for all the people" (Constitution of the State of Washington, Article XVI). There is on going discussion about that latter requirement and its implications for future generations. Whether the trust mandate is interpreted by the courts or by public opinion and the legislature, that interpretation will have a major impact on the future management of the state trust lands.

The history of Washington's forestry laws dates back to 1905 when the state legislature enacted the Forest Protection Act. This act was primarily to assure forest protection and fire prevention. The law established the State Board of Forestry, with the State Commissioner of Public Lands as an *ex officio* member. The first legislation regulating forest practices in the state was enacted in 1948, the "reforestation law" (Garry Gideon, pers. comm.).

The 1971 State Environmental Policy Act (SEPA) required an environmental review of all major state and local government actions. The law, however, contained an exemption for all forest practices with the exception of those designated Class IV (having a potential for substantial impact on the environment) (RCW 43.21C.037). In 1978, the "Classic U" court case established that forest practices on both state and private lands were subject to SEPA, within the limits of the statutory exemption.

In 1974, the Forest Practices Act (RCW 76.09) was passed. It was the first comprehensive state law addressing forest practices and it regulates both state and private lands. The Act established the Forest Practices Board as the administrative review body for the Department of Natural Resources (DNR) and authorized the Board to adopt statewide rules. The rules require a DNR permit for all forest practices, including logging, road building, applying pesticides, etc; this approach regulates on a permit-by-permit basis. Until re-

CLASSES OF FOREST PRACTICES

I.	Those operations that have been determined to have no direct potential for damaging a public resource.
II.	Forest practices that have been determined to have a less than ordinary potential to damage a public resource.
III.	Those practices not listed under Classes IV, I, or II.
IV Special.	Practices determined to have a substantial impact on the environment. Must comply with SEPA.
IV General.	(a) Forest practice (other than Class I) on lands platted after January 1, 1960, or lands being converted to another use.
	(b) Forest practices that would otherwise be Class III, but which will not be reforested because of the likelihood of future conversion to urban development.

(WAC 222-16-050)

cently, the permit approach of the 1974 Act included no mechanism to look at a broader picture or consider the cumulative effects of timber practices.

During the 1980s there was conflict among the various stakeholders. The environmental community was concerned for the protection of public resources; the tribes were concerned that the resources guaranteed for their use by treaties be protected; the timber companies were concerned that their access to predictable harvests be protected; the beneficiaries of the trust lands were concerned that they derive the maximum financial return from those lands to finance common schools construction and the universities. In 1986, the parties sat down together to craft what has come to be known as the Timber, Fish and Wildlife (TFW) Agreement. This was a forum in which to negotiate regulations that had the consensus of all stakeholders before going to the legislature for statutory changes or to the Forest Practices Board for rule changes. The major accomplishment of the early agreement was to codify the practice of Watershed Analysis for large areas of timber lands as a method of addressing cumulative effects. This has become a very effective compliance tool because the only way the DNR can regulate and monitor forest practices on an ecosystem level is through prescriptions put in place as a result of a watershed analysis.

The TFW process continues in an effort to negotiate agreements on contentious forest practices issues. Recently, TFW was attempting to arrive at consensus so it could come to the Forest Practices Board with proposed regulations to address the salmon protection required to satisfy the federal Endangered Species Act, the Clean Water Act and tribal treaty rights to harvestable supplies of fish. In September 1998, the environmental organizations withdrew from the process when the parties failed to meet their self-imposed deadlines.

The most recent state legislation to recognize the importance of protecting productive forest lands is the Growth Management Act of 1990. Counties which are required to plan for growth must classify forest lands and adopt development regulations with assurances that the use of adjacent land will not interfere with the continued production of timber. This requirement does not apply to forest lands within the urban growth areas unless the city or county has enacted a program for the transfer or purchase of development rights. Thus an effort is underway to prevent further conversion of forest lands to urban areas in an unplanned sprawl.

In 1997, the Washington Legislature approved a pilot project that allows forest landowners to develop Landowner Landscape Plans (LLP) as an alternative to the permit-by-permit requirement of the Forest Practices Act. Somewhat analogous to the Habitat Conservation Plan allowed under the federal Endangered Species Act but with more public involvement, the state LLPs give the state Department of Fish and Wildlife a formal role in regulating forest practices along with DNR. Most importantly, LLPs have the potential to encourage integrated long range planning. A single long-term permit (up to fifty years) will be issued in lieu of the harvest-by-harvest permits. As with HCPs, the incentive for the landowner is regulatory certainty and relief from the burden of individual permits.

More and more, the concept of Watershed Analysis appears to have the greatest favor by all parties. The value of these analyses, however, will depend heavily on the state standards for the program and actual implementation and monitoring of the forest practice prescriptions.

E. WHAT IS THE CITIZENS' STAKE?

1. The Public Trust Doctrine

An underlying legal doctrine, called the Public Trust Doctrine, is an important consideration in issues involving natural resource protection. This tenet has its roots in Roman law and evolved through English common law where it was held that the crown retained navigable waters in trust for the use and benefit of the people. As the name implies, it follows the principles of trust law whereby the trustee (government) has the responsibility to protect the assets (the public resources) for the good of the beneficiaries (the public). The Doctrine has been interpreted primarily as a state government responsibility.

At the end of the last century in a property title dispute with a railroad, the U.S. Supreme Court decided that the state of Michigan holds title to the submerged lands in Lake Michigan "in trust for the people of the state that they may enjoy the navigation of the waters, carry on commerce over them, and have liberty of fishing therein, freed from the obstruction or interference of private parties" (*Illinois Central R.R. v Illinois 1892).* Since then, the major application of the Public Trust Doctrine has been to state waterways, preventing the obstruction of navigation. More recently the Doctrine has been the basis for protecting in-stream flows, wetlands, access to waters, and even resources beyond water such as park land and pristine forest (Parker, 1987).

Increasingly, legal scholars argue for an expanded scope of the Public Trust Doctrine to protect natural resources from the impacts of private actions and to preserve those resources for the use and benefit of the public and future generations (Sax, 1970).

2. Timber-based Communities

The rapid decline in timber related jobs in recent decades has had a heavy negative economic impact on small logging communities and mill towns in the Northwest. It is the cause of much bitter feeling aimed primarily at "urban environmentalists" who "probably invented their love for the outdoors on their weekend hikes" (Dietrich, 1992). There have been, however, other major changes in the industry that have contributed to the decrease in timber related jobs. Raw log export, mechanization of both harvesting and mills, and conversion of timberlands into other uses have also played important roles.

Since early 1991, the U.S. Dept. of Labor has awarded supplemental grants to the states to address the needs of timber workers (Tuchmann et al., 1996). A variety of retraining services were made available to fit local circumstances. Washington State was awarded $10,035,000 between late 1990 and 1993 to benefit 3,094 participants. Up to the end of 1996, over $27 million of federal money was awarded to retrain more than 4,900 workers in Northwest regional communities affected by timber industry changes. Eighty-one percent of these workers have subsequently been placed in jobs (Tuchmann et al., 1996).

Individual counties receive payments from the U.S. Forest Service based on a percent of gross timber revenues. By law these payments to counties are for public schools and roads, with state legislatures deciding on the actual division of funds (Tuchmann et al., 1996). In 1994, '95 and '96, Washington State counties received a total of $6,564,000 under this program

The Timber Retraining Benefits program extended unemployment benefits to displaced loggers and secondary workers by almost two years. Applicants were given the opportunity to receive these extended benefits if they were in a certified retraining program in a community college, enrolled in a private technical school, or completing a four-year program at a college or university. Also available was a 13-week remedial program to upgrade skills such as reading, a more advanced retraining program, and five weeks at the end of training to find a job. Changes have been made to this program in subsequent legislative sessions including adding commercial salmon fishers and reducing the number of secondary workers in some counties. Monies to fund this program come from the federal Unemployment Insurance Trust Fund (Dean Judd, Department of Community Trade and Economic Development, pers. comm.).

In 1993, the Washington Legislature created the Jobs for the Environment (JFE) Program, to be managed by DNR and funded by state, federal and private, local contributions. JFE program goals are to:

- restore and protect fish and wildlife habitat,
- provide family wage jobs, health benefits, and training opportunities for dislocated natural resource workers,
- assist in establishing new businesses in watershed restoration, and
- encourage the creation of local partnerships to develop and implement projects (ESHB 1785 (1993) WA Statutes).

Since 1993, 116 grants have been awarded to over 25 sponsors (non-profits, local governments, tribes, and conservation districts) of projects in or near timber and fishing communities. Over 900 workers have been employed in salmonid habitat restoration projects at over 500 sites (DNR-WDFW, 1998).

3. Citizen Activism

SEPA and Forest Practices

The "Classic U" court decision in 1979 (*Save the Trees v Bert Cole, Commissioner of Public Lands*) narrowed the exemption from SEPA for logging and reaffirmed that Class IV Forest Practices (those with the potential for substantial impact on the environment) on both public and private lands trigger a requirement to conduct an environmental review. A direct result of this decision was the "2.1 Million Acres of Trees" lawsuit in 1980 (*2.1 Million Acres of Trees v Bert Cole*) which was brought by a coalition of environmental groups and challenged the adequacy of the EIS on DNR's Forest Land Management Plan for all the state trust lands. DNR had written the plan as a direct result of the Classic U decision. The case was ultimately settled with an agreement by DNR to write a new EIS and define "maximum income" in the management of the trust lands. The combined effect of these two court rulings was broader authority for SEPA to address forest practices and for more inclusive DNR decisions on managing trust lands.

The Loomis Lawsuit

In the mid '90s, two lawsuits were filed by non-profit conservation groups to challenge the Department of Natural Resources' plans for logging and road building on state trust lands in an alpine lodgepole pine forest in northeast Washington called the Loomis Forest. One of the groups proposed to purchase the timber on the lands so the money would be available to fund school building (but the purchasers would not harvest the trees).

A settlement was reached in April 1998 that allowed for the Loomis Fund Coalition to form to raise the money needed to accomplish the purchase. The League of Women Voters of Wash-

ington decided to join this coalition to protect 25,000 acres of wild lands valuable for wildlife habitat and water resources. The League's decision was based in part upon our national position on resource management that encourages conservation, stewardship and long-range planning for land uses.

Changing Forest Practice Regulations for the State's Salt Water Islands

In May 1997, residents of the state's salt water islands brought a proposal to the Forest Practices Board asking to modify or add rules for forestry on islands. This proposal was inspired by the 40-acre clearcut limit on islands already in the rules. The proponents feel that several factors deem that practices in island forests should not be lumped with mainland practices. The factors include:

- very small or indefinite watersheds (sole source aquifer status),
- small parcel sizes and residences located among the harvest operations devalue both the aesthetic and commercial worth of lands, more than for similar cutting in similar spaces on the mainland (in part due to cumulative impacts),
- enforcement, as well as technical assistance, and even proper seedlings, is not just a phone call away, and
- application details and data analysis are so vague as to wonder who is minding the store.

They feel that forest degradation on islands is occurring unnoticed but so rapidly that marginal soils, lack of rainfall (Island and San Juan Counties average 25 in.), and drastically altered-from-historic conditions can only lead to annual harvesting that far exceeds annual timber growth.

The Forest Practices Board established a five person subcommittee to address the proposal. The state Administrative Procedures Act compels the subcommittee to study the proposal and make a recommendation, which could include similar items, new changes or no changes. Subcommittee chair Steve Wells says that they will make their announcement in summer 1999. The points of the proposal include:

- categorize Point Roberts as an island,
- applications will conform to critical areas regulations and require selective harvest 200 feet from shore when land is prone to mass slope movement,
- pesticide use will refer to a checklist with provisions for application on sole source aquifers,
- parcel numbers and precise site location of cutting will be required on forest practice applications,
- approved applications will be posted,
- loggers with repeat violations must be bonded,
- replanting shall take place by the end of the first season following cutting, rather than the third, and
- clearcuts will be limited to 2.5 acres.

The group requesting these changes is known as SWIFT, Salt Water Islanders for Timberedlands.

Citizens' Organizations

Organization	Contact
Chehalis River Council	PO Box 586, Oakville WA 98568, 360-273-6137
Chums of Barker Creek (Hood Canal)	PO Box 111, Tracyton WA 98393, 360-698-4004
Clark County Natural Resources Council	1701 Broadway #231, Vancouver WA 98663, 360-695-4500
Federation of Fly-Fishers—Steelhead Council	16430 72nd W, Edmonds WA 98026, 425-742-4651
Friends of the Columbia Gorge	319 SW Washington Street, Suite 301, Portland OR 97204 503-241-3762
Friends of the Earth—NW Office	4512 University Way NE, Seattle WA 98105, 206-633-1661
Friends of the Loomis Forest	PO Box 36, Loomis WA 98827, 509-223-3003
Kettle Range Conservation Group	PO Box 150, Republic WA 99166-0150, 509-775-3454
The Lands Council	517 S Division St., Spokane WA 99202, 509-838-4912
The Mountaineers	300 Third Avenue West, Seattle WA 98119, 206-284-6310 clubmail@mountaineers.org http://www.mountaineers.org/climb
National Audubon Society WA State Office	PO Box 462, Olympia WA 98507, 360-786-8020 http://www.audubon.org/audubon/washstate.html
North Cascades Conservation Council	PO Box 95980, Seattle WA 98145 206-282-1644
Northwest Ecosystem Alliance	Box 2813, Bellingham WA 98227, 360-671-9950
1000 Friends of Washington	1305 Fourth Avenue, Suite 303, Seattle WA 98101, 206-343-0681
Pacific Crest Biodiversity Project	4614 Sunnyside Ave Nth #321, Seattle WA 98103, 206-545-3734
Salt Water Islanders for Timberedlands	Nancy Silver, PO Box 927, Vashon WA, 98070, 206-463-9173.
Save Our Wild Salmon	975 John Street, #204, Seattle WA 98109, 206-622-2904
Save the Woods on Saratoga	4011 S Saratoga Rd. PO Box 154 Langley, WA 98260, 360-221-5385
Sierra Club—Cascade Chapter	8511 15th Avenue NE, Room 201, Seattle WA 98115, 206-523-2147 cascade.chapter@sierraclub.org www.sierraclub.org/chapers/wa
Sierra Club's Cascade Checkerboard Project	8511 15th Avenue NE, Room 201, Seattle WA 98115, 206-523-1347 ccraines@aol.com
The Nature Conservancy of Washington	217 Pine Street, Suite 1100, Seattle WA 98101, 206-343-4344 http://www.tnc~washington.org
Washington Environmental Council	615 2nd Avenue, Suite 380 Seattle WA 98104, 206-622-8103 http://www.greeenwec.org greenwec@aol.com
Washington Public Interest Research Group (WASHPIRG)	5200 University Way NE #201, Seattle WA 98105, 206-523-8985
Wilderness Society - Pacific Northwest Region	1424 Fourth Avenue, Suite 816, Seattle WA 98101-2217, 206-624-6430
Willapa Alliance	PO Box 773 Long Beach, WA 98631

F. CONCERNS

1. Inadequate Laws

Federal lands are still managed with a piecemeal approach by various agencies. A single comprehensive law defining a public land policy would reduce the conflicts among agencies and between agencies and the private parties that have traditionally depended on extracting public resources. Critics of existing management argue that the interests of the public are not being protected. Their arguments include:

- federal subsidies to private interests should be eliminated,
- the extraction of resources, in this case the timber, should yield a profit to the public,
- the cutting of timber must be on a truly sustainable basis,
- the health of the forest is essential, and
- other values such as wildlife habitat, surface water quality, ground water recharge and impacts on hydrologic cycles should be factored into the economic analyses of harvests on public lands.

A comprehensive public land law addressing these concerns would be effective only if there is assured funding for research, monitoring, and compliance.

At the state level, existing regulations under the Forest Practices Act are currently being reevaluated in light of the loss of habitat for endangered species, especially salmon. Regulations need to be adaptable to new scientific evidence, such as soil science, biodiversity, species habitat, and the cumulative effects of timber harvest practices. There is a recognition that the permit-by-permit approach does not capture these broader concerns, with the exception of those basins which have a completed watershed analysis, and even that process has significant problems, including no analysis of wildlife needs. Comprehensive long-term permits such as LLPs and HCPs, on the other hand, have the drawback of locking in practices which may prove harmful over time. A balance must be sought between the need for flexibility to integrate new scientific information with the need for regulatory certainty.

There has been a woeful lack of funding for the processing, monitoring and enforcement of individual permits in DNR's forest practices permit program. By law, DNR must process a permit within 30 days (Class III and IV practices) or it is automatically considered approved (Forest Practices Rules, WAC 222-20-020). The degree of scrutiny given an application depends on whether there is adequate staffing to review each permit. Permits are seldom denied, but they may be approved subject to conditions. Enforcement, which is mainly procedural, is not a strong enough deterrent to prevent environmental damage (Garry Gideon, pers. comm.). Funding for research, monitoring, and enforcement is the essential element of a successful policy.

2. Compliance, Enforcement and Funding of State Programs

Compliance

Compliance with forest practice rules is the responsibility of the individual landowner, timber owner or operator. Results of a 1995 Timber/Fish/Wildlife Field Implementation Committee (TFW FIC) compliance survey indicated that the majority of forest practice applications, 70 percent in eastern Washington (out of a total of 97 permits surveyed) and 68 percent in western Washington (out of a total of 104 permits surveyed), were out of compliance on one or more rules (TFW, 1995). The rules most often noted as out of compliance pertained to road maintenance and wildlife reserve trees. Non-compliance was found in all three of

the ownership groups included in the survey: small private land owners, large private land owners, and state managed lands.

Enforcement

Enforcement of non-compliance with forest practice rules often begins with notification of a concern by a neighbor or citizen. The decision on whether to take enforcement action on an offender is discretionary and is the responsibility of DNR's field officers. The majority of offenses are minor and easily rectified. Of the 139 occurrences of non-compliance noted in the TFW FIC survey, seven received DNR enforcement action. Two of the enforcement actions were triggered by damage to public resources, which include water quality, fish and wildlife, and capital improvements of the state (e.g. roads and bridges). Enforcement actions ranged from Informal Conference Notes (ICN), Notice to Comply (NTC) and Stop Work Orders (SWO). Fines are rare, and SWO are often too late to stop environmental damage.

Enforcement actions may be triggered by intent, and repeat offenders are more likely to be the recipients of an enforcement action. Action may be taken against the land owner, timber owner, or operator. The DNR's "authority for enforcement is pretty empty" (Jennifer Belcher, Commissioner of Public Lands). Penalties are difficult to collect, and tracking operators when they change names and addresses is a cumbersome process. Table 3 summarizes the number of forest practice permit applications and enforcement actions in recent years.

Funding

The 1994 passage of Initiative 601 resulted in a loss of funding to the enforcement arm of the Department of Natural Resources. In the 1993-1995 biennium, the Forest Practices budget was $15,713,000. In the 1997-1999 biennium, the budget had been cut to $13,472,000, a decrease of 14 percent (Forest Practices Division, DNR, pers. comm.). DNR currently has 42 foresters employed in its Forest Practices Division (32 in western Washington, 10 in eastern Washington). These foresters are responsible for overseeing a total of approximately 12 million acres of private and state forest lands. This works out to 248,000 acres per forester in western Washington, and 403,000 acres per forester in eastern Washington (Natural Resources Program Coordinator, DNR Forest Practices Division, pers. comm.) (Figure 7).

Year	Applications, Notifications, Renewals	Notices to Comply	Stop Work Orders	Civil Penalties	Forest Practices Appeals Board
1989	11,399	210	133	*	*
1990	11,297	257	153	*	*
1991	11,982	360	131	*	*
1992	13,445	441	282	25	*
1993	16,501	501	319	79	*
1994	11,974	405	244	40	*
1995	11,357	410	147	31	33
1996	9,107	354	138	5	43
1997	9,432	426	158	18	21
Total	**106,494**	**3364**	**1705**		

* data not available

Table 3. Forest Practice permit applications and enforcement actions from 1989 to 1997, Forest Practices Division, DNR.

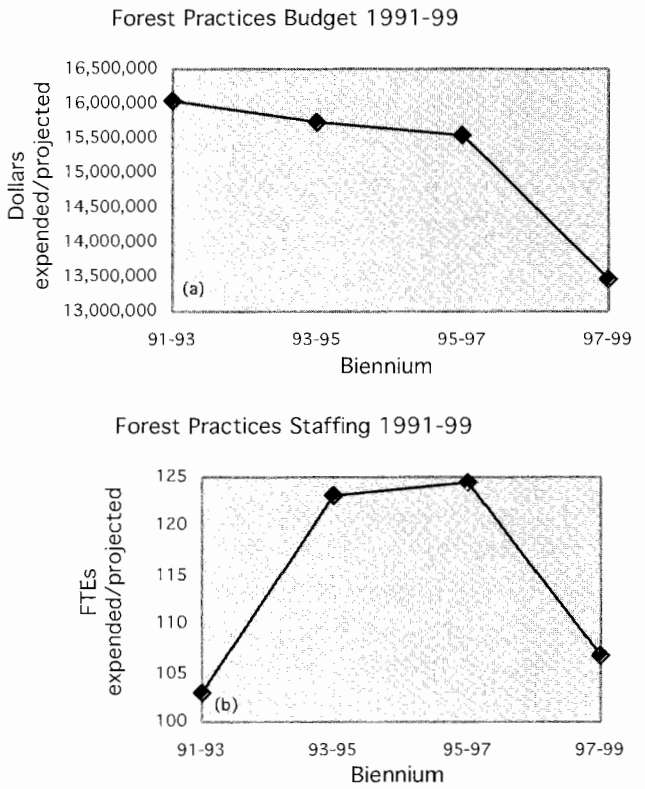


Figure 7 (a) Forest Practices Division, DNR, budget, and (b) full-time person equivalents (FTEs) for the past eight years.

3. Data - Accurate or Not?

Permits issued by DNR include a base map generated from DNR's Geographic Information System (GIS). Data layers available from the GIS include legal boundaries, hydrology divided into stream types, and wetlands derived from the National Wetland Inventory. Data on stream types, in particular the differentiation of fish-bearing and non-fish bearing streams, is often found to be incorrect during field verification. In the TFW FIC compliance survey, in a total area of less than 12,500 acres, seven streams were found to be mistyped. In addition, several wetlands were missing from the basemap, as well as one pond (TFW, 1995).

The water typing system used by DNR's Forest Practices Division was developed over twenty years ago. Water type assignment is being continuously updated, and many streams have not been field verified. In 1994, the Point-No-Point Treaty Council and the Quinault Indian Nation independently completed studies reviewing stream typing on the Olympic Peninsula. Both studies indicated that up to 72 percent of Type 4 streams were in actuality Type 2 or Type 3 streams (fish-bearing). Due to inadequate staffing, corrections to the GIS data layers may take several months to more than a year to be entered into the system (Forest Practices Division, DNR, pers. comm.).

DNR'S WATER TYPE CLASSIFICATON

Type	Description
1	Shorelines of the State (e.g., rivers, lakes, salt water), based on county designations.
2	Usually a defined channel wider than 20', substantial fish use and domestic use.
3	Generally, a defined channel less than 20' wide, presence of game or anadromous fish.
4	Typically, a stream channel 2' and wider, no game or anadromous fish.
5	All natural waters less than 2', no game or anadromous fish.

(DNR, 1997)

Harvest rates are determined by DNR from multidate satellite data. This methodology is fairly accurate for identifying clearcuts greater than several acres in area, but inappropriate to detect selective harvests, especially in complex terrains such as those found on the San Juan Islands.

Lack of programs to monitor long-term changes in land cover and land use across the state make it impossible to monitor cumulative effects.

4. Conversion of Land from Forest to Non-Forest Use

DNR's computerized permitting system reported that, over the last ten years, 64,000 acres of forest lands in Washington State were approved for conversion to other uses (Class IV-General permit) (Forest Practices Division, DNR, pers. comm.).

This number is well below the annual rate of urban conversions of 15,000 acres reported by the U.S. Forest Service for the nine counties along the I-5 corridor (MacLean and Bolsinger, 1997). One reason for this discrepancy could be the prevalence of "back door" conversions, where land owners do not apply for the appropriate permit while intending to convert their land to a use other than forestry. The TFW FIC compliance survey found that in eastern Washington, two percent (2 of 97) of the landowners submitting forest practice applications (FPAs) converted their land to urban use without the appropriate permit, and at the time of the survey those lands were finished homesites. In western Washington, 13 percent (14 of 104) of the FPAs filed for non-conversion practices were for lands that were or would shortly be converted to urban usage. Of these lands, six units were finished homesites at the time of the survey (TFW, 1995). A difference in cost, $50 for Class II and Class III permits versus $500 for Class IV-General permits, may encourage landowners to file for incorrect permits.

There is currently no easy means of accurately determining how much forest land is converted to non-forest use in the state of Washington. DNR does provide copies of their permits to the counties, and it relies on the county to cross check the permits with development applications.

Early in 1998, Thurston County, under new Growth Management Act regulations, accepted responsibility for issuing and monitoring all Class IV-General permits, allowing the county to process timber harvest and development applications at the same time. Applicants attempting a "back door" conversion by obtaining a Class II or III permit rather than a Class IV permit will find their development application given a moratorium of six years on any development activity.

Given the economic returns of land development, it is not surprising that small and large forest land owners are converting land to non-forest usage. With well over six million acres of land in the hands of major timber companies and farm foresters, and perhaps an additional three or four million acres in the hands of the small land owner, the stakes are high enough that governments need to provide incentives to land owners to keep their land covered in forests.

5. Roads

The public and private forest lands of Washington State are crisscrossed with roads, a pattern not realized until viewed from the air, as many of the roads are gated or locked (and thus not seen from the ground). The vast majority of the roads are unpaved and single lane, built to provide access to a particular area at a particular time. When open to the public, the forest roads provide access to areas that would otherwise remain untouched by the activities of hunters and people seeking recreation opportunities. Forest roads increase the chances of damage to the forest and wildlife through poaching, roadkill and fires. Roads serve as linear boundaries that fragment the landscape. These boundaries can be intimidating to animals, restricting the size of their home ranges.

In themselves, roads create ecological damage. Inadequately designed culverts block the migration of juvenile and adult fish, including salmon. Poorly designed roads, unmaintained roads and roads placed in areas of steep slopes or convergent topography often fail and result in landslides and increased incidents of mass wasting. Erosion from unpaved road surfaces can increase the input of fine sediments into streams and the spawning gravel of salmon, increasing egg and alevin mortality. Culverts, both maintained and unmaintained, can become blocked with debris, leading to large sections of roads washing out during storms.

The public is only beginning to comprehend the cost of dealing with timber roads after the timber is cut: road closures, decommissioning or repair, and compensating land owners for loss of life and property when roads fail all add to the cost. The cost of road removal alone can vary from $5,000 to $250,000 per mile (Bagley, 1998).

As timber roads have proliferated in recent years, the public is becoming aware that this massive network is not in its best interest and has become impatient with timber sales that subsidize road building activities (see section G. 3.). For the last two sessions of Congress, measures to end subsidized timber roads in national forests, backed by fiscal conservatives and environmentalists alike, have come close to passage.

While there is currently a moratorium on road building in national forests over most of the nation, the Pacific Northwest and Alaska are excluded, ostensibly because of the Clinton Forest Plan. The debate over new and existing roads in the national forests is far from resolved.

Under current forest practice regulations, land owners must now design roads to minimize the impact on the environment. Further attention must be given to maintaining or decommissioning roads when they are no longer needed for forest extraction activity. Of greater concern are the thousands of miles of existing roads and thousands of existing culverts that do not meet current standards. With the past practice of using tree stumps for fill and using side-cast building techniques, old roads stand at high risk of failure. Many of the older roads are sure to lead to hillside collapse, damage to wildlife habitat and damage to human life and property before funding is obtained for their decommissioning. Decommissioning, at a minimum, should entail revegetation and the removal of all culverts. The state does not currently have a comprehensive inventory of culverts, adequate or otherwise.

6. The Checkerboard Legacy

The railroad land grants have left this state with a checkerboard land-use pattern vividly apparent from satellite imagery and aerial photography. Differences in harvest practices by private and public timberland owners are reflected in the pattern, with the vast majority of the remaining mature or old-growth forests in the three national parks and surrounding national forest lands. Public forests are often abutted by private timberlands. Harvesting on these private timberlands leaves what is left of the old-growth in the national forests fragmented, isolating wildlife into restricted home ranges and restricting their genetic pools. The trees along the edges of the patches are susceptible to blowdown, thus expanding the zone of disturbance. Recognizing these problems, the U.S. Forest Service is continuously negotiating land trades or swaps with private timber companies in an effort to consolidate its holdings.

7. Land Trades

Many problems in forest management and habitat protection are seen as consequences of the checkerboard nature of land ownership in the American west. The timber industry, public land agencies and environmental advocates are all interested in "blocking up" contiguous forest areas to provide more efficient management of lands, eliminate boundary problems, and allow management activity over naturally defined areas, rather than the artificial boundaries of section lines. Land trades are one way to achieve this goal, and trades are currently the subject of vigorous discussion and debate as the Plum Creek Timber Company land trade deal in the Gifford Pinchot National Forest moves toward resolution.

The Western Land Exchange Project, an organization formed for the purpose of scrutinizing proposed land exchanges, has researched land exchanges nationwide (Blaeloch, 1997). The main

concern identified by this organization is that often public benefit seems to be sacrificed in land exchanges, with timber companies receiving public lands with mature trees in exchange for largely cutover areas. Moreover, damaged lands are sometimes brought into the public domain, and the cost of restoration is not included in appraisal prior to the exchange agreement. The public may lose old growth forest and valuable habitat as it accepts cutover contiguous land parcels in exchange for harvestable trees. And, once in private corporate hands, the lands passing from public ownership will be managed for economic gain.

The organization likewise notes that, by law, the federal government still has the authority to exercise control over the management of privately owned checkerboard lands because of their unique history.

The Western Land Exchange Project identifies 11 principles to serve as a framework by which citizens can evaluate proposed land exchanges:

1. Land exchanges shall not violate the public interest. The public interest includes, but is not limited to: preservation of water quality and water supply; the health and abundance of fish and wildlife; biological integrity of ecosystems; preservation of late-successional and old-growth forests; preservation of roadless areas and critical habitat; and public safety.
2. No late-successional or old-growth forest shall be transferred from the public domain.
3. No land comprising critical habitat shall be transferred from the public domain.
4. No roadless areas shall be transferred from the public domain.
5. Land exchanges shall not create or perpetuate a split estate; acquisitions by public agencies shall include all surface and sub-surface rights.
6. Land exchanges shall not promote the conversion of natural forest.
7. Land exchanges shall recognize the special public interest that inheres in lands derived from the railroad land grants. Where this special interest has not been extinguished, it shall operate to limit private activity on these lands. In addition, it shall limit the value of the land for land exchange purposes.
8. Land exchanges shall respect the rights and interests of Indian tribes: Exchanges shall never violate treaty rights. Tribal interests shall be fully analyzed in environmental analyses and planning documents. Where land exchanges affect tribal property or rights, the affected tribe must be treated as an equal party to the exchange. No irreplaceable cultural resources shall be transferred out of the public domain.
9. Land exchanges shall involve equal value. This requires that:
   - Valuation methodology shall be fully disclosed in planning documents.
   - Public costs of restoration from past damage on corporate lands exchanged to the public shall be included in the valuation.
   - Public costs associated with future damage on lands exchanged to corporations shall be included in the valuation.
   - Corporate subsidies in the form of tax breaks shall be included in the valuation.
   - Federal agencies shall impose federal management standards on any public lands which are exchanged to corporations.
10. Non-exchange alternatives such as purchase or regulation shall be considered and included in the planning documents.
11. Programmatic analysis shall be conducted on the cumulative effects of multiple land exchanges on all affected ecosystems.

STEPS TO A TYPICAL LAND TRADE

Overture: Landowner or broker approaches the U.S. Forest Service or Bureau of Land Management (BLM) supervisor with a proposal. Or vise-versa.

Public Notice: After an agreement to begin the process is drawn up, the first public notice is issued.

Environmental Review: Agency staffers must arrange for an environmental impact statement (EIS).

Public Comment: After the draft EIS is published, the public has 45 to 60 days for review.

Appraisal: To determine the value of the land. The public may see BLM appraisals, but not the U.S. Forest Service or Park Service appraisals.

Decision: Made by local supervisors in U.S. Forest Service; BLM requires approval from the national office on deals over $500,000.

(Seattle Times, 1998)

At this writing, U.S. Forest Service Chief Michael Dombeck has begun a review of land appraisals for three major land exchanges in Region 6 (the Pacific Northwest), including the I-90 land exchange with Plum Creek. Abuses documented in Region 4 (Southern Idaho Nevada, Utah and Western Wyoming), including improper appraisals that have resulted in multi-million dollar losses to taxpayers as well as liquidation of old growth habitat, are now subject to criminal proceedings and have prompted Dombeck to order wider investigations.

While relatively little attention has been given to land trades in recent years, the work of citizen activists in the Western Land Exchange Project and other volunteer groups is uncovering a pattern of serious and large-scale abuse in the National Forests as well as lands managed by the Bureau of Land Management.

8. Trust Lands - Pressure to Provide School Funding

The state trust lands are lands given to Washington at statehood to be used in the financing the construction of new schools, universities and prisons. The rapid growth of Washington State's population is leading to mushrooming financial obligations by trust land beneficiaries. When combined with a decreasing timber land base, where land is removed from timber production to be placed into conservation areas to meet the needs of wildlife and environmental concerns or sold to accommodate rapid growth and urban development, the problem is compounded. Linking school construction to income generated from these lands is problematic at best.

While the beneficiaries demand a steady supply of income to fund their commitments, the prices for timber follow global markets that are often cyclic. To harvest only when the return on timber products is high seems natural to the timber companies, but for DNR, the manager of the trust lands, the situation is more complex. To keep a steady income for trust land beneficiaries, DNR is forced to harvest during unfavorable economic conditions. When prices for timber products are low, they may feel pressure to harvest more timber in order to maintain an adequate amount of income. To complicate matters further, while DNR has a clear legal responsibility to trust land beneficiaries, the department also acts as a major supplier of timber to the industry, creating jobs, keeping mills open and providing lumber to accommodate the state's rapid growth. With the recent dramatic decrease in logging on federal forest lands in this state (due to restrictions on harvesting old-growth forests, identified as critical habitat for the spotted owl), the pressure on the state to provide timber sales to the industry has grown.

The beneficiaries of the trust are not only those who exist today, but those of future generations; the trust must be managed in perpetuity. With upland trust lands predominately in forest production, decisions on harvest practices today will affect what will be available in the future, and DNR has an obligation to manage the lands appropriately.

Of increasing concern to the public is the role of the trust lands in maintaining ecological reserves. Trust land managers should expect to answer for their decisions to the public on an ongoing basis.

9. Forest Fire Suppression Policy

A century of wildfire suppression has led to changes in Washington's forests. In many areas on the east side of the Cascade Mountains, open pine forests with meadows have given way to dense stands of shade-tolerant climax species. Periodic creeping ground fires in the ancient open forests removed old wood and rejuvenated forests, doing little damage to large trees; stands of ponderosa pine, western larch and Douglas-fir became fire-tolerant over time. Without periodic cleansing by fire, there was a shift from seral forests to climax forests dominated by true firs and Douglas-fir and overstocked with fuel due to high stand density and debris. Under these conditions, wildfires are catastrophic (Russell, 1992).

Many of these climax forests are unhealthy. Dense stands and overstocking of dead wood make the living trees susceptible to infestations of parasites. In the Yakama Indian Nation's forests, repeated infestations of the spruce bud worm have weakened trees and made them susceptible to secondary parasite and insect infestations. Over a hundred thousand acres of the forest have been affected (Eric Hanson, pers. comm.). In this condition, wildfires could devastate the entire forest in one season. Attempts to chemically eradicate the spruce bud worm were not successful over the long term, as the conditions that encourage this parasite still remain. Efforts to thin the forest, remove defoliated and dead trees and generate fire breaks require a long term commitment and funding. Even when the forests are restored to a condition where fires can no longer be considered catastrophic, a large scale shift away from fire suppression may not occur. Other considerations such as recreation opportunities, vacation homes, aesthetics and air quality must now be considered.

G. CURRENT ISSUES

1. Salmon Recovery

In August 1997, the Upper Columbia Steelhead was listed as endangered, and the Snake River Steelhead as threatened by the National Marine Fisheries Service (NMFS) under the Endangered Species Act. In February 1998, NMFS announced the listing of several Puget Sound salmon "evolutionary significant units" (ESUs) as proposed threatened (under examination to see if they should be listed as threatened). In March 1998, the Lower Columbia Steelhead was listed as threatened. The listings and proposed listings have already had a major impact on forest practice laws in Washington State. In May of 1998, the Forest Practices Board of Washington State adopted an emergency rule that provided protection for Upper and Lower Columbia and Snake River Steelhead (by setting SEPA triggers that would classify certain forest practice actions as Class IV - Special). It also required road maintenance and abandonment plans. The emergency rule was challenged by the Northwest Forestry Association and others, and overturned by the Thurston County Superior Court on Sept. 11, 1998. The Forest Practices Board passed another emergency rule on Sept. 22, 1998. In the meantime, the environmental caucus of the Timber, Fish and Wildlife forum stepped out of negotiations on the forestry module. The Forest Practices Board will now have to consider proposals from the remaining caucuses and separate proposals from environmental groups. As the Forest Practices Board will not be receiving a consensus recommendation, they will need to spend more time studying the proposals prior to adopting any permanent rules. In addition, several environmental groups are suing the Forest Practices Board to ensure that stricter measures to protect salmon are passed.

Forest practices affect salmon in many ways. In the various stages of their development, salmon require water of sufficient quality and quantity, gravel for spawning, food, cover and suitable stream morphology for rearing and nutrient retention. The logging of a forest can have numerous impacts on the riparian and aquatic environments, depending on the specific silvicultural prescriptions followed. Impacts can be summarized in the following categories:

- changes in the hydrologic cycle,
- changes in erosional effects,
- changes in the amount of large woody debris contributed to a system (large woody debris is defined as material that is greater than 2 m in length and 10 cm in diameter),
- changes in stream temperature, and
- obstructions to fish passage.

Although forest practice regulations currently require riparian buffer zones on all streams and rivers that are designated as "fish bearing," protection of the smaller, headwater streams is at the discretion of the land owner and timber operator. The water quality and temperature in the headwater streams, classified as Types 4 and 5 in DNR's classification scheme, have a direct influence on downstream water quality and temperature. As many landslides and road failures occur on steeper slopes commonly found near these small headwater streams, they act as a corridor for sediments to flush into fish-bearing streams. High levels of fine sediments in stream beds restrict the availability of oxygen to salmon eggs and alevin. Increased temperatures speed the development of eggs and alevin, and can result in increased salmon mortality.

As mentioned previously, the accuracy of the stream classification data has been called into question. Many Type 4 streams, designated as non fish-bearing, have been shown to have fish within their waters. Other streams are missing from DNR's database altogether.

RIPARIAN PROTECTION FOR WESTERN WASHINGTON

Water Type	Stream Width	RMZ Max. Width*	Number of Leave Trees**
1 & 2	75' and over	100'	25 - 50
1 & 2	less than 75'	75'	50 - 100
3	5' and over	50'	25 - 75
3	less than 5'	25'	25
4 & 5		none	none

* RMZ is the Riparian Management Zone, measured from stream bank. Harvesting is allowed in the RMZ, provided the appropriate number of leave trees remain.

** per 1000' of stream length; varies by stream substrate.

RIPARIAN PROTECTION FOR EASTERN WASHINGTON

Harvest Type	Min. RMZ	Max. RMZ	Av. RMZ
Partial Cut	30'	50'	N/A
Even-Aged	30'	300'	50'

(DNR, 1997)

Figure 8. Current forest practice regulations do not require a buffer on Type 4 and 5 (non fish-bearing) streams. Under advisement from the TFW forum and environmental groups, the Forest Practices Board is moving toward passing legislation to protect these streams. This photo of a clearcut along a Type 4 stream was taken in November 1997, Grays Harbor County.

The relationship between the health of salmon and our forests is complex. Forest practices in the last century have contributed to the demise of Washington's historically abundant salmon runs. Current forest practice regulations are designed to minimize the effects of logging on salmon health, and many landowners and land managers are making long term commitments that surpass current regulations to aid salmon recovery.

2. The Loomis Settlement

On April 7, 1998, the DNR signed an historic agreement with conservationists concerning the Loomis Forest. For the first time in history, private dollars could be utilized to transfer state trust land from the Common School Trust into a conservation designation. This agreement was the direct result of two lawsuits filed by the conservationists, the Northwest Ecosystem Alliance, Friends of Loomis Forest, and other allied groups, to challenge DNR's management plan. The Loomis Forest is an ecologically diverse region, located just south of the Canadian border on the eastern edge of the Cascade mountains. It is home to many wildlife species, including grizzly bear, gray wolf, wolverine, fisher and lynx. It spans several ecosystems, including the southern extension of the boreal ecosystem. Most importantly, much of this forest remains far from the reaches

of roads, allowing plants and animals a sanctuary from human intrusions (Friedman, 1998).

Ironically, while the region is richly diverse ecologically, its salvation was in great part enhanced by its limited economic worth. The high cost of timber harvesting, distance from mills, beetle-infested lodgepole pine, and slow tree growth rates, have combined to make harvesting a barely profitable venture, especially in comparison to the majority of trust lands in western Washington. But, in the Loomis, the trust system made it impossible to protect the lands from harvesting as long as some profit could be made for the beneficiaries.

The Loomis purchase effort, in which the League of Women Voters of Washington is a participant, offers a solution. If the money can be raised, 25,000 acres of mostly roadless forest lands will be set aside for wildlife habitat and the retention of biodiversity in our state. (It should be noted that DNR intends to continue management activities as needed for the health of the forest.) At the same time, the Common School Trust will gain a large cash settlement.

Whether or not the environmental community can raise the large amount of money necessary for the agreement to go forward remains to be seen. Reaching the agreement itself, nonetheless, has been a monumental and ground-breaking feat.

3. Subsidies and Economics of Harvest Decisions

Assessing the economics of forest management decisions is a difficult process. Often secondary impacts, generally referred to as externalities, take the form of damage to the environment or losses to other connected industries such as fishing or recreation and cannot be easily quantified. Some of the commonly identified externalities to logging activity are:

- degradation of fish habitat and loss of revenue to the fishing industry,
- sediment accumulation in public waters to the point where dredging is necessary,
- flooding,
- damage to water quality,
- ecosystem damage where restoration costs must be incurred by the public,
- loss of tourism by loss of landscape aesthetics, and
- the unquantifiable damage to the overall land aesthetics and quality of life (Niemi and Whitelaw, 1997).

Another externality, often overlooked, is the contribution to climate change. This results from the continued cutting of trees that can sequester the additional carbon put into the atmosphere by burning fossil fuels. When the climate changes, so will our forests. The ten warmest years since record keeping began in 1850 have all occurred since 1980. Scientists expect the climate here in the Northwest to warm another one degree centigrade within the next 20 years (IPCC, 1996). The likely results will be that the total area of forest in the Northwest will shrink because forests will migrate upslope at a slower pace than they will die off at a lower elevation due to temperature change. In addition, species moving upslope will have less habitat because mountains are smaller at the top than at the base (Franklin et al., 1991).

It is conceivable we, as a society, may eventually pay people to plant trees rather than cut them down because global climate change can be very disruptive to established economics by causing flooding, drought and harm to agriculture. There is now a movement internationally for industries to buy the right to emit climate-changing gases by paying for trees to be planted. Oregon was the first state to pass a law requiring any new gas-fired power plant to reduce or offset their CO_2 emissions by 17 percent in comparison with the most efficient plant operating in the United States (Ryan, 1997).

Recent reports from the U.S. Forest Service indicate that the timber sales program has been losing money. By the Forest Service's own admissions, timber sales have resulted in a $15 million dollar loss in 1996, even though the costs of road building, repairing streams, or payments to municipal governments were not included. By General Accounting Office calculations, $995 million was lost between 1992 and 1994 (Durbin, 1998). The "purchaser road credit" program, which allows timber companies to deduct their road-building costs from the timber sale, costs taxpayers approximately $50 million a year. In March 1998, the chief of the U.S. Forest Service unveiled a Natural Resource Agenda for the 21st century in which adequate road maintenance and closure, watershed restorations, sustainable ecosystem management, and meeting the needs of the recreation industry are the priority. Absent was priority given to "getting out the cut" (Durbin, 1998). The timber industry objected to the new priorities. The battle is just beginning, and how it unfolds will shape the way our federal forest lands are managed in the future.

While much of the discussion over retaining logging on federal forests seems to come down to timber industry jobs versus environmental protection, a recent report by the U.S. Forest Service indicates that increased logging may not result in more timber-industry jobs or higher wages. In Georgia, North Carolina and South Carolina, timber production increased 20 percent from 1983 to 1992, while timber jobs rose only 2 percent, and the total income was 4.8 percent smaller (Niemi and Whitelaw, 1997). In the Pacific Northwest, much of the harvest activity is concentrated on private lands, where standing timber is considerably smaller in diameter than old-growth trees. On flat ground loggers with chainsaws are being replaced by machines that "snip" and load up the trees (called "feller-bunchers") with very little person-power. Older and often labor-intensive mills, designed for old-growth trees, are closing; newer, automated mills are taking their place. It is becoming less efficient to process lumber in local mills, and some trees are being exported for processing, while others are taken to a more central location when local mills are not competitive. All of these factors affect what were traditionally thought of as timber-based economies of small towns.

4. Forest Diversity

> *"In a wood that has been left alone for the longest period the greatest regularity and harmony in the disposition of the trees will be observed, while in our ordinary woods man has often interfered and favored the growth of other kinds than are best fitted to grow there naturally."*
>
> *Henry David Thoreau (1817-1862)*

Decades of management, harvesting and replanting of Washington's public and private forests have changed their genetic diversity. Species such as Douglas-fir that bring a high market price are chosen for replanting over less valuable species. Many of the private timber companies selectively breed "super trees," or trees with desired characteristics such as fast growth. Cloning of these "super trees" and replanting them in massive numbers would further reduce the genetic diversity of our forests. While forest managers are careful to point out that they replant land with trees of appropriate seed lots (forest zone and elevation zone), the trend away from natural regeneration is reducing the genetic diversity of our forests.

To some land owners trees are a commodity to be harvested the moment they become "unproductive" to keep on the land. Productivity is measured by the growth curve of the species; for many of the species found in the Northwest, growth curves indicate that maximum yield, or rate of growth per year, can be obtained in 40 to 80 years. This thought process fueled the massive liquidation of old-growth forests on private and public

land in the 70s and 80s; landowners were eager to rid the land of "unproductive" older forests and replant them with fast-growing, young trees. Harvesting trees using clearcutting techniques on a 40 to 80 year cycle encourages the development of sun-requiring species such as Douglas-fir and alder, but at the expense of climax species such as cedar and hemlock. Continuous harvesting on these cycles keeps the land in young seral species.

While planting with desirable species can change the genetic diversity of a forest, so can management practices. Hemlock and red alder are aggressive species that naturally regenerate on the Olympic Peninsula. Seedlings of these species are often cut in order to allow Douglas-fir to become established in plantations.

Monocultures of genetically similar trees are more susceptible to parasitic invasions than are diverse forests. The dwarf mistletoe, for example, seems to move from tree to tree of similar species until it encounters a barrier of a different species. Diverse forests provide a natural barrier against the spread of this parasite.

Perhaps the true implications of the large-scale changes in species diversity and genetics Washington's forests are experiencing will not be felt for several more centuries.

5. New Perspectives and Landscape Planning

New forestry, new perspectives and ecosystem management - the three terms refer to essentially one idea. No longer can a forest stand be looked upon as a discrete unit, but rather it must be viewed as an integral part of an ecosystem. To apply a silvicultural practice on one stand of trees will have effects on the remainder of the ecosystem. These effects, which must be considered both in time and space, are cumulative.

With ecosystem management comes a new approach to silviculture. To minimize the effects of disturbing the forest with clearcuts and heavy treatments, new methods of harvesting have been suggested: injudicious selective cutting (not high grade cutting), patch cutting, and leaving features such as snags and wildlife trees (currently in forest practice regulations), all with the intent of "lifeboating" the biology of the old forest to the new forest. Seen by some as dangerous to loggers, uneconomic, and unlikely to produce results, and by others as a means of the forest industry to gain access to the remaining set-aside old-growth habitat, these methods have not been embraced whole cloth by either the forestry industry or environmentalists. Whether they will be incorporated into silvicultural practices of large land owners remains to be seen.

H. SUMMARY

Understanding the importance of forests requires an understanding of the history of our forests, the current state of our forests, and the laws and policy decisions that have shaped them. The state League has worked to gain an understanding of the various landowners: public agencies such as the U.S. Forest Service, Washington State Department of Natural Resources and Indian nations and tribes, and private landowners such as large timber companies, small tree farmers and small landowners.

As this study is being published, Washington State is struggling to design a plan to protect endangered runs of wild salmon. The fate of the salmon is closely related to changes in forest practice regulations, as these practices affect salmon habitat. Citizens' groups are fighting to halt harvest of some of DNR's pristine forests. Environmental groups are watching carefully as timber companies negotiate long term land management plans with the federal and state governments. Within DNR, the U.S. Forest Service and timber companies, forestry practices learned decades ago are giving way to new ideas, but implementation still finds resistance with those schooled in the old methods. Small landowners worry that increased regulation will make harvesting uneconomic in the future. Growth and urban development are being increasingly regulated, and incentives are given to keep the land in forests.

Even with all of the changes, the forests seem resilient in many ways. What remains of the state's old-growth appears to have been granted a stay, if only for the time being, not for the forests themselves, but for the species that depend on them for survival. Citizens' groups are gaining a voice. Environmentally damaging land practices are being reported.

What this will mean on a regional and global scale is unknown. With increased protection in the Northwest, perhaps the major timber companies will abandon Washington's forests for less regulated parts of the world. Perhaps increased standards and changed practices will set an example for the rest of the world. Washington's forests are important locally, regionally and globally. Understanding our forests is a step towards protecting them.

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APPENDICES

Appendix 1: Tours and Interviews

Forest Tours:

June 24, 1998	Jean Shaffer, Shepherd Tree Farm. A small (10 acres) experimental ecoforest outside of Olympia, WA.
June 24, 1998	Gary McCausland, Forester, Ft. Lewis. An example of a large (46,000 acres) forest managed for military training cover, that demonstrates a profitable large-scale forestry without clear-cutting.
June 26, 1998	Doug Stinson, Cowlitz Ridge Tree Farm. An example of a small tree farm (50,000 acres) managed for wood production, but owner-operated. Lewis County.
July 17, 1998	Cedar River Watershed field trip, ranger with Seattle Public Utilities.
August 20, 1998	Weyerhaeuser helicopter tour with stops at Mima Nursery, South St. Helens Tree Farm, Green Mountain Mill, and St. Helens Forestry Learning Center, and flights over Toutle River and Mt. St. Helens to observe the comparison of managed forestry and natural regeneration of the devastated area.

Interviews:

September 3, 1997	Marcy Golde, Washington Environmental Council.
September 10, 1997	Eric Huart, Growth Management Planner, Department of Natural Resources.
February 26, 1998	Becky Kelley, Washington Environmental Council.
April 8, 1998	Fran Abel, Forest Practices Board member (League of Women Voters of South Whidbey meeting).
May 18, 1998	David Thorud, Dean of College of Forestry Resources, University of Washington.
June 2, 1998	Garry Gideon, Assistant Regional Manager, Central Region, Department of Natural Resources.
June 9, 1998	Stuart Smythe, Door Plant Manager, Shelton & McCleary Simpson Timber Company.
June 18, 1998	Jennifer Belcher, Commissioner of Public Lands.

Appendix 2. Administration for Forest Lands in Washington

Forest Practices Act
1974, RCW 76.09

Governs Entity:
- local government
- state government (incl. trust lands)
- private lands

Regulates Practice:
- growing
- harvesting
- processing

Forest Practices Board
Established by Forest Practices Act

Eleven members who make forest practices rules:

- Commissioner of Public Lands
- One elected public official appointed by the Governor
- Three state department representatives:
  - Community Trade & Economic Development
  - Agriculture
  - Ecology
- Six general public members
  - Small (< 500 acres) timberland owner
  - Independent logging contractor
  - Four members at large

Department Of Natural Resources
Enforces forest practices rules

Board Of Natural Resources
(Six members)

- Commissioner of Public Lands
- Governor (or his representative)
- Superintendent of Public Instruction
- Dean of College of Agriculture, Washington State University
- Dean of College of Forest Resources, University of Washington
- Elected representative from a county having forest land

Commissioner Of Public Lands

Administers Department of Natural Resources

Chairs Forest Practices Board

Chairs Board of Natural Resources

Appendix 3. Washington State Land Trusts

Established	Trust Name	Beneficiary	Original Acres	Acres Today	Forested Acres
1889	Agricultural School Trust	Washington State University	90,000	70,651	57,002
1889	Capitol Building Trust	State buildings in Olympia	132,000	107,511	100,488
1889	Charitable, Educational, Penal, & Reformatory Institutions Trust	Dept. of Corrections, Dept. of Social and Health Services	200,000	73,334	40,927
1889	Common School Trust Indemnity & Escheat lands	K-12 public school construction	2,432,654	1,781,617	1,111,640
1889	Normal School Trust	Eastern, Central & Western Washington Universities, The Evergreen State College	100,000	64,311	55,210
1889	Scientific School Trust	Washington State University	100,000	80,497	66,480
1889	State Aquatic Lands	Washington State residents & visitors	2,400,000	2,100,000	0
1889	University Trust, original & transferred	University of Washington	146,080	86,740	57,661
1921	Forest Board Transfer Trust	21 counties with Forest Board lands, for county services	539,173	543,563	607,933
1923	Forest Board Purchase Lands	21 counties with Forest Board lands, for county services	79,400	77,796	combined with above
1972	Natural Area Preserves (45 sites) Conservation land	Washington State residents & visitors		28,425	
1987	Natural Resource Conservation Areas (23 sites) Conservation land	Washington State residents & visitors		47,400	
1990	Community & Technical College Forest Reserve	Community & Technical Colleges		3,314	3,314
		Total	**6,219,307**	**5,065,159**	**2,100,655**

(Murphy and Rudnick, 1997).

Appendix 4. Acronyms

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CWA	Clean Water Act
d.b.h.	Tree diameter at breast height (4.5' from the ground)
DNR	Department of Natural Resources
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESUs	Evolutionary Significant Units
FMA	Forest Management Act
FPAs	Forest Practices Applications
GIS	Geographic Information System
HCP	Habitat Conservation Plan
JFE	Jobs for the Environment
LLP	Landowner Landscape Plan
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OFM	Office of Financial Management
RCW	Revised Code of Washington
RMZ	Riparian Management Zone
SEPA	State Environmental Policy Act
TFW	Timber, Fish and Wildlife
USDA	United States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geological Survey
WAC	Washington Administrative Code
WAU	Watershed Administrative Unit
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area

Appendix 5. Glossary

ALEVIN Newly hatched juvenile salmonid with visible yolk sac.

ANADROMOUS FISH Fish whose life cycles includes time in both fresh and salt water.

BEST MANAGEMENT PRACTICES (BMP) Forestry practices aimed at prevention of environmental damage or pollution; i.e. suggesting a specific BMP during logging activity to maintain a desired water quality standard.

BIODIVERSITY A characteristic of a healthy, sustainable forest which implies variety at several (hierarchical) levels of biological organization: genetic, species, community/ ecological and landscape.

BIOMASS The total amount of organic matter, both living and dead, in a given area.

BUFFER A forested strip left during timber harvest to conserve sensitive ecosystems or wildlife habitat.

CANOPY The continuous cover of branches and foliage formed collectively by the crowns of adjacent trees and other woody growth.

CLASSIC U-COURT CASE In the late 1970s the state courts ruled, in this lawsuit over timber sales on Whidbey Island , that timber harvests and other forest management activities on state trust lands must comply with the State Environmental Policy Act.

CLEARCUTTING A harvest method in which the entire stand of trees is removed in one timber harvesting operation.

CLIMAX The culminating, highly stable stage in plant succession for a given environment; an ecosystem will stay at the climax stage until disturbance affects the ecosystem and the stages of ecological succession begin again.

CONIFER A cone-bearing tree with needles, such as pine, spruce, fir and larch.

CONVERSION A general term often used to refer to forest land permanently designated to a different use than growing harvestable trees.

CREEP Slow, downstream movement involving subtle deformation of the soil mantle.

CUMULATIVE EFFECTS Changes to the environment caused by the interaction of natural ecosystem processes with the effects of two or more forest practices. Analysis of the cumulative effects of any forest practice should take into account the length of time over which the consequences of each activity lasts, as well as all the landscape and ecosystem characteristics affected.

DEBRIS AVALANCHE Rapid, shallow soil and organic debris movement from hilltops.

DEBRIS FLOW A moving mass of rock, soil, and mud which can travel many miles down steep confined mountain channels.

DEBRIS TORRENT Rapid debris movement along downstream channels.

ECOSYSTEM The ecosystem is the basic functional unit of ecology. Ecological units include, in ascending hierarchy: biotopes, populations, communities and landscapes. An ecological unit is often analyzed at the scale of a watershed.

ECOSYSTEM MANAGEMENT or 'NEW' FORESTRY: Forest practices with the primary aim of maintaining needed biological components to support the interdependencies of the indigenous animal and plant species originally on-site.

EDGE EFFECTS The drastically modified environmental conditions, especially of increased sunlight exposure, along the margins or 'edges' of forest patches surrounded by partially or entirely harvested lands. And edge is defined as where plant communities meet or where successional stages or vegetative conditions with plant communities come together.

ENDANGERED SPECIES A federal and state designation for a species determined to be in danger of extinction throughout all or a significant portion of its range.

ENVIRONMENTAL IMPACT STATEMENT A document prepared under the National and/or State Environmental Policy Act to assess the effects that a particular action will have on the environment.

EVEN-AGED HARVEST Removing all merchantable trees at one time, or over a short period of time, and replanting to produce a stand of trees that are about the same age.

EVEN-AGED STANDS Stands where 70% or more of the stock falls within three adjacent 10-year age classes. Stands with minor differences in age; generally, less than a 10-year difference in age.

EVOLUTIONARY SIGNIFICANT UNITS A population reproductively isolated from other population units of the same species, which represents an important component in the evolutionary legacy of the species. Term used in implementation of the Endangered Species Act. See SALMON STOCKS.

EXTERNALITIES A category of effects which are either beneficial or detrimental and no corresponding compensation is provided to or paid by those who generate the externality. In forestry these externalities include such environmental costs as road building, road maintenance, loss of wildlife habitat, water quality and air quality.

FOREST ECOSYSTEM The interrelationships between the various trees and other organisms (both plants and animals) that form a community; and the interrelationships between these organisms and the physical environment in which they exist.

FOREST LAND Land capable of supporting trees and not actively in a use which is incompatible with timber growing.

FOREST PRACTICE Activities conducted on forest lands related to growing, harvesting or processing timber as regulated by the Forest Practices Act. These include road construction and maintenance, thinning and salvage of trees, harvesting, reforestation, brush control, and using fertilizers or pesticides to prevent and suppress disease and insects.

FRAGMENTATION The spatial arrangement of successional stages across the landscape as the result of disturbance; often used to refer specifically to the process of reducing the size and connectivity of late successional or old-growth forests.

FIDUCIARY Held in trust.

GEOGRAPHIC INFORMATION SYSTEM (GIS) A computer system that stores and manipulates spatial data and can produce a variety of maps and analyses.

HABITAT CONSERVATION PLAN (HCP) A federal land management plan authorized by the Endangered Species Act and managed by USF&WS and NMFS. It is a long-term ("no surprises") contract agreement between a landowner and federal agencies that guarantees habitat needs are met and allows the incidental "take" of listed species that may happen with approved activities. An implementable program for the long-term protection and benefit of a species in a defined area; required as part of a Section 10 Incidental Take Permit application under the federal Endangered Species Act.

HARDWOODS Non-coniferous trees, usually broad-leaved and deciduous. In Washington State, these include alder, bigleaf maple, cottonwood, madrone, oak, ash, and cherry.

HARM A form of take under the federal Endangered Species Act; defined in federal regulations as an act which actually kills or injures wildlife. Such acts may include significant habitat modification or degradation where it actually kills wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

INCIDENTAL TAKE The taking of a federally listed wildlife species, if the taking is incidental to, and not the purpose of, carrying out other-wise lawful activities. Also see TAKINGS.

LANDSCAPE A unit of land with separate plant communities or ecosystems forming ecological units with distinguishable structure, function, geomorphology, and disturbance regimes.

LATE SUCCESSIONAL FOREST A mature and/or old-growth forest stand. Also called late seral stage forest. Typical characteristics are moderate to high canopy closure, a multi-layered, multispecies canopy dominated by large overstory trees, numerous large snags and abundant large woody debris (such as fallen trees) on the ground. Typically, stands 80 to 120 years old are entering this stage.

LEAVE TREES Trees intentionally left standing after a harvest or thinning, usually for wildlife habitat or as seed trees.

LIFEBOATING A method of meeting a structural retention objective of providing refuge, such as habitat in the form of live trees, snags, undisturbed forest floor and forest understory species, for elements of biological diversity that might otherwise be lost from the harvested area.

LISTED WILDLIFE SPECIES Species formally listed an endangered, threatened, or sensitive by a federal (USF&WS or NMFS) or state (WDFW) agency.

MASS WASTING Dislodgment and downslope transport of soil and rock under the direct application of gravitational stress, i.e., without major action of water, wind, or ice (creep, debris flow, debris avalanche and debris torrent).

NATIVE AMERICAN LANDS Tribal and allotted lands held in trust by the federal government.

NONCOMMERCIAL SPECIES A tree species not suitable for industrial wood products: western juniper, Pacific yew, white alder, Pacific dogwood, apple and willow.

NOTICE TO COMPLY A notice issued by DNR pursuant to RCW 76.09.090 of the FPA and may require initiation and/or completion of action necessary to prevent, correct and/or compensate for material damage to public resources which resulted from forest practices.

OLD GROWTH FOREST 1. An ecosystem distinguished by the presence of populations of old trees (close to maximum age for species and site) that is not necessarily in a late-successional condition or free from evidence of human activity. 2. A successional stage after maturity that

may or may not include climax old-growth species; the final seral stage. Typically, contains trees older than 200 years. Stands containing Douglas fir older than 160 years, which are past full maturity and starting to deteriorate, may be classified as old growth.

PUBLIC RESOURCES The Forest Practices Act defines public resources as: water, fish, wildlife, and capital improvements of the state or its political subdivisions (i.e., counties and cities).

RAIN-ON-SNOW ZONE An area without a canopy, such as a clearcut, where it is common for snowpacks to be partially or completely melted during rainstorms several times during the winter, especially in western Washington, leading to a more rapid run-off than from forested areas.

REFORESTATION Reestablishing a forest in an area where trees have been removed.

RIPARIAN MANAGEMENT ZONE Specific areas along rivers and streams where certain steps are taken to protect water quality, fish and wildlife habitat. Riparian Management Zones are measured horizontally from the ordinary high water mark; specific widths (usually between 100 to 400') are set by the forest practices rules. Timber may be removed from riparian management zones if adequate protection can be provided to fish and other nontimber resources.

ROTATION Length of time between tree harvests, typically based on economic or biological criteria.

SALMON STOCK An animal stock is a group of genetically similar individuals of a species.

SALVAGE Harvesting damaged or defective trees for their economic value or for forest health. Includes salvage of residual cedar, blow-down stands, and fire-damaged stands The removal of snags, down logs, windthrow, or dead and dying material.

SCRIBNER RULE The board-foot rule used commonly in Washington to determine volume of sawtimber. Scribner conifer volume is estimated by 32' logs in western Washington; 16' logs in rest of state.

SELECTIVE HARVEST A general term for partial cutting or salvage cutting in which individual trees are removed.

SERAL A series of plant (and/or animal) communities, each naturally succeeding the previous one.

SIDE CAST Excavated material pushed over the road edge.

SILVACULTURE The art, science and practice of planting, caring for, harvesting, and regrowing forest stands with desired qualities, based on knowledge of species and their requirements.

STAND A group of trees that possess sufficient uniformity in composition, structure, age, spatial arrangement, or condition to distinguish them from adjacent groups.

SUSTAINED YIELD Traditionally used to refer to tree harvest, such as that annual cutting not exceed the annual or periodic tree growth increments of a forest.

TAKE or TAKINGS The Endangered Species Act defines take as 'harass, harm, pursue, shoot, wound, kill, trap, capture, or collect' any listed endangered or threatened species, or any attempt to do so. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

TIMBER, FISH AND WILDLIFE AGREEMENT In 1987, several county, state and federal government agencies, environmental groups, tribes and timber landowners met to resolve on-going forestry issues. The goal of the TFW Agreement they forged is to protect public resources while maintaining a viable timber industry. Participants in the TFW process may review and comment on forest practices applications.

TIMBERLAND Forest capable of growing 20 cubic feet or more per acre per year (mean increment at culmination) of industrial wood and not withdrawn from timber utilization by statute, ordinance, or administrative order.

UNEVEN-AGED HARVEST Periodically removing merchantable trees of different ages and sizes, including thinning and salvage, to maintain a stand with a mix of age classes.

UNRESERVED TIMBERLANDS Forest land available for timber harvest.

UPLAND Terrestrial site. Land which is not submerged, aquatic or wetland area.

WEED Any plant which tends to overgrow or choke out more desirable vegetation.

UNEVEN-AGED STANDS Stands where less than 70% of the tree stock falls in three adjacent 10-year age classes.