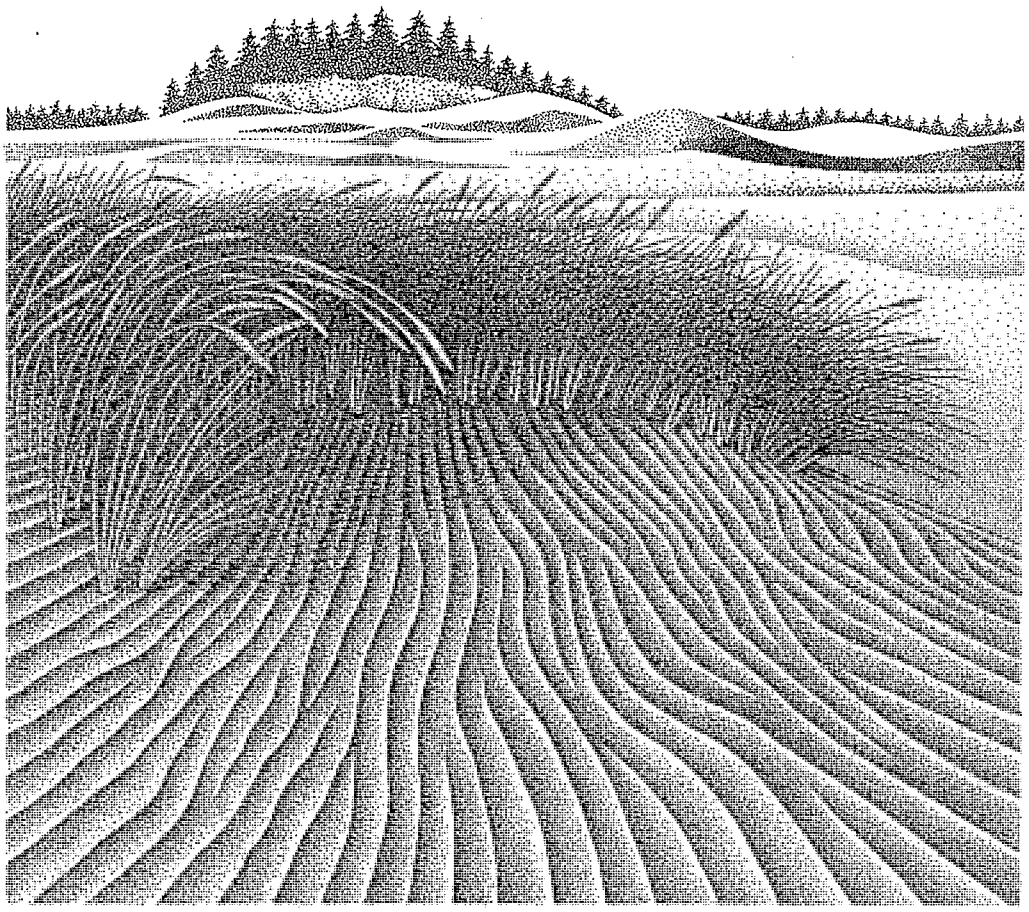
Chapter III
Affected Environment



CHAPTER III

AFFECTED ENVIRONMENT

This chapter describes the environment which will be affected by revising the current management plan. First, physical and biological characteristics of the Oregon Dunes NRA are briefly described, followed by short discussions of landownership patterns and social and economic settings of the NRA.

Later in the chapter, specific resources, environmental conditions and land uses that would be significantly affected by the alternatives are discussed in resource element sections. Emphasis is on past, current and projected conditions, as well as the role of each resource in managing the NRA.

CHANGES BETWEEN DRAFT AND FINAL

Plant Communities & Wildlife Habitat

A new discussion entitled "Plant Species" was added under Plant Species and Communities. It lists dune-maritime endemic and uncommon plant species that were described in Wiedemann (1984).

A Fire discussion was added.

Additional information was added concerning a new species of *Daphnia* discovered on the NRA.

A Special Forest Products discussion was added.

Additional information was added to the T&E Plant Species discussion describing which species occur on the Oregon Dunes NRA and a 1993 survey for pink sandverbena.

A discussion entitled "Globally Significant Plant Communities" was added.

In Figure III-15, marbled murrelet and western snowy plover were changed from Federal candidate C2 to Threatened species.

In Figure III-16, two of the plants are now Federal candidate C2 species, meaning they are being studied for possible threatened or endangered status.

Recreation Section

The discussion of the NRA enforcement/compliance program under Management Practices was expanded and a figure (III-8) was added.

Two figures (III-10 and III-11) displaying national, statewide, and local ORV trends were added under Historic Trends.

A figure (III-12) showing projected growth for various recreation activities was added under Future Trends.

The discussion of demand for the various NRA ROS settings under Recreation Settings was enlarged.

Fish Section

More discussion of the roles of wild, non-native, and hatchery fish was included.

W&S River

Recreation was added as an outstandingly remarkable value for Tenmile Creek.

Water Section

More reference was made to the current study by the Coos Bay-North Bend Water Board and to possible relationships between amounts of vegetation and quality of groundwater.

Lands

A discussion of ownership of the beds of navigable waterbodies was added.

PHYSICAL AND BIOLOGICAL SETTING

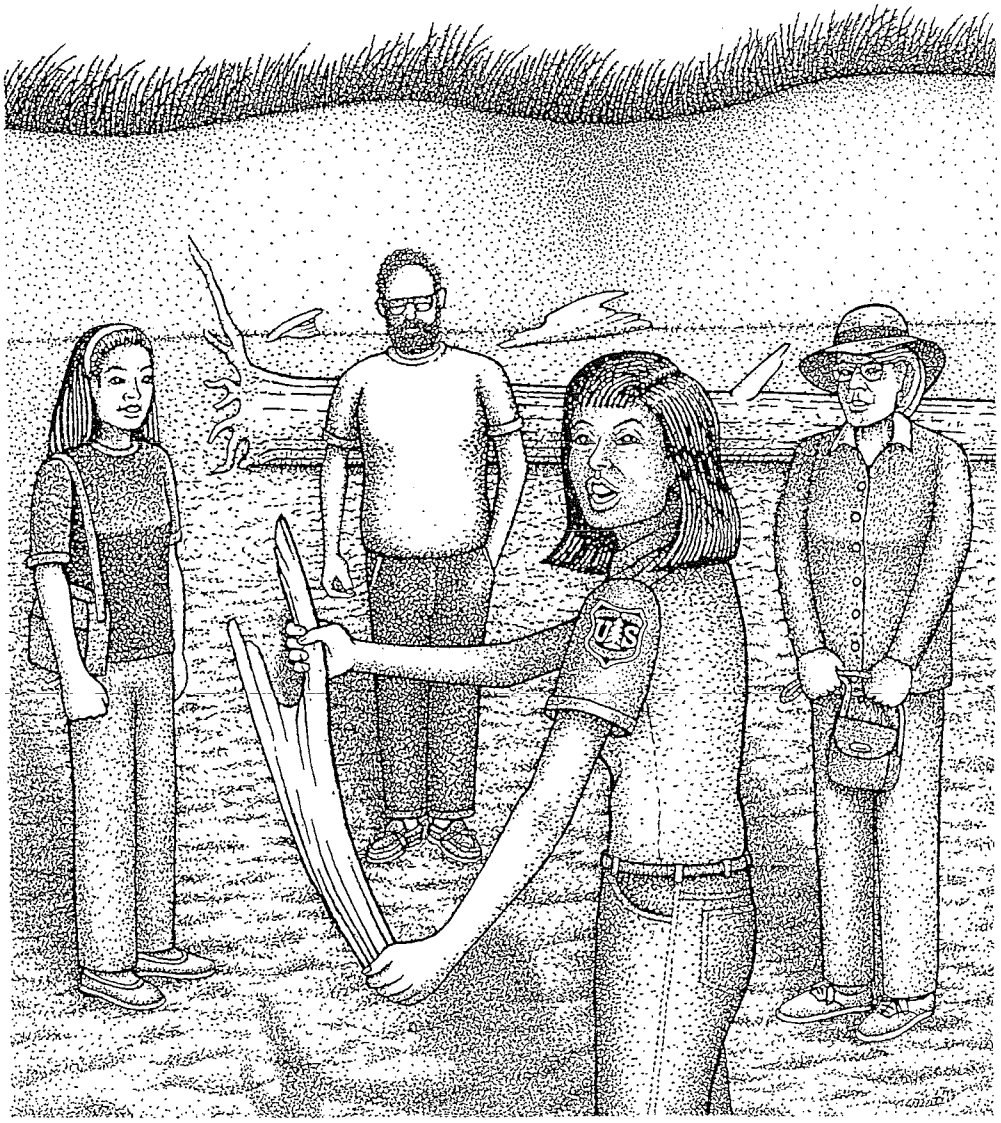
The Oregon Dunes NRA manages 28,900 acres of federally-owned land within the boundaries of the Siuslaw National Forest (Figure III-1). It extends for 40 miles along the Pacific Ocean from Florence and the Siuslaw River on the north to Coos Bay/North Bend on the south. The width of the NRA varies from a few hundred feet to approximately 3 miles, and averages 1-1/2 miles. The area includes parts of Coos, Douglas and Lane counties. Access to the NRA is provided by U.S. Highway 101, which roughly parallels its eastern boundary. State highways 126, 38 and 42 connect Highway 101 with Interstate 5.

Topography, Geology, and Soil

The Oregon Dunes NRA derives its name from the extensive sand dunes that comprise the singlemost important feature of the area. About 20% of the area is active unvegetated sand dunes, which range from small undulating dunes with crests 6-8 feet high to large dunes up to 300 feet high and 5,000 feet long. These large oblique dunes are unique to the NRA; coastal dunes of this magnitude occur nowhere else.

An additional 50% of the area has a sand base, and consists of older naturally vegetated dunes and areas where the sand has been removed by wind action down to or near the water table. The remaining 30% is forested foothills of the Coast Range with predominantly clay soils.

The 40 miles of ocean beach along the NRA are broad and sandy, interrupted only by mouths of streams and rivers as they enter the ocean. Rock outcroppings, cliffs and headlands are missing, and beaches stretch for as far as the eye can see.



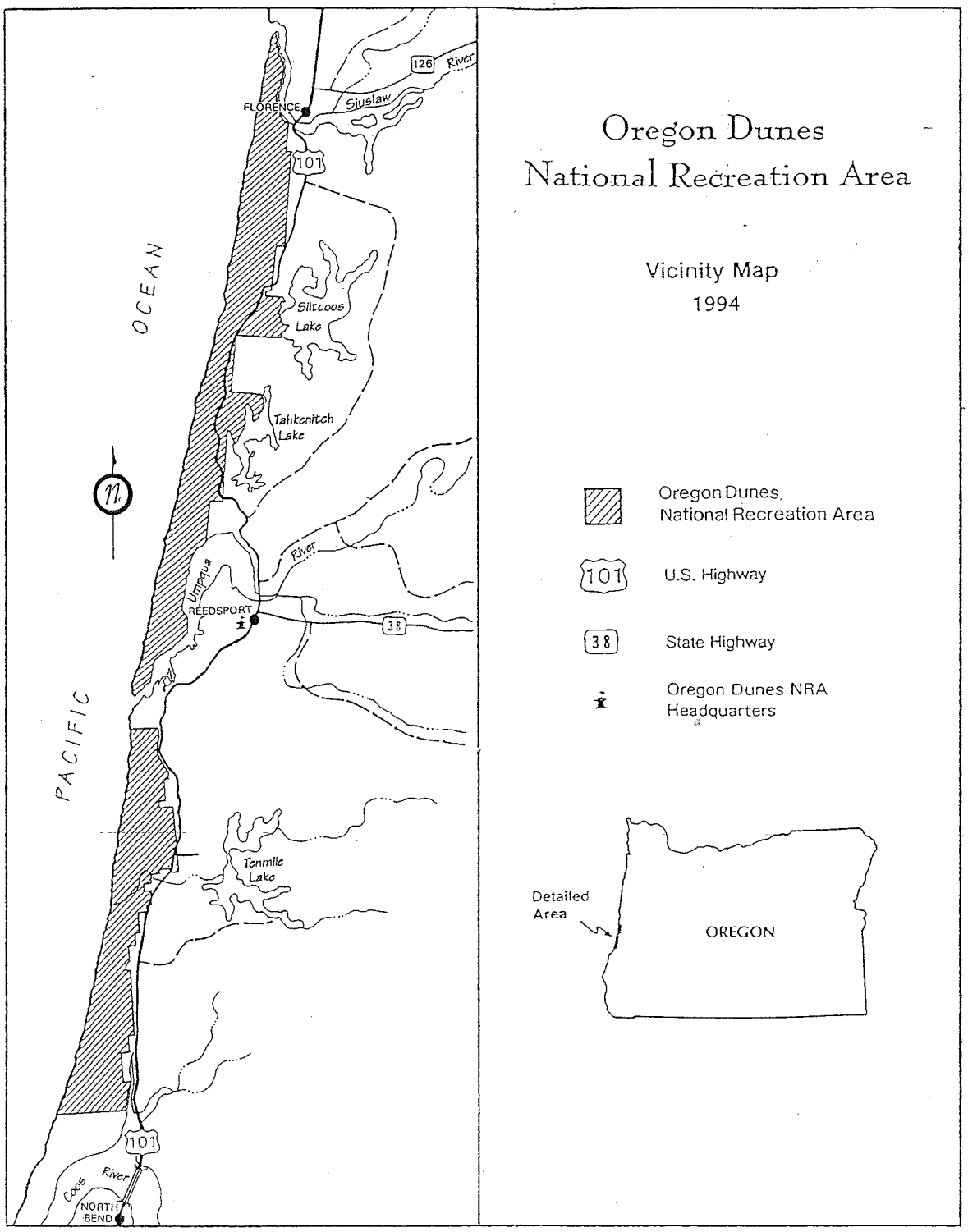


Figure III-1. Location of the Oregon Dunes NRA

Climate

The Central Oregon Coast has a temperate maritime climate due to the nearness of the Pacific Ocean and the influence of the Japanese Current. In particular, the Oregon Dunes NRA is characterized by relatively cool, dry summers and mild, wet winters. Average annual precipitation of 65-70 inches occurs mainly from November through March, when low pressure systems feed a stream of cool, moist air from the North Pacific onto the Coast. This moist air rises in the foothills of the Coast Range and drops large amounts of precipitation.

Summer temperatures generally range from highs of 65-75 degrees to lows of 45-55 degrees. Winter temperatures range from highs of 40-50 degrees to lows mostly in the 30s. Temperatures above 90 and below 20 degrees are rare.

Prevailing winds are moderate northwesterly in summer and strong southwesterly in winter. Dry easterly winds can occur for 2-3 days at any time of the year. Also, during the winter there will generally be several windstorms each year that reach up to 100 miles per hour velocity. Relative humidity is generally above 40%, except during easterly wind conditions.

Summer weather is characterized by foggy mornings, warm, sunny afternoons and cool evenings. The northwesterly wind which blows almost every afternoon is quite cool. Precipitation is light and spotty. Fog or low overcast sometimes lasts all day, and fog drip may contribute significantly to available moisture during the summer. Winter weather is characterized by frequent rains with intermittent clearing periods. Snow may fall on the beach once every few years when Arctic air meets an onshore flow of moist air.

Water

The Siuslaw River borders the Oregon Dunes NRA on the north and the North Slough of Coos Bay lies adjacent to the extreme southeast boundary. The Umpqua River, and smaller streams like the Siltcoos River and Tahkenitch, Threemile, and Tenmile creeks dissect the NRA. The mouths of these smaller streams in the Pacific Ocean create relatively small areas of brackish water. Although these areas may not have all the physical attributes of estuaries in terms of size, shape and stability, much of their biology is characteristic of estuaries.

The NRA boundary is also contiguous with the western boundary of Siltcoos and Tahkenitch lakes, while smaller freshwater lakes like Cleawox, Carter, Threemile, Beale, and Horsfall lie within the NRA. In all, 32 lakes are in or adjacent to the NRA.

Plant Communities

Although sand dunes are not hospitable to many forms of life, a wide variety of plant communities exist within the Oregon Dunes NRA. They include: European beachgrass and American dunegrass communities on the foredune; European beachgrass and other species on hummocks; plantations of European beachgrass, Scot's broom, and shorepine; various communities in the deflation plain that are dominated by either grass, rush, sedge, low shrub, tall shrub or shorepine; shorepine forest; clearcut or second-growth transition forest; communities in salt and freshwater marshes that are adapted to continuous or periodic flooding; and aquatic plant communities in rivers, streams, lakes and ponds. The variety of communities is due partly to blending of ocean and coastal forest ecosystems and introductions of exotic species. Some of the plant communities found on the Oregon Dunes NRA are globally significant, occurring only in a very few other places in the world.

Fish and Wildlife

The Oregon Dunes NRA and nearby offshore waters support 316 species of birds, 54 mammals, 12 amphibians, 3 reptiles, 54 estuarine fish, 20 freshwater fish, 9 anadromous fish and 2 shellfish. Of these, over 30 species of fish and 50 birds and mammals are taken by anglers, hunters and trappers, while several species of anadromous salmon have commercial value. Wildlife observation is a major activity on the NRA.

Populations of some animals found on the NRA are either low or limited; 10 have been classified as threatened and endangered (T&E) or sensitive species. Also, 5 plants found on the NRA are considered sensitive species.

LAND OWNERSHIP

There are 31,500 acres within the boundaries of the Oregon Dunes NRA. A total of 27,450 acres are managed by the Forest Service within the NRA boundary. The remainder is in private, State of Oregon and county ownership. The NRA also manages an additional 1,450 acres of non-NRA, National Forest land immediately south of the NRA boundary. See the Navigability section in Lands and Special Uses, Chapter III for a discussion of ownership of the beds and banks of navigable waterbodies.

SOCIAL AND ECONOMIC SETTING

History

American Indian occupation on the Oregon Coast dates back at least 8,000 years according to evidence from a shell midden near Tahkenitch Landing. Permanent settlements of these early people were clustered along shores of estuaries which empty into the Pacific Ocean. Siuslaw Indians settled the area from Heceta Head to the north, and Siltcoos River and Tahkenitch Creek to the south. The Lower Umpqua Tribe's territory stretches from these two streams to the Tenmile Lake area. The area south of Tenmile Lake to Coos Bay and the Coquille River was settled by the Coos Indians.

Fort Umpqua was built at the mouth of the Umpqua River in 1856, only to be abandoned in 1862. Umpqua City, the first town platted in Douglas County, was established even earlier on the North Spit of the Umpqua River in 1850. The spit also housed an Indian village and cemetery until 1859, when the Indians were removed from the site to Yachats. Just prior to that, trappers and explorers first visited the area. Because of thick coastal underbrush found inland, beaches and waterways became the natural routes of transportation.

Lumbering turned into a commercial venture in 1856 when Captain Asa Mead Simpson began cutting trees for his mill near Coos Bay, exporting the lumber to booming California. As the logging business continued to expand, the fishing industry also emerged when the area's first cannery was built near Gardiner in 1877.

In 1908 the Oregon Dunes area was placed under Forest Service management as part of the Smith River Ranger District. Soon after, many businesses and families moved to Reedsport, which was established in 1900. With new railroad lines connecting the Willamette Valley with coastal communities, people flocked to the Coast for a change of pace. Completion of the first road between Reedsport and Winchester Bay made the latter a popular resort area. Traveling the Coast became much easier when river bridges and the Coastal Highway were built in the 1930s.

Area of Influence

The Oregon Dunes NRA's area of influence has been defined as Lane, Douglas and Coos counties. This is the area in which NRA resources influence economies and quality of life of local communities. Residents of these counties gain employment and income from expenditures by NRA visitors (most of whom are non-residents and therefore bring in dollars from outside the area). A portion of Forest Service receipts from camping and other uses is shared with the counties to fund roads and schools. Residents also benefit from close proximity to the recreational opportunities and amenities provided by the NRA.

Communities in the Area of Influence

Florence marks the northern tip of the Oregon Dunes NRA boundary. With a population of 5,126, the community's economy is based on commercial and sport fishing, tourism, and lumber and wood products. Within the last 10 years, Florence has had an influx of people, making it the second-fastest growing community in Oregon. Many newcomers are making Florence their retirement or vacation home.

Reedsport is located at the midpoint of the Oregon Dunes NRA. Primarily supported by resource-based industries such as commercial and sport fishing, and lumber and wood products processing, the community is becoming more dependent on tourism with recent development of a nearby elk refuge and addition of the Umpqua Discovery Center and the Hero, a retired Antarctic research vessel. The community's population is nearly 4,800.

The communities of **Coos Bay/North Bend** are located at the southern terminus of the Oregon Dunes NRA. With a combined population of 24,530 in the Bay Area, the communities are dominated by lumber and wood products processing, shipping and commercial fishing. Tourism also plays an important role due to sport fishing; the Oregon Dunes NRA; and nearby attractions such as museums, theaters, and state parks.

Lakeside is an example of a smaller community, with a population around 1,500. Many residents are retirees or vacationers. The community's main support is trade, tourism and other related services. Unincorporated communities include Glenada (just south of Florence), Gardiner (two miles north of Reedsport), and Winchester Bay (south of Reedsport).

Population

The Bureau of the Census lists the population of Oregon as 2,930,000 people (Center for Population Research and Census, personal communication) Most people in the state currently live in the Willamette Valley, a situation expected to remain the same by the year 2000. Figure III-2 gives the current population, a projection for the year 2000 (made in October 1989), and the populations of the incorporated communities within the Oregon Dunes NRA boundary.

Figure III-2. Current population and population projected for the year 2000 for representative communities in the 3 counties located within the Oregon Dunes NRA boundary.

COUNTY	Current Population	Population in Year 2000	Incorporated Community	Current Population
Lane	290,000	334,220	Florence Dunes City	5,126 1,081
Douglas	96,100	114,709	Reedsport	4,796
Coos	61,200	69,539	Coos Bay/ North Bend	24,530
Total	447,300	518,468		

Employment and Income

Figure III-3 shows how current employment is distributed by sector for the counties in the area of influence (see below for sources of information).

Figure III-3. Percentage of employment in several main sectors by county.

COUNTY	Lumber & Wood Products	Tourism-Based	Trade	Government
Lane	10%	11%	27%	18%
Douglas	26%	11%	21%	21%
Coos	13%	10%	25%	23%

Although the timber industry has traditionally been a strong factor in the economic base of Lane, Douglas and Coos counties, employment is shifting to other sectors. In Lane County, employment in the lumber and wood products industry is expected to shrink 20% by the year 2010. Growth in other manufacturing sectors is expected to more than offset the projected job losses (Lane Council of Governments 1989).

In Douglas and Coos counties, most growth has occurred in the non-manufacturing sector, especially in the services industry. This trend reflects that the two counties are favorite destinations for tourists and retirees.

Increases in the manufacturing sector in Douglas County are largely because of non-lumber and wood products firms moving to or re-opening in the county. The lumber and wood products sector's share of manufacturing is at the lowest point in 7 years (CCD Business Development Corp. 1990). Coos County expects the growing number of retirees and expansion of tourism to be the major driving factors in the southern county's economic development in the 1990s (State of Oregon 1992; Figure III-3).

The median family income in the three counties is $29,200 for Douglas, $29,300 for Coos and $32,200 for Lane. These compare to a median family income of $34,300 for the state of Oregon; the state's metropolitan areas average $36,500 and non-metropolitan areas average $30,100 (T. Afton, pers. commun.).

A 1991 economic impact analysis (USFS 1991) showed that the Oregon Dunes NRA contributes significantly to the economies of Coos, Douglas and Lane counties. The study was based on a detailed 1990 survey of activities and expenditures of Oregon Dunes visitors. Using the IMPLAN model[1] it was estimated that in 1990 approximately 1.5 million Oregon Dunes NRA visitors contributed 5,214 jobs and $161.4 million[2] in total income to local economies. This indicates a strong interdependence between the Oregon Dunes NRA and local firms and industries. The study broke out relative economic contributions of different types of Dunes recreationists (Figure III-4).

Figure III-4. Estimated total income supported by Oregon Dunes NRA recreationists in 1990 in Coos, Douglas, and Lane counties.

TYPE RECREATION USE	Total Income $Millions[2]	Percent of Total
Non-beach day use	96.4	60
Other	35.2	22
ORV use	21.6	13
Fishing	4.6	3
Camping	3.6	2
TOTAL	161.4	100

[1]The IMPLAN model is a computer model that simulates the economic interdependence between firms, industries and government in a local economy.
[2]1993 dollars.

Oregon Dunes NRA Receipts and Expenditures

Campground fees collected in the Oregon Dunes NRA for fiscal year 1990 totaled $165,000, with $185,000 for fiscal year 1991. Nearly 90% of campground revenues accrue during the peak season of May through September. Special use permit receipts (for collection of mushrooms, greenery and live trees, shrubs and boughs, for commercial dunes-ride concessions, etc.) totalled $25,000 in fiscal year 1991.

Twenty-five percent of a national forest's annual receipts are distributed to the counties within which the forest's lands lie. Receipts from timber sales, recreation fees, special use permits and other uses are pooled; 25% of the total is then distributed among the counties on the basis of the proportion of the forest's total acreage within each county.

Of the $210,000 in recreation and special use fees collected by the Oregon Dunes NRA in 1991, $52,500 (25%) were distributed among the 8 counties in which the Siuslaw National Forest is located; $27,000 of that total went to the 3 counties in the area of influence. Timber receipts make up the largest portion of annual payments to counties; with timber receipts included, total payments to Lane, Douglas and Coos counties in 1991 amounted to $7.8 million.

With changes in traditional industries, local residents, communities and counties are looking to the Oregon Dunes NRA for expanded commercial and special use opportunities, as well as rural economic development assistance through provisions of the 1990 Omnibus Farm Bill. Commercial harvest of mushrooms and other special forest products has become a multi-million dollar industry in the state of Oregon. Demand for commercial mushroom harvesting on the Oregon Dunes NRA is increasing annually at a rapid pace. Management is increasingly having to balance this and other commercial uses with the legislatively mandated outdoor recreation and resource conservation purposes of the area.

Current annual operating costs for the NRA are approximately $1.3 million; average facilities construction costs are roughly $100,000 per year.

RECREATION

Overview

The Oregon Dunes NRA, spanning about 40 miles of Pacific Ocean frontage and home for the largest tract of coastal sand dunes in the western United States, is a unique recreation area in the Pacific Northwest. The Oregon Dunes NRA hosts about 1.5 million visitors annually from throughout the United States and many other countries and is one of the most heavily visited Forest Service areas in the Pacific Northwest.

The area provides a wide variety of recreational opportunities including hiking and walking, horseback riding, warm-water and cold-water fishing, off-road vehicle (ORV) riding, wildlife and scenery viewing, picnicking, mushroom and berry picking, deer and waterfowl hunting, boating and canoeing, photography, nature study and environmental education, camping, sightseeing and driving for pleasure, and dog (retriever and sled-dog) training. Many recreationists also use the Oregon Dunes NRA as an access point to the beach, administered by the State of Oregon, that runs the length of the area. To facilitate and support recreation use, the Forest Service provides 14 developed campgrounds, 21 day-use sites, 25 miles of access roads and 25 miles of trail.

In addition to Forest Service facilities, the State operates three campgrounds and Douglas County operates two campgrounds immediately adjacent to the Oregon Dunes NRA. There are numerous private motels, resorts, campgrounds and recreational vehicle parks nearby. The Bureau of Land Management provides opportunities for dispersed recreation on the North Spit of the Coos River adjacent to the area's southern boundary. The Mapleton Ranger District of the Siuslaw National Forest also provides a variety of recreation opportunities and facilities in the Sutton area just north of Florence.

Current Situation

Recreation Visitation

The Oregon Dunes NRA's 1.5 million annual visitors ranks it in the top 5% of recreation sites managed by the Forest Service in the Pacific Northwest. It is a major tourist attraction on the Oregon Coast which, in turn, is the most popular destination location for tourism in the state (Dean Runyan Associates 1989). Visitation to the Oregon Dunes NRA stimulates expenditures that eventually generate about $245 million of total industrial output (including income and other outputs) for the three counties in which it is located (USFS 1991).

While people come from around the world, most NRA visitors originate from Oregon, Washington and California. A surprisingly large percentage (32%) of visitors travel over 500 miles to reach the Oregon Dunes NRA (USFS 1991). This percentage is high when compared to most other outdoor recreation locations.

Visitors participate in a variety of recreation activities at the Oregon Dunes NRA. The relative amount of time spent at various recreation activities can be represented by percentage of total visits and percentage of total Recreational Visitor Days (number of visitors times average time spent per activity) accounted for by each recreation activity (Figure III-5).

Figure III-5. Percent of visits and use (RVDs) attributed to various recreation activities (1989-1990 traffic counter survey)

Primary Activity	Percent of Visits	Percent of Rec Use (RVDs)
Sightseeing	46	9
ORV Riding	13	30
Pleasure Driving	7	2
Walking/Day Hiking	7	5
Collecting Berries, Shells, Mushrooms, etc.	5	3
Beach/Sand Play	5	6
Fishing (Anadromous, Surf, Cold/Warm Water)	3	5
Wildlife Viewing/Nature Study & Photography	3	1
Picnicking	2	1
Camping	3	36
Other Activities	6	3
TOTAL	100	100

Some conflicts between incompatible recreation uses and between recreation and other resource values are inherent to settings that accommodate a variety of recreation activities. A primary use conflict at the Oregon Dunes NRA, since its inception, has been between ORV recreation and non-motorized recreation, nearby residents, and resources such as plants and wildlife.

Several long-standing issues focus on ORV use in sections of the Oregon Dunes NRA. To many nearby residents and non-motorized recreationists, the engine noise from ORV riding areas (often well into or all through the night) degrades their quality of life or recreation experience. Some adjacent property owners have experienced ORVs trespassing onto their land. Mixing of ORV and non-motorized recreationists within the same sand areas, on the same roadways, and in the same developed facilities has also been cited by both groups as an unsafe situation. Currently all 4 major access corridors into the Oregon Dunes NRA mix ORVs with other recreationists. ORV trespass into areas closed to protect wildlife, plants, sensitive habitats and non-motorized recreation has also been a recurrent problem. Even within areas open to ORV operation, impacts to plants, wildlife, water and other resources are a concern for many people. ORV management at the Oregon Dunes NRA is one of the primary issues to be addressed in this planning effort.

Recreation Supply and Demand

The supply of recreation resources at the Oregon Dunes NRA consists of facilities, settings and programs that encourage or allow visitors to participate in various activities. The amount of use and mix of recreation activities that people engage in at the Oregon Dunes NRA is at least partly a product of the recreation facilities, settings and programs provided.

Facilities

Facilities are designed to promote or allow a specific recreation activity and experiences resulting from that activity. At the Oregon Dunes NRA, recreation facilities are designed for broad categories of overnight and day use.

Overnight facilities at the Oregon Dunes NRA consist of 14 campgrounds ranging in size from 3 to 70 camping units. The campgrounds' maximum annual capacity is 952,650 PAOT-days. PAOT-days are computed by first mutiplying the number of campsites by the number of persons using the campsite, and then multiplying that figure by the number of days the campsite is available for use (managed use season). Since some campgrounds are closed during low visitation periods, the current managed capacity of overnight facilities is 721,785 PAOT-days. Current demand (1991 use) for this supply is represented in Figure III-6.

Figure III-6. Percentage of use (occupancy) of the Oregon Dunes NRA campground capacity (1991).

Campground	Percent Occupancy (Year Round)[1]	Percent Occupancy (May - September)
Lodgepole	29	70
Lagoon	28	65
Waxmyrtle	49	66
Driftwood II	20	57
Spinreel	29	87
Horsfall	19	54
Bluebill	28	77
Wildmare	11	31
Horsfall Beach	20	25
Tyee	29	79
Carter Lake	44	80
Tahkenitch Landing	30	104
Tahkenitch	19	65
North Eel	31	72

[1] **Based on 1991 managed capacity.**

Figure III-6 illustrates that during the high visitation summer season demand for overnight facilities approaches available supply at some locations, but that overall, even during the busy season, there are overnight facilities available. For summer, campgrounds that serve primarily motorized recreationists have an average occupancy rate of 63%. Campgrounds serving primarily non-motorized recreationists are, on the average, 80% full during the summer.

Typically the campgrounds (including three overflow locations) are full during Memorial Day, July 4th and Labor Day holiday weekends. Periodically, some campgrounds may be full during nice-weather on summer weekends. During fall, winter, and spring there is adequate supply to meet current demand.

Day-use facilities can be further broken down into those designed primarily to gain access to undeveloped areas, such as trailheads, staging areas, trails, parking lots and boat ramps; and those designed primarily to provide a recreation experience at the facility itself, such as viewing platforms, picnic areas, overlooks and interpretive sites.

There are 21 day-use facilities, of which most are designed primarily to promote recreation use of undeveloped areas. Annual capacity of day-use facilities designed for such use of the Oregon Dunes NRA is 917,975 PAOT-days. The annual capacity of day-use facilities designed to concentrate use at developed locations is 76,650 PAOT-days. There are 25 miles of maintained trail on the Oregon Dunes NRA. Trails vary in length from 1/4 to 7 miles, and provide primitive to fully-accessible experiences. Trails are primarily designed for hiking with only limited opportunities for mountain bikers or horseback riders. However, newly acquired lands near Tahkenitch Lake could provide additional bike and equestrian trail opportunties.

Few day-use facilities in either category are currently used to capacity even during summer. Again, some facilities may be fully utilized during summer holidays and nice weather on weekends, but most have space available. The only day-use facility that seems to be consistently used weeklong at or very near capacity during the summer is the Oregon Dunes Overlook. Day-use staging for ORVs at several locations is at or near capacity on good weather weekends during summer, fall and spring. Trails are, for the most part, moderately used year round.

Recreation Settings

The percent of Oregon Dunes NRA land area within the different Recreation Opportunity Spectrum (ROS) settings is presented in Figure III-7.

Figure III-7. Relative amount of ROS settings.

ROS Setting	Acres [1]	Percent of NRA
Primitive	0	0
Semiprimitive Nonmotorized	11,030	38%
Semiprimitive Motorized	13,990	48%
Roaded Natural	3,630	13%
Rural	250	1%
Urban	0	0

[1]Includes National Forest lands within the Oregon Dunes NRA and within the mile-wide buffer south of the NRA boundary.

Specific demand figures for various ROS settings at the Oregon Dunes NRA are unknown. However, the 1991 Recreational Needs Bulletin published as a component of the Oregon Statewide Comprehensive Outdoor Recreation Plan (SCORP) 1988-1993 (Oregon State Parks and Recreation Division 1988) provides some insights. The Needs Bulletin compares ROS settings people actually use for various recreation activities versus the ROS setting they would prefer to use for their activity. Examining those SCORP regions applicable to the NRA (Regions 5 and 6) and those activities that occur on the NRA, the following relationships are found:

1) preference for semi-primitive settings exceeds actual use of these settings

2) use of roaded natural setting exceeds preference for this setting

3) use of rural setting exceeds preference for this setting

Taken together these relationships would seem to indicate that in the area covered by the NRA, outdoor recreationists are using settings (rural and roaded natural) that are for some, more developed than they would prefer. Conversely fewer people than would prefer are actually using less developed settings (semi-primitive). Both conclusions indicate that there may be a shortage of semi-primitive (non-motorized and motorized) settings available in the area for the types of outdoor recreation engaged in at the NRA.

Generally ROS settings are operating in a manner consistent with ROS guidelines for the various settings found at the NRA: Rural, Roaded Natural, Semi-Primitive Motorized, and Semi-Primitive Non-Motorized. A primary exception would be in the Semi-Primitive Motorized ROS class, where user densities and frequency of encounter levels (encounters with other recreationists) usually exceed ROS guidelines on holiday weekends and summer weekends when the weather is good. User densities at these times, assuming that users are perfectly distributed within available riding areas, are between 1 and 2 riders per acre. Actual densities (acknowledging that use is not perfectly distributed) exceed this 1 to 2 riders per acre in some portions of the riding areas and are less than this density in other portions. This higher than intended density of use results from staging occurring on National Forest lands, as well as private and state lands adjacent to the NRA boundary. When existing staging capacity is fully utilized it results in user densities that exceed ROS guidelines for SPM settings.

Recreation Programs

Recreation programs at the Oregon Dunes NRA include dispersed recreation, developed recreation and information services/interpretation. Dispersed recreation is away from developed facilities and accounts for approximately 54% of use. Developed recreation is based at facilities, such as campgrounds or overlooks, and accounts for about 46% of total use. Information services and interpretation is provided at developed sites (campgrounds), in dispersed settings (along trails), and away from the NRA (schools and community group meetings). It consists of both personal contacts and indirect contacts through printed information and signs. It is estimated that 80% of all visitors to the Oregon Dunes NRA have contact with some aspect of the information services and interpretive programs.

Management Practices

A wide variety of practices can be used to manage recreation resources at the Oregon Dunes NRA. A basic step is an inventory of the area's recreation resources and capabilities. This is accomplished through the ROS which allows managers to categorize lands according to their ability to provide various recreation experiences. A more detailed recreation inventory also employed at the Oregon Dunes NRA records the number, type and capacity of various recreation facilities. A third inventory records recreation use of the area. Using all these inventories along with statewide and nationwide recreation demand projections, managers estimate how well resources are meeting current user needs, as well as what trade-offs of future options are involved in commiting additional resources to current demand.

Specific management practices include development and maintenance of roads and trails leading to recreation settings or locations. Campgrounds, trailheads or staging areas, parking lots, picnic areas, overlooks, fishing piers, boat ramps and docks, and viewing platforms encourage and facilitate specific recreation activities and experiences. In addition to promoting access and recreation use, developed facilities help to minimize impacts on other resources by focusing and concentrating human uses. Developed facilities are regularly maintained to ensure they are useable for the intended purpose, safe and sanitary, and attractive and pleasant for users. Some portions of the Oregon Dunes NRA are purposely maintained in an undeveloped condition to provide for more primitive and self-reliant types of recreation experiences.

Two additional on-the-ground practices are education and enforcement. These practices protect resources and public safety by promoting compliance with regulations and enhance visitor enjoyment through increasing visitor knowledge. The NRA, with 4 full-time law enforcement officers, has the highest level of law enforcement staffing for any management unit in Forest Service Region 6 (Oregon and Washington). Figure III-8 compares the level of law enforcement activity on the NRA to that of other Region 6 management areas with similar levels of recreation visitation. As can be seen, the NRA has approximately 4 times more law enforcement activity than other national forest units with similar visitation levels.

Figure III-8. NRA law enforcement activity (1989-1992) compared to other R-6 units with similar recreation visitation (from USFS R-6 Law Enforcement, Portland.

Location	Annual RVDs[1]	Warnings 1989-1997	Incidents 1989-1997	Violations 1989-1992	Total LE[2] Activity 1989-1992
Oregon Dunes NRA	Approximately 1.54 million	2,595	1,305	475	4,375
White River Ranger District (Mount Baker-Snoqualmie National Forest)	Approximately 1.43 million	490	610	211	1,311
Diamond Lake Ranger District (Umpqua National Forest)	Approximately 1.63 million	335	131	100	566
Naches Ranger District (Wenatchee National Forest)	Approximately 1.55 million	194	423	95	712

[1] RVD - Recreation Visitor Day
[2] LE - Law Enforcement

Historic Trends

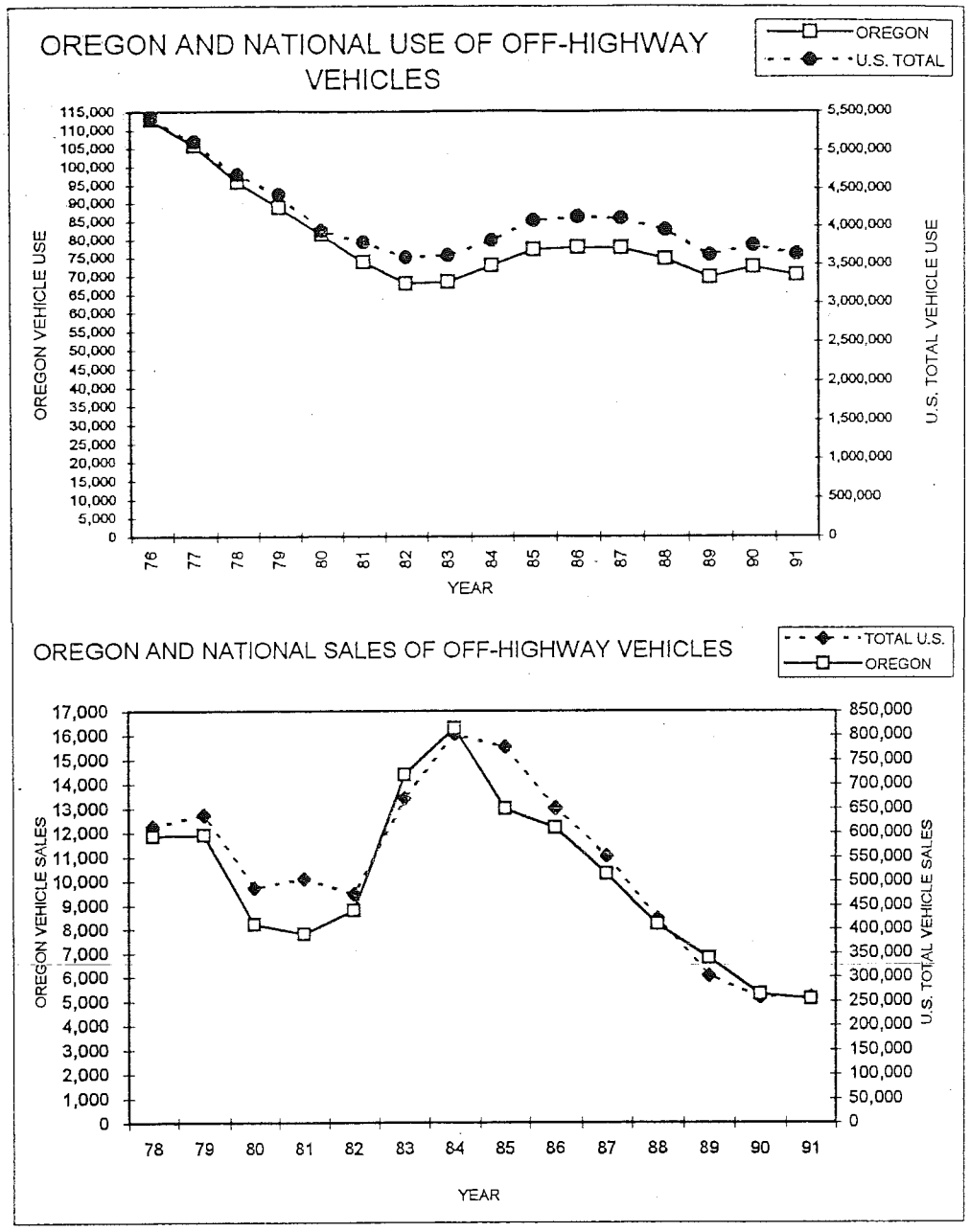
Visitation to the Oregon Dunes NRA has slowly increased since the NRA was established. Numerous entry points without access controls such as entry booths, and dispersal of many visitors into undeveloped portions of the NRA make accurate measurement of visitation difficult. Nevertheless, a trend of increasing visitation to the Oregon Coast, traffic counter data collected at some locations on the NRA, increasing use of state parks adjacent to the NRA, and perceptions of long-time NRA employees indicate that use at the NRA is generally increasing over time. The first systematic estimate of annual NRA visitation since 1977 (in 1989-1990) was 1.5 to 2 million. There were only slight shifts in the primary recreation activities of NRA visitors between 1977 and 1989-90 (Figure III-9).

Figure III-9. Percentage of 1977 and 1990 use made up of various recreation activities

Primary Recreation Activity	Percent of 1977 Recreation Use	Percent of 1990 Recreation Use
Sightseeing	11	9
ORV Riding	28	30
Pleasure Driving	3	2
Walking/Day Hiking	2	5
Collecting Berries, Shells, Mushrooms, etc.	1	3
Beach/Sand Play	5	6
Fishing (Anadromous, Surf, Cold/Warm Water)	5	5
Wildlife Viewing/Nature Study and Photography	1	1
Picnicking	2	1
Camping	38	36
Other Activities	5	3
TOTAL	100	100

Relatively stable ORV-use percentages at the NRA as reflected in the above figure run contrary to national/state and regional trends as represented in Figures III-10 and III-11 respectively.

Figure III-10. National and Oregon trends for use and sales of vehicles used off highways (1976-1991).[1]



[1] From Motorcycle Industry Council and Specialty Vehicle Institute in America.

Figure III-11. Regional ATV trends as represented by vehicle registration (from Oregon Department of Transportation statistics).

County	1986	1987	1988	1989	1990	1991
Coos	1,349	1,768	1,554	1,752	1,624	1,696
Douglas	2,060	2,723	2,279	2,369	2,054	2,206
Lane	3,111	3,916	3,134	3,406	3,090	3,218
3-County Total	6,520	8,407	6,697	7,527	6,768	7,120
Oregon Total	25,369	31,568	25,343	26,775	24,365	25,754

(1) Coos County ATV registration increased by 7% between 1986 and 1991.
(2) Douglas County ATV registration decreased by 11% between 1986 and 1991.
(3) Lane County ATV registration decreased by 10% between 1986 and 1991.
(4) Three NRA county ATV registration decreased by 7% between 1986 and 1991.
(5) State of Oregon ATV registration decreased by 12% between 1986 and 1991.

While primary recreation activities and their relative percentages of total visitation have changed only slightly, technological changes have resulted in different patterns of use and amounts and types of impacts. Among these trends are growth in size of vehicles that must be accommodated on NRA roadways and in campgrounds and parking areas; proliferation in the number of ORVs in developed and undeveloped settings resulting from a shift from multiple passenger dune buggies and rails to single operator ATVs; and a series of technological changes in ORVs (including more powerful engines, new tire designs, and light-weight plastic bodies) have made once inaccessible areas accessible.

Future Trends

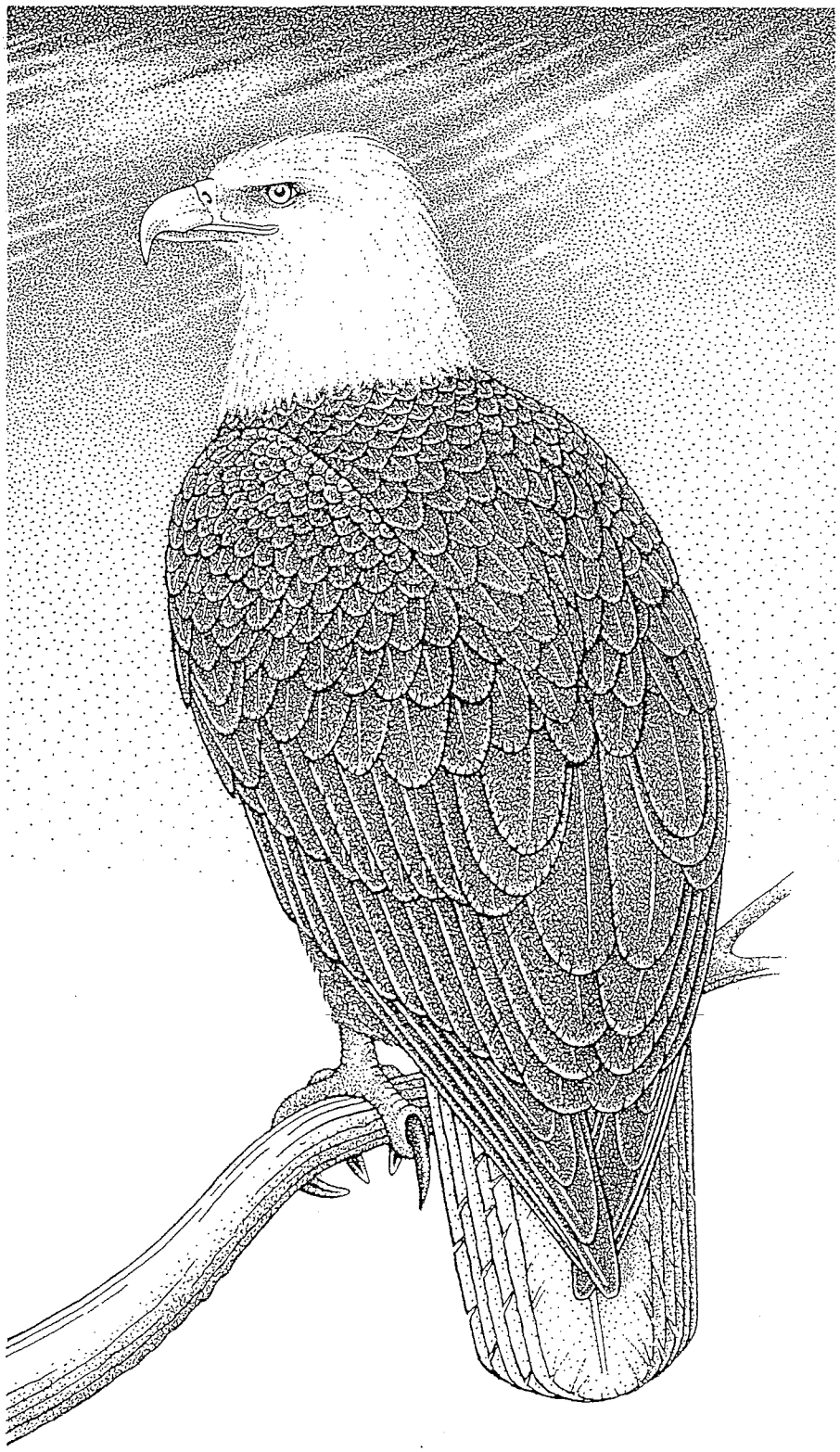
Outdoor recreation experienced tremendous growth in the decades after the Second World War up to the mid-1970s. Since that time, nationwide outdoor recreation growth has leveled off to about 1% annually (Task Force on Outdoor Recreation Resources and Opportunities 1988). However, outdoor recreation in Oregon continues to grow faster than the national average. A 1989 study for the Oregon Tourism Department reports about a 30% statewide growth rate in travel/tourism-related business from 1975 through 1987. Much of this growth is related to outdoor recreation and the study cites the Oregon Coast as the most popular destination for visitors to the state (Dean Runyan Associates 1989). Many outdoor pursuits are growing at rates well in excess of the state's population growth of 1.2% annually. Figure III-12 represents projected statewide annual percentages of increase for various outdoor recreation activities that occur on or near the Oregon Dunes NRA

Figure III-12. Projected statewide annual percentage increases for various outdoor recreation activities (from SCORP, 1988).

Activity	Projected Yearly Increase %
Bicycle on road day trip	12.0
Day hiking on trails	11.9
Lake nonmotor boating	9.7
Outdoor photography	9.3
Nature study/wildlife observation	8.6
Visiting interpretive center	6.6
Recreation vehicle camping	6.1
Boat fishing (fresh water)	5.5
Sightseeing/exploring	4.9
ATV	4.3
4-Wheel Off-road	4.0
Tent camping/motor vehicle	3.7

Resource Relationships

The varied recreation opportunities found at the Oregon Dunes NRA are partially compatible with other resource capabilities of the area. Activities of a low density, low impact nature such as hiking, photography, nature study, angling, and wildlife viewing would generally not conflict with resources such as fish, wildlife, plants, geology, water or scenery. Higher density or higher impact recreation uses such as developed camping or ORV use would be incompatible with other resource uses in many cases, but could be managed to reduce impacts to an acceptable level in some of those situations. In other cases, needs of other resources may preclude or restrict most or all recreation uses in some areas.



SCENERY

Overview

The Oregon Dunes NRA is nationally renowned for its scenic quality. Visual variety is evidenced by bold contrasts in ever-changing sand dunes, vegetation and water body patterns. Most of the landscape is natural appearing with very few human-made deviations. Ample opportunities exist for panoramic or undisturbed views with little sense of boundary or human intervention. There are also opportunities to view the detailed landscape at a pedestrian pace along one of the many hiking trails throughout the dunes, or by cross-country travel. Detailed elements of the landscape and their relationship to each other often create desirable visual variety.

The dunes have a very distinct landscape character, or overall impression one gets when viewing the landscape, that consists of the following features (including landform, rock, vegetation, and water):

Foredunes -- Creates barrier to ocean. Covered with beachgrass and driftwood.

Hummocks -- Curious formations. Inviting to explore. Partially covered with beachgrass.

Deflation Plain -- Variety of plant textures. Interesting water forms.

Open Sand -- Extremely inviting to explore. Spectacular landforms. Fine textures.

Tree Islands -- Bold vertical contrast to surrounding sand. Color contrast between dark vegetation and light sand.

The composition of these features is what gives the dunes its distinctive landscape character. Landscapes, such as the dunes, with the greatest diversity have the greatest visual value.

Current Situation

Viewsheds are the land seen from popular locations such as roads, rivers, trails and developed recreation sites. Figure III-13 lists the name of each viewshed and linear miles it contains. Such viewing locations are generally more important than those viewing locations used by few people. However, the dunes are seen from all angles because visitors meander through them. Thus, it is important that all lands be managed for scenery.

The Forest Plan has established the Visual Quality Objective (VQO) along Highway 101 through the NRA as Retention in the foreground (0-1/4 to 1/2 miles) and Partial Retention for the middle-ground (3-5 miles).

Visual management practices are evaluated on a project-by-project basis. Sand trails created by ORV use and other activities are part of the existing condition that do not necessarily conform to the desired landscape character.

Figure III-13. Viewsheds

VIEWSHED	MILES
Roads	
Highway 101	26.0
Overlook	0.4
Major Road Corridors	
Horsfall	2.4
Siltcoos	2.0
South Jetty	5.2
Umpqua Beach	2.2
Minor Road Corridors	
Threemile Rd.	1.0
Trails	
High Use Trails	
Carter Dunes	1.0
Eel Dunes	1.0
Lagoon	0.8
Overlook Loop	3.2
Waxmyrtle	1.4
Umpqua Dunes	1.8
Moderate-Low Use Trails	
Bluebill	1.2
Chief Tsiltcoos	1.4
Siltcoos Lake	3.5
Tahkenitch	6.8
Threemile Lake	1.8

Management Practices

Visual resources are managed by establishing VQOs for each viewshed. VQOs are measurable standards against which activities can be evaluated (see Scenery, Chapter II). Viewsheds are managed by controlling how the scenery is altered from a natural appearance and introducing or maintaining variety in the seen area. Since this landscape is so dynamic, areas of high aesthetic value require some management activities of both types to retain the valued character.

Resource Relationships

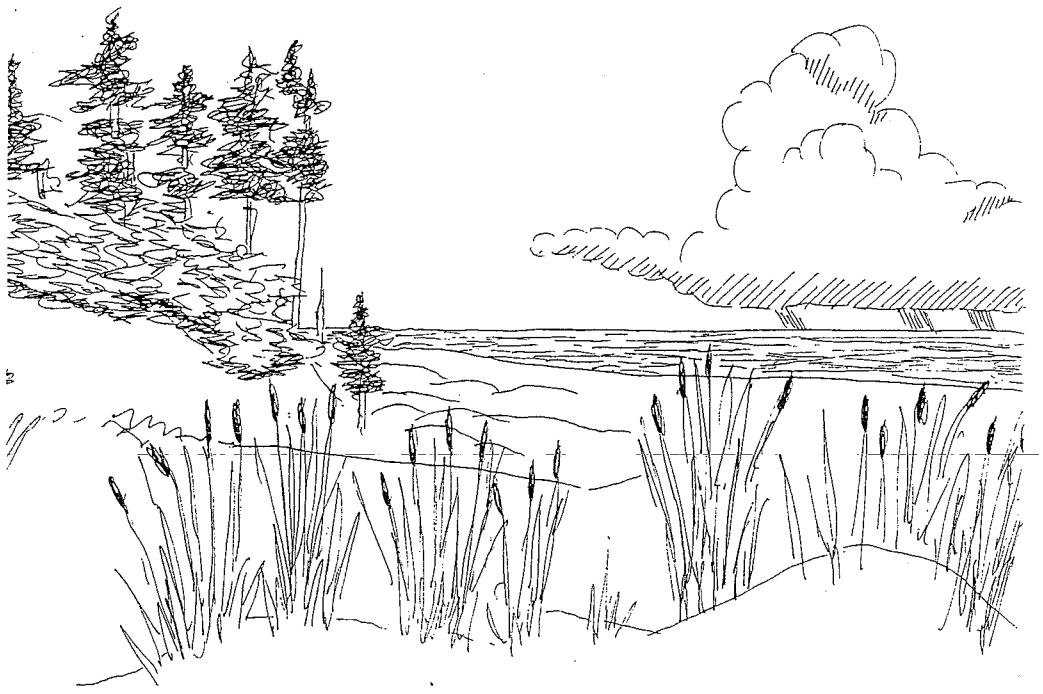
Scenery contributes to high-quality recreation experiences. Such things as developed recreation areas, structures, and some vegetation and wildlife habitat manipulation projects can detract from a natural appearance. Also, vegetation that is allowed to spread unchecked will create a less diverse landscape and growing vegetation may block views from popular roads and trails. Activities such as building roads and structures not in keeping with the natural character of the land will detract from visual quality.

Historic Trends

A major factor in visual management of the dunes is the introduction of European beachgrass. It has caused a tremendous change in character of the dunes scenery. Vegetation has modified the landscape by beachgrass and native vegetation migrating into previously unvegetated areas, and shore pine blocking views in some areas. ORV activity in some areas leaves travelways through previously vegetated areas resulting in an unnatural appearance. Management activities have addressed visual quality only on a project-by-project basis.

Future Trends

If there is no intervention, major portions of the dunes will most likely become vegetated. If this happens, visual variety will be lessened and some natural landscapes and unique visual features will be lost.



PLANT COMMUNITY AND WILDLIFE HABITAT DIVERSITY

Overview

Planning regulations define diversity as "the distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan" (36 CFR 219.3). The environmentally determined occurrence of plant associations, natural disturbance and succession, and management activities all affect diversity on the Oregon Dunes NRA. This section will focus on habitat diversity and the assumed coinciding diversity of animal species. Diversity will only be considered within the Oregon Dunes NRA with the assumption that maintenance of plant and wildlife diversity in the NRA is important because these species and habitats may be threatened within the coastal eco-region. Although most wildlife and plant populations will not be considered in detail, federally-listed T&E species, species proposed for such listing, and sensitive species and plant communities will be specifically addressed.

Available specific diversity indices do not adequately describe the diverse character of the Oregon Dunes NRA. Landforms and plant associations indicate the range of habitats present (Figure III-14). Information on the numbers and types of wildlife species associated with particular habitat types is presented when known. Note that some habitats support a more diverse flora and fauna than others, and are therefore considered more "diverse". Thus, to determine area diversity, one must consider the type of habitat present as well as the area (abundance) and spatial distribution of habitats.

Figure III-14. Acres per landform on the Oregon Dunes NRA and number of wildlife species supported by each (from USFS 1972)[1]

Landform	Acres	Species
DEFLATION PLAIN		
Deflation Plain - Carex	287	92
Deflation Plain - Grasses	199	92
Deflation Plain - Rushes	393	92
Deflation Plain - Low Shrub	1,575	70
Deflation Plain - Tall Shrub	909	40
Deflation Plain - Shore pine Forest	1,868	113
FLOOD PLAIN		
Flood Plain - Active	155	96
Flood Plain - Saltmarsh	67	77
Flood Plain - Stabilized (Shore pine Forest)	77	--
Flood Plain - Stabilized (Transition Forest)	73	--
HUMMOCKS		
Hummocks - Dry	1,370	47
Hummocks - Dry, Plantation	46	(a)
Hummocks - Dry, Stabilized	173	--
Hummocks - Wet, Occasionally	1,915	54
Hummocks - Wet, Occasionally, Stabilized	1,807	54
Hummocks - Wet, Occasionally, Stabilized Plantation	29	(a)
STABILIZED DUNES		
Stabilized Dune - Plantation	666	(a)
Stabilized Dune - Shore pine Forest	314	137
Stabilized Dune - Transition Forest	1,485	
Stabilized Dune - Transition Forest Clearcut	36	96
Stabilized Dune - Transition Forest Second Growth	105	102 (70) (b)
Stabilized Eroding - Shore pine Forest	114	--
Stabilized Eroding - Transition Forest	551	--
Stabilized Eroding - Transition Forest Second Growth	155	--
MOUNTAIN FRONT		
Mountain Front - Marsh	15	58
Mountain Front - Transition Forest	1,323	70
Mountain Front - Transition Forest Clearcut	9	96
Mountain Front - Transition Forest Second Growth	691	102 (70) (b)
Mountain Front - Transition Forest Hardwood	28	
OBLIQUE RIDGE		
Oblique Ridge	3,461	--
Oblique Ridge - Plantation	139	(a)
PARABOLA		
Parabola	383	--
Parabola - Plantation	15	(a)

Landform	Acres	Species
PRECIPITATION RIDGE		
Precipitation Ridge	378	--
Precipitation Ridge - Transition Forest	54	144-135
Precipitation Ridge - Threatening	122	--
ROLLING		
Rolling - Partially Stabilized, Shore pine Forest	233	Up to 135
Rolling - Partially Stabilized Plantation	221	(a)
CONDITIONALLY STABLE		
Conditionally Stable - Slipface	162	--
Conditionally Stable - Slipface Plantation	6	(a)
TRANSVERSE RIDGE		
Transverse Ridge - Dry	1,321	--
Transverse Ridge - Dry, Plantation	45	(a)
Transverse Ridge - Occasionally Wet	1,339	--
Transverse Ridge - Occasionally Wet, Plantation	2	(a)
AQUATIC		
Creek	29	--
Lagoon	5	--
Lake	395	63
Marsh	205	85
River	47	34
Riparian	38	--
FOREDUNE	291	21
BREACH	5	--

[1]Some acres of NRA land were not classified and are not included.
(a) All Plantations may be used by up to 52 species.
(b) 13-25 year old clearcut vs 26-50 year old clearcut

Current Situation

The existence of a variety of habitats ranging from sandy beaches and estuaries to upland transition forests on the Oregon Dunes NRA is due in part to the interface of two highly diverse ecozones, the ocean and coastal mountain forest. In addition, introduction of European beachgrass in the early 1900s created other habitats through vegetation of open sand dunes. While the sand dunes themselves are not particularly hospitable to plants and wildlife, they do support unique plant communities and are used by wildlife traveling between resting, foraging and breeding habitats dispersed throughout sand dune landforms. A landform is a specific land structure such as the foredune, deflation plain, hummocks, and oblique dunes. These landforms may be completely unvegetated (as is the case with oblique dunes, parabola dunes, and active slip faces) or may support one or more plant communities with associated wildlife species. The major landforms associated with plant communities include the beach, sand dunes, hummocks, deflation plain wetlands, upland forests, rivers, aquatic habitats (rivers, streams, lakes, ponds, estuaries), riparian areas, meadows and plantation. More detailed information on these landforms and the plant and animal communities they support is available in Appendix H.

The level of fire hazard present at the Oregon Dunes NRA is related to plant communities and changes in vegetation. As the area becomes more vegetated, fire hazard increases because vegetation provides fuel that supports and carries fire. Fire risk also increases because more area becomes potential ignition points. Fire severity also tends to increase because bare sand areas fill with vegetation creating continuous fuel loading that allows fires to spread farther. Persistent summer winds and a high percentage of early seral stage vegetation, such as grasses and shrubs can create dry conditions conducive to extremely fast-moving fires. In combination with high numbers of people often recreating in or adjacent to vegetated areas, with limited escape opportunities, this situation creates not only fire risk, but also public safety concerns at the Oregon Dunes NRA. The NRA has the highest incidence of fire starts on the Siuslaw National Forest.

Wildlife Species Supported by Plant Communities

General

Habitats found within the Oregon Dunes NRA and nearby offshore waters support 316 species of wildlife; 247 birds, 54 mammals, 12 amphibians and 3 reptiles (USFS 1972). Approximately 38% of the birds are yearround residents, 28% are summer residents or visitors, 28% are winter residents, and 14% use the area on migration stopovers. The 50 species of terrestrial mammals are mostly yearround residents. Of the 4 marine mammals which use the beaches and estuaries, only the harbor seal is a common yearround resident; Stellar's and California sea lions are seasonal residents and the elephant seal is an occasional visitor. All 15 reptiles and amphibians present are yearround residents.

At least 50 native species of birds and mammals found on the Oregon Dunes NRA are classified as "game" or "furbearers" (Mills et al. 1980). Their harvest - by hunting or trapping - is regulated by the Oregon Department of Fish and Wildlife (ODFW). Game species include black-tailed deer, black bear, California quail, Canada goose, band-tailed pidgeon, common snipe, ring-necked pheasant, and a variety of duck species; furbearers include beaver, mink, nutria, muskrat, river otter and raccoon.

Since publication of the DEIS, researchers from the University of Oregon have found a unique species of black daphnia (*Daphnia* sp.) in ephemeral (temporary) pools in open sand in the South Jetty area and below Umpqua Lighthouse State Park. Daphnia are small freshwater crustaceans commonly called water fleas. Similar black daphnia are known to occur only in the Arctic. This is the first time they have been found in a temperate climate. Detailed information regarding habitat needs, geographic range, and effects of various management activities on them is currently unavailable, but is being studied.

T&E

Ten species of animals classified as T&E by the U.S. Fish and Wildlife Service (USFWS) or as sensitive by the Regional Forester have been documented on the Oregon Dunes NRA. Suitable habitat for an additional 5 T&E or sensitive species also exists, although the presence of these species has not been documented (Figure III-15). Suitable habitat for the other 5: the California mountain kingsnake, the California wolverine, the ferruginous hawk, the northern spotted owl and the Oregon silverspot butterfly is not present on the Oregon Dunes NRA; therefore these species were not considered further.

Plant Species and Communities

T&E

Thirty-two plant species are on the Siuslaw National Forest's Sensitive Plant List. Of these, 4 species occur on the NRA: salt-marsh bird's beak, which, as the name implies, occurs in salt marshes, and water pennywort, bog clubmoss, and adder's tongue, which occur in dune deflation plains. Historical records report that pink sandverbena occurred on the Oregon Dunes NRA. In 1993, Oregon Department of Agriculture Botanists surveyed foredune habitats on the Oregon Dunes NRA for this species. No populations were found. This species has declined due to encroachment by European beachgrass and disturbance from off-road vehicles.

An additional 12 species are suspected to occur because suitable habitats are present (Table III-16). The following four sensitive plant species that may or do occur on the Oregon Dunes NRA are under consideration (Category 2) as Federal candidate species: pink sandverbena, tall bugbane, salt-marsh bird's beak, and Frye's moss.

Figure III-15. Occurrence or potential occurrence of federally-listed T&E animals, species proposed for listing (federal candidate C2), and species listed as sensitive by the Regional Forester on the Oregon Dunes NRA.

Common Name	Species	Designation	Occurrence
Alsea micro caddisfly,	*Ochrotrichia alsea*	Federal candidate C2; R-6 sensitive	Small streams, springs and seeps. Suitable habitat exists on the NRA.
Aleutian Canada goose	*Branta canadensis leucopareia*	Federal endangered; R-6 sensitive	Winter migrant along coast in estuaries and wetlands. Historically documented migrant on the NRA.
American peregrine falcon	*Falco peregrinus anatum*	Federal endangered; R-6 sensitive	No known nest sites; potential foraging habitat exists. Several winter sightings on NRA.
American white pelican	*Pelecanus erythorhynchos*	R-6 sensitive	Coastal shores and off-shore island migrant. Suitable resting habitat exists on NRA.
California brown pelican	*Pelecanus occidentalis*	Federal threatened; R-6 sensitive	Common visitor along coastal shores, off-shore islands; does not nest in Oregon. Many fall sightings on NRA.
Common loon	*Gavia immer*	R-6 sensitive	Coastal lakes, rivers and estuaries. Documented non- breeding sightings on the NRA.
Long-billed curlew	*Numenius americanus*	Federal candidate C2; R-6 sensitive	Oregon coast migrant using salt marshes, mudflats and beaches. Migratory documentations on NRA.
Marbled murrelet	*Brachyramphus marmoratus*	Threatened; R-6 sensitive	Mature and old-growth forests. Uses coastal streams as flight corridors. Suitable flight corridors exist on NRA.

Figure III-15 Cont. Occurrence of T&E and sensitive animals

Common Name	Species	Designation	Occurrence
Northern bald eagle	*Haliaeetus leucocephalus*	Federal threatened; R-6 sensitive	No known nest sites on NRA. Several known foraging locations documented on NRA.
Pacific western big-eared bat	*Plecotus townsendii townsendii*	Federal candidate C2; R-6 Sensitive	No known roost sites on NRA. Suitable foraging habitat exists on NRA.
Red-legged frog	*Rana auroa*	R-6 sensitive	Moist wooded habitats and riparian zones. Breeding documented on NRA.
Northwestern pond turtle	*Clemmys marmorata marmorata*	Federal candidate C2; R-6 sensitive	Lakes, ponds and sloughs of large rivers. One documented sighting on NRA.
Western snowy plover	*Charadrius alexandrinus nivosus*	Threatened; R-6 sensitive	Nests in sandy spits associated with estuaries. Documented during both breeding and wintering season on NRA.
White-footed vole	*Arborimus allbipes*	Federal candidate C2; R-6 sensitive	Woodland species in coniferous forests. Documented breeding on NRA.

Figure III-16. Occurrence or potential occurrence of federally-listed T&E plants, species proposed for listing (federal candidate C2), species listed as T&E by the State of Oregon, and species listed as sensitive by the Regional Forester on the Oregon Dunes NRA.

Species	Common Name	Designation	Occurrence
Abronia umbellata breviflora	Pink sandverbena	Federal candidate C2; State of Oregon - Endangered; R-6 sensitive	Beaches and foredunes; open sand. Historically documented on NRA, but not located since 1978.
Anemone oregana felix	Oregon anemone	R-6 sensitive	Coastal marshes; sphagnum bogs. Suitable habitat exists on NRA.
Carex macrochaeta	Large-awn sedge	R-6 sensitive	Moist or wet open places. Suitable habitat may exist on NRA.
Carex pluriflora	Several-flowered sedge	R-6 sensitive	Sphagnum bogs. Suitable habitat exists on NRA
Cimicifuga elata	Tall bugbane	Federal candidate C2; State of Oregon - candidate for listing; R-6 sensitive	Moist forest edges. Suitable habitat exists on NRA.
Cordylanthus maritimus palustris	Salt-marsh bird's beak	Federal candidate C2; State of Oregon - candidate for listing; R-6 sensitive	Coastal salt marshes. Documented in one location on NRA.
Hydrocotyle verticillata	Water pennywort	R-6 sensitive	Dune deflation plains; bogs; marshes. Documented in one location on NRA.
Limbella fryei	Frye's moss	Federal candidate C2; State of Oregon - candidate for listing; R-6 sensitive	Sphagnum bogs. Suitable habitat exists on NRA.
Lycopodium inundatum	Bog clubmoss	R-6 sensitive	Dune deflation plains; lakeshores. Documented in several locations on NRA.
Ophioglossum vulgatum	Adder's-tongue	R-6 sensitive	Dune deflation plains; lake, bog, pond edges. Documented in one location on NRA.

Figure III-16 Cont. Occurrence of T&E and sensitive plants

Species	Common Name	Designation	Occurrence
Plantago macrocarpa	North Pacific plantain	Possibly extinct	Sphagnum bogs. Suitable habitat exists on NRA.
Pohlia sphagnicola	Moss	R-6 sensitive	Sphagnum hummocks. Suitable habitat exists on NRA.
Scirpus cyperinus	Wool-grass	R-6 sensitive	Wet, low ground. Suitable habitat may exist on NRA.
Utricularia gibba	Humped bladderwort	R-6 sensitive	Standing or slow moving water. Suitable habitat exists on NRA.
Utricularia minor	Lesser bladderwort	R-6 sensitive	Standing or slow moving water. Suitable habitat exists on NRA.
Wolffia columbiana	Water-meal	R-6 sensitive	Ponds. Suitable habitat exists on NRA.
Wolffia punctata	Water-meal	R-6 sensitive	Ponds. Suitable habitat exists on NRA.

Plant Species

Wiedemann (1984) lists 10 plant species that are "dune-maritime endemics", meaning that they occur only on the beaches and dunes of the Pacific Coast of North America. Of these, 7 (yellow sandverbena, dune bentgrass, silver burweed, American glehnia, seashore bluegrass, black knotweed, and dune tansy) are known to occur on the Oregon Dunes NRA in beach strand, sand dunes, and wetland habitats.

Wiedemann (1984) also listed uncommon plant species that occur in sand dunes of the Pacific Northwest Coastal Region. Of these, 4 (leathery grape-fern, giant helleborine, Labrador tea, and bog clubmoss, which is on the Forest's Sensitive Plant List) occur on the Oregon Dunes NRA in wetland and sand dune habitats; one (Scouler's polypody) occurs in forest habitats. Other species that Wiedemann listed as common in 1984 may actually have decreased in abundance, such as the large-headed sedge, which is found in sand dune habitats. Information is still needed regarding the distribution and abundance of this species as well as others, including Hind's sedge, pale sedge, and green sedge.

Globally Significant Plant Communities

Since the DEIS was released for public comment in April 1993, Oregon Natural Heritage Program ecologists have surveyed the NRA and provided information regarding the presence and status of several unique plant communities. These communities, found only along the North American Pacific Coast, have declined throughout the region for various reasons, including invasion by introduced plant species, ORV recreation, and residential development and logging on private lands. Globally, these plant communities are becoming scarce and, therefore, their occurrence on the Oregon Dunes NRA, where they can be afforded recognition and protection, is significant.

A commonly accepted 5-point ranking system is used by Natural Heritage Progams in about 100 offices worldwide for determining global significance of plant or animal species or natural communities. Global, or "conservation priority" ranks are assigned to "elements", which can be plant and animal species, or natural communities. Global ranks are based on number, quality and condition of occurrences, narrowness of range and habitat, trends in populations and habitats, and threats to and fragility of the element being assessed. This information is routinely documented in a computerized "element global rank" record. The global ranks are:

G1 - critically imperiled globally (typically 5 or fewer occurrences);
G2 - imperiled globally (typically 6 to 20 occurrences);
G3 - rare or uncommon but not imperiled (typically 21 to 100 occurrences);
G4 - not rare and apparently secure, but with cause for long-term concern (usually more than 100 occurrences);
G5 - demonstrably widespread, abundant, and secure.

The globally significant plant communities on the Oregon Dunes NRA ranked as G1 (critically imperiled) are red fescue, American dunegrass, seashore bluegrass, and Port Orford cedar/evergreen huckleberry. The globally significant plant communities ranked as G2 (imperiled) are shore pine/hairy manzanita, bog blueberry/tufted hairgrass, and shore pine/slough sedge. These communities are described below.

Red fescue (G1)

Few remaining occurrences exist of this formerly widespread community that occurs on open dunes. Once common on partially-stabilized dunes inland from the deflation plain, most stands have been overrun by European beachgrass. High quality areas have no European beachgrass and are at least 5 acres in size. Five high quality sites occur on the NRA. Red fescue communities continue to decline as European beachgrass, Scot's broom and shore pine invasion intensifies. These communities can tolerate heavy hiking if traffic is confined to trails. Some casual hiking without trails probably has little effect.

Port Orford cedar/evergreen huckleberry (G1)

Old-growth coniferous forests on coastal sand dunes that are dominated by Port Orford cedars are unique to the immediate vicinity of the NRA and are probably the last such occurrence in the world. The 150-350 year-old Port Orford cedars occur with evergreen huckleberry in the understory and Sitka spruce, Douglas-fir and western hemlock in the overstory. The geographical range of Port Orford cedar is extremely limited, and most low-elevation old growth has been logged. Only 6 occurrences are known, 5 on the NRA. The community is fragile due to vulnerability to root rot and disturbance from ORVs. High quality stands have both reproducing and mature Port Orford cedar, and no disturbance from vehicle entry or road construction. These stands may serve as refugia from the root rot *Phytophthora lateralis* that is decimating Port Orford cedar throughout its range. The fungus spreads in the soil by water-borne spores, and is spread further by soil adhering to machinery and livestock. The droughty sand of the dunes, and isolation from areas of infestation, may inhibit dispersal of the spores and protect the trees from infection. Although there is currently no indication of root rot infection in these stands it could be present but not yet evident if recently introduced.

American dunegrass (G1)

Once the dominant native grass on partially stabilized foredunes from northern California to British Columbia, this community has largely been replaced by introduced European beachgrass. It also occurred in areas further inland that were subject to ongoing sand burial. Small patches of American dunegrass occur on the NRA, but the community itself (American dunegrass and its associated species) is not known to exist any longer on the NRA.

Seashore bluegrass (G1)

This community occurs on sparsely-stabilized coastal sand dunes, both on the foredune and inland from the deflation plain. The seashore bluegrass community often occurs mixed with stands of red fescue, though it seems to be more tolerant of sand burial than the red fescue dune community. European beachgrass has replaced nearly all stands throughout its range and this once widespread community is rarely found. The Nature Conservancy's global database states that few occurrences are known, and this community is more rare than either the red fescue or American dunegrass community. No high quality sites are known to occur on the NRA.

Shore pine/hairy manzanita-bearberry (G2)

This long-lived pioneer community occurs on partially-stabilized dry sand ridges and slopes. The ground layer is a fragile mat of mosses, lichens and bearberry. The lichen flora is diverse and includes several rare species, some disjunct from populations in the southern hemisphere. Globally, only 5-8 high quality sites are known, almost all on the NRA. Quality is determined by presence and amount of Scot's broom and type and amount of recreational damage (e.g., high quality stands are greater than 20 acres, contain varied age classes of trees and shrubs, include a variety of conditions ranging from open sand to mature stands, and have no Scot's broom or recreational damage). The community is declining from succession, damage to plants caused by ORVs, and residential development. It is easily destroyed by trampling and vehicular traffic. Conifers and Scot's broom are invading stands.

Bog blueberry/tufted hairgrass (G2)

Never large in extent, this community occurs infrequently in seasonally-flooded depressions on old deflation plains and marine terraces, and around margins of shallow dune lakes. Tufted hairgrass dominates openings in the shore pine forest or at the edge of coastal lakes, with bog blueberry forming low thickets around margins or scattered through the interior. The community is flooded in winter because of iron hardpan in the sand. Sphagnum moss is nearly always present among the stems of bog blueberry. This community is declining throughout its range from recreational and residential development, and possible dewatering of coastal aquifers by groundwater pumping. It is not tolerant of excessive trampling or manipulation of the water regime. High quality sites are 2-5 acres in size, with less than 2% cover by introduced species. Only 3 sites are known to occur on the NRA.

Shore pine/slough sedge (G2)

This unique community occurs in depressions on perennially to seasonally wet deflation plains, where a perched water table in winter precludes invasion by shrubs. Characterized by old-growth shore pine (80-130 years old), the understory is dominated by slough sedge, with bog blueberry and sphagnum moss frequently present. Sites are determined to be high quality if they are larger than 5 acres in size, dominated by old age classes, seasonal flooding is extensive, and bog blueberry is well established on hummocks with sphagnum moss forming mats on the ground.

This community is restricted to ancient marine terraces of the southern Oregon coast and ancient deflation plain areas of the NRA. Although considerable acreage of this community appears to be developing on deflation plains as an artifact of the foredune formed by European beachgrass, it is not clear that these young 50-year-old stands will develop into the same community described here. Old-growth stands are rare and contain elements such as sphagnum moss that are absent from younger stands. Threats include recreation, groundwater pumping and road building. Motorized recreation and camping during the dry season decimate the understory. Stands off the NRA are being destroyed by residential development. Currently, one known site exists on the NRA.

Management Practices

The Forest Service is responsible for managing habitats of all existing native plant and wildlife species and desirable non-native species (36 CFR 219.12g). Close coordination between the Oregon Dunes NRA and a variety of other agencies is essential, however, to effectively managing plant communities and wildlife habitats because other state and federal agencies retain responsibility for managing wildlife populations. In particular, the state of Oregon is responsible for managing most wildlife populations within the state. The USFWS has jurisdiction over federally listed species, species proposed for federal listing, and migratory birds. The National Marine Fisheries Service (NMFS) is responsible for managing marine mammal populations. Coordination and cooperation in the management of plant species and communities occurs between the Forest Service and Oregon Natural Heritage Program, Oregon Department of Agriculture, and university botanists and ecologists.

Cooperation with ODFW generally includes consulting the District Biologist and/or District Nongame Biologist on all habitat enhancement projects and other projects which may affect wildlife habitats and assisting with state programs including population surveys. Coordination with USFWS may include either formal or informal consultation when a proposed management activity may affect species listed as threatened or endangered. The Oregon Dunes NRA manages very little habitat used by marine mammals, but assists NMFS through the Marine Mammal Stranding Network.

Plant community and wildlife habitat management practices on the Oregon Dunes NRA consist of protecting existing communities and habitats, restoring or enhancing habitats, and providing plant and wildlife-related recreation and education. Protection is accomplished primarily through reviewing proposed NRA projects and policies for potential affects on populations and habitats and incorporating resource needs in project design. Special protection is afforded federally listed species and species proposed for listing to ensure that proposed management activities will not jeopardize their existence. Activities are also planned so that they are compatible with habitat requirements of sensitive and globally significant species to prevent their listing as T&E. In addition, protective measures may be implemented to remedy site-specific incidences of resource damage (e.g., fencing a heron rookery, closing an ORV trail near a special habitat).

Habitat restoration and enhancement projects can also be used to manage plant communities and wildlife habitats. Plant and animal habitat conditions may be altered through management practices to provide food, water, cover, or a suitable microclimate for a particular species or group of species. Restoration and enhancement projects may also include protective measures (discussed above) designed to reduce human or other disturbance to plant and wildlife habitats. Past habitat improvements on the Oregon Dunes NRA have primarily focused on enhancing important wetland habitats for waterfowl and other wetland-related species. The program has included such activities as maintaining snags for cavity nesters, constructing berms to inundate wetland habitat, excavating potholes for waterfowl and other wetland-related wildlife, flooding forested areas, maintaining early seral stages by clearing brush mechanically or with fire, planting desirable food or cover species, and placing nest boxes for small birds, osprey and mammals.

Providing plant- and wildlife-related recreation is also a management strategy used on the NRA. Managing to increase recreation opportunities may include activities like enhancing habitats to make huntable or viewable populations more abundant, constructing viewing structures such as platforms or boardwalks, providing signs and other interpretive materials, and speaking to visitors, local civic groups, and schoolchildren about plant and wildlife resources on the NRA.

Resource Use

Human uses of plants and wildlife may be consumptive (hunting and plant gathering) or nonconsumptive (viewing, photographing). Few statistics are available regarding the numbers of individuals participating in wildlife or plant-related activities on the Oregon Dunes NRA, although the following is known.

Some waterfowl hunting occurs, most notably on the North Spit of the Umpqua River, in the South Jetty deflation plain, and near the mouth of Tenmile Creek. However, waterfowl hunting is limited to a few local individuals, most likely because: 1) wintering waterfowl populations are much lower than populations found in the nearby Willamette Valley, 2) the most productive wetland areas are difficult to access, 3) the NRA has not marketed or encouraged hunting in the past, and 4) dark goose hunting is prohibited west of Highway 101 to protect the endangered Aleutian Canada goose. Black-tailed deer hunting is popular with local residents, but is limited by lack of road access, heavy brush cover, and shotgun-only regulations north of Tahkenitch Creek. Several mineral springs along Tahkenitch Creek, Tenmile Creek and the Siltcoos River are locally popular band-tailed pigeon hunting areas. Upland bird hunting is not popular because game birds such as grouse and quail are scarce; a few ring-necked pheasants are present as a result of pre-1983 releases by ODFW.

Consumptive uses of plant species include both recreational and commercial gathering of special forest products including firewood gathering, mushroom picking, bough and greenery collection, transplant collection (small shrubs, European beachgrass, slough sedge, coast strawberry, willow), and occasionally cascara bark collection. In 1992, the following special forest product collection permits were issued: 38 commercial mushroom permits, 2 commercial bough/ greenery permits, 100 Christmas tree permits, 9 commercial transplant permits, and approximately 45 commercial permits for miscellaneous plant and shrub collection. Although no data is available, recreational gathering of special forest products, including mushrooms, is suspected to be increasing.

While consumptive uses of wildlife appear to be declining nationwide, nonconsumptive uses of plants and wildlife are rapidly growing in popularity. Both motorized and non-motorized recreationists on the Oregon Dunes NRA appreciate the value of seeing, and learning about plants and wildlife species. Bird watching is popular, particularly in accessable areas such as the Siltcoos Corridor and South Jetty deflation plain. Whale watching is also growing in popularity during peak migration periods. Nature hiking and photography are also common. An increased focus on natural resource interpretation in recent years will likely continue to increase public interest in the unique plant and wildlife species found on the Oregon Dunes NRA.

Resource Relationships

Many factors can affect abundance and health of plant communities and wildlife habitats, diversity and size of habitats, and abundance and diversity of species within a particular habitat. Changes in condition of water, soils and climate can affect types of habitat present, while introducing exotic plants and/or animal species may affect native species through increased competition. For example, introduction of European beachgrass to the Oregon coast has dramatically reduced habitat for native beach and sand dune plant communities and is a major cause for the decline of the western snowy plover.

On the Oregon Dunes NRA, the factor which most notably affects plant communities and wildlife habitats is recreation. Both recreation development and recreation activities may affect types of habitat present, species present within a particular habitat, and diversity of habitats over the landscape. Some habitat types and species are more sensitive to change or disturbance than others. Thus, recreation and other activities must be managed differently in different habitats to ensure that a wide range of habitats and species continues to exist on the NRA.

Historic Trends

Plant and animal habitats are constantly changing as a result of human activities and naturally-occurring events such as fire, disease and succession. Major wildfires are rare on the Oregon Dunes NRA and timber harvest has been very limited. The main factors which have changed - and continue to change - plant and wildlife habitats and habitat diversity are introduction of European beachgrass, natural succession, and recreation use in specific areas.

European beachgrass was introduced in the early 1900s to stabilize the mouths of major rivers. Within 30 years, this tenacious species had spread along much of the Oregon Coast, causing formation of a large foredune. This foredune blocked further inland sand movement, allowing a scoured out area (the deflation plain) to form immediately east of the foredune. As succession proceeds, habitats within the deflation plain, transition forests and stabilized sand dunes continue to change.

The following trends between 1900 and the present have greatly affected plant and wildlife habitat diversity on the Oregon Dunes NRA:

- Amounts of open beach and sand spits associated with stream mouths declined;
- Open water habitats declined;
- Vegetated deflation plain widths (and thus area) increased as winds continued to scour and carry sand inland, east of the foredune;
- Rapid succession in the deflation plain resulted in more acres of tall shrub and shore pine deflation plain habitat and fewer acres of grass/sedge/rush and low shrub deflation plain habitat;
- Amounts of open, unvegetated sand east of the foredune decreased as beachgrass spread inland;
- Amounts of undisturbed habitats decreased as recreation use expanded into new areas (this resulted, in part, from advances in ORV technology and the increased number of ORV's operating due to shifts from multiple passenger ORV's to single operator ORV's); and
- Habitat fragmentation increased as new ORV paths and hiking trails cut through vegetated areas, isolating habitats.

Although detailed survey information is not available regarding associated changes in wildlife use, suspected changes include:

- Species associated with open sand spits, open sand, and open water declined;
- Species associated with early successional deflation plain habitats first increased as the deflation plain expanded eastward; then decreased as succession proceeded;
- Species requiring dense forest shrub communities (transition forest clearcuts and early stages of second growth transition forest) declined as these habitat types succeeded;

- Exotic plants such as European beachgrass and Scot's broom increased; thus wildlife using such stands for either breeding, loafing, wintering or travel increased;

- Species requiring minimal disturbance or large, unfragmented tracts decreased.

Future Trends

The historic trends identified above are expected to continue unless natural events and/or human activities change. Vegetative succession will proceed, replacing early seral stages with later stages. If management activities are not planned to maintain a range of seral stages, most deflation plain habitats will advance toward the climax seral stage (shore pine), and transition forests will advance toward mature coniferous stands. Over time, plant and wildlife habitat diversity is likely to decline. Plant and wildlife populations will shift, favoring those associated with later successional stages of wetlands and forest. Drying conditions will also favor succession toward forested conditions.

The overall level of recreation use at the Oregon Dunes NRA is expected to increase only gradually over time, although use patterns may change. Those plant and animal species tolerant of high human activity levels will be favored over those less tolerant of human disturbance. Non-native plant species, which are typically more tolerant of disturbed sites, will increase and may outcompete and eventually replace native species. Some wildlife species and individuals within the species will acclimate to human disturbance; others may not.

FISH

Introduction

The unique dunes environment at the Oregon Dunes NRA provides fish habitats unlike those elsewhere on the Siuslaw National Forest. The Forest in general is noted for its dense network of rapidly flowing streams supporting native anadromous salmonids (species of salmon and trout that mature in the sea and migrate back to their native streams to spawn). In contrast, the Oregon Dunes NRA is characterized by relatively slow moving streams and freshwater lakes that support introduced warmwater species as well as anadromous and resident salmonids.

The Oregon Dunes NRA is also noted for its 6 estuaries, the downstream portions of river systems that widen under the influence of tidal action. These are transition zones between fresh and salt waters. Physical, chemical and hydrologic conditions vary quickly and greatly, resulting in high biological productivity. Estuaries are particularly important because sensitive young stages of fish, shellfish and other aquatic organisms often rear there.

Current Situation

Appendix III of the 1979 Oregon Dunes NRA plan listed 85 species, including 54 estuarine, 20 freshwater, and 9 anadromous fish, as well as 2 shellfish. That list was a rough estimate based on a checklist of species in Coos Bay (Cummings and Schwartz 1971) and personal communications with ODFW biologists. A list of fish and shellfish harvested in the Siuslaw River estuary (Gaumer et al. 1974) includes a few others.

Warmwater fish include largemouth bass, bluegill, black crappie, yellow perch, warmouth, and brown bullhead (see Appendix F for scientific names). Additionally, harvestable-size rainbow trout are stocked in some of the lakes at various times in the spring and summer by ODFW. Bay and ocean fish that are commonly found within estuaries are Pacific herring, numerous species of surfperch and greenling, sculpins, tomcod, sand sole and starry flounder. Important anadromous species are the American shad, striped bass, steelhead and cutthroat trout, and coho and chinook salmon.

A number of lakes reportedly served as coho salmon rearing areas in the past, and several currently support naturally reproducing coho and cutthroat trout populations. Wild salmon and steelhead stocks at the Oregon dunes NRA are relatively pure genetic strains compared to those in bodies of water which are heavily stocked with anadromous salmonids from hatcheries, and could serve as gene pools in the process of ultimately restoring such wild runs.

Parsons (1982, 1983) surveyed the lakes to determine their potential for fisheries development. Species present and relative abundance (from 1973-74 gill net sampling), ODFW trout stocking programs, and ease of access formed the basis for identifying lakes as having either developed (high-use) or undeveloped (low-use) recreational potential. Extensive aquatic plant cover in some lakes and substantial declines in water levels during the summer in others were mentioned as creating "problem conditions". Developing both cold- and warmwater fisheries in lakes where conditions are suitable was emphasized as a means for expanding fishing opportunities at the Oregon Dunes NRA. More intensive surveys of fish populations in particular lakes were made by ODFW (Woolington 1983a, 1983b, 1983c) and the Forest Service (Merritt and Davies 1991).

The Forest Service has not widely advertised freshwater fishing opportunities on the Oregon Dunes NRA. Brochures and maps depicting fishing opportunities associated with hiking and wildlife viewing are available at information centers in Reedsport, Florence and Coos Bay-North Bend. However, no information has been provided on basic biology of fish species inhabiting the area's waters, or the likely species/size composition of the catch. Interpretive signs on lakes are limited to information to help identify species caught.

ODFW has responsibility for managing fish populations on federal lands in Oregon. Current fishing regulations (1992) restrict harvest to not more than 5 largemouth bass per day with no more than 3 bass over 15 inches in length. Special regulations are in effect for Siltcoos River (mainstream above tidewater to Siltcoos Lake), Tenmile Lake, Tenmile Creek, Tahkenitch Creek and Tahkenitch Lake. There are no creel limits or special closed seasons on bluegill, catfish, crappie, other sunfish and yellow perch. Trout, salmon and steelhead season and harvest regulations vary by lake or stream. At this time, all wild steelhead must be released unharmed back into the stream.

Lakes

Thirty-two named freshwater lakes, many of which do not have significant inlets or outlets, are usually associated with forested deflation plains between two sand ridges, and are contiguous with the water table. Lake levels fluctuate with the season (3 to 6 feet on the average), and there is outflow only when they are at their highest level (Robinson 1973), if there is outflow at all. Submerged and floating aquatic plants (called macrophytes) are well established in those lakes that either have limited drawdown, or have extensive areas of shallow water throughout their basin. Deeper lakes with mostly steep banks and lakes with seasonal water level fluctuations of more than 10 feet, such as Carter and Threemile, do not have extensive growths of macrophytes (Parsons 1982, 1983).

Larger lakes east of Highway 101 (Woahink, Siltcoos, Tahkenitch, Clear, Eel, and Tenmile) are valleys of streams flooded by rising ocean levels and dammed by advancing sand dunes. Water typically flushes rapidly through these lakes (in 1 to 3 months) and into the ocean, and the lakes have historically supported large runs of anadromous fish (Johnson et al. 1985) that have been important to commercial and recreational fisheries. Some of these runs probably are relatively pure genetic strains, with little influence from hatchery fish.

Coastal lake waters typically contain low nutrient levels, and the transparency of the water often exceeds 6 feet in depth. In the deeper, more protected lakes, maximum surface temperatures reach 72-75 degrees, while water temperatures deeper in the lake may be as low as 50 degrees in the summer. In more productive lakes, dissolved oxygen concentrations may decline to near zero near the bottom. Even large, shallow lakes subject to strong summer winds may have reduced dissolved oxygen levels during periods of relative calm in summer (Larson 1974).

Most lakes except Tenmile and Siltcoos have concentrations of particulate organic matter of less than 5 parts per million (ppm). Such low concentrations limit potential growth of various fish species and produce only one-third to one-half as much total weight of fish as do fertilized ponds, or ponds receiving nutrients from the watershed (Boyd 1990). Nutrient levels appear to be lower in those lakes closest to the ocean and not connected to any other waterbodies by well defined channels (e.g., Beale and Snag lakes).

Macrophytes

The proportion of the lake bottom or surface that is covered with submerged or floating higher plants depends on average depth, nutrient levels, steepness of shoreline, and the percentage of water less than 6 feet in depth. Largemouth bass feed less efficiently in structurally complex environments, and high densities of prey species resulting from inefficient bass predation can ultimately reduce the number of bass surviving to adulthood (Swingle 1956). Conversely, insufficient cover in a lake environment can result in prey populations being decimated by predation to the extent that larger largemouth bass can not find enough larger prey and suffer reduced growth and condition.

Aquatic macrophytes respond to any increase in nutrients by increasing their coverage. Snag and Beale lakes and Siltcoos Lagoon have macrophyte cover that exceeds 40% of the surface area. Carter Lake, which characteristically fluctuates over 10 feet between summer and winter, has virtually no macrophytes. Any increase in nutrients entering Carter Lake would very likely be recycled through microscopic floating algae (plankton), rather than macrophytes (Merritt and Davies 1991). Tenmile, Tahkenitch and Siltcoos lakes are relatively large bodies of water that have had extensive beds of macrophytes.

Fish Populations

Most of the fish populations at the Oregon Dunes NRA are introduced warmwater species that to a large degree have displaced the few native species of salmonids and sculpins in the lakes. Since total removal of warmwater fish is neither desirable nor feasible, this situation limits how much can be done to increase native populations. Nevertheless, the NRA takes advantage of opportunities to restore populations and habitats of wild anadromous salmonids whenever possible.

The structure of the fish community (e.g., species, sizes, and ages of fish present) is important in deciding how to manage a given lake. Both Siltcoos and Tahkenitch lakes, for example, have large populations of yellow perch, while none are present in Tenmile Lake. Large numbers of species like yellow perch and black crappie may eat largemouth bass eggs, and/or compete with young bass for food (Davies 1976, 1987). These species spawn before largemouth bass, and therefore are preyed upon very little by largemouth bass hatched the same year. Bluegills, however, spawn about one month later than largemouth bass, and are easily eaten by bass hatched the same year (Davies et al. 1982). For these reasons, and probably others, there is a higher density of largemouth bass and more bass larger than 9 inches in Tenmile Lake compared to Tahkenitch and Siltcoos lakes (Merritt and Davies 1991).

Other Oregon Dunes NRA lakes are relatively small and unproductive compared to Tenmile, Siltcoos and Tahkenitch lakes. Yet their fish populations may reflect the same predator-prey relationships that influence abundance of desirable sport fish in the larger lakes. There are no yellow perch in Butterfield and Hall lakes, and both have relatively high largemouth bass populations compared to lakes with similar amounts of nutrients and macrophytes that have yellow perch.

Management Practices

Several types of strategies can be used to manage fish habitat and improve recreational fishing opportunities. The most important are those to **protect** fish habitat by maintaining water quality, lake levels, streamflows and vegetation along lakes and streams. Such protective actions should be coordinated closely with appropriate state and federal agencies, and aimed at maintaining present diversity of fish habitats.

Another management practice is to either **improve or restore** habitat. Habitat improvement for streams consists of building structures to create gravel beds for spawning and pools for rearing, modifying blockages to fish passage, and planting beneficial vegetation along the banks. Habitat improvement in lakes includes various types of aquatic macrophyte control, placing structures for cover, and planting shoreline vegetation such as native grasses and shrubs.

ODFW can **regulate** fishing to manage populations. Such regulations should reflect angler attitudes and expectations, as well as abundance and growth of largemouth bass, the key warmwater predator. Small largemouth bass populations in the presence of macrophytes have limited surplus fish available to be caught, while fish in the 8- to 12-inch range often "stock-pile" in larger populations. Usually a high minimum size limit is appropriate for the former, while harvest of only moderate-size bass is appropriate for the latter. The current state largemouth bass harvest regulation for Tenmile Lake is appropriate in that fishing harvest is focused on fish in the 8- to 12-inch size range where a surplus exists (Merritt and Davies 1991).

Potential for harvest greater than 20% is needed to make such regulations for largemouth bass meaningful and effective. This should be the case in most Oregon Dunes NRA lakes, where relatively low nutrient levels and potentially low abundance and growth of largemouth bass mean that 20% of the bass could be caught by a relatively few, but persistent, anglers.

ODFW can also **stock** fish, usually trout, in selected lakes to provide a range of recreational fishing experiences. Stocking rates should reflect access and desired angling pressure, size of lake, and proportion of the year that the lake is suitable for these coldwater species.

Any stocking of resident fish should also consider goals to restore anadromous salmonid runs into some of the lakes, and be curtailed if negative impacts on anadromous stocks from increased fishing pressure, competition, or predation are likely.

Resource Use

Anglers fish for salmon and steelhead in Tahkenitch and Siltcoos lakes and larger streams and for warmwater fish and trout in the lakes. Largemouth bass tournaments have been popular on Siltcoos, Tahkenitch and Tenmile lakes. Bay and surf fishing are increasing in popularity. Angling methods vary widely, depending on the type of water fished and the species sought. Clamming is primarily confined to the mudflats within the estuaries of the Siuslaw, Umpqua and Coos rivers.

Although most fishing on the Oregon Dunes NRA is by Oregon residents, people travel from throughout the United States to fish along the Oregon Coast. The heavy dependence of economies of coastal communities like Florence and Reedsport on summer sport salmon fishing in the Pacific Ocean and Siuslaw and Umpqua estuaries has been demonstrated by hardships created in recent years by dwindling salmon runs and shortened fishing seasons. Diversification of recreational fishing to focus more on family trips to the Oregon Dunes NRA freshwater lakes could lessen these impacts to a small degree.

Resource Relationships

Major factors affecting quality and quantity of fish habitat are toxic materials and organic waste that reach water, dense growths of aquatic macrophytes in shallow areas of some lakes, and declining surface water levels in the south end of the Oregon Dunes NRA (see Water, Chapter III). Habitat in larger streams with anadromous fish runs is affected by dams, existing and proposed water withdrawal, and activities on private and state land upstream from the large lakes. Chronic changes in streamflow and sediment delivery in the contributing watersheds can significantly alter plant and animal communities in lakes and estuaries.

Ultimately, the amount and type of angling use is determined by providing a variety of access points, facilities and recreational opportunities that attract people to the Oregon Dunes NRA to fish.

Historic Trends

Fishing pressure on the smaller freshwater lakes has traditionally come from a relatively few local people. The streams, larger lakes like Siltcoos and Tahkenitch, and estuaries have had heavier use from a broader spectrum of the angling public.

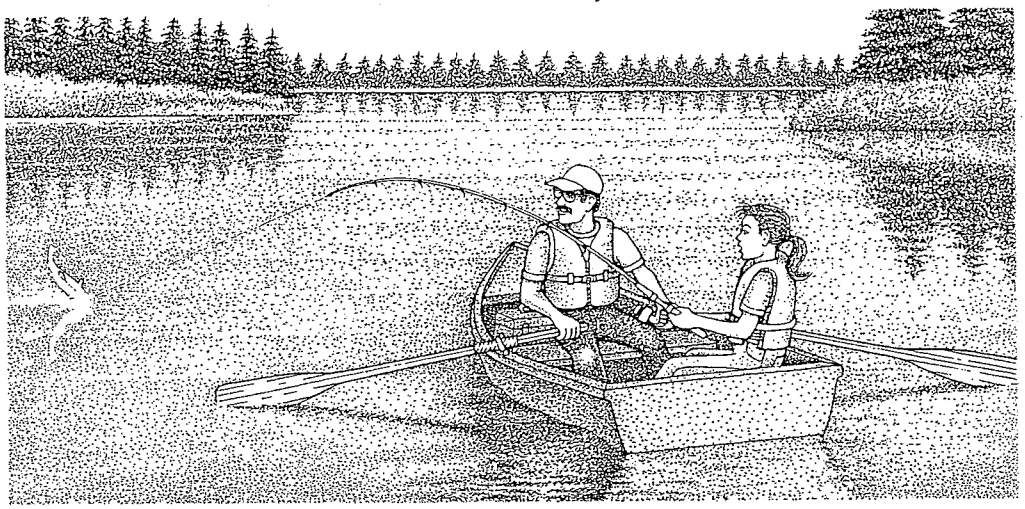
Future Trends

Freshwater sport fishing and fish viewing have been growing in popularity and are expected to continue to do so, particularly in the West (USDA Forest Service 1980). Demand for fish and fishing is clearly affected by factors such as the amount of leisure time available and economic conditions, although how these interact is not totally clear. Even if an unlimited supply of fish were available for recreational fishing, the fish may not all be utilized because of limited access to fishing areas and the amount of crowding that anglers will tolerate.

Visitor numbers at the Oregon Dunes NRA Headquarters Office increased from 15,000 in 1987 to approximately 22,000 in 1989. The majority of respondents to a recent marketing survey rated the area's natural attractions as "above average" compared to other areas they had visited, and indicated "vacation" and "fishing" were the dominant reasons for visiting (Moore 1990). Public relations efforts to promote fishing opportunities in many of the smaller lakes could increase angling on the Oregon Dunes NRA.

Runs of anadromous salmonids in streams on the Oregon Dunes NRA, like those elsewhere on the Oregon Coast, have been severely reduced in recently years. Possible causes include loss of freshwater habitat in streams from land management activities, loss of rearing habitat for the young in the large lakes due to introduction of warmwater species and invasion of aquatic plants, detrimental effects of hatchery fish, dams, overharvest and environmental changes in the ocean, and increases in marine mammal populations. Undoubtedly, a combination of factors is responsible.

Future trends in stream fishing on the Oregon Dunes NRA are not clear at this time. Many anadromous salmonid runs in Oregon have suffered serious declines and are considered to be at risk of becoming threatened and endangered (Nehlsen et al. 1991). These runs include those of the coho salmon and searun cutthroat trout, which are found in several area streams. Angling regulations are being made more restrictive by the Pacific Fishery Management Council and ODFW in an effort to preserve the runs.



RESEARCH NATURAL AREAS

Overview

Research Natural Areas (RNAs) contain specific biological or physical attributes. Maintained in their natural condition as much as possible, they preserve biologically important ecosystems and ecosystem processes. An area that contains unique or representative plant communities, aquatic ecosystems or geologic resources is a candidate for RNA status. Federal, state, municipal and territorial governments, as well as private individuals and organizations have cooperated to form a national system for preserving these natural areas.

RNAs serve several purposes. Existing in a relatively undisturbed state, they may be used as control areas to measure effects of management and recreation activities on other natural systems. Research may be conducted to better understand development, structure and function of natural systems. RNAs also preserve gene pools of threatened and endangered species and associated habitats. They are permanently protected and ensure the public of continued aesthetic enjoyment of natural systems.

The Oregon Dunes NRA is a very unique area containing great biological and geological diversity. Although a major emphasis of this area is recreation, the 1972 Act that established the NRA states that the area will be created for, among other things, "the conservation of...scientific...and other values contributing to public enjoyment of such lands..." In order to protect qualities of the dunes over the long term, it is desirable to have baseline data and monitoring sites to evaluate management actions. RNAs are a vehicle for accomplishing this.

Current Situation

The Tenmile Creek area (Figure III-17) is a 2,019-acre area that is an excellent representation of the coastal dune mosaic described in Dryness et al. (1975). It includes all major dune features, except parabola dunes, that exist in the Umpqua Dunes Scenic Area. This site also contains deflation plains in various successional stages, tree islands, stabilized forests, and small freshwater lakes typical of the Oregon Dunes NRA. Establishment of an RNA here would provide opportunities for research into coastal ecosystem development and dune movement. Studies on tree island stability are currently underway in this area, and can provide useful information for management of these isolated systems. This site could serve as a control to help monitor dune stabilization efforts on adjacent lands, as well as effects of beachgrass control, recreation, and special forest products gathering. Public use on this site is low, although the Umpqua Dunes Trail runs through its southern section.

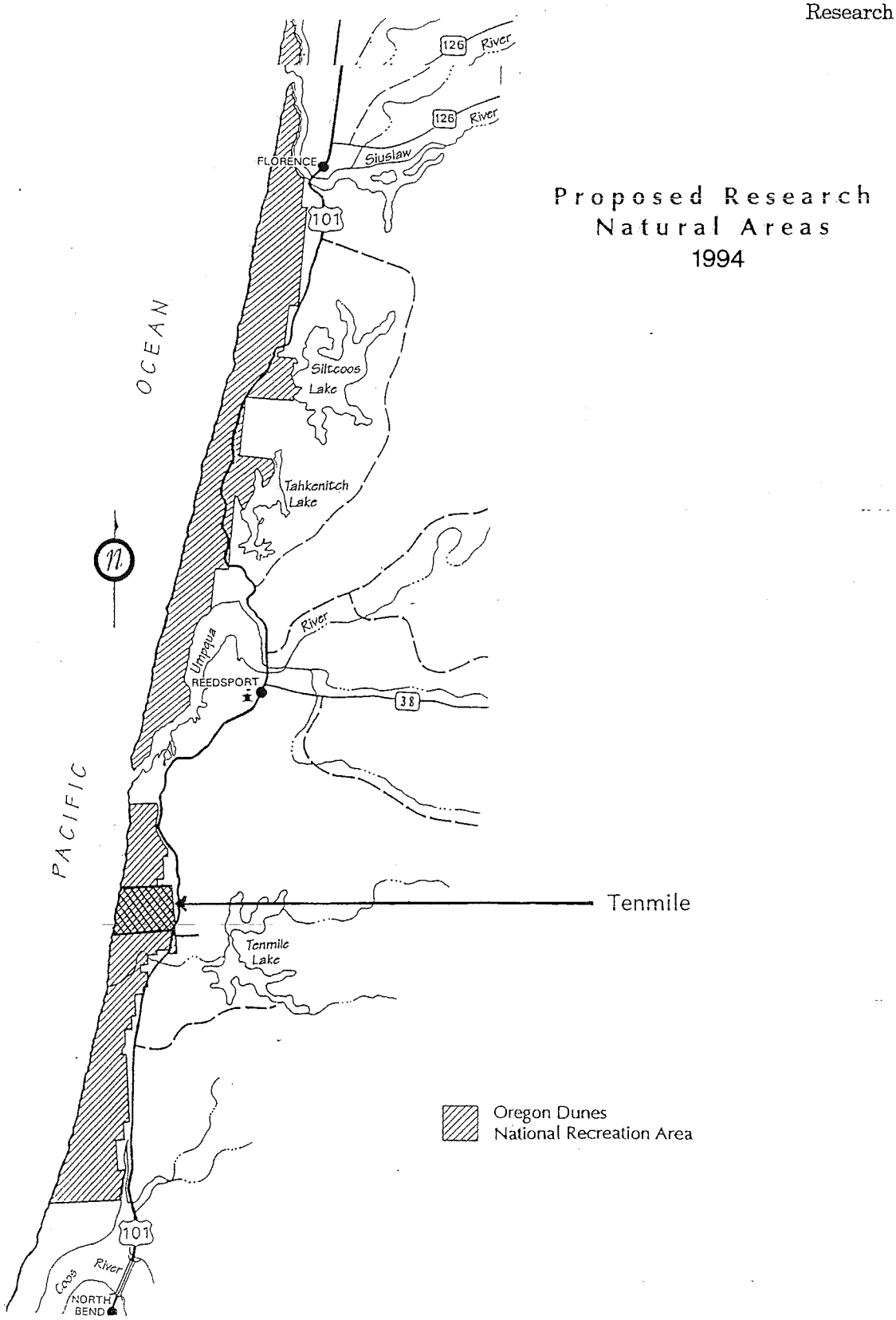


Figure III-17. Proposed Natural Research Areas, 1994

The Umpqua Spit site (formerly called Threemile Creek) occupies 2,103 acres (Figure III-17). This area contains several large parabola dunes, found most commonly on the North Coast. There is also a red alder/willow sedge marsh (on the south side of Threemile Creek), and partial representation of a coastal dune mosaic. This area supports the most extensive grass, sedge and rush deflation plain communities in the Oregon Dunes NRA. Studies of early successional stages of deflation plains could shed light on rates of change of this feature on the landscape. Public use of this area is low and limited primarily to dispersed hiking and waterfowl hunting. An established ORV corridor (the Clambed Road) is used intermittently for access. About 770 acres of private land within the area that was recently patented for mineral use (see Lands and Special Uses, Chapter III) must be included in the RNA for it to be viable.

Management Practices

RNAs are managed to allow ecological patterns and processes to occur naturally. Although some recreation use would be allowed in addition to research activities, emphasis would be more on preservation than on active manipulation.

Resource Relationships

Allocation of land for an RNA would protect plant and wildlife habitat, scenery, and roadless areas. It could result in attempts to remove European beachgrass from the area. Intensive recreation activities and wetland management would not be allowed.

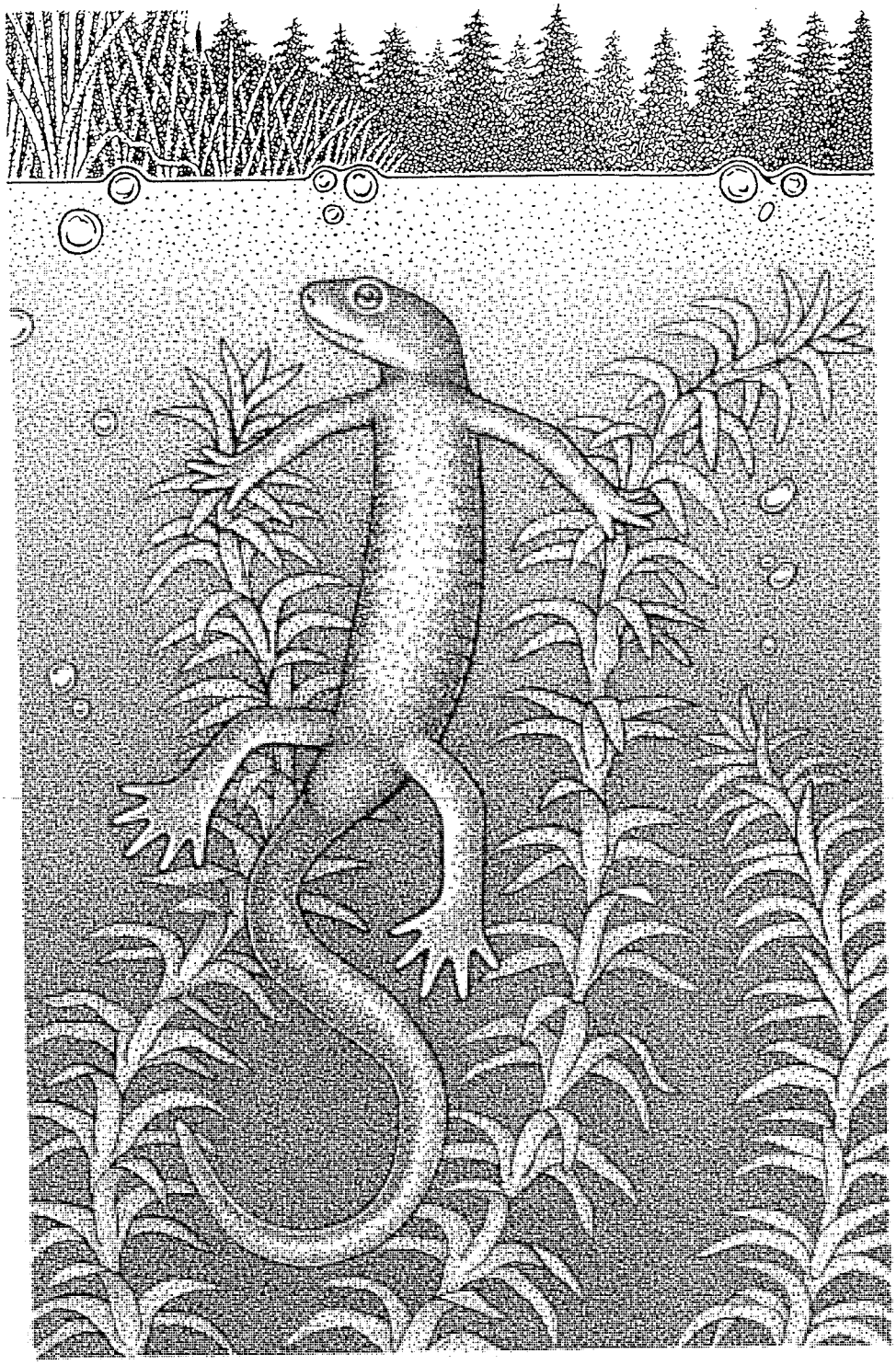
History

Potential for RNAs on the Oregon Dunes was first investigated in 1969. After considerable exploration and discussion, Franklin and Dyrness (1973) formally proposed an RNA, stating "suitable locations for an RNA do not exist outside the NRA in terms of full representation and typicalness of desired features. Further it appears that the best overall location is in the Umpqua Scenic Dunes area" (now called Tenmile Creek).

In the following 10 years, more studies on dune ecosystems along the Oregon Coast reaffirmed the importance of Tenmile Creek as the best and only active coastal dune mosaic on the Coast. These studies added to our understanding of dunes ecosystems, and resulted in a proposal for another RNA on the North Spit of the Umpqua River. Of four similar areas of fescue-dominated dunes along the Oregon Coast, Umpqua Spit was found to contain the most remote and diverse example.

Future Trends

More emphasis on ecosystem management by the Forest Service in the future will increase needs for baseline information provided by RNAs. Movement to preserve gene pools for T&E and sensitive species could enhance values of habitats protected in RNAs.



WILD AND SCENIC RIVERS

Overview

A Wild and Scenic River is a river, or river segment, designated by Congress, which is free-flowing and contains at least one outstandingly remarkable value (such as scenery, recreation, wildlife, fish, geology, history, or archeology). Congress adds rivers to the National Wild and Scenic River System in order to preserve their free-flowing condition and protect them and their immediate environments.

The Wild and Scenic Rivers Act requires the federal government to determine if additional rivers or streams are eligible for inclusion in the National System, and if so, to recommend to Congress whether or not they should be designated. If a river is determined to be eligible, it must be given one of three potential classifications: wild, scenic or recreational. This classification is based primarily on currently existing amounts of road access and development of the shoreline.

Segments of the Siltcoos River, Tahkenitch Creek and Tenmile Creek, all streams which flow through the Oregon Dunes NRA, have been found to be free-flowing and possess outstandingly remarkable river-related values. Therefore, these streams are eligible for inclusion in the National System. This process of revising the management plan for the Oregon Dunes NRA is being used to determine whether any of these streams is suitable for inclusion in the National System and should be so recommended to Congress.

River Segments

Following are brief descriptions of current conditions along the streams and conclusions about their eligibility and potential classification. For more detailed descriptions of these streams, see Appendix E, Wild and Scenic Rivers.

Siltcoos River

Description - The Siltcoos River is located in southwestern Lane County, about 6 miles south of Florence. It is about 3 miles long from its source at the outlet of Siltcoos Lake to its mouth at the Pacific Ocean. There is a small metal and concrete dam owned and operated by International Paper Company (IP) about 1¾ miles upstream from the ocean, but the river is free-flowing below the dam. Approximately 30% of the land along the river is privately owned, although all but 10 acres of land along the lower 1¾ miles is federally owned.

The Siltcoos River is one of only three small perennial streams flowing completely through the active, coastal sand dune complex at the NRA. It is an unusual feature in a rare geologic area. Flow of the river through the sand dunes provides a textbook example of geologic and hydrologic processes.

The river and estuary provide habitat for several T&E species and is home to a wide range of "special interest/watchable wildlife." The salt marsh is a limited coastal habitat within the Oregon Coast region.

The Siltcoos River corridor is a popular recreation complex with easy access from a paved parallel road. Recreation opportunities available along this river are fairly diverse, including several developed recreation sites, trails, and potential for interpretation of a broad array of themes.

Conclusions - The 1¾ miles of the Siltcoos River between the dam and the Pacific Ocean are eligible for inclusion in the National Wild and Scenic River System. Wildlife and geology are the outstandingly remarkable values of this river. Based on the current level of road access and human modifications along the river, its potential classification is recreational.

Tahkenitch Creek

Description - Tahkentich Creek is located in western Douglas County about 11 miles south of Florence. It is about 3 miles long from its source at the outlet of Tahkenitch Lake to its mouth at the Pacific Ocean. There is a small metal and concrete dam, owned and operated by IP, just below the outlet of Tahkenitch Lake. Within the river corridor, all but about 30 acres of land is owned by the federal government.

The stream and its corridor appear very natural with few modifications. Even though traffic on Highway 101 can be heard for the first 1/2 mile below the dam, there is a strong sense of remoteness which makes this is one of the few streams along the Oregon Coast which provides semi-primitive recreation opportunities.

The scenery along Tahkenitch Creek is diverse and striking due to contrasts between sand dunes, conifer trees, and the open estuary near the crashing surf of the Pacific Ocean. Like the Siltcoos River and Tenmile Creek, geologic and hydrologic features and processes of Tahkenitch Creek are textbook examples.

The Tahkenitch estuary provides habitat for several T&E species. In addition, freshwater and saltwater marshes within the corridor provide habitat types which are limited within the region.

Conclusions - The 3 miles of Tahkenitch Creek between the dam and the Pacific Ocean are eligible for inclusion in the National Wild and Scenic River System. Scenery, semi-primitive recreation, wildlife and geology are the outstandingly remarkable values. Because roads and human development are absent along the river, its potential classification is wild.

Tenmile Creek

Description - Tenmile Creek is located in northwestern Coos County about 10 miles north of Coos Bay/North Bend. It is about 5 miles long from its source at the outlet of Tenmile Lake (in the City of Lakeside) to its mouth at the Pacific Ocean. This stream is free-flowing for its entire length. There are just under 1,500 acres of land within the ½–mile-wide river corridor. Of this, about 525 acres is privately owned, Coos County owns about 150 acres and the remaining 825 acres is federally owned.

The upper 2½ miles of the stream have stretches of private residences, docks and bridges, interspersed with stretches of open fields and dense riparian vegetation. The lower 2½ miles lack roads and human development but, due to the occasional sight and sounds of vehicles on the south bank, they do not provide quite as much solitude and remoteness as Tahkenitch Creek does.

Scenery along the lower 2½ miles of Tenmile Creek is similar to Tahkenitch Creek, with active sand dunes spilling into the creek, patches of conifers and rhododendrons lining the banks, dramatic viewpoints, and striking contrasts of light, color and textures. Unusual geologic features and processes of Tenmile Creek are similar to those of the Siltcoos River and Tahkenitch Creek.

Wildlife habitats along Tenmile Creek, especially the estuary at the mouth and an extensive salt marsh, are also similar to those of the Siltcoos River and Tahkenitch Creek. They supply habitat for several T&E species.

Conclusions - Although the outstandingly remarkable values of scenery, recreation opportunities, geology and wildlife are concentrated along the lower 2½ miles of the stream, the whole 5 miles is eligible for inclusion in the National Wild and Scenic River System. Due to the interspersed stretches of development and open fields in the upper 2½ miles, this upper area is split into four segments whose potential classifications alternate between scenic and recreational. The lower 2½ miles have a potential classification of wild.

Summary

All three of the streams being studied for suitability as components of the National Wild and Scenic River System have been found to be eligible. Figure III-18 summarizes information about each of these streams.

Figure III-18. Rivers eligible for the Wild and Scenic River System

River	Miles	Potential Classification	Outstandingly Remarkable Values
Siltcoos	1¾	Recreational	Geology, Wildlife
Tahkenitch	3	Wild	Scenery, Recreation, Geology, Wildlife
Tenmile	5	Wild, Scenic, Recreational	Scenery, Recreation, Geology, Wildlife

LANDS AND SPECIAL USES

The NRA Act provides direction for the land acquisition and real estate management program. Land acquisition and use within the area must support public outdoor recreation use and enjoyment of the area and must contribute to conservation of scenic, scientific, historic and other values of the area within the NRA boundary. In addition, the Act establishes a Dunes Sector and Inland Sector. (See Figure III-19.) Private lands within the Inland Sector may not be acquired without the consent of the owner so long as certain conditions are met. Through this provision, the Forest Service was given oversight responsibilities to ensure uses on private lands within the Inland Sector are consistent with the objectives of the Act.

Management of other aspects of the Lands Program are also guided by these objectives described in the Act. Special use authorizations, rights-of-way grants and acquisitions, landline location and maintenance, and encroachment and title claim resolution all must be accomplished within the context of the special emphasis given this area.

Current Situation

There are 31,500 acres within the boundary of the Oregon Dunes NRA. Of this total 27,450 acres have National Forest System (NFS) status. As of January 1, 1975, the NRA contained 21,632 acres of NFS land. The increase in the amount of NFS land since 1975 has come about through land exchanges, land purchases and donations.

In March 1994 the Forest Service completed acquisition of 2,059 acres of land within the NRA boundary adjacent to Tahkenitch Lake (Figure III-20). Since these lands are new acquisitions, detailed planning has not been completed for this area, but the lands will be managed as part of Management Area 10A (non-motorized undeveloped recreation). Potential uses include fishing, wildlife viewing, hiking, mountain biking, and dispersed camping.

Authority to use eminent domain (or condemnation) differs between the area adjacent to Highway 101 (Inland Sector) and the area to the west of it (Dunes Sector). Within the Inland Sector, eminent domain authority can only be used if conditions described in Section 7 of the Act are satisfied. There are currently approximately 3,280 acres of private land within the Inland Sector. Most of the Inland Sector lands are undeveloped; current uses include dispersed recreation, timber management and agriculture. As long as use patterns remain as they were when the NRA was established, these lands are protected from the use of eminent domain authority. In the Dunes Sector, private lands are afforded no protection from the use of eminent domain authority.

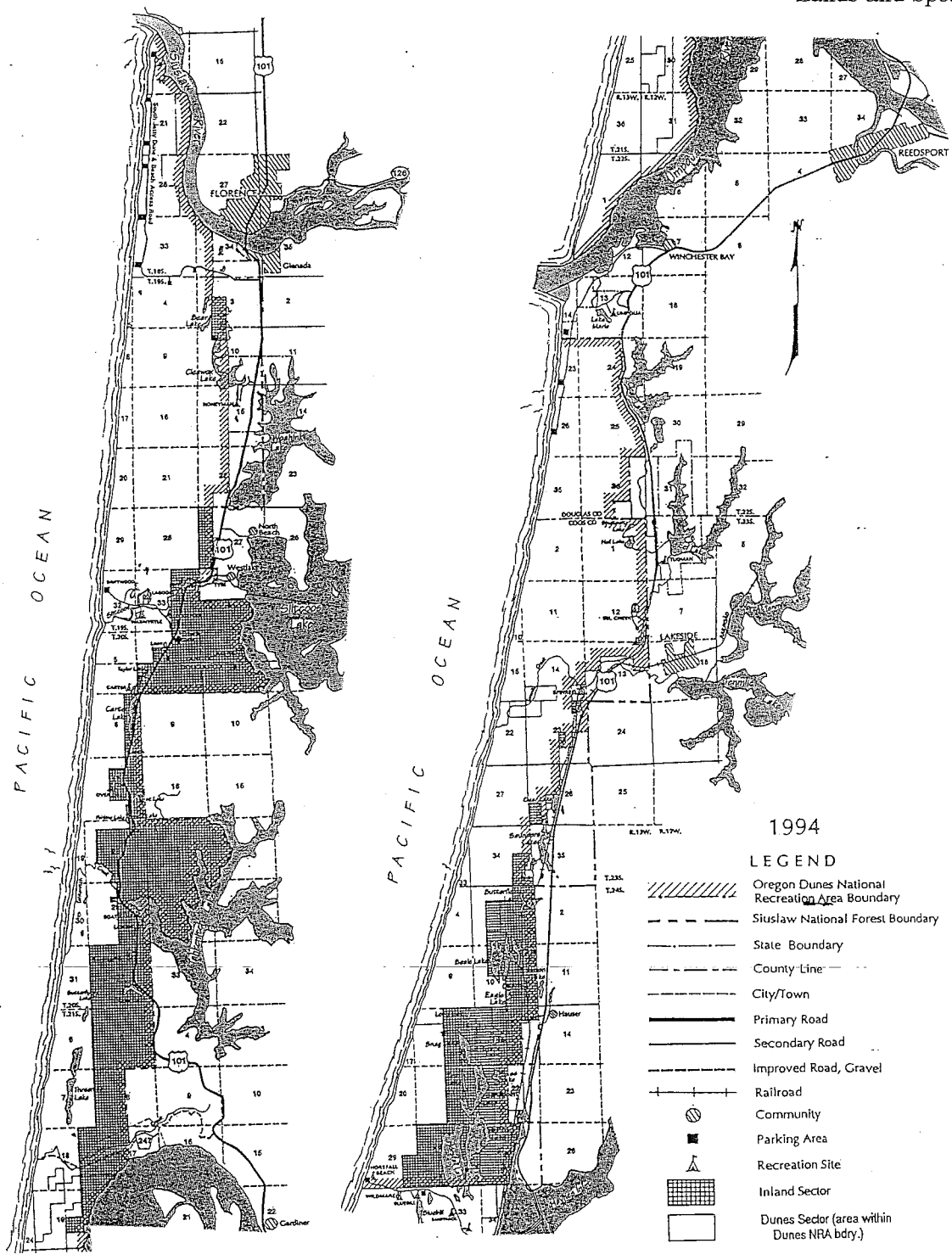


Figure III-19. Inland and Dunes Sector Lands at Oregon Dunes NRA.

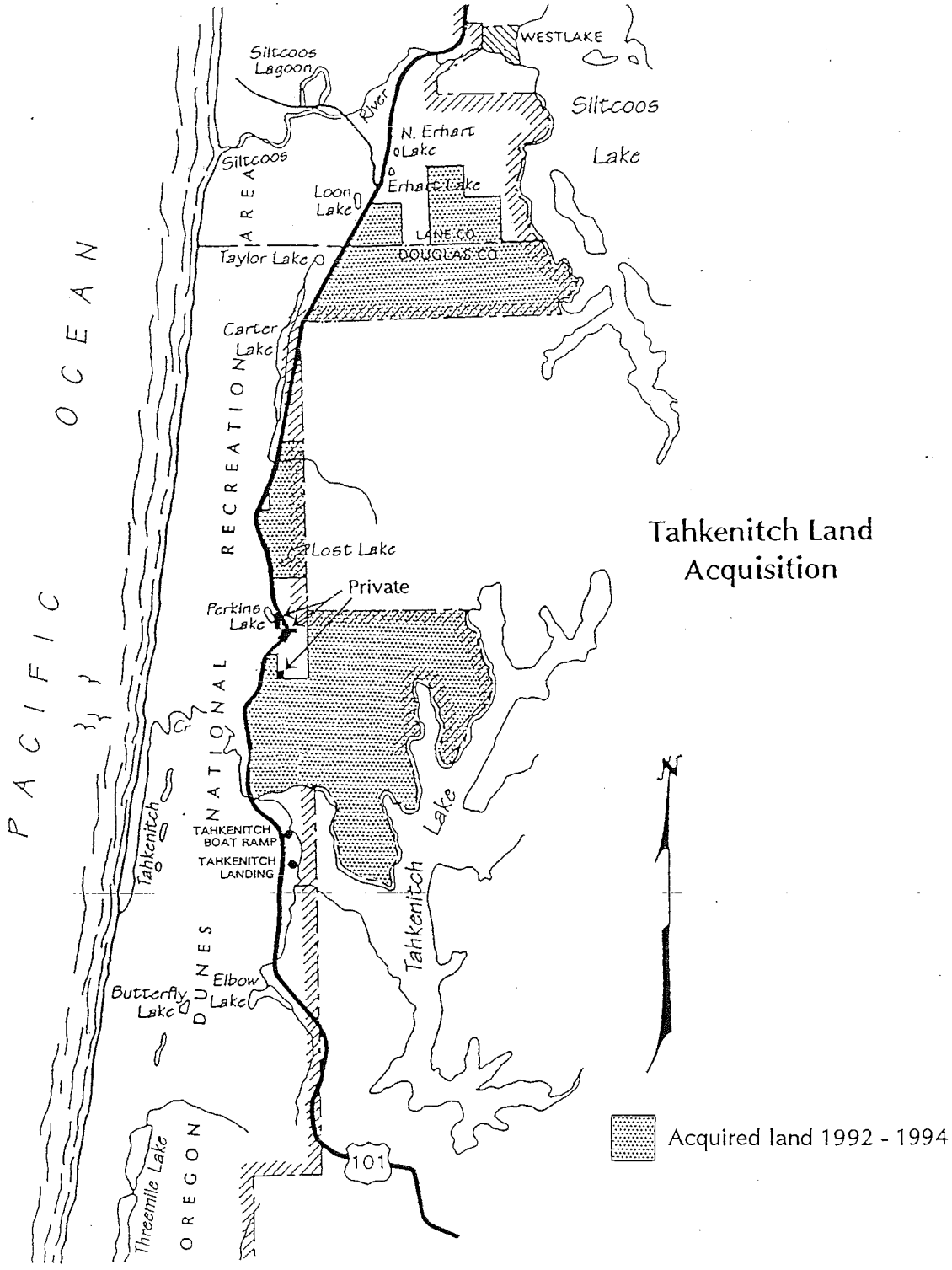


Figure III-20. Tahkenitch land acquisition

There are currently 770 acres of private land within the Dunes Sector. This land exited from federal ownership in 1990 under terms and conditions of the 1872 Mining Act. This private land is located on the North Spit of the Umpqua River in an area allocated as an RNA in some alternatives. This area is currently undeveloped and land use patterns have not changed from what they were when the land had NFS status. The Forest Service currently has no plans to re-acquire this land.

In addition, there are 1,450 acres of NFS land, administered by the Oregon Dunes NRA, outside of the established NRA boundary. Almost all of these acres are located along the southern boundary of the NRA in the Horsfall area and serve as a buffer to the developed area to the south. As National Forest, but not NRA lands, the management focus on these lands may at times be different than that on the NRA.

There are 34 special use permits issued for the NRA. The majority of these are for roads and transmission lines.

There are 75.4 miles of property line boundary between NFS lands and other lands within the NRA boundary. Of this total, approximately 48 miles were resurveyed and posted to current standards. Resurveys and better identification of property boundaries revealed several cases of occupancy trespass. Most were resolved by either removing the encroachments in trespass, using the Small Tracts Act, or authorizing the encroachment with a special use permit.

Navigability

State ownership to the beds of navigable waterbodies and to lands subject to natural tidal influence was granted to Oregon in 1859 as an incidence of statehood and is an inherent attribute of state sovereignty protected by the U.S. Constitution. The beds of non-navigable waterbodies remained in the ownership of the United States or its grantees. The navigability of those portions of the Siltcoos River and Threemile, Tenmile and Tahkenitch creeks within the NRA boundary has not been established. Currently, both the state and federal government claim ownership of these stream's beds and banks. This plan does not propose to address the issue of navigability. Rather, this plan is intended to provide a management philosophy for the above stream segments.

Under state law, the Division of State Lands (DSL) is responsible for the management of the beds and banks of navigable waterbodies (ORS 274.005-274.590). DSL is the administrative arm of the State Land Board (the Board), composed of the Governor, Secretary of State, and State Treasurer. Under constitutional and statutory guidelines, the Board is responsible for managing the assets of the Common School Fund. These assets include the beds and banks of Oregon's navigable waterways and are to be managed for the greatest benefit of the people of this state, consistent with the conservation of this resource under sound techniques of land management. Protection of public trust values of navigation, fisheries, and public recreation are of paramount importance, too.

The original federal test for determining navigability was established in *The Daniel Ball* case over 100 years ago. This U.S. Supreme Court admiralty case clarified that rivers "are navigable in fact when they are used, or susceptible of being used, in their ordinary condition, as highways of commerce ...." Interpreting this requirement, subsequent court decisions have adopted this test for title purposes and have ruled that a waterbody is navigable if it was capable of use, at the time of statehood, as a public highway for transporting goods or for travel in the customary modes of trade and travel on water.

DSL has determined that there is sufficient evidence to support a claim of navigability and state ownership for the beds and banks of the Siltcoos River and Threemile, Tenmile and Tahkenitch creeks within the NRA boundary. The position of the Forest Service is that the navigability of these streams has not been established.

For purposes of managing the above portions of these streams (where navigability has not been established), any non-federal activities or land uses such as new utility or transportation corridors and boat ramps or similar facilities that impose into or cross a waterway below ordinary high water will require an easement from the Board. Existing non-federal facilities will require an easement at such time as they undergo major structural alteration, replacement, or relocation. In addition, removal of sand and gravel requires a royalty lease and any non-federal use that occupies any area of submerged or submersible land requires a waterway lease.

Further, the DSL also administers the State's Removal-Fill Law which protects Oregon's waterways from uncontrolled alteration. The law requires a permit for fill or removal of more than 50 cubic yards of material within the State's waterways. The permit-review process involves coordination with the natural resource and land use agencies from the local through the federal levels.

Nothing set forth herein shall limit the ability of the Forest Service to administer these stream segments.

As with any jointly managed resource, jurisdiction is not as important as care for the resource. The DSL and the Forest Service will continue to work together to assure that the public trust interest is met.

Management Practices

The primary management focus over the course of the present plan was to acquire private lands in the Dunes Sector on a willing-seller basis or through land exchange. A total of 7,660 acres have been acquired since the NRA was established in 1972. A secondary emphasis was administering requests for private use of NFS lands through the Special Use Permit process. Commercial uses of NRA lands were discouraged and most special use permits issued to private individuals or non-profit groups for short-term events. Compatibility analyses were conducted on private lands in the Dunes Sector to determine whether protection from the use of eminent domain would be maintained when uses change on those private lands. Property boundaries are surveyed, posted and maintained to ensure NFS lands are identified to users and adjacent landowners. Encroachments and title claims are resolved using provisions of law.

Resource Relationships

Management of lands and associated property rights of the Oregon Dunes NRA is a fundamental stewardship responsibility. Land and property rights are the underlying foundation for all other management activities. Acquiring land can help accomplish other resource management objectives and ensure that the unique features Congress recognized when it enacted the NRA Act are protected. Analysis of compatibility of uses of private lands within the Dunes Sector redeems responsibilities given to the Forest Service in the legislation and maintains the basic values the legislation was designed to protect. These analyses are conducted using a process described on pages 41-43 of the present Dunes Plan (USDA Forest Service 1979). Policies for how special use applications will be evaluated and permits administered facilitate adjacent uses and ensure consistency with the Act.

Future Trends

Most of the high priority land has been acquired within the Oregon Dunes NRA. As additional properties become available for purchase or land is offered for exchange, acquisition would be aggressively pursued. New encroachments would be identified and remedied as remaining miles of property boundary are surveyed and posted. Once all the lines are properly posted and provided routine maintenance is conducted, future instances of encroachments and boundary disputes should lessen considerably. Special use applications would continue to be received at about the same rate as in recent times and for generally the same kind of uses.

ROADLESS AREAS

Four areas within the Oregon Dunes NRA meet the definition of roadless areas because they lack roads, major structures and recreation facilities. These areas are mostly unvegetated sand, wetlands and deflation plains.

Current Situation

Four inventoried roadless areas within the boundary of the Oregon Dunes NRA were evaluated for wilderness potential in both 1976 (USFS 1976) and as part of the subsequent Roadless Area Review and Evaluation II (RARE II) process. It was determined that none of the areas were suitable for wilderness designation, and none were included in the Oregon Wilderness Act of 1984.

The areas are Woahink (5,060 acres), Threemile Lake (4,770 acres), Umpqua Spit (2,360 acres which includes 770 of recently patented private land), and Tenmile (7,800 acres). The areas are described in detail in Appendix D. Together they total almost 20,000 acres, which is about two-thirds of the NRA.

Dispersed recreation uses such as hunting, hiking, horseback riding and photography occur within all four areas. In addition, there is extensive ORV use within the Woahink and Tenmile areas. Although general ORV use is not allowed in the Threemile Lake or Umpqua Spit areas, each contains a travel corridor which is open to ORV use. The Tenmile area contains a number of water well developments which help supply water to the Coos Bay/North Bend area.

Resource Relationships

Roadless areas support undeveloped recreation. They are generally natural appearing and help ensure high quality water and fish and wildlife habitat. Development of roads, utilities and other facilities eliminates or diminishes roadless conditions.

Trends

If present trends continue, almost all present roadless acreage will remain undeveloped. Any further developments, such as recreation facilities, special use developments and roads should be concentrated in, or adjacent to, existing road corridors.

WATER

Current Situation

Streams

Streams in the Oregon Dunes NRA are characterized by low gradient, meandering channels with sand substrates and banks. This is in marked contrast to the steep, highly dissected streams on the rest of the Siuslaw National Forest. The Siuslaw, Umpqua and Coos rivers pass through the Oregon Dunes NRA, as do three other major streams, the Siltcoos River and Tahkenitch and Tenmile creeks.

Two dams managed by International Paper Company (IP) on the Siltcoos River and Tahkenitch Creek maintain lake levels and supply water to a pulp mill at Gardiner. Provisions in the Oregon Dunes NRA Act protect the company's right to obtain water from these lakes. The dams were installed in 1968 with an original agreement with the State to assure withdrawal of 20 cubic feet per second of water at the Siltcoos site and 15 cubic feet per second at the Tahkenitch site.

An additional agreement for the Siltcoos dam with local residents and ODFW is designed to deal with tidal upstream flow which causes flooding. The agreement provides that the dam level is dropped an extra foot during the winter storm months and that it is closed as a barrier to high tidal upstream flows to prevent flooding. Following high tide, all 4 gates are opened to exit accumulations during the period when the system is closed. The Tahkenitch dam is 15 feet higher, and is not influenced by the tide. This dam is occasionally flushed of debris by opening all the gates at once.

Gates are operated to ensure adequate flows through the fish ladders at both dams. IP opens the gates on the dams to cut a channel for incoming anadromous fish based on reports of concentrations of seals at the stream mouths. ODFW concurs with this activity.

Lakes

Larger lakes in the Oregon Dunes NRA include Cleawox, Siltcoos, Carter, Tahkenitch, Elbow, Threemile, Eel, Beale, Sandpoint, Saunders, Clear and Horsfall. There are about 20 smaller lakes in the area (see Fish, Chapter III). Factors that affect quality and quantity of water in the dune environment include water withdrawal, dams, pollutants and sand intrusion into lakes and streams.

Groundwater

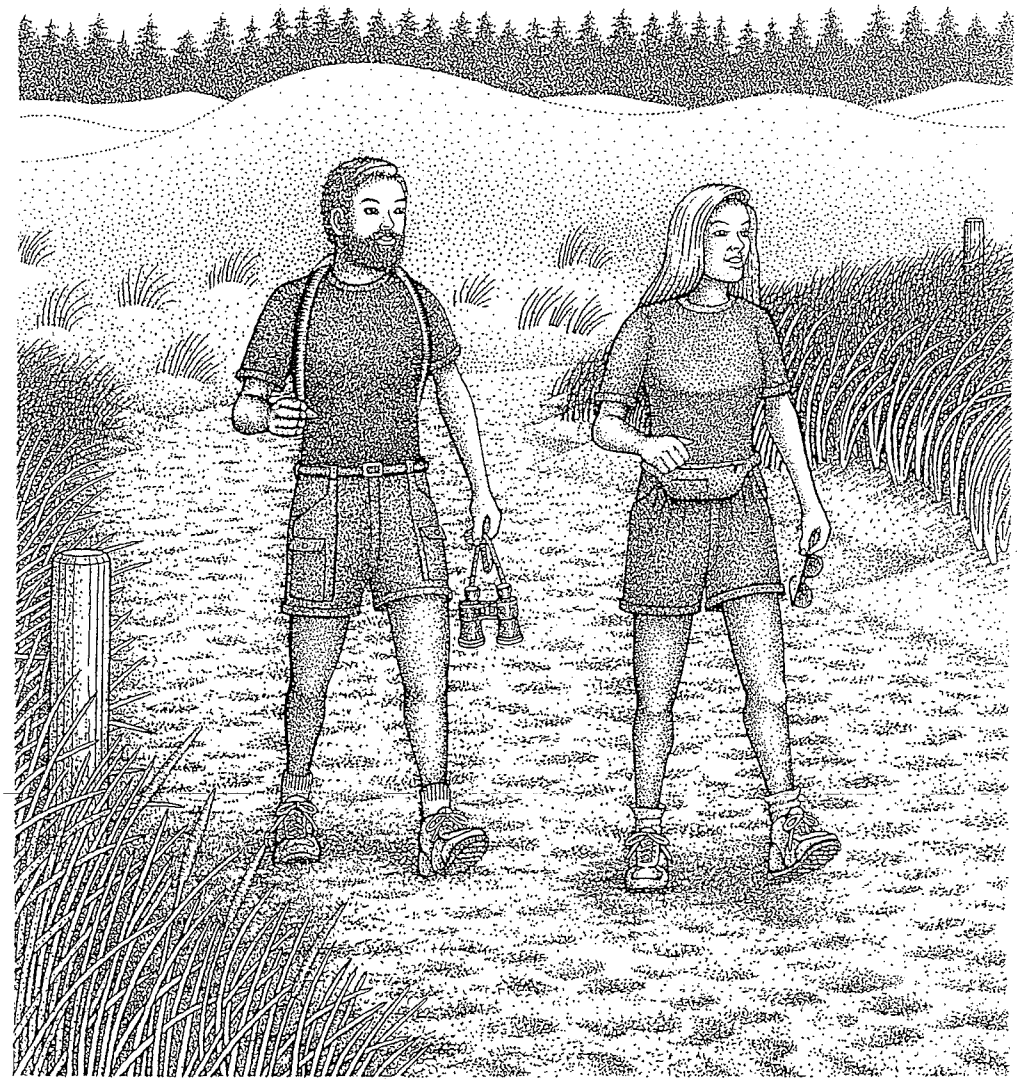
Sand dunes are an excellent aquifer. The sand absorbs and stores a large percentage of the average annual 70 inches of precipitation as fresh groundwater. There are 53 State Water Right permits inside the Oregon Dunes NRA boundary or within a quarter of a mile of the boundary. This includes 22 groundwater permits with 71 groundwater intakes, 31 surface water permits and 2 reservoir permits. Seawater (salinity) has not been found in test wells drilled in the area, including those immediately behind the foredune. Groundwater south of Tenmile Creek discharges naturally into the ocean, Coos Bay, and the North Slough through seeps and springs.

Quality of the groundwater is soft and generally of good chemical quality, except it is slightly basic, and in some areas requires iron removal for certain uses. Bortleson et al. (1990) noted a significant increase of iron in 12 of the 20 wells used by the Coos Bay-North Bend Water Board, which has a 30-year special use permit for removal of groundwater. The Board currently has 20 wells in production, using approximately 5 million gallons per day (MGD) of water for both industrial and municipal purposes. Their long range plans would increase the number of wells to 64. The Water Board can provide more detailed information on the economic value of their collection systems and the water provided to their users.

Initial studies in the 1970s by the U.S. Geological Survey (USGS) indicated that up to 30 MGD could be withdrawn from the aquifer without salt water intrusion. Recent research, as discussed below in Management Practices, indicates a much lower level of available salt-free water. Provisions in the NRA Act protect continuance of this operation provided natural resources are not significantly degraded by drawdown of the water table. Determining such impacts of pumping is complicated by the possibility that concurrent increases in vegetation increase loss of groundwater through transpiration. Subsequent decay of the added vegetation may also increase iron in the groundwater.

Although considerable information is available on groundwater in the southern dunes of the Oregon Dunes NRA, very little is known about the northern portion. At this time, it is assumed that similar relationships exist between the bedrock, marine sand, dune sand, annual precipitation and groundwater storage. Freshwater stands free during the late winter and spring in many areas. These small bodies of water have permeable sand bottoms and undoubtedly are continuous with the groundwater. Widespread and numerous areas of "quicksand" conditions along the edge of the transverse dunes indicate that hydraulic pressure of the ground water is sufficient to buoy up the sand and greatly reduce its ability to support concentrated loads.

Many summers in the Oregon Dunes NRA are dry, with frequent water shortages, and increasing demands from local communities for water may require examination of alternative sources. There already have been efforts to explore the possibility of using surface water from streams and lakes upstream from the Oregon Dunes NRA. These efforts may conflict with recreation and water quantity requirements for fish and wildlife habitats downstream.



Estuaries

The lower reaches of coastal streams, called estuaries, are influenced by tides and flows are altered dramatically in very short time periods. Estuaries are also subject to dynamic changes in their chemical and biological components.

The Siuslaw, Coos and Umpqua rivers are navigable and used by large barges moving lumber to market and by commercial and sport fishing boats as sanctuaries. Large jetties extend seaward from the mouths of these rivers.

Management Practices

The most significant issue in management of water resources in the Oregon Dunes NRA is groundwater withdrawal. Under natural conditions, an equilibrium is maintained whereby recharge to the aquifer balances discharge from it. Pumping of water from wells is an additional discharge, and there is a great deal of controversy about the consequences of this pumping. The most complete assessment of effects of withdrawals on surface water levels concluded that "pumping 15 to 16 MGD can lower the lakes to levels that may be considered undesirable or unacceptable for some uses" (Robinson 1973).

Current research by USGS focuses on a different groundwater issue - potential for salt water intrusion due to pumping from the aquifer. Jones (1991) found that 10 MGD could be pumped with little risk of intrusion. His model simulations indicate that up to 17 MGD could be pumped without intrusion, although the effects of this much pumping remain uncertain. Certainly much more information is needed to accurately assess the effects of groundwater withdrawal on surface water resources of the Oregon Dunes NRA, and just recently, the Coos Bay-North Bend Water Board initiated a thorough study of the causes of historical changes in water levels.

Other management considerations related to water resources include maintenance of streamside vegetation to assure bank stability and maintenance of stream flows to assure adequate flows for biological and recreational entities.

Resource Use

Streams and lakes of the Oregon Dunes NRA provide recreation activities such as fishing, boating, sight-seeing, swimming and photography. Waterways are habitat for many plants and animals, and are also important for municipal and industrial use. Lakes and streams of the NRA support anadromous salmonids, several species of which may be "at risk" (see Fish, Chapter III). Water is enjoyed by both local and out-of-state visitors.

Future Trends

All uses of water resources in this unique area are expected to grow in the near future. Recreation use in particular will continue to expand, while demand for high-quality drinking water is becoming a critical issue. As conflicting uses of lakes, streams and groundwater continue to grow, it will be essential that water quality and quantity are carefully managed on a long-term basis.

SOILS AND GEOLOGY

Overview

The Oregon Dunes NRA consists of a complex assembly of foredunes, deflation plains, dune lakes, and active and vegetated parabolic and transverse dune systems nestled between the Pacific Ocean and foothills of the Coast Range. These primary geomorphic features form the signature landscapes of the Oregon Dunes NRA; their appearance and functioning are being changed rapidly by profound long-term alterations in erosional and depositional processes in the sand dune terrain.

Current Situation

The Oregon Dunes NRA is underlain by mudstones and sandstones developed over long periods of successive uplifting and subsidence of the coastal strip, and great changes in sea level associated with major glacial periods. Soils developed on these rocks include undeveloped sands, weakly developed forested dune sands and bog soils, and deep, moderately well developed soils over bedrock. A specific detailed description of the geologic sequences of coastal uplift and submergence, and rock and sand forming processes can be found in The Oregon Dunes NRA Resource Inventory (USFS 1972). Since that document was written, new discoveries about plate tectonics and sand migration have added to our understanding of coastal land forming processes. However, basic concepts of formation of dunal features remain essentially unchanged.

The large unvegetated active dunes move fluidly as ponderous sandy sculptures to the north and east. They eventually are halted along the face of prehistoric vegetated dunes, or at nearshore foothills of the Coast Range. As these remnant open dunes flow onto steep inland slopes, their sandy windblown surfaces are stilled, and they finally are covered by brush and trees.

The open dune systems are being replaced by vegetated deflation plains at a rate that could eliminate much of the open sand in the near future. This evolution towards broad marshy thickets and vegetated inactive sand dunes is a direct result of introduction of European beachgrass and subsequent development of the foredune, and could be a dramatic change in a very short geologic time.

The foredune is a long, essentially continuous ridge of grass-covered sand paralleling the beach just above the high tide line. The foredune has developed since the 1930s due to the earlier introduction of European beachgrass to control sand movement along harbors and roads. Beachgrass eventually spread to all central Oregon beaches through tidal and current drift. It effectively traps sand that blows inland from the beach. The grass grows through the added sand and slowly raises the elevation of the area adjacent to the beach and eventually forms the foredune. Over the past several decades, the foredune has grown to 25 or more feet in height and has essentially cut off the supply of wind-blown sand to the inland open sand dunes. Onshore winds continue to move the remaining inland dune sands eastward toward the older vegetated dune systems, stripping sand from the area immediately east of the foredune and exposing the water table. The yearly cycle of sand removal by wind erosion and consequent exposure of the water table has formed the ever-widening strip of densely vegetated lowland known as the deflation plain. Because the soil surface of the deflation plain is at the summer ground water level, only plants tolerant of perennially wet soils can survive. Deflation plains are true wetlands.

Grassy hummocks have developed and persisted as interspersed elevated landforms throughout the deflation plain areas. The grassy hummocks are up to 6-8 feet in diameter, and 3-4 feet in height above the surrounding deflation plain. They formed on remnant patches of open sand within the deflation plains where isolated communities of beach grass have become sufficiently established to prevent wind erosion. They generally occur at the periphery of, or occasionally within, the deflation plain. The hummock surfaces are well above the summer or winter groundwater levels.

Management Practices

Sand still moves onto roads, railroads, campgrounds and other facilities (which originally prompted planting of European beachgrass). To mitigate this encroachment, beachgrass is still occasionally planted by the Forest Service and State of Oregon where other solutions are not feasible.

The Forest Service has considered rejuvenation of the inland sand dunes by altering the foredune. An experiment by the Oregon State University Department of Geography tested potential for reinstating a sand supply to the open dune system through physically removing a portion of foredune north of the Siltcoos River in 1985. Since then, field measurements have shown that beachgrass establishment in the flotsam that collects in the mouth of the breach has begun reestablishment of the foredune. Little new sand has moved from the beach to inland areas since the breaching, and, if the foredune rebuilds, the source will again be eliminated. Another experiment along the Northern California Coast attempted to eliminate the foredune by killing beachgrass with chemicals. It was found that herbicides did not effectively eradicate European beachgrass because of it's ability to propagate from roots and broken pieces of stalk. Since control is so difficult, the beachgrass and foredune could be permanent features of the Oregon Dunes NRA.

Resource Relationships

Gradual, persistent stabilization by encroaching vegetation of many of the open dunes could rapidly alter future potential for recreation in many areas. Since there may be no practical solutions to the effects of the foredune on the inland dune sheet, alternate strategies should be developed for the "new" landscapes that may eventually define the area.

Historic Trends

The dunes have undergone periodic submergence and uplifting associated with cycles of continental glaciation. Since the last general submergence, the sand dunes have undergone several cycles of stabilization and rejuvenation depending upon the type of vegetation, and degree and type of disturbance. By far the greatest impacts on the dunes in this century have been from introduction of European beachgrass in the early 1900s.

Future Trends

Except immediately along the beach, amounts of open, drifting sand within the Oregon Dunes NRA could diminish considerably in the next several decades. Lakes and streams that now have open sand at their margins could have their shorelines covered with brush and trees.

MINERALS

Current Situation

Mineral commodities are classified by law into three categories: locatable, leasable, and salable. The manner in which each is managed, and the authority of the Forest Service to control exploration for, and development of, each commodity varies.

In the legislation creating the Oregon Dunes NRA, Congress withdrew all lands within it's boundary from further mineral entry. And, on October 10, 1989 the last of the Oregon Dunes NRA outstanding mining claims were resolved when the Bureau of Land Management issued mineral patents covering 770 acres.

Management Practices

Although removal of small amounts of sand from roadsides and parking areas has been allowed under free use permits issued to the public, no outstanding leases or mineral material permits exist within the Oregon Dunes NRA, nor new permits established. The Forest Service control of mining activity in the buffer zone is limited to minimizing impacts on surface resources.

Resource Use

Eight unpatented placer mining claims were located and are currently being maintained in the buffer zone south of the Oregon Dunes NRA boundary which is open to mineral entry. These claims, covering approximately 160 acres, were located for silica sand, a major component in the manufacture of glass. Mining activity has not occurred or been proposed on these claims since their location in 1989. On April 21, 1992, these claims were deemed abandoned and void by the Bureau of Land Management since there wasn't an affidavit of annual assessment work performed (proof of labor) or notice of intention to hold the claims filed on or before December 30, 1991. Currently, this land continues to remain open to mineral entry; it is unknown if any new claims have been located or filed recently in this area.

There is an intermittent mining operation on private land adjacent to Forest Service lands in the buffer zone on the North Spit of the Coos River. The Duvals, under the name of CooSand Corporation, are mining silica sand from their site at Cordes. The sand is loaded onto boxcars and transported to a plant in Clackamas, Oregon for processing into brown glass bottles.

Trends

Mining operations are required to be conducted in accordance with an approved plan of operations. This ensures compliance with environmental protection standards. There are no current leases or lease applications for the area within the buffer zone.

CULTURAL RESOURCES

Overview

The Oregon Dunes NRA lies within the ancient tribal homelands of the Coos, Lower Umpqua and Siuslaw Indians. This coastal region was subsequently explored, then settled by Euroamericans by the mid-19th century. As a consequence, the Oregon Dunes NRA contains a variety of prehistoric (before the coming of Europeans) and historic (after the arrival of Europeans) cultural resource sites. These include Indian shell gathering places and villages, and homesteads, wagon roads, military installations and other historic ruins.

Dense coastal vegetation and shifting sand dunes, however, have severely restricted opportunities for discovering cultural resources in the Oregon Dunes NRA and adjacent coastal areas. Few cultural resource inventories have been undertaken other than those related to disturbance from specific projects. Large projects such as timber sales that would create enough ground exposure to reveal the locations of cultural sites are uncommon. Consequently, the exact number of prehistoric and historic sites within the Oregon Dunes NRA is unknown. However, recent discoveries and research indicate that the area has high cultural resource potential.

Current Situation

The Tahkenitch Landing archaeological site is the oldest known Indian encampment on the Oregon Coast (Minor and Toepel 1982). Excavations revealed that the site was continuously inhabited from 8,000 to about 130 years ago and document a dramatic shift in the Central Coast's environment. The Tahkenitch Landing site is eligible for listing on the National Register of Historic Places.

The Hauser archaeological site is a "shell mound" where shellfish were once cooked and eaten by American Indians next to an ancient estuary that is now covered by sand dunes (Keyser 1991). It was continuously inhabited from about 3,000 to 2,000 years ago and may contain older archaeological evidence. The Hauser site is also eligible for inclusion on the National Register.

Other known but un-investigated shell mounds and villages have been identified at the mouths of Tenmile Creek and the Siltcoos River. In addition to these sites, observation of rock cracked by primitive campfires at other locations in the Oregon Dunes NRA indicates that hunting and butchering of wild game also ocurred. Some of these sites may also be partly exposed villages and shell mounds similiar to the Hauser site. These sites have not yet been fully documented and studied so their nature and values are unknown.

Within the Oregon Dunes NRA, the historic period is best documented by a variety of significant sites located on the North Spit of the Umpqua River. It was the site of the earliest settlement south of the Columbia River at Umpqua City (1850), the U.S. Coast Survey's second Astronomical Station (1853), the Bureau of Indian Affairs' Umpqua Indian Sub-Agency (1854-59), the U.S. Army post of Fort Umpqua (1856-61) built to protect refugee Coos Indians from settlers, the U.S. Life Saving Service Station (1888-1935), and the U.S. Army Corps of Engineers' North Jetty Construction Camp in the 1920s (Beckham 1990). Recent (1990) surveys on the North Spit also indicate the presence of a prehistoric shell mound, a cemetery and other archaeological remains.

Other properties of potential historical value include the 1826 fur trading sites of Alexander McLeod of the Hudson Bay Company and the 1828 exploration routes of the American fur seeker, Jedediah Smith. With the exception of a few homesteads, much of the Oregon Dunes NRA was unattractive for settlers, although stage and freight lines between Coos Bay and the Siuslaw River and surrounding areas crossed the dunes during this initial period of coastal settlement and commerce (Beckham et al. 1982a).

Management Practices

All potential land disturbing activities in the Oregon Dunes NRA are preceeded by a cultural resource survey to ensure that significant sites are protected. The surveys are designed in accordance with a cultural inventory plan agreed to by the Forest Service and the Oregon State Historic Preservation Officer (SHPO; Toepel and Beckham 1985). Cultural Resource Technicians complete the surveys under the direction of the Forest Archaeologist.

Inventory is followed by an evaluation of whether any identified cultural resource sites have scientific and/or historical value or "significance" according to criteria of the National Register of Historic Places. A determination of significance then leads to appropriate treatment and protection of the site in face of potential land disturbing projects and management activities. Projects may be canceled, relocated or redesigned to avoid damaging sites or include mitigation plans agreed to by the Oregon SHPO and the Forest Service. Mitigation may require archival research and/or archaeological excavations that remove portions of the site from harm's way prior to proceeding with projects.

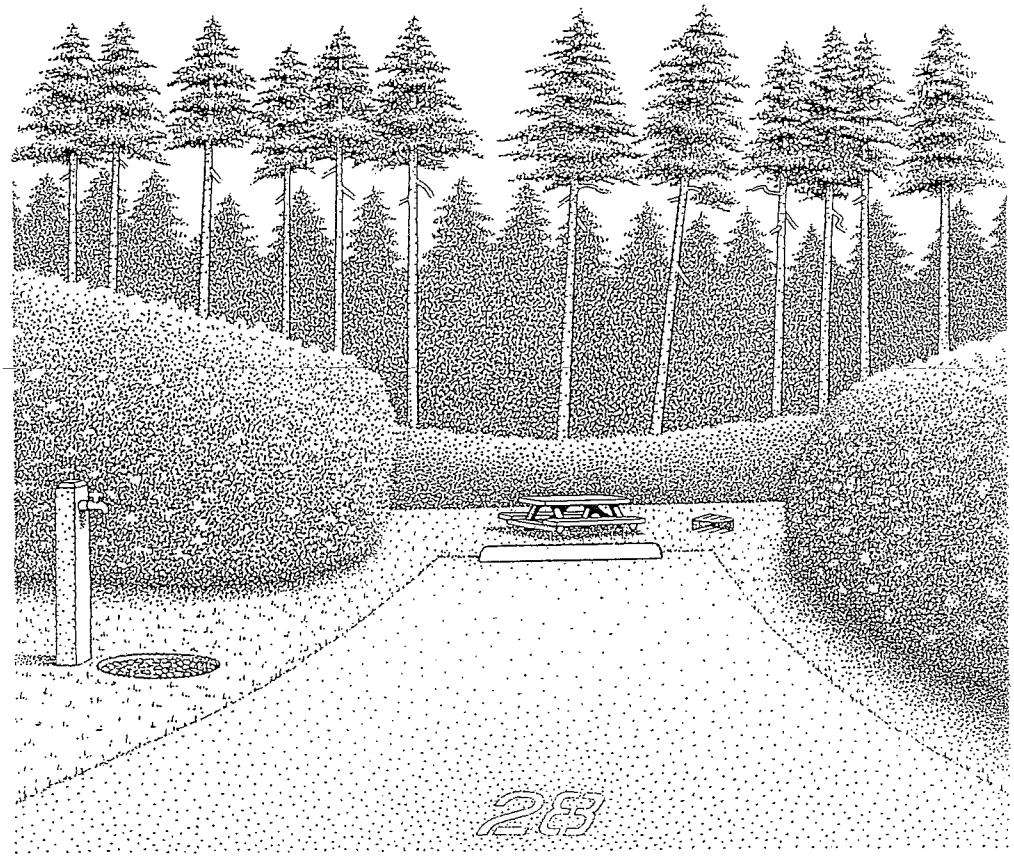
Resource Relationships

Cultural resource surveys preceeding proposed land disturbing projects, particularly those related to recreational development, are the primary means by which cultural resources are identified, evaluated, and studied. Therefore, rate of discovery of cultural resources is directly related to rate of project activity.

Future Trends

To date the number and diversity of cultural resources, particularly prehistoric (archaeological) sites, within the Oregon Dunes NRA is largely unknown. However, cultural resource inventory, evaluation and mitigation work in advance of recreation-related (and other) projects is gradually adding to the knowledge base. If the level of recreation and other developments in the area remains approximately the same, this situation will eventually produce a reliable, though piece-meal, record of ancient and historic human use of the Oregon Dunes NRA. An increase in the number of projects, especially those in heavily-used areas around lakes and streams, will proportionately increase the cultural resource knowledge base, but at the same time may place limits on recreation (and other) developments.

Accumulating cultural resource knowledge about the Oregon Dunes NRA will greatly enhance opportunities for integrated natural resource and cultural heritage interpretation. Further, identification, interpretation and protection of cultural resources within the area is very important to the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians; this interest is likely to accelerate following the recent Tribal restoration by Congress.



AMERICAN INDIAN RELIGIOUS PRACTICES

Overview

Historically, American Indians have used some parts of the Oregon Dunes NRA for traditional religious practices. It is the policy of the United States to protect and preserve the Indians' inherent right of freedom to believe, express and exercise their traditional religions (Joint Resolution on American Indian Religious Freedom 1978).

Current Situation

In 1954, the United States ended federal trusteeship of the tribes in the area through a process called termination. Several tribes, however, have recently reestablished the trust relationship, and the local Confederated Tribes of Coos, Lower Umpqua and Siuslaw had federal recognition restored in 1984. The 1980 Census identified about 4,700 American Indians living in Coos, Douglas and Lane counties.

A study of traditional practices of the tribes found no continuing religious practices on either the Oregon Dunes NRA or elsewhere on the Forest (Beckham et al. 1982b). Two quarries for paint and two quest areas were identified on other parts of the Forest which were once important to native inhabitants.

Historic Trends

Several tribes occupied lands now in and around the Oregon Dunes NRA. They include the Alsea, Coos, Lower Umpqua and Siuslaw tribes. In the 1770s, the Indians' religious practices were focused on unique, individual linkages with the natural world. Their primary religious use of surrounding areas appears to have been for spiritual quests and quarries for materials used for facial and body paint. In the mid-19th century, the tribes underwent a period of calamitous change, population loss and uprooting. Epidemics from introduced disease, white-Indian warfare, removal by whites to alien lands, reservation life, and Christian missions disrupted the Indians' traditional religious practices.

Future Trends

Oregon Dunes NRA personnel will continue to cooperate with the Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians in identifying and maintaining their traditional uses of the area. If any sites once important for religious purposes are discovered, their setting and location would be protected from disturbance and made available for use.

TRANSPORTATION SYSTEM

Current Situation

All visitors to the Oregon Dunes NRA travel highly scenic U.S. Highway 101 for at least a portion of their journey. State Highways 36, 38, 42 and 126 connect Highway 101 with Interstate 5 in the Willamette Valley. During the summer months, U.S. 101 is heavily laden with tourist traffic all week. The connecting highways become congested on weekends with visitors to the Coast.

In addition to being the major transportation artery supplying visitors to the Oregon Dunes NRA, Highway 101 is also a focus for recreation opportunities with many campgrounds, developed day-use facilities, and access points to undeveloped portions of the NRA located along it. Current Oregon Department of Transportation scenic highway planning efforts for Highway 101 provide opportunities for additional integration of the highway into the mix of recreation opportunities that could be provided at the NRA in the future.

About 500,000 vehicles annually use NRA roads, which are constructed and maintained by the Siuslaw National Forest. This traffic figure represents about 1.5 million visitors. At present, there are 23 miles of double-lane paved roads open to the general public, and 2 miles of "sand access" roads used by ORVs to reach the dunes.

The Southern Pacific Railroad maintains a rail line that extends along the eastern boundary of the NRA from the southern boundary north to Tenmile Creek. At this point the line veers eastward and leaves the NRA. The railroad right-of-way is recognized in the NRA Act, which also prescribes that the Secretary of Agriculture may obtain easements across the right-of-way for public ingress and egress. The line is currently used only for the movement of freight.

Management Practices

Roads on the Oregon Dunes NRA (such as the major roads into the South Jetty, Siltcoos, Umpqua Beach, and Horsfall areas) are generally double-lane, paved, and of a high standard, suitable for most types of traffic. Maintaining these roads includes resurfacing (when needed), sweeping the pavement to remove sand and other debris, cleaning drainage ditches, replacing and/or repairing signs, and striping (painting) to aid traffic flow and define driving lanes. Maintenance work is similar to that which occurs on a rural county road. Sand roads and gravel roads like the Threemile Road receive less maintenance.

Resource Relationships

Recreation opportunities are affected by a visitor's ability to reach the sites of interest. Thus, the road system on the Oregon Dunes NRA is a major factor in the quality of recreation that may be experienced. Day-use, bicycling, many overnight, and all ORV-using visitors use Forest Service roads in the NRA.

Future Trends

Any additional roads will provide recreation access, and will be built to reach a specific facility (i.e., viewpoint, parking area, picnic area, campground). Although some alternatives include graveled access, roads will generally be double lane, and asphalt surfaced, with the exception of one-way ingress and egress where the roads will be single lane and asphalt surfaced. Roads will be designed and constructed to accommodate typical visitor traffic.

Roads will be designed to reduce problems with flooding, wind scour and sand deposits and to minimize impacts on wildlife, scenery, and other aspects of the sensitive NRA environment. Any additional roads constructed to provide ORV access to dune "play" areas will be paths or lanes of native (sand) material or aggregate. Parking facilities, some with toilets or potable water, will be located to provide access for the public, so visitors may enjoy the dunes environment, and have the minimum impact on the land, visually and physically.