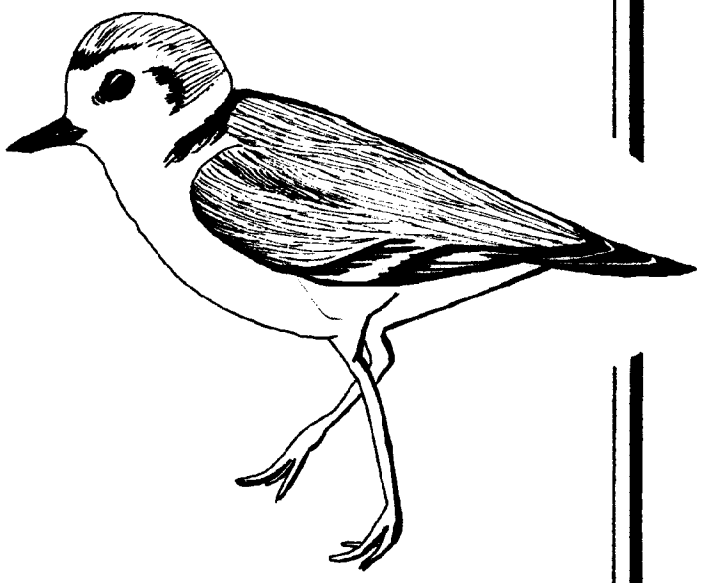
Critical Species & Habitats Of Oregon's Coastal Beaches & Dunes



Oregon Coastal Zone
Management Association, Inc.

This report was prepared as part of a larger document addressing various beach and dune planning and management considerations and techniques. Other segments of the document and additional materials are:

I. BACKGROUND ON BEACH AND DUNE PLANNING:

Background of the Study

An Introduction to Beach and Dune Physical and Biological Processes

Beach and Dune Planning and Management on the Oregon Coast: A Summary of the State-of-the-Arts

II. BEACH AND DUNE IDENTIFICATION:

A System of Classifying and Identifying Oregon's Coastal Beaches and Dunes

III. PHYSICAL AND BIOLOGICAL CONSIDERATIONS:

Physical Processes and Geologic Hazards on the Oregon Coast

Critical Species and Habitats of Oregon's Coastal Beaches and Dunes

IV. MANAGEMENT CONSIDERATIONS:

Dune Groundwater Planning and Management Considerations for the Oregon Coast

Off-road Vehicle Planning and Management on the Oregon Coast

Sand Removal Planning and Management Considerations for the Oregon Coast

Oregon's Coastal Beaches and Dunes: Uses, Impacts and Management Considerations

Dune Stabilization and Restoration: Methods and Criteria

V. IMPLEMENTATION TECHNIQUES:

Beach and Dune Implementation Techniques: Findings-of-Fact

Beach and Dune Implementation Techniques: Site Investigation Reports

*Beach and Dune Implementation Techniques: Model Ordinances**

VI. ANNOTATED BIBLIOGRAPHY:

Beach and Dune Planning and Management: An Annotated Bibliography

VII. EDUCATIONAL MATERIALS:

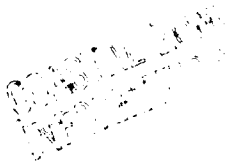
Slide show: *Managing Oregon's Beaches and Dunes*

Brochure: *Planning and Managing Oregon's Coastal Beaches and Dunes*

*Prepared under separate contract between Oregon Department of Land Conservation and Development and the Bureau of Governmental Research, Eugene.

Cover illustration by Lorraine Morgan, Newport, Oregon.

CRITICAL SPECIES AND HABITATS OF OREGON'S COASTAL BEACHES AND DUNES



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ABSTRACT

This report was developed by the Oregon Natural Heritage Program of The Nature Conservancy under contract with the Oregon Coastal Zone Management Association, Inc. in order to assist coastal land use planners and decision-makers in the identification, protection and management of critical biological species and habitats of the beaches and dunes of the Oregon Coast. The report describes a framework for the assessment of critical biological habitats which is based upon The Nature Conservancy's statewide effort to identify and conserve (1) species of plants and animals which are rare, threatened, or endangered in Oregon, and (2) typical and representative examples of native ecosystem types. A "natural element approach" is defined and used which lists the basic types of species and ecosystems, and an inventory of the occurrence of those elements. Natural elements of the beaches and dunes zone are identified and described. Nineteen areas are described which depict or represent occurrences of these elements. It is recommended that planners consult the statewide information bank, maintained by the Natural Heritage Program, in assessing the significance or comparative value of any site which contains occurrences of the listed elements prior to a land use decision. A variety of methods are listed and discussed for protecting critical biological habitats, including programs by federal and state agencies and private conservation organizations. The characteristics (ownership, attitude of owner, biological frailty, etc.) of each area must be considered in designing an appropriate conservation action. The recommended role of the county or city planning department is to (1) maintain an inventory of known locations of important natural elements and identify any potential conflicts between the elements and proposed development, (2) when a conflict is noted, prepare or cause to be prepared an assessment of the quality and quantity of the important elements on the land in question, (3) contact the State Heritage office for an assessment of the statewide importance of the elements, and (4) contact, or cause to be contacted, the appropriate agencies or organizations to initiate actions for conservation. In addition, jurisdictions

are encouraged to make known to land owners the availability of the open space tax assessment law.

PREFACE

The following report presents the results of an in-depth analysis of critical biological species and habitats found on Oregon's coastal beaches and dunes. This study was conducted by Bill Burley with the Oregon Natural Heritage Program of the Nature Conservancy under contract with the Oregon Coastal Zone Management Association, Inc. and with assistance from OCZMA's Beaches and Dunes Study Team composed of Carl Lindberg, Project Leader, Christianna Crook, Project Associate, Arlys Bernard, Project Secretary, Wilbur Ternyik, Project Coordinator, Timms Fowler, WICHE Intern, and Kathy Fitzpatrick, Project Administrator. This report constitutes one element of an overall analysis of planning for and managing coastal beaches and dunes as required by Oregon's Beaches and Dunes Goal.

Funding for this study was provided by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, under Section 306 of the Coastal Zone Management Act through the Oregon Department of Land Conservation and Development.

On behalf of Bill Burley and the Nature Conservancy, OCZMA expresses appreciation to the following individuals for their contributions during the preparation of this report: Madeline Hall, Environmental Remote Sensing Applications Laboratory, Corvallis; Mary Arneson, U.S. Army Corps of Engineers, Portland; Ruth Wilson, RoseAnn Deering and Geoff Pampush, Oregon State University, Corvallis; Dr. David McCorkle, Oregon College of Education, Monmouth; Mark Westling and Bob Keith, Bureau of Governmental Research and Service, University of Oregon, Eugene; Jean Siddall, Oregon Rare and Endangered Plant Study Center, Lake Oswego; and Linda Marston and John Morgan, Northwest Coastal Information Center, Newport. Special thanks is given to the University of Washington Press for permission to use several of Jeanne Janish's beautiful line drawings from Vascular Plants of the Pacific Northwest, 1955-1969.

Additionally OCZMA acknowledges the valuable review and comment made by the Beaches and Dunes Steering Committee composed of:

R. A. Corthell, U.S. Soil Conservation Service
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I. INTRODUCTION

This report addresses critical biological areas associated with coastal beaches and dunes as required by the Oregon Land Conservation and Development Commission's Beaches and Dunes Goal (#18) which requires that:

> "Coastal comprehensive plans and implementing actions shall provide for diverse and appropriate use of beach and dune areas consistent with their ecological, recreational, aesthetic, water resource, and economic values, and consistent with the natural limitations of beaches, dunes and dune vegetation for development." (LCDC, 1977, emphasis added).

Additionally, the information and recommendations contained herein are directly pertinent to the LCDC Goal #5 (Open Spaces, Scenic and Historic Areas and Natural Resources), particularly section "e" of that Goal which addresses ecologically and scientifically significant natural areas.

The purposes of this report are threefold:

(1) to provide decision-makers and planners with information on the important biological considerations which must be addressed when evaluating coastal beach and dune sites for preservation, conservation or development;

(2) to provide scientific data, and a framework for use of that data, which is necessary for the selection of sites which warrant conservation due to the presence of either "elements of special concern" or good representatives of Oregon coastal ecosystems; and,

(3) to recommend to decision-makers and planners the planning and management techniques necessary for protecting critical habitats.

Following is a listing of terms, and their definitions, as used in this report:

ELEMENTS: plant or animal species, plant community or aquatic types, or geomorphic features of the coastal beaches and dunes.

ELEMENTS OF SPECIAL CONCERN: those elements which are considered to be rare, threatened, endangered, or in some other way are especially sensitive and fragile and which will likely decline toward extinction or be eliminated unless specific conservation efforts are made to protect them.

CRITICAL HABITATS: specific places where one or more elements of special concern are known to occur. This is a site-specific term, in contrast to "critical habitat type".

CRITICAL HABITAT TYPE: a generic term for a type of habitat; it is not site-specific. It is a type of habitat in which one or more elements of special concern are typically found.

RARE: a general term to indicate low numbers of individuals and/or populations.

THREATENED: a species or other taxon which is likely to become endangered within the foreseeable future throughout all, or a significant portion, of its range.

ENDANGERED: any species which is in danger of extinction throughout all, or a significant portion, of its range. When capitalized, signifies a species which has been listed or proposed for formal listing by the federal government.

II. WHY SAVE DIVERSITY?

A. The Role of Natural Areas--A National Perspective[1]

"In its land and its history the nation finds the things which give it continuity. By preserving places that have special natural, historical, cultural, and scientific value, we can ensure that our children and grandchildren have a chance to know something of the America that we....simply took for granted."

President Carter, 1977

The reasons for protecting our natural diversity are as diverse as nature itself. Our high quality of life, both economically and aesthetically, in the past, now and in the future has been and will be tied to an ability to utilize our natural resources. It is through the preservation of ecosystems and their natural diversity that we guarantee ourselves continued access to the storehouses of genetic information upon which all of our agriculture and much of our industry is based.

While President Carter has called for protection of natural ecosystems, the reasons for preserving sites of ecologic or geologic importance are perhaps not well understood by most people. Most of the following discussion about the value of diversity will pertain to the biological elements. Among the many reasons for this are the following.

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[1]Adapted from materials assembled by the Natural Heritage Trust Task Force (1977), and Nutter (1978).

First, it is in the realm of biology where diversity reaches its zenith. Second, biological organisms and species are subject to the condition of mortality--they can become extinct. This does not apply to inorganic features. Biotic species are especially vulnerable because their existence depends on a complex web of interrelationships, all of which must be ensured. Third, we ourselves are a part of this biological fabric and depend on other organisms for our existence. Fourth, biological species reproduce; they are "renewable resources" and their relative abundance can be deliberately altered to serve our purpose.

The diversity of chemicals and capabilities found in existing organisms has unique potentials. None of them have ever been randomly determined, but have evolved through eons of adaptive change. The practical value that they have to their possessing species in combatting, competing with, and otherwise interacting with other possible influences in their primordial context may be of similar value in human affairs. In other words, if human society needs to find active agents against disease, pests or other harmful elements, we stand a much greater chance of finding suitable substances and mechanisms in the complex machinery of natural species and ecosystems than in random attempts to create such agents in the chemistry laboratory. Indeed, of 76 major compounds obtained from higher plants, only about seven can be commercially produced at competitive prices through synthesis.

The protection of natural ecosystems is the best way to preserve and study species. Ecosystems are highly evolved, mutually interactive associations of species and inorganic landscape components which are uniquely adapted to specific parts of the earth's surface. They undoubtedly possess species and properties of which we are totally ignorant. Mankind simply cannot accurately duplicate natural ecosystems in artificial settings. Thus we must study species in their natural environments in addition to laboratory-based studies if we are to gain all available knowledge from them.

1. Baseline Monitoring and Research

The example of the miner's canary may be a bit trite, but it is none-the-less apt. Just as the canary will display distress from poisonous gases before the miner (giving the latter time to escape), some lichens will wither if exposed to low concentrations of nitrous oxides, giving notice of the need to take action. A cave dwelling creature, the cave scud can help monitor groundwater pollution. The honey of honey bees can be used to monitor heavy metal pollution. At the rate at which new chemicals are introduced into the environment it is inevitable that other species will become important in assessing the quality of the environment. Furthermore, since most natural systems have been working essentially in their present form many thousands of years, it makes sense to look to those successful systems for clues to the traits that lead to survival, including that of man's. Nature

preserves serve as undisturbed islands where instrumentaion can monitor ambient environmental quality, where the differences between altered and natural systems can be studied, and as models of how ecosystems should function.

2. Ecosystem Reconstruction

Nature is a healer of wounds. Deliberate environmental modification leading to ecosystem simplification has frequently had disastrous side effects. Ecological succession has often been able to repair this modification. The process is operating right around us in the gradual recovery of the depleted mid-Atlantic tobacco lands. It was all done for us as a "free service" of nature and each beech and maple tree grew on a spot prepared for it by some grass or forb or shrub which we cannot even name without intensive research and experimentation.

In the past this process took care of itself. There were always some refugia in which the diversity of life forms persisted no matter how catastrophic the local impact of destruction. At present, we can no longer rely on such random perpetuation since landscape alteration is more pervasive and permanent. More and more species, among the minority for which we have any information, reach endangered status as their habitats shrink. Agricultural areas now tend to become tomorrow's suburbs rather than tomorrow's forests.

A dramatic example of the hidden value of an individual species involves an American plant, the prickly pear cactus, which, when introduced in Australia, rapidly spread over thousands of acres of pasture and rangeland. Attempts to eradicate this pest were unsuccessful until a natural predator, a moth, was introduced to Australia from America. The irony of this story is that the role of the moth in controlling the spread of cactus was not recognized until the "Australian experiment ". The "usefulness" of the insect in its native habitat is now realized. Biological control mechanisms such as this are becoming more and more important as a safe means of controlling pests.

3. Education

Only be preserving the ecosystems, communities, species, geologic features, minerals, and other natural features can our children know and understand their natural heritage. Just as we would not eliminate any of Edgar Allan Poe's short stories, so we should not eliminate any elements of our natural heritage. It is the entire collection that is critical; no one volume being more important than the next, each is unique.

4. Medical Research

Each extant biological species, no matter how rare, is a potential resource of untold value. If there are only a few individuals of a species in existence and mankind discovers an important use for that species it may be possible to generate it in an almost infinite abundance. The number of instances in which such unique attributes instantly appreciated in the scale of perceived human values from "useless" to "priceless" is legion. A few examples follow.

-The armadillo is used in leprosy research as it has a high tolerance to that disease.

-Blood of the horseshoe crab is used in the diagnosis of spinal meningitis in children.

-A substance which holds barnacles on rocks is being studied as a dental adhesive.

-The electric organs of the electric eel are used in the treatment of muscle disease.

-The nearly extinct desert pupfish may prove beneficial to human kidney disease research because of its tolerance to extremes in temperature and salinity.

Prescriptions obtained from the higher plants alone are estimated to have a market value of one billion dollars. The use of foxglove (Digitalis) as a source of medicine for heart disease is but one example. In 1975, the commerce in medicinal plants was estimated to be worth 300 million dollars annually. A 1967 analysis of over 1 billion prescriptions in the U.S. found that 50% had as their active ingredient material from a native plant species, yet at the same time it has been estimated that 95% of over 350,000 plant species worldwide have never been studied for their medicinal value.

5. Agricultural Benefits

In 1974, the value of the total world wheat crop was valued at $30 billion. Wheat is a good example for exploration of the value of genetic diversity within a species. As with other plant species, wheat can be most efficiently grown as a monoculture. However, monocultures are also ideal for efficient disease transmission and for exploitation by pests. We can manipulate the situation in a variety of ways to minimize our losses to diseases and pests, most importantly by constantly developing new varieties with resistant properties. However, diseases and pests have properties which preadapt them to this sort of struggle and they develop the ability to overcome the innate resistance of the latest varieties almost as fast as we can develop them. Small grains

like wheat are the chief basis of human subsistence and under present conditions this situation has been rather frighteningly referred to as the "race between agricultural research stations and catastrophe".

One of the principal sources for the agricultural scientist has been the genetic diversity of the whole wheat species complex, including the wild progenitors. By selection and interbreeding different varieties it has been possible to continue to generate new recombinations with needed characteristics. But the elimination of the wild wheat habitats and the constant narrowing of the genetic base has caused grave questions about the future. Agricultural scientists have been expressing their increasingly serious concern not just about wheat but about the loss of genetic diversity in nearly every major crop species.

As recently as 1970, one fifth of the U.S. corn crop was eliminated by a corn blight. Only a change in the genetic makeup of the hybrid corn by breeding with wild progenitors allowed a new stronger hybrid to develop. There are numerous other examples of the agricultural benefits of wild species.

-The National Academy of Sciences in a study of new food sources has discovered a native Texas wild rice which is becoming rare.

-A Southwestern weed, the buffalo gourd, has high potential because of its oil and protein content.

-A weedy but disease resistant sugar cane has recently been identified and bred into the commercial stock to prevent disease.

-Wild plants have been the basis for the entire horticultural field.

As the dangers of pesticides both in the field and in the manufacturing plant are becoming better understood, integrated pest control strategies are being developed utilizing previously unrecognized predators or parasites to control agricultural tests for disruptive exotics. California's fruit and wine stocks have been saved by biological controls.

6. Industrial Uses

While the number of industrial uses for natural diversity may not equal those of the agricultural uses, numerous examples exist.

-In 1910, 50% of the U.S. natural rubber production came from the wild guayule, a species of sunflower. As worldwide rubber reservoirs are depleted and the price of petro chemicals escalates, this plant could again become commercially important.

-The bean of the jojoba plant produces an oil which can replace the oil of the sperm whale (a threatened species) for industrial use.

-The giant sea kelp is the basis of a multi-million dollar industry. Algin, a chemical substance extracted from the kelp, is used as a thickening, stabilizing and emulsifying agent in numerous products including ice cream, paints, toothpaste, and pharmaceuticals.

All of these examples have a sort of unreality about them, akin to finding a $1,000 bill on the street. You can't plan for such things, but like any occurrence with a certain probability, eventually it will happen to someone.

The way to guarantee good luck is to plan ahead. By setting aside selected areas of the natural landscape representing the full range of communities with their component species we can create a resource bank of incalculable value which is sure to yield critical irreplaceable and therefore priceless resources to meet unanticipated future needs.

7. The Final Rationale

All the aforementioned reasons have shown that it is important for man's survival to preserve the plant and animal life which sustains him. Beyond these anthropocentric arguments for preserving natural diversity, species should be preserved simply because they exist. Existence is ultimately the only criterion for value. We feel twinges of guilt about the extinction of large creatures. Why should we feel differently for small ones?

There is going to be much open space in most parts of the U.S. for a foreseeable period into the future. What matters for our purposes is its distribution. It is not necessary to swim upstream against all the momentum of development in order to preserve natural diversity, but only to breast the tide in places and make it wash around instead of over the spots containing the natural systems requiring protection. Among a large number of growth pattern alternatives, there is probably no net cost difference to society as a whole. A modest expenditure on planning and some muscle exerted in seeing that the plan isn't totally ignored could work wonders.

Though most of this discussion has dealt with the value of biological diversity, this cannot in practice be separated from the diversity of geological, hydrological, edaphic, climatic, and other environmental values. All of these play roles in the function of the total ecosystem as well as possessing individual attributes and significance.

B. The Role of Natural Areas--A State Perspective[1]

As Oregon's natural resource agencies are confronted with mounting pressures on a diminished resource base, wise resource management calls for precise scientific knowledge. Natural area preserves are critical to the development of this knowledge. Because of the positive, long-term commitment of these small, carefully selected tracts to scientific research and educational purposes, natural areas serve as irreplaceable laboratory facilities. Here, knowledge can build on knowledge, aiding the resource manager in the solution of vexing management problems.

Natural area preserves, for example, can contribute to wetlands management. State and federal agencies must precisely define wetlands contiguous to navigable waters in order to administer permit procedures under federal and state legislation. One candidate natural area preserve in Tillamook County, West Island, was the site of a detailed study of salt marsh vegetation in which marsh communities were defined, described, mapped, biological productivity determined, and the pattern of marsh vegetation related to tidal levels (Eilers, 1974). The research suggested the utility of using vegetation as a measure of mean high water and as an indicator for various land use decisions.

We can also expect serendipitous discoveries such as the alder-nitrogen-microbe-Phellinus (a root rot) connection. This discovery grew from a series of unrelated, intensive research studies which were being conducted on natural area tracts at Cascade Head, Lincoln and Tillamook Counties. Independent research was being carried out on the role of alder as a nitrogen fixer, on soil chemistry, on litter decomposition, and on successional development of forest stands. During the ensuing discussions and comparisons, it was discovered that in a variety of ways red alder creates a condition unfavorable for the survival of a root rot (Phellinus wierii), which can be a serious disease of crop trees. Alder produces more acid soils and promotes other fungi antagonistic to Phellinus. Natural area research has in this way shed new light on the role of alder in forest management.

Natural areas can be regarded as research facilities, complementing the roles of university and research institution laboratories. The 35 established research natural areas on National Forest lands in Oregon and Washington average more than one active study per tract, with some areas having many projects. While some studies may appear esoteric, many have great potential importance in resource management. One such example is a current University of Oregon study using all forested natural areas. This study focuses on the effects of widespread conifer needle fungi on tree productivity. Another set of forestry-related

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[1]Oregon State Natural Area Preserves Advisory Committee (1977).

studies has developed definitive data on the seeding habits of ponderosa pine and lodgepole pine at Pringle Falls RNA south of Bend; similar work on upper slope tree species has been conducted at Wildcat Mountain, Steamboat Mountain, and Goat Marsh Research Areas in the Cascades. Pathological studies are underway at the Port Orford Cedar RNA on the Coquille River in an attempt to understand the effect of another root rot, Phytophthora lateralis, on Port Orford cedar.

In addition to these research roles, natural areas serve as vital controls for manipulative experiments and management practices. In nutrient budget studies using small watersheds as the experimental units, there is a need for at least one control watershed where outputs of nutrients, sediments, and rates of forest growth can be measured and compared with those of other watersheds where various patterns of vegetation manipulation have taken place. Flynn Creek Research Natural Area has been used as just such a control. Recent problems have occurred in identifying the origins of pathogens threatening nursery production, plantations, and second growth coniferous stands. Protected natural areas functioning as base line tracts will help determine whether these pathogens are indigenous and previously unnoticed, or are newly introduced.

In these and many other ways natural areas provide solutions to resource management problems which are becoming more complex as our resource base is more intensively utilized.

III. NATURAL AREA[1] PROGRAMS IN OREGON

A. Federal

A variety of federal programs for natural area protection are available, and are being utilized within the State of Oregon. Examples include:

(1) At the base of the entire natural area inventory and protection process is a classification of the elements of the state's natural heritage. A preliminary classification has been developed for Oregon and Washington under the general coordination of the *Pacific Northwest Research Natural Area Committee*, an interagency committee coordinated by the U.S. Forest Service.

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[1]Natural area - unit of land and water which has substantially retained its natural character and which represents elements of Oregon's natural heritage.

The Committee conducts intensive natural area studies and recommends the designation of Research Natural Areas on federal lands. Several federal agencies are actively involved in the program, including the Forest Service, the Bureau of Land Management, the National Park Service and the U.S. Fish and Wildlife Service. In Oregon, thirty-six Research Natural Areas have been established to date, none of which involve Oregon's coastal beaches and dunes although some areas are proposed within the Dunes National Recreation Area. The inventory files maintained by the Committee contain information only on established and proposed preserves.

In the winter of 1973, a conference was convened involving federal, state natural resource agencies, representatives of the academic community, and The Nature Conservancy. The "Wemme Workshop" resulted in the publication of Research Natural Area Needs of the Pacific Northwest, commonly called the "yellow book". Although this classification is in need of revision and expansion, it has provided an excellent framework for the state, federal, and private natural area programs in Oregon and Washington.

(2) The *National Natural Landmarks Program*, until recently, was conducted by the National Park Service. It is now administratively a part of the Heritage Conservation and Recreation Service (includes the former Bureau of Outdoor Recreation). The Program contracts with recognized experts to identify and propose sites of national significance according to specified themes. Public or private land areas are selected for designation as National Natural Landmarks; this, however, provides no formal protection.

Additionally, several federal land managing agencies have special programs to protect natural lands. For example, the U.S. Forest Service has a *Special Interest Area Program* and the Bureau of Land Management has an *Outstanding Natural Area Program*.

The U.S. Fish and Wildlife's *Endangered Species Program*, pursuant to the Endangered Species Act of 1973, involves the formal listing of species, the assessment of their status, and the development and implementation of plans for species recovery.

B. State

Within the State of Oregon, the legislature has provided a variety of opportunities for natural area protection, including the following:

> The *State Natural Area Preserves Advisory Committee* (NAPAC) was established by state legislation (ORS 273.562-273.597). It recommends to the State Land Board the dedication of State Natural Area Preserves. Such preserves can be dedicated on lands owned by any of the major state land managing agencies. The committee also recommends to the State Land Board candidates for the Oregon Registry of Natural Areas. The Committee has conducted (under contracts with the Environmental Remote Sensing Applications Laboratory, the Geography Department of Oregon State University, and The Nature Conservancy and through Committee efforts) a preliminary inventory of all state lands to determine potential preserve candidates. To date two State Natural Area Preserves have been established--Winchuck Slope, Curry County and Steins Mountain, Harney County.

Additionally, several state agencies have special programs to protect natural areas. For example, the Oregon Parks and Recreation Branch oversees the *Primary Resource Protection Program* and the *Research Natural Preserve Program*. The Oregon Department of Fish and Wildlife is involved in the federal *Endangered Species Program*, and prepares a list of state endangered and threatened species.

C. Private

A number of natural area protection and species inventory programs are conducted by private organizations within the State of Oregon. These organizations include:

(1) The *Oregon Rare and Endangered Plant Study Center*, located in Lake Oswego, is a mainly volunteer effort under the leadership of Mrs. Jean Siddall. Its purpose is to (1) compile information on the location and status of the species on the Oregon Provisional list of over 600 rare, threatened, or endangered plant species, (2) write status reports for species being proposed for threatened or endangered status nationally, and (3) assist in drafting endangered species legislation in Oregon. Information on nearly 10,000 plant localities is stored in the Center's manual file system. The Center is now (1978-79) under contract with several federal agencies to produce the status reports mentioned above.

(2) The *Oregon Natural Heritage Program* is one of about

fourteen state heritage programs initiated to date by The Nature Conservancy. Under contract with the State of Oregon, the Program is working to identify, classify, and inventory ecologically significant natural areas in all classes of land ownership. Its goal is to help establish a limited system of natural preserves which will protect typical examples of all of Oregon's elements of natural diversity. Similar to heritage programs in other states, the Oregon Natural Heritage Program is scheduled to be integrated into state government, becoming part of the Oregon Department of Transportation, Parks and Recreation Branch, pending passage of state legislation in 1979. (See Appendix A.)

(3) The *Nature Conservancy Oregon Land Protection Office* has been established to implement the Natural Heritage inventory through private land conservation. Preservation techniques include land acquisition, fundraising, conservation easements, preacquisition for government agencies and several innovative land protection measures.

IV. METHODS USED IN THIS REPORT

A. Lists of Elements and Inventory of Element Occurrences

In identifying critical biological habitats in the coastal beaches and dunes, a search was made through the Heritage Program's classification of elements which are found in, or characteristic of, Oregon's coastal beaches and dunes. Because of the natural intergradation of these areas with other coastal landforms, the list of elements was initially rather large and all-inclusive. Contact was made with other biologists and persons knowledgeable of the Oregon coast, and gradually this list was narrowed down to those elements considered to be most important and most in need of some form of protection (the elements of special concern). Meanwhile, a search for known occurrences of the elements was initiated by drawing upon the Heritage Program's data base, followed by additional consultation with biologists currently engaged in various research projects on the coast. The Oregon Rare and Endangered Plant Study Center was contacted frequently to obtain all data pertinent to rare, threatened or endangered plants of Oregon's coastal beaches and dunes.

The Heritage Program's data base included many of the sites identified in this report, but most of these needed to be re-evaluated. It was strongly suspected that there would be additional areas which had not yet been identified by the Heritage Program and about which county planners were not yet aware. For this reason, additional fieldwork and photointerpretation was considered to be essential.

B. Photointerpretation, Fieldwork, and Selection of Sites

With knowledge of many coastal sites already in mind, additional study of the coast was made through examination of color and black and white aerial photos. The Environmental Remote Sensing Applications Laboratory in Corvallis provided 9" by 9" color transparencies (NASA Missions 366, Rolls 12 and 13, 1977), and the U.S. Army Corps of Engineers provided 9" by 9" black and white aerials (Roll 691, December, 1977). The color transparencies, mostly at the scale of 1:12,000, were very useful in locating plant communities, delineating boundaries, and assessing current use and development of coastal areas.

A fieldwork schedule was established to re-examine all known sites and to search for additional areas suspected of having biological value. Some populations of rare plants were rechecked to determine present status, although this was not always possible due to flowering seasons, etc. During examination of a site being considered for identification as an important biological resource, an attempt was made to evaluate the importance of the site relative to other coastal sites which contain similar elements. Factors considered included: adjacent development, probability of future development, and feasibility of protection. Throughout the entire site evaluation process, one objective was paramount: to identify areas of important or unique species or habitats which would assist in ensuring the continuance of coastal beach and dune natural diversity.

V. HOW TO USE THIS REPORT: A NOTE TO DECISION-MAKERS AND PLANNERS

Nineteen areas containing twenty-one sites are described in this report in order to demonstrate the kinds of factors that should be considered in evaluating the critical biological habitat values of a site. The primary considerations are the quality and quantity of each element that occurs on the site and how those occurrences compare to others in the state. The sites identified were selected either (1) because they contain one or more elements of special concern, or (2) because they contain good representative examples of typical coastal Oregon ecosystems.

The purpose here is to provide the decision-maker and planner with the tools necessary to perform a preliminary evaluation of sites under their consideration and to establish a two-way communication network between jurisdictions and inventory efforts, such as the State Heritage Program, which are assessing natural areas on a statewide or larger basis. Many of the sites discussed occur on land already in public ownership. The jurisdiction's role then would be to work cooperatively with appropriate agency officials in helping to ensure the natural values at a particular site as consistent with the Beaches and Dunes Goal and local input.

Descriptions of the elements of special concern are presented to assist in the identification of those beach and dune elements (species, community types, etc.) which, because of their increasing scarcity and/or habitat destruction, are of high priority for protection. Before being approved for development, or before any site investigation report is completed, the site of a proposed development should be examined for the occurrence of these elements. Ideally, the site should be investigated by a biologist or someone trained in natural area assessment. Short of that, the jurisdication can at least be alerted to the most important biological elements (plovers, a few rare plants, plant community types, etc.). If it is suspected that some of the important elements occur at the site and would be detrimentally affected by the proposed development, further information and counsel from the Heritage Program should be sought.

VI. IDENTIFIED ELEMENTS OF SPECIAL CONCERN

A. Process of Identification

Determining which species are the most rare, threatened or endangered is a relatively straightforward, though not necessarily easy, process since one is dealing with a single entity, the taxon in question (species, subspecies, variety, etc.). There are numerous problems concerning correct identification of specimens, accuracy of museum records and herbarium labels, and difficult taxonomic questions, but essentially the process is one of determining how many element occurrences are known for a taxon and how many of those occurrences have good, viable populations free of imminent threats. Depending on several factors, including abundance, distribution, and habitat frailty, biologists judge whether a taxon should be "listed" in some way. Actual legal protection of the species or subspecies after it has been listed depends on federal laws, such as that provided under the Endangered Species Act of 1973, or state laws, if such exist. As of December, 1978, there were no Oregon plant species listed in the Federal Register (1975, 1976) as being proposed for threatened or endangered status. However, one or more of these may attain such status in the coming months. In practice, most state and federal agencies pay close attention to listings and treat the species in question as though they had the official status proposed for them.

It cannot be overemphasized that the listing process for plant and animal species is a dynamic one. New data is produced each week or month, and inevitably the status of some listed species will change. The Oregon Provisional List of Rare, Threatened, and Endangered Plants (January and March, 1977) has recently had several deletions and additions. It is hoped that, as some species are more closely watched and searched for, new populations will be found and additional species will be dropped from the lists. Currently, however, coastal development is destroying natural areas at an ever-accelerating rate. For this reason alone,

species now only uncommon are expected to become rare, and it is likely that eventually several coastal beach and dune species will be listed as threatened or endangered nationally.

In this report, the following lists have been useful in determining which coastal elements are of greatest concern, and consequently designated as elements of special concern:

(1) "Provisional List of the Rare, Threatened, and Endangered Plants in Oregon," January and March, 1977, by the Oregon Rare and Endangered Plant Species Task Force (this inventory now incorporated as the Oregon Rare and Endangered Plant Study Center.)

(2) "Report on Endangered and Threatened Plant Species of the U.S." by the Smithsonian Institution, January 9, 1975, printed as House Document #94-51 of the 94th Congress, First Session. This list was subsequently published in, and usually is cited from the Federal Register, Volume 40, No. 127, Part V, July 1, 1975. (Smithsonian list.)

(3) U.S. Fish and Wildlife Service List of Endangered and Threatened Species (plants). Federal Register Vol. 41, No. 117, June 16, 1976.

(4) "A Working List of Rare, Endangered or Threatened Vascular Plant Taxa for Washington," August, 1977, Dr. Melinda Denton et. al.

(5) U.S. Fish and Wildlife Service List of Endangered and Threatened Wildlife and Plants, Federal Register, Vol. 42, No. 135, July 14, 1977. (animals)

(6) "Rare and Endangered Vertebrate Animal Cells, " in Research Natural Area Needs in the Pacific Northwest, C.T. Dyrness et. al., 1975.

(7) "Oregon's Threatened or Endangered Wildlife," by the Oregon Department of Fish and Wildlife, 1975.

Using this information, plant and animal species identified as high priority for protection are presented in Table 1.

Table 1. Elements of special concern of Oregon's coastal beaches and dunes--species of high priority for protection

Species (Scientific Name)	Common Name
PLANTS	
Abronia umbellata	pink sand-verbena
Cordylanthus maritimus ssp. palustris	saltmarsh bird's beak
Habenaria greenei	rein orchid
Hydrocotyle verticillata	marsh pennywort
Lasthenia minor ssp. maritima	hairy lasthenia
Phacelia argentea	silvery phacelia
Romanzoffia tracyi	mist maidens
Sisyrinchium californicum	yellow-eyed "grass"
ANIMALS	
Charadrius alexandrinus ssp. nivosus	western snowy plover
Arborimus (Phenacomys) albipes	white-footed vole
Speyeria zerene ssp. hippolyta	coastal silverspot butterfly
Callophrys polios	hairstreak butterfly
Callophrys eryphon	pine elfin butterfly

When determining the status of a plant or animal species, a perspective larger than county or state is necessary. A plant species may be quite rare in Oregon, but rather common and widespread in California. In such instances, its population(s) in Oregon is termed peripheral. It is important to protect the species in this state, but obviously protection in Oregon is not likely to be as critical to the long-term perpetuation of that species as would protection in California. What effort then, if any, should Oregon make to protect that species? A similar question can be asked by a local jurisdiction. If for example, a coastal plant species is found at one locality in Tillamook County but is also found at several locations southward along the coast, why should Tillamook County limit development in its area to help protect a rare plant species, if the species can be adequately protected elsewhere on the coast? This is the type of situation in which information from existing inventory efforts,

given their statewide or larger perspective, is essential. What must be avoided is the situation in which everyone waits for some other jurisdiction(s) to make the effort to protect the species while inexorably all the remaining populations are destroyed by increasing development.

With this introduction, the thirteen plant and animal species noted in Table 1 have been identified as elements of special concern within the context of Oregon's coastal beaches and dunes. The following pages present a discussion of the location of these species, their status, and illustrations to assist in on-site identification.

B. Plant Species

The following pages contain a discussion, accompanied by illustrations, describing eight plant species identified as having a high priority for protection. Attention is also given to ten additional plant species requiring careful monitoring.

1. Hairy Lasthenia

Lasthenia minor (DC.) Ornduff
ssp. maritima (Gray) Ornduff

Sunflower family
(Compositae)

= Baeira minor ssp maritima (A. Gray) Ferris

Hairy Lasthenia is a small wildflower of coastal bluffs and salt-spray areas. It is to be looked for along any of Oregon's beaches, especially where there are rock outcrops which receive moisture from the surf zone. Four localities in Oregon have been recorded, although the populations are not large at any of these places. Locations are: Yaquina Head, Seal Rock, Otter Crest, and "1/4 mile south of Yachats". The best population known is probably on the Farallon Islands west of San Francisco.

The flower heads are light yellow, the rayflowers not very conspicuous. Leaves are narrow, opposite, and somewhat succulent and are often slightly lobed or toothed. The species flowers between July and September. Lasthenia, a courtier and reputedly a student of Plato, lends his name to this genus. This species is proposed for threatened status in the Smithsonian List (1975) and has been recommended for endangered status.

Figure 1. Hairy Lasthenia illustrating the light yellow flower heads and narrow opposite leaves. The flower heads and fruit are shown at the right, (from Hitchcock, 1955-1969).

2. Mist Maidens, or Romanzoffia

Romanzoffia tracyi Jeps. — Waterleaf family (Hydrophyllaceae)

This species is a delightful little wet-cliff dweller, found in several localities along the Oregon Coast, always within the salt-spray zone. It is a perennial herb with brown-wooly tubers at the base and usually tightly wedged between the rocks where it grows. It never grows very tall, forming instead rather low, rounded tufts. The leaves are somewhat fleshy-succulent, round in outline, but with shallow indentations; they appear glossy and form clusters around the several flowering stems.

The flowers are small, delicate, white, five-petaled, and funnelform in shape. Flowering season is early, from March to May, slightly later further south along the Oregon Coast. Known localities include Yaquina Head, Seal Rock, the trail to Devil's Punchbowl at Cape Perpetua, and the state park area immediately north of the mouth of the Rogue River.

The genus was named for Count Nikolai von Romanzoff, a promoter of Kotzebue's voyage to California. This species is on the Oregon Provisional List of Rare, Threatened, and Endangered Plant Species.

Figure 2. Mist Maiden has brown-wooly tubers at the base and delicate, white, funnelform-shaped flowers (from Hitchcock, 1955-1969).

3. Pink Abronia
Pink Sand-Verbena

Abronia umbellata Lam. — Four-o-clock family (Nyctaginaceae)
= Abronia acutalata Standl.

This is a sand-dune species par excellence. It is a perennial with spreading prostrate stems and stout taproots. The leaves are opposite, noticeably glandular-sticky and picking up sand grains; leaf blades are thin although somewhat fleshy or delicately succulent. The pink to purple flowers are in dense, showy flower-heads, but the individual flowers are rather small. The fruit is prominently and broadly winged.

This species can be expected anywhere on the Oregon coast where there are dunes; it is known from only a half-dozen locations however, and nowhere is it abundant. It flowers May to September. Beachcombers and dune enthusiasts are more likely to encounter its close relative, Abronia latifolia, which is very similar in appearance, except that the flowers are yellow. Pink sand-verbena is on the Oregon Provisional List of Rare, Threatened and Endangered Plants. It is most likely to be found at sites within the Oregon Dunes National Recreation Area.

Figure 3. Pink Abronia (or Sand Verbena) illustrating the opposite leaves and dense, pink to purple flower-heads. The broadly winged fruit is shown at the lower right (from Hitchcock, 1955-1969).

4. Rein Orchid

Habenaria greenei Jeps. — Orchid Family
= Platanthera unalascensis ssp. maritima — (Orchidaceae)

This beautiful orchid is frequently associated with another, more common species of orchid known as ladies tresses or twisted orchid, Spiranthes romanzoffiana; both occur in the deflation plains, but the rein orchid is also found on coastal bluffs, wet meadows, and small seepages. Rein orchid leaves are mainly basal; densely-flowered spikes are found at the end of a stout stem on which can be seen very small leaves. Flowers are white to greenish, with a small "spur" hanging downward. The entire plant can be up to 30 cm. tall, though most specimens are considerably shorter. Flowering is from July to September. Both of these orchids should be carefully watched for when walking in the deflation plains; they are not conspicuous, and are easily trampled. There are less than a half-dozen verified records for this species in Oregon; other records may be questioned since there are other species of Habenaria with which H. greenei may be confused if the observer is not cautious.

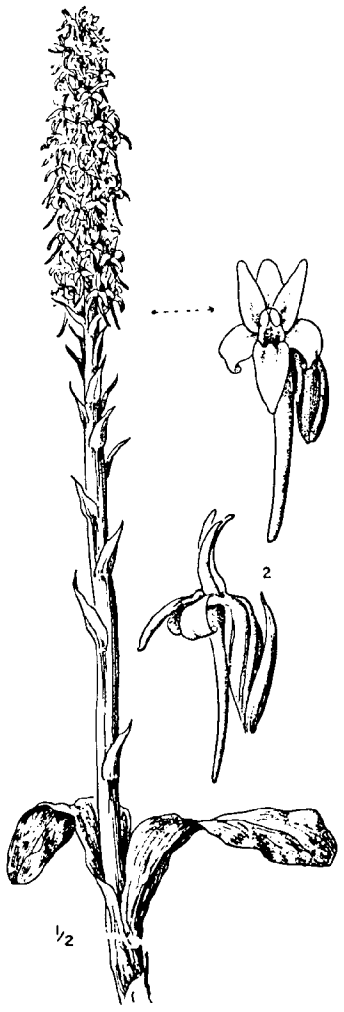


Figure 4. The Rein Orchid has densely flowered spikes at the end of a stout stem. The insets illustrate the individual white to greenish flowers with the downward spike (from Hitchcock, 1955-1969).

5. Saltmarsh Bird's Beak

Cordylanthus maritimus Nutt. ssp. palustris — Figwort family (Scrophulariaceae)

This species of Cordylanthus is an inconspicuous, branched, annual herb of salt marshes and estuaries. In habit and general appearance it somewhat resembles species of paintbrush (Castilleja spp.) though it is usually smaller and more lax. Leaves are slender, alternate; the flowers are located in the leaf axils, they are purplish in color and not conspicuous. Flowering occurs from May through September.

Saltmarsh bird's beak is known to occur in three locations: Netarts Spit, South Slough of Coos Bay, and the North Spit at Coos Bay. Only at the North Spit is the population substantial in size and apparently stable. There are several records in the San Francisco Bay area and near Humboldt Bay in northern California, but many of these have been destroyed in recent years; protection of one or more populations in Oregon is becoming increasingly important.

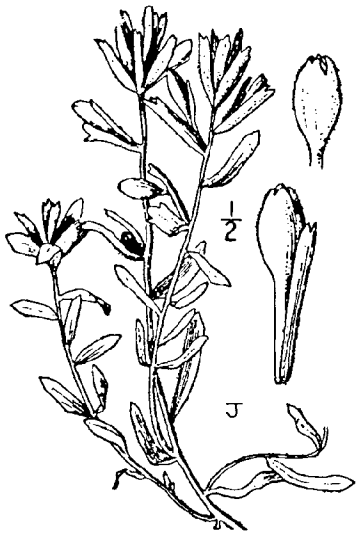


Figure 5. The Saltmarsh Bird's Beak is characterized by slender, alternate leaves and inconspicuous purplish flowers located at the leaf axils (from Hitchcock, 1955-1969).

6. Silvery Phacelia
Sand-dune Phacelia

Phacelia argentea Nels. & Macbr. — Waterleaf family (Hydrophyllaceae)

Silvery phacelia is a perennial, sand-loving plant--potentially a good sand stabilizer after one or two colonizing species such as sea rocket (Cakile spp.) or beachgrass (Ammophila arenaria) have begun the process of dune stabilization. Its leaves are densely smooth-hairy, soft to the touch, and silvery in appearance; there is often a pair of smaller lobes near the base of the leaf. Flowers are borne in dense, curving (scorpioid) clusters, are cream-colored or white, and rather small.

This species is known from several localities on the southern Oregon coast, mainly south of Bandon in Coos County. It is restricted to sandy areas near the beach, and is seen growing with coast strawberry (Fragaria chiloensis), seashore lupine (Lupinus littoralis), ambrosia (Ambrosia chamissonis), and other species characteristic of the dunes. Its range is somewhat limited, from central Oregon along the coast south into northern California. Nowhere does it appear in great abundance. It flowers in June through August.

Since silvery phacelia appears to be a satisfactory sand-binder once several of the plants are established, one method of protecting this species over the long-term would be to transplant specimens to other areas which need sand stabilization. Such transplanting for protection purposes should be attempted with several of the dune species which occur in Oregon and California.

Figure 6. Silvery Phacelia (or Sand-dune Phacelia) illustrating the smooth-hairy leaves and dense clusters of cream-colored or white flowers. The Silvery Phacelia fruit is shown at the upper left. (from Hitchcock, 1955-1969; photograph courtesy of Bill Burley).

7. Whorled Marsh Pennywort
Water Pennywort

Hydrocotyle verticillata Thunb. — Carrot or parsley family (Umbelliferae or Apiaceae)

Water pennywort is a low, inconspicuous perennial plant found at the edges of ponds, streams, marshes, dune lakes, etc. It has slender creeping stems which at intervals (nodes) send down roots into the mud. Leaf petioles and flower peduncles come off the stem at these same nodes. Leaves are generally round in outline, with shallow notches at the edges. The leaf petiole (stalk) is attached to the center of the leaf (peltate).

Flowers are tiny, in small spikes at the end of the peduncle; the flowering season is through spring and summer, generally April - September.

This is a rather unusual looking plant, but because it is inconspicuous and grows in moist environments, it is very easily overlooked. There are several other species in the genus Hydrocotyle, most of them water-loving, but they can usually be distinguished from H. verticillata by leaf shape, leaf attachment, inflorescence structure, and other minute details of morphology.

Oregon records are few and not well-documented. Peck recorded the species at the margin of Garrison Lake near Port Orford in 1918, but that lake is now being heavily developed (Peck, 1919). There is another record from Tugman St. Park (Eel Lake), but this locality has not been reverified for several years. The species should be looked for in any of the permanently wet areas in the beaches and dunes, including or especially those areas which are within state parks.

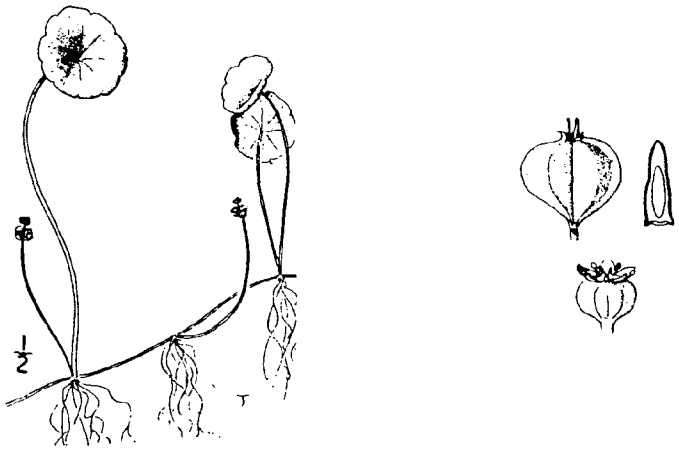


Figure 7. Whorled Marsh Pennywort illustrating roots at the nodes; stems emerging from the center of the circular leaves. Fruit and seed illustrated to the right (from Hitchcock, 1955-1969).

8. Yellow-Eyed "Grass"

Sisyrinchium californicum (Ker-Gawl.) Dryand — Iris family (Iridaceae)

This species is not a true grass, but without its yellow flowers, can be mistaken for a type of grass. Leaves however, are definitely iris-like on closer inspection; they are flattened and narrow. The stems also are flattened or wing-margined, several stems arising from a common base. Flowers are six-petaled, rather delicate, and appear from June to July. The species is perennial and usually found in wet areas, especially seepages near rock cliffs, but also in the deflation plains behind the foredunes. It is never abundant, but fortunately several new localities have been found in the past two years. Its status should be monitored closely since its habitat includes deflation plains which are under increasing pressure for development.

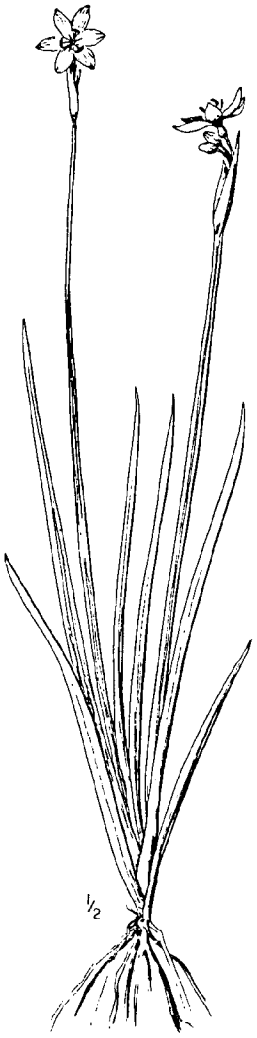


Figure 8. Yellow-eyed "Grass" is not a true grass but rather an iris. This plant has several stems arising from a common base and delicate, yellow flowers (from Hitchcock, 1955-1969; photograph courtesy of Bill Burley).

9. Species Requiring Careful Monitoring

In addition to the preceding eight plant species, Table 2 lists additional plant species which are found in, or often immediately adjacent to, coastal beaches and dunes. The plants considered to be "species of concern" and will need to be carefully watched and searched for by botanists to prevent their extirpation. Some, like the pitcher plant, Darlingtonia californica, are not immediately threatened and are found in numerous locations along the coast in and adjacent to the dunes. But pitcher plant habitat, coastal bogs, is becoming more and more scarce because of land filling, and measures should be taken soon to protect several areas in addition to the State Darlingtonia Wayside north of Florence.

Table 2. Elements of special concern of Oregon's coastal beaches and dunes---plant species needing careful monitoring

Species (Scientific Name)	Common Name	Location
Anemone oregana var. felix	Oregon anemone var. felix	Bogs or wet areas
Darlingtonia californica	California pitcher plant	
Vaccinium oxycoccus var. intermedium	cranberry	
Allium cernuum	nodding onion	Plants of coastal bluffs, cliffs, and hillsides
Clarkia amoena var. pacifica	fare-well-to spring	
Empetrum nigrum	crowberry	
Dudleya farinosa	sea-cliff stonecrop	
Cirsium acanthodontum	acanthus-toothed thistle	
Spiranthes romanzoffiana	spiranthes	Deflation plains
Salix hookeriana	Hooker's willow	

C. Animal Species

The following pages contain a discussion describing five animal species identified as having a high priority for protection.

1. Western Snowy Plover

Charadrius alexandrinus ssp nivosus — Charadriidae: plovers, turnstones, surf-birds

The snowy plover is the most important animal species of concern in the beaches and dunes of the Oregon coast. It is a quiet, inconspicuous little sandpiper-like bird, known from approximately 20 localities along the coast, and from additional locations in Washington and California. The species is currently under rather intensive study by biologists in Washington, Oregon, and California. Most of the data for this report were obtained from Ms. Ruth Wilson and Ms. RoseAnn Deering, who have completed the first year of a two-year study on the breeding biology of the Oregon plovers. The data from the 1978 field-season and from the earlier 1972 study are available in Wilson (1978) and Hoffman (1972) and are briefly summarized here.

Based on two plover population censuses (1972 and 1978) and on additional field observations in the intervening years, it appears that the plover population on the Oregon coast is declining sharply. Ms. Wilson sighted approximately 130 birds on the entire coast in the 1978 field season. More alarming however, is the poor nesting success seen at the four primary nesting areas. Out of forty-eight nests, only six were successful in that one or more fledglings were seen. Predation by crows, dogs, cats, and other predators, in addition to harassment of the birds or destruction of nests by people walking on the beach or by ORV's, probably contributed to this low nesting success. Fledgling success is inevitably even lower than nesting success, and unless this situation improves in the near future, the coastal population will continue its rapid decline. It is uncertain how much migration into or out of the coastal area occurs, though there is evidence that some of the birds do migrate southward as far as San Francisco. The species does not migrate in the usual sense however, and Oregon's plovers are considered to be year-round residents.

The plovers can be seen usually at the seaward base of the foredunes, frequently near driftwood, but rarely in the foredune itself or inland from it. The amateur will most likely confuse them with sanderlings, however, plovers are generally smaller, their beaks are shorter, and they do not exhibit the frenetic foraging activity seen in the sanderlings. The latter also are more commonly seen at water's edge. Several other details of coloration and pattern can be used to distinguish between the two species, but these are complicated by seasonal changes in plumage. Sanderlings often congregate in groups of a dozen or more whereas it is unusual to see more than a half-dozen plovers together at

one location.

Nesting occurs approximately April through June and it is at this time of the year that the species is most susceptible to human disturbance or predation. The nests are not very elaborate--usually simply a small depression in the sand not far from the high water mark. Clutch size is normally three. Both sexes incubate the eggs, and the young leave the nest within a few hours of hatching.

Ornithologists and wildlife biologists have been concerned about the snowy plover for several years, and in 1975, the Oregon Department of Fish and Wildlife classified the species as threatened. It is currently under review by the U.S. Fish and Wildlife Service to determine whether it should be listed as threatened or endangered nationally. The data from the OSU study and from other studies currently underway will be used to help determine the national status.

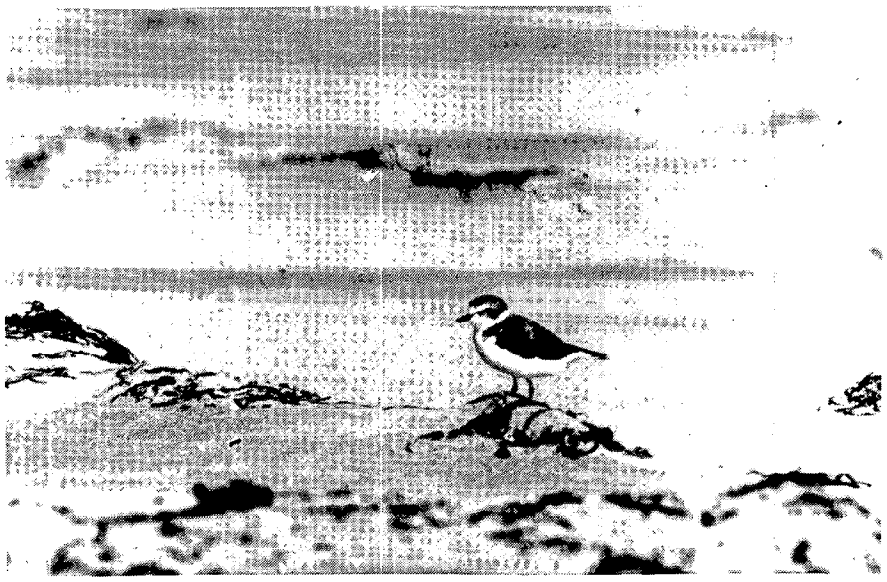


Figure 9. The western snowy plover (Charadrius alexandrinus ssp. nivosus). A rare species found in the open sand areas at the base (ocean side) of the foredune, it is known to nest successfully at fewer than a half-dozen localities along the Oregon coast. Recent trends in population levels suggest that the plover is declining significantly (photograph courtesy of Jeffrey Pampush).

2. White-footed Vole

Aborimus (Phenacomys) albipes — Cricetidae (Microtinae) mice, rats, voles

The white-footed vole is a secretive, seldom-seen rodent of wooded areas in the coast range and immediate coastal area in Oregon; its range extends into northwestern California. It is considered to be one of the rarest microtine rodents in North America, although some biologists feel that it may be slightly more common than the few museum records indicate. Maser (1966) studied the life history and ecology of the white-footed vole and two related species, but relatively little is known of the basic biology of this animal.

The longer tail (greater than half the body length) and larger size distinguish the white-footed vole from it's more common relative, the heather vole. Its upper body parts are brown with dark hairs, and the underparts are buff-colored.

In the coastal beaches and dunes, this rodent may be expected to occur in isolated "islands" of Sitka spruce and/or lodgepole pine; there are museum records from all seven coastal counties, but there have been very few sightings or specimens trapped in recent years. Olterman and Verts (1972) list most of the museum records for this species, including most of the coastal localities. The Oregon Department of Fish and Wildlife has listed its status as rare.

Protection of the white-footed vole would require that some forested areas be set aside to remain free of disturbance, however, the species has occasionally been trapped in areas that have been cut and burned, indicating some compatibility with usual forest practices. Transplanting animals to new locations may be attempted in the future, although it is difficult to capture enough individuals to seriously consider this form of protection.

3. Other Vertebrate Species

Several other vertebrate species are noteworthy and of concern in coastal Oregon, but because they are found as frequently adjacent to estuaries and inland as they are in the beaches and dunes, they cannot be considered to be elements of special concern for the coastal beach and dune area in particular. Included in this group would be the osprey, bald eagle, common egret, and great blue heron. This should not be interpreted as meaning, however, that these species can therefore be ignored in the beaches and dunes. It means simply that they are not narrowly endemic to, or primarily resident of, the beaches and dunes, and that there are good opportunities elsewhere to ensure their protection. Where they do occur along the coast, however, an attempt should be made to minimize the impact of development. This is especially

important in areas where two or more of these species occur, such as on the North Spit of Coos Bay.

4. Butterflies and Other Invertebrates

Several species and subspecies of butterflies are elements of special concern on the Oregon coast. The most noteworthy is the coastal silverspot butterfly (Speyeria zerene ssp. hippolyta) which has been recorded from eight localities along the coast, but which apparently now is represented by a good population only in Lane County between Big Creek and Rock Creek. It occurs only in isolated salt-spray meadows along the coast of northern Oregon and extreme southwestern Washington. Real estate development is rapidly reducing this specialized habitat, and the Lane County site may offer the last opportunity to save habitat critical to the species' survival.

Dr. David McCorkle of Oregon College of Education in Monmouth has studied this specie in detail. He has circulated to biologists materials on the butterfly's life history and distribution, and he strongly recommends that the species be protected at one or more of the coastal sites. The national status of the coastal silverspot is now under review by the U.S. Fish and Wildlife Service (pending proposed rulemaking, threatened status; see Endangered Species Technical Bulletin, Vol. III, No. 8, page 7, August, 1978).

The larvae of the silverspot feed on a species of violet, Viola adunca, which occurs in these coastal meadows. Presumably the meadows were formerly more widespread, and it is unclear whether native shrubs such as salal have invaded these meadows. It is possible that this subspecies depends on the meadow stage of the natural coastal succession from recently-burned or pioneered areas to the coastal shrubland or forest community, and that formerly the species was able to migrate freely from one meadow to the next as vegetation succession occurred. Now, because of coastal development and fire suppression, such coastal salt-spray meadows are fewer in number and further apart, resulting in a serious decline in the size and number of butterfly populations.

Another subspecies of the silverspot, Speyeria zerene ssp. behrensii, occurs on the southern Oregon coast and into northern California. It too is represented by only a few good populations, including one at Cape Blanco. It is to be expected at several other localities such as Floras Lake State Park (Blacklock Point).

The hairstreak butterfly, Callophrys polios, is recorded from only one Oregon locality--the dunes north of Waldport in Lincoln County, an area now known to coastal residents as the Bayshore real estate development. Its larvae feed on kinnikinnick, Arctostaphylos uva-ursi, and adults may be expected to be seen in the Dunes National Recreation Area.

The pine elfin butterfly, Callophrys eryphon, is another uncommon species whose larvae feed on lodgepole pine, but whose nectar source for the adults is unknown.

At this time, most of the invertebrate fauna of the beaches and dunes is poorly known. Consequently, except for those species mentioned above, biologists do not yet have an accurate perception of which species are most rare, threatened, or endangered. Most of this information will not be gathered for at least five to ten years, and so it becomes increasingly important that some larger coastal areas be protected to ensure that such species will not become rare or extinct. By establishing a limited system of protected areas, most of the invertebrate species will be protected "by default", that is unintentionally, in areas which were protected initially because of one or more other elements known to be in need of protection.

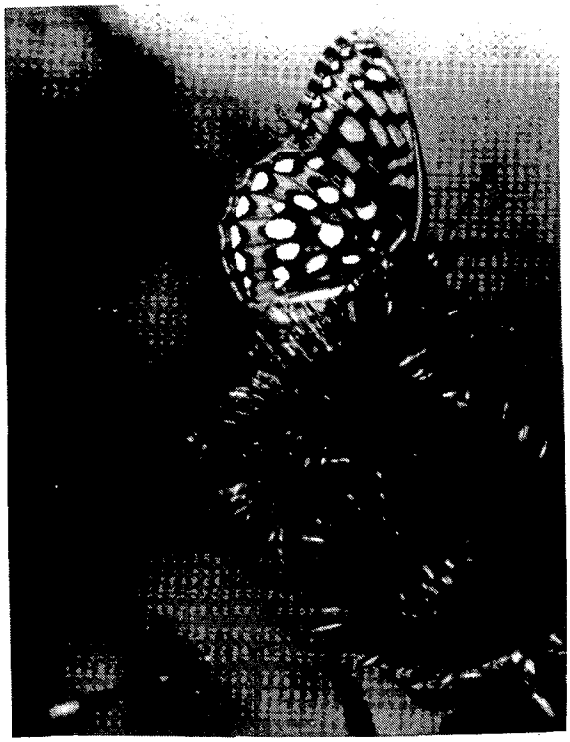


Figure 10. The silverspot butterfly, Speyeria zerene. One of the subspecies, S.z. hippolyta, is very rare and is found at only a few isolated localities along the Oregon coast (photograph courtesy of Dr. Robert Pyle).

D. Plant Communities and Aquatic Habitats

The plant community types and aquatic habitat types of the coastal beaches and dunes have been studied in considerable detail, beginning with House (1914) who studied the dunes in the vicinity of Coos Bay. Franklin and Dyrness (1973) briefly discussed several of the studies which were completed prior to 1972, but Wiedemann (1966, 1969) and Kumler (1963, 1969) provide thorough descriptions of the coastal vegetation and succession of the Oregon dunes. Plant ecologists argue interminably over which vegetation units, vegetation associations, and plant community types should be recognized and named. Often it is easy to forget the important fact that the coastal dunes exhibit a complex succession of plant community types from the pioneering communities composed of only one or two species, to the more diverse and complex communities found in the deflation plains, the dune mosaic, and the coastal forest. This natural succession has been complicated and disrupted by extensive planting of European beachgrass, Ammophila arenaria, since the mid-1800's on the West Coast and since the 1900's in Oregon. The conspicuous foredunes along the Oregon Coast are recent landforms built-up as a result of this introduced plant. Its introduction has interrupted natural successional processses and undoubtedly has added several seral stages to it.

For plant communities and aquatic habitats, the determination of the rarest or most threatened types is more difficult than for individual species, since communities are generally not as discreet and well-defined entities as are species and subspecies. To ensure good representative examples of all the coastal plant community and aquatic types, it is necessary to identify and conserve several examples of each of the distinct landforms found on the coast. Ideally, two or more widely separated examples of each landform type should be protected from development or destruction, thus helping to ensure protection of all community types in addition to many or most of the coastal plant and animal species. These landforms, examples of which should be protected are:

(1) Foredunes: examples of all successional stages;
(2) Deflation plains: community composition varies greatly, again several examples in different areas of the coast;
(3) Dune Mosaic or Dune Complex: examples of the several different dune types;
(4) Dune lakes, permanent ponds and vernal ponds: characteristic vegetation varies depending on latitude and permanence of the water body. To ensure adequate protection of the various community types, examples of these aquatic habitats need to be protected in several locations over the entire length of the coast;
(5) Beach bluff areas: including those backed by coastal forest, by meadows and by stabilized dunes, expecially in those few remaining areas where the usual foredune has not developed.

Additional community types and aquatic habitats needing protection in or adjacent to the beaches and dunes are:

(1) Coastal bogs: especially those which occur within, or on, older stabilized dunes. Again, vegetation composition varies substantially with latitude;
(2) Creek edges: vegetation associated with coastal dune creeks is quite similar to that found in other aquatic areas such as marshes and ponds, although some species either are limited to or prefer flowing water; and
(3) Marshes: both freshwater and brackish, and wet interdune areas.

VII. SELECTED COASTAL SITES

Based on the identified elements of special concern and representative habitat types, nineteen areas (twenty-one sites) have been identified as examples of high quality occurrences of critical habitats. From the natural area preservation perspective, the importance of individual sites and therefore their priority for protection, will vary depending on new data, the finding of rare elements elsewhere, and the protection status of other sites. When a rare plant species is protected at one site for example, the relative importance of protecting it at another site may change and so continued communication with the Natural Heritage Program and other inventory efforts is essential.

The sites identified as a result of this study are considered to be of high quality for either, or both, of two reasons: (1) the site contains one or more elements of special concern, and/or (2) the site is especially representative of typical Oregon coastal ecosystems and is relatively undisturbed, with the single exception of early planting of European beachgrass. If most or all of these nineteen areas, or equivalent areas, were to receive some form of protection, then very likely most of the coastal elements and typical ecosystems would be relatively secure in the sense of short-term protection of critical elements. One must remember that extinction of species and ecosystems is the normal course of events in the natural world, but that mankind's ubiquitous developments are greatly hastening the rate of these extinctions.

In general, the spits at the mouths of rivers and estuaries are very important biologically. They are dynamic areas of sand erosion and accretion, and these physical factors greatly influence vegetation development and species distribution. It is essential that at least a few of these spits be left undisturbed to continue to evolve naturally--in a very real sense, they are the living laboratories from which we learn the basic ecological processes of the beaches, dunes and estuaries.

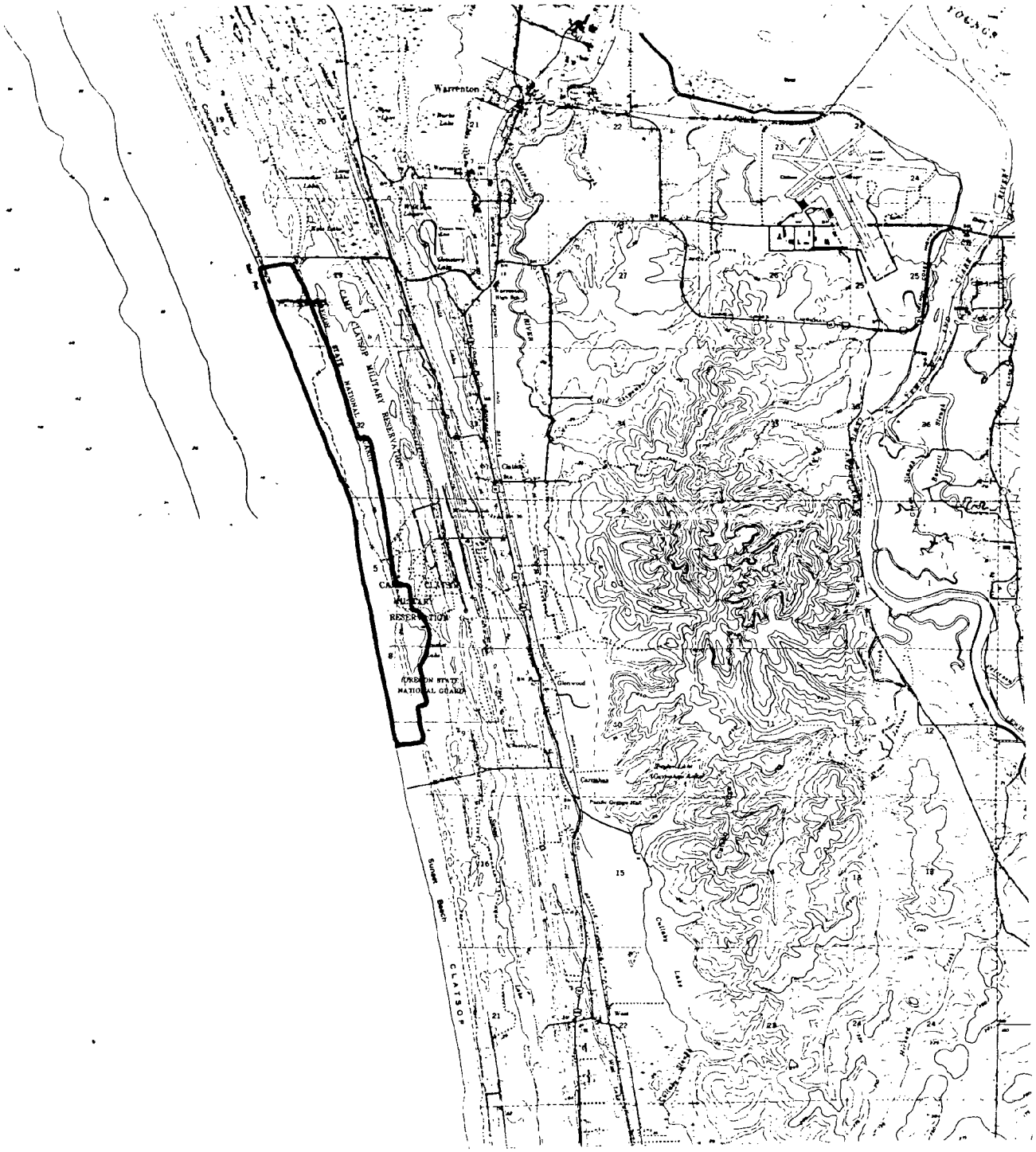
The identified sites are distributed more or less evenly throughout the seven coastal counties. However, responsibility for protection of coastal elements is not distributed evenly because of land ownership patterns. For example, most of coastal Douglas County is within the Dunes National Recreation Area, so it is incumbent upon this federal administrative unit to carry a large share of the responsibility for protecting coastal species and ecosystems. Likewise, in Tillamook County, many of the sites deserving protection are in state or federal ownership, and so these agencies need to shoulder a proportionally greater share of the conservation responsibility. Many critical biological habitats, however, remain in private ownership, and it is in these areas that county and city governments can play an especially important role in natural area protection and conservation while addressing the statewide planning goals and guidelines.

Table 3 lists those sites recommended as deserving careful consideration of their biological value during the planning process. A brief synopsis of each site and its biological value is presented, followed by mapping of the site[1].

[1] Maps are at a scale of 1:62,500 from the Oregon Coastal Conservation & Development Commission. Enclosed areas delineate selected coastal sites containing one or more elements of special concern and/or representative examples of Oregon's coastal beach and dune ecosystems.

Table 3. Selected coastal sites containing one or more elements of special concern and/or especially representative of Oregon's coastal beach and dune ecosystems

County	Description of Site
Clatsop	Beach south of Iredale Wreck to Country Club Road (Sunset Beach to Columbia Beach)
Clatsop	Slusher Lake in Camp Rilea
Tillamook	Bayocean Spit
Tillamook	Netarts Spit
Tillamook	Sandlake area (three sites)
Tillamook	Daley Lake and Marsh
Lincoln	South Beach State Park to mouth of Henderson Creek
Lincoln	Seal Rock State Park stack
Lane	Big Creek to Rock Creek
Lane	Lily Lake to mouth of Sutton Creek
Lane	Siltcoos River mouth and spits
Douglas	Tahkenitch Spit
Douglas	North Spit of the Umpqua River (Threemile Creek to North Jetty)
Coos	Mouth of Tenmile Creek
Coos	North Spit of Coos Bay
Coos	Bullards Beach to North Jetty of Coquille River
Curry	New River to Floras Lake
Curry	Euchre Creek to Nesika Beach
Curry	Myers Creek to Crook Point (mouth of Pistol River)



Map 1. Beach south of Peter Iredale wreck to Astoria Country Club road, Clatsop County.

SITE OR AREA:	COUNTY:
Beach south of Peter Iredale wreck to Astoria Country Club road. (Sunset Beach to Columbia Beach)	Clatsop

LEGAL DESCRIPTION:

T. 8 N., R. 10 W., portions of sections 18, 19, 29, and 32.
T. 7 N., R. 10 W., portions of sections 5, 8, 9.

ELEMENTS AT SITE:

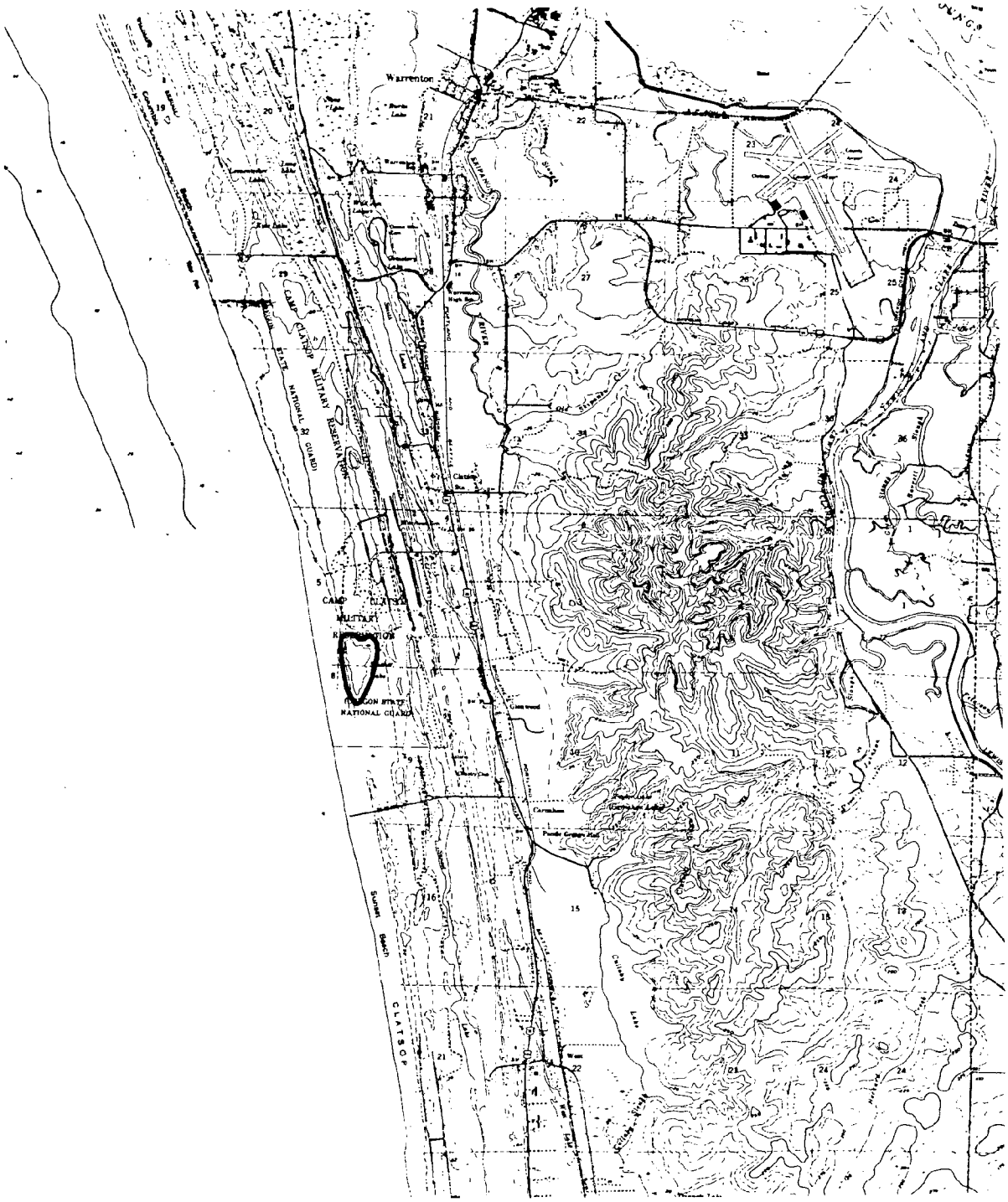
1. Snowy plover habitat, Sunset Beach to Columbia Beach; plovers have been seen along this stretch of the Clatsop Plains for at least the past six years.
2. Coastal dune mosaic exhibiting full succession of plant community types from pioneer stage to coastal forest of lodgepole pine/ Sitka spruce, and including great diversity of deflation plain stages each with its characteristic vegetation. Area was extensively planted in the early 1900's to stabilize the dunes, but it is gradually returning to native plant community types.
3. Important waterfowl and wildlife habitat, expecially in and near the dune lakes such as Slusher Lake (aerial photo 77-2321)
4. Coastal Silverspot butterfly, Speveria zerene ssp. hippolyta; a small colony has been found immediately south of Sunset Beach in a salt-spray meadow. The species is expected to occur at other locations within this area.

PLANNING/MANAGEMENT CONSIDERATIONS:

Management primarily involves control of ORV activity. Most of the area is in public ownership, so pressure for residential development is not expected to be a major problem. The southern boundary of this site was mapped deliberately at Country Club Road to minimize conflict with future residential development; although from the perspective of critical biological habitat, the area south of there, toward Gearhart, is also of value.

Recommended are: 1) strong control or elimination of all ORV activity, including closure of the beach to vehicles during the plover nesting season April through June; 2) restrictions on hunting in the area, especially at Slusher Lake, which is already getting some hunting pressure; and 3) posting of information signs along the beach to alert the public to the existence of snowy plovers, their nesting season, and the importance of protecting the plant communities of the beaches and dunes (not simply for the purpose of stabilization, but also for the purpose of preserving and protecting natural diversity).

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
parts of CP-6, 51, 60	CENPP 77-2319 77-2320 77-2321	mixed private, state, federal	Warrenton 7½' and Gearhart 7½'



Map 2. Slusher Lake in Camp Rilea (Oregon National Guard), Clatsop County.

SITE OR AREA:	COUNTY:
Slusher Lake in Camp Rilea (Oregon National Guard)	Clatsop

LEGAL DESCRIPTION:

T. 7 N., R. 10 W., SW ¼ of Section 4, and NW ¼ of Section 9

ELEMENTS AT SITE:

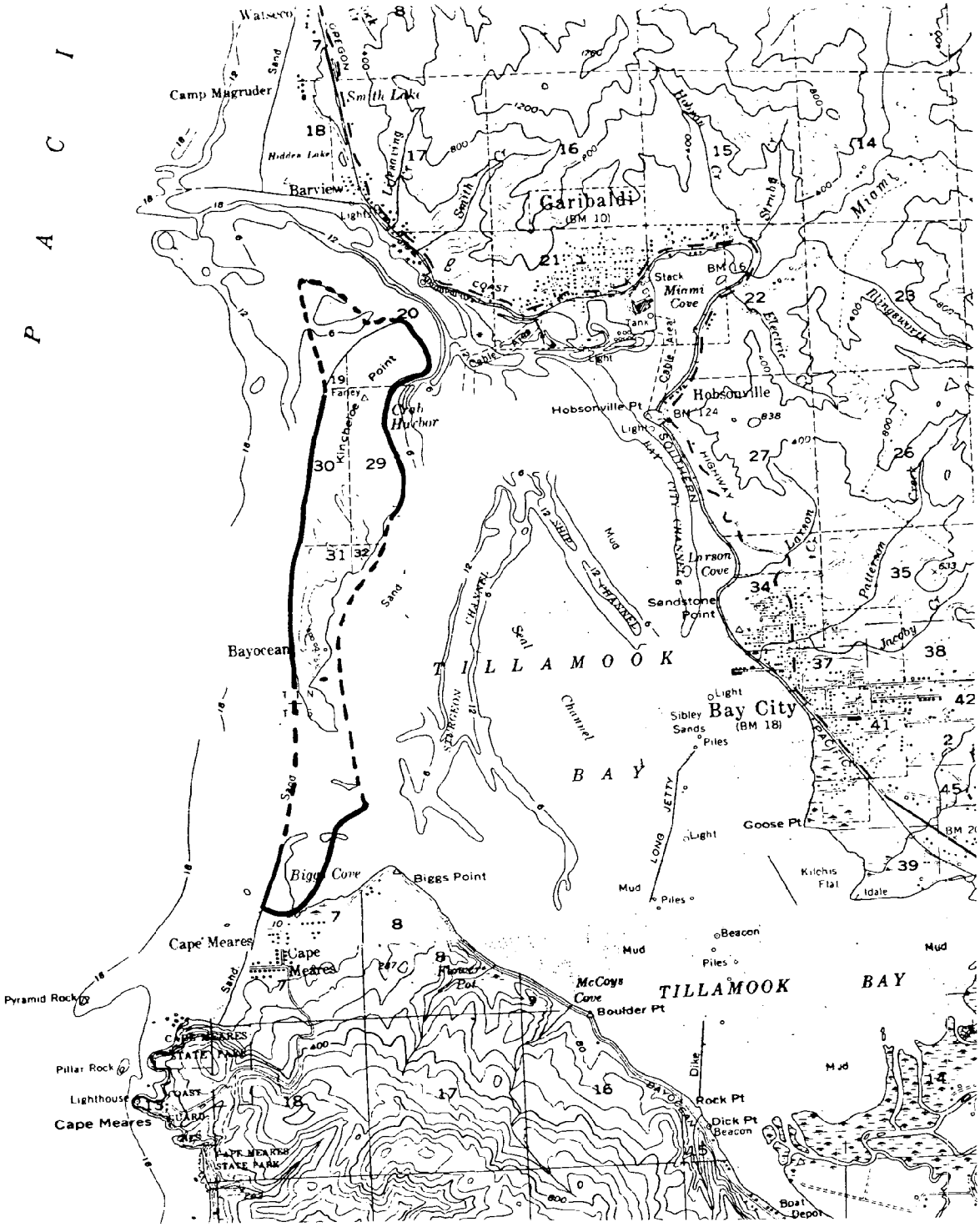
This is a permanent lowland lake, approximately 20 acres in size, located in an area of stabilized dunes, at about 20' elevation.

Vegetation has been disturbed in the past and replanted to lodgepole pine and Sitka spruce. Lake-edge communities include willow, sedges, rushes. Primary value here is the lake's use by waterfowl (extensive) and other water-dependent birds, such as the great blue heron.

PLANNING/MANAGEMENT CONSIDERATIONS:

There is some evidence of use by hunters; waterfowl use could be maintained or increased by limiting or eliminating hunting. Low-density passive recreation (hiking, picnicing) would be compatible with maintaining the natural values of the area. Four-wheel drive roads into and around the area should be blocked; beach access is available at other locations and there is no need to pass immediately adjacent to the lake.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
CP-41	CENPP 77-2321	State	Gearhart 7.5'



Map 3. Bayocean Spit in Tillamook Estuary, Tillamook County.

SITE OR AREA:	COUNTY:
Bayocean Spit in Tillamook Estuary	Tillamook

LEGAL DESCRIPTION:

T. 1 N., R. 10 W., portions of sections 19, 20, 29, 30, 31, 32
T. 1 S., R. 10 W., portions of sections 5 - 8

ELEMENTS AT SITE:

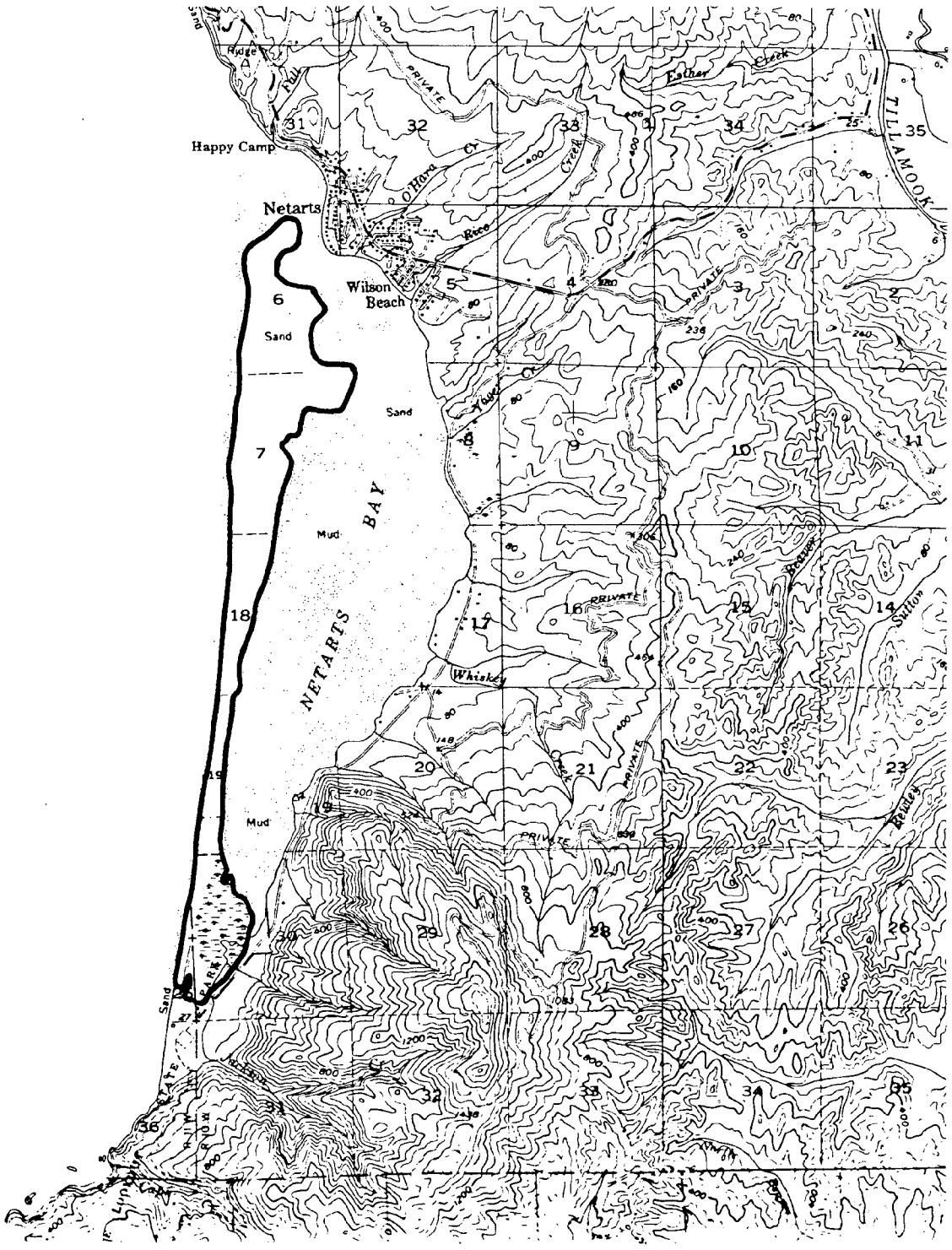
Snowy plover habitat, especially at the north and south ends of the spit; used less by plovers in the middle section.

Entire spit exhibits wide range of coastal dune vegetation and plant community types, including areas of salt marsh, open sand areas, vernal pools, willow and sedge marsh, and coastal lodgepole pine/Sitka spruce forest. Although the area has been extensively altered in the past (sand stabilization and residential development), there remain numerous areas which are returning to normal coastal succession patterns.

PLANNING/MANAGEMENT CONSIDERATIONS:

Extension of the south jetty to Tillamook Bay will inevitably affect the spit, presumably by building up sand immediately south of the jetty. The entire west side of the spit should be considered to be plover habitat, although use in the 1978 field season was primarily at the N. and S. ends of the spit. Vehicle access should be restricted on the North ½ of the spit; vehicles should use only the existing road and parking area on the SE side of the spit. Posting of beaches to alert the public to the April through June plover nesting period is recommended.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
TI-60-62	CENPP 77-2369 and 77-2370	mixed	Nehalem 15'



Map 4. Netarts Spit, Tillamook County.

SITE OR AREA:	COUNTY:
Netarts Spit	Tillamook

LEGAL DESCRIPTION:

T. 2 S., R. 10 W., portions of sections 6, 7, 18, 19, 30

ELEMENTS AT SITE:

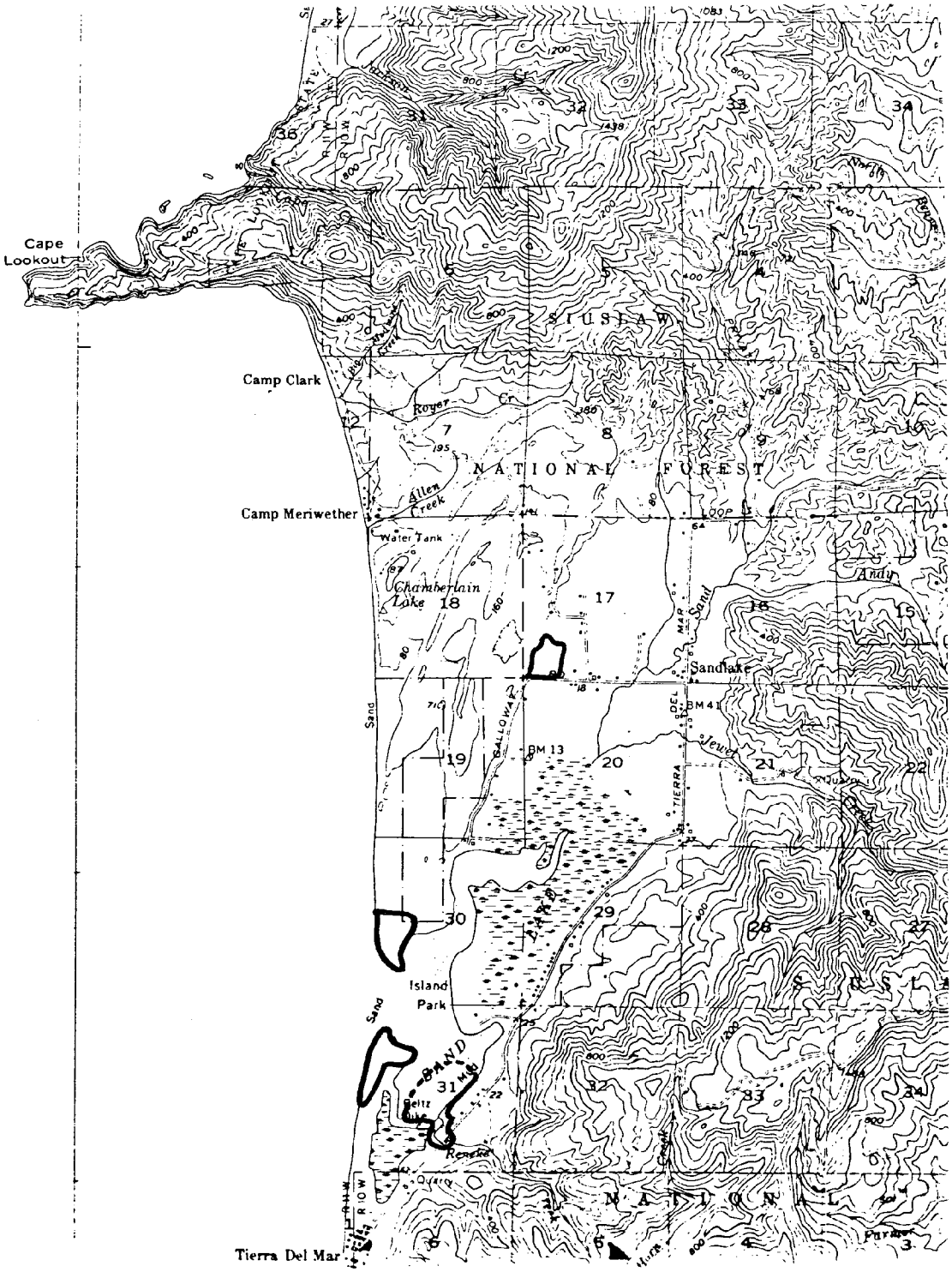
One of the coast's less-disturbed sand spits, the area contains:

1. Coastal dune mosaic with several dune types
2. Lodgepole/salal and Sitka spruce/salal communities
3. Vernal ponds in the sand dunes
4. Estuarine ecosystem and salt marsh mosaic of community types
5. Snowy plover habitat; the plover has been recorded from Netarts in recent years, although none were seen during the 1978 field season.
6. Rare plant Cordylanthus maritimus ssp. palustris found here
7. Harbor seals use the spit as a "haul out" area

PLANNING/MANAGEMENT CONSIDERATIONS:

The natural area values of Netarts Spit have been recornized for several years. The Spit is currently being proposed by the State Natural Area Preserves Advisory Committee (NAPAC) for Natural Area Preserve status. Ownership is entirely state, and the area to the south is in Cape Lookout State Park; control of access should be relatively easy. The spit is currently being used for several research projects; and further documentation of its natural area value may be obtained from NAPAC and Dr. Robert E. Frenkel, OSU Geography Department, Corvallis.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
TI-72	CENPP 77-2381 and 77-2383	State	Tillamook 15'



Map 5. Sandlake area: three sites, Tillamook County.

SITE OR AREA:	COUNTY:
Sandlake area: 3 sites	Tillamook

LEGAL DESCRIPTION:

Bog: T. 3 S., R. 10 W., Section 17 (SW¼ of the SW¼)
Spits: T. 3 S., R. 10 W., part of Section 30 and 31
Reneke Creek mouth: T. 3 S., R. 10 W., part of Section 31

ELEMENTS AT SITE:

1. Bog: An undisturbed coastal bog on stabilized dunes near the bend in Galloway Road. Pitcher plants (Darlingtonia californica) and other unusual plants such as sundew and bog huckleberry. Likely the northern-most point of distribution for Darlingtonia.

2. Spits: The tips of both north and south spit at the estuary mouth are snowy plover habitats.

3. Reneke Creek mouth: productive marsh and wetland area, and five anadromous fish species. A diverse site.

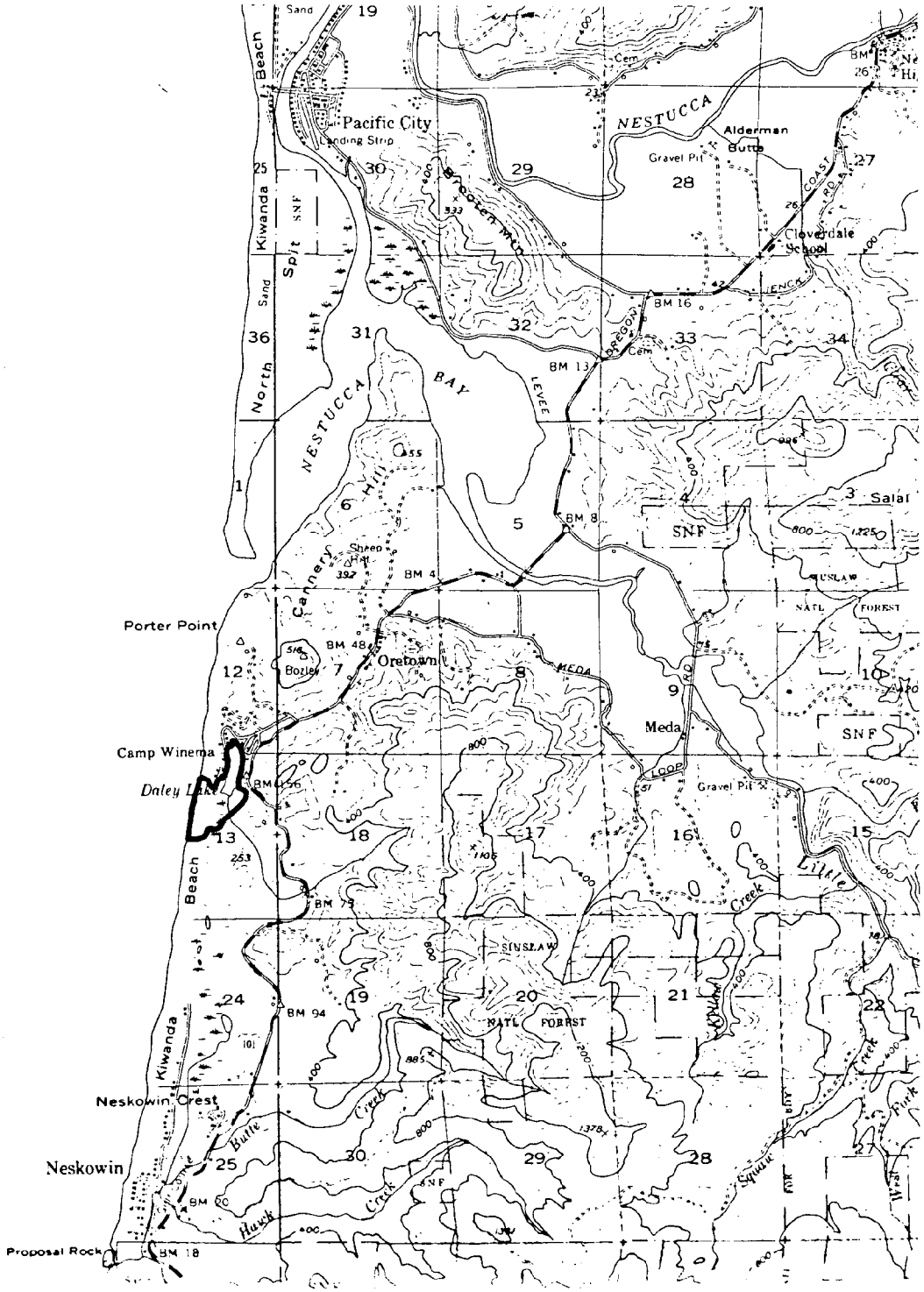
PLANNING/MANAGEMENT CONSIDERATIONS:

1. Bog: Development should be restricted in the bog; drainage needs to be protected. Possibility of state or county acquisition should be explored; it would receive heavy public use if it were to be developed similarly to the Darlingtonia Wayside north of Florence. High potential for public education facility.

2. Spits: Both north and south spits should be posted to alert public to presence of plovers; beach area should be closed either to ORV's or to both ORV's and foot traffic during nesting season, April - June. Extensive posting would be necessary on the north spit to keep ORV enthusiasts from entering the beach area from the dragstrip located on county land immediately to the N.

3. Reneke Creek mouth: This is a complex area with a diversity of natural area values. It has been considered by state and federal agencies for designation as a Research Natural Area and/or an Area of Critical State Concern. Ownership is complex, and outright acquisition would be difficult.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
TI-21 and 22	CENPP 77-2399 and 77-2400	mixed	Tillamook 15'



Map 6. Daley Lake (Camp Winema) and marsh, Tillamook County.

SITE OR AREA:	COUNTY:
Daley Lake (Camp Winema) and Marsh	Tillamook

LEGAL DESCRIPTION:

T. 5 S., R. 11 W., portions of Sections 12 and 13

ELEMENTS AT SITE:

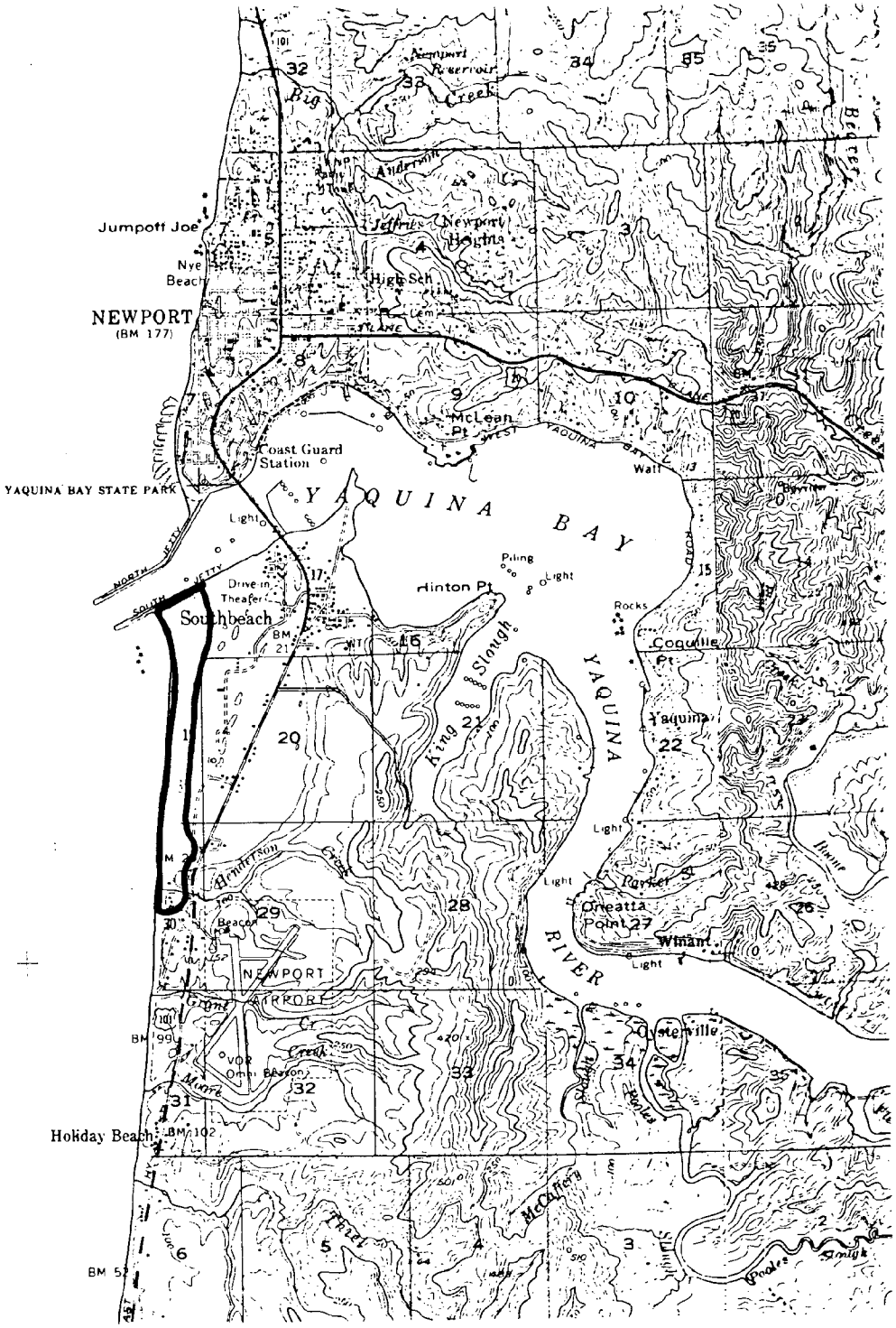
Shallow dune lake and adjacent marshland; area is unusually rich in waterfowl (concentrations of several duck species).

Marsh areas on the south end of the lake and extending southward in the dunes are relatively undisturbed and contain good, representative examples of several plant community types.

PLANNING/MANAGEMENT CONSIDERATIONS:

The area has been under consideration by biologists and conservationists for several years because of its obvious natural area potential. Camp Winema (Christian camp) on the west edge of the lake is a potential conflict; recent landfilling (for a road) extending south from the camp area likely will disrupt waterflow and could have long-term consequences on the area's hydrology. If no additional development occurs around the lake or in the marsh area to the south, it is possible that most of the natural area values could remain relatively undisturbed. Posting of the area to alert the public to the wildlife is recommended.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
TI-27	CENPP 77-2407	Mostly private	HEBO 15'



Map 7. South Beach State Park and Mouth of Henderson Creek, Lincoln County.

SITE OR AREA:	COUNTY:
South Beach State Park and Mouth of Henderson Creek	Lincoln

LEGAL DESCRIPTION:

T. 11 S., R. 11 W., portions of Sections 18, 19, and 30

ELEMENTS AT SITE:

1. Snowy plover habitat and nesting area in the north portion of South Beach State Park; one of the few recently verified nesting sites on the Oregon coast.

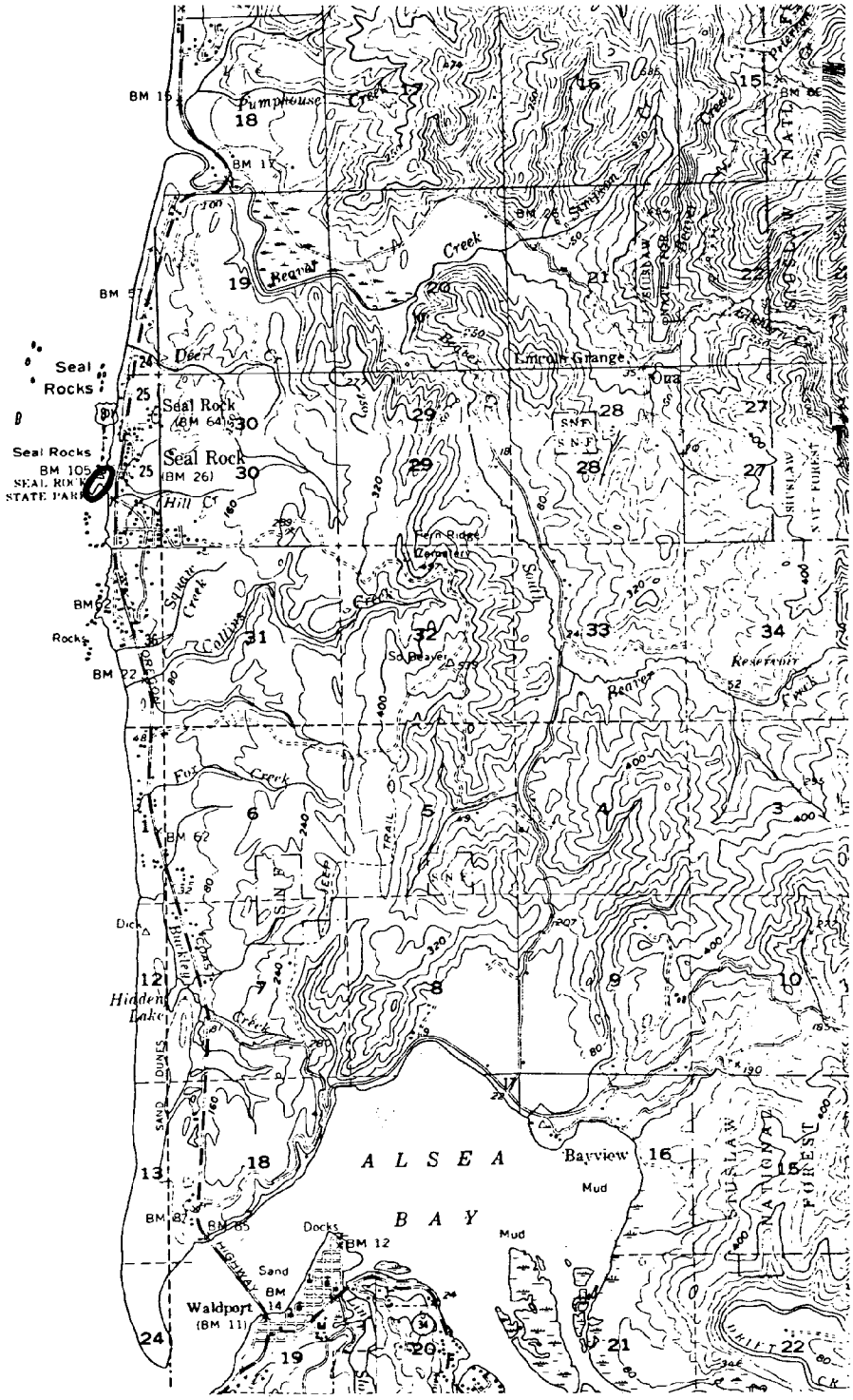
2. The Henderson Creek mouth site contains a full array of beach and dune plant communities in addition to freshwater marsh. The natural area values here are primarily botanical; although no rare native plants have been recorded from the site, the diversity of the flora is impressive especially when considering both the dune communities and the marsh.

PLANNING/MANAGEMENT CONSIDERATIONS:

Management of the State Park area to protect the plovers would mainly require posting to alert the public to the existence of the birds and to publicize the nesting season (April - June). An attempt should be made to keep ORV's out of the foredune area specifically.

The privately owned land at the mouth of Henderson Creek is currently fenced at Highway 101, but ORV's enter the area from the north. This land should be considered for county or state park use (acquisition) or should be managed so that the natural values remain essentially undisturbed. High value as an educational facility.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
LC-7	CENPP 77-2597	State and private	Yaquina 15'



Map 8. Seal Rock State Park, Lincoln County.

SITE OR AREA:	COUNTY:
Seal Rock State Park	Lincoln

LEGAL DESCRIPTION:

T. 12 S., R. 12 W., portions of Section 25

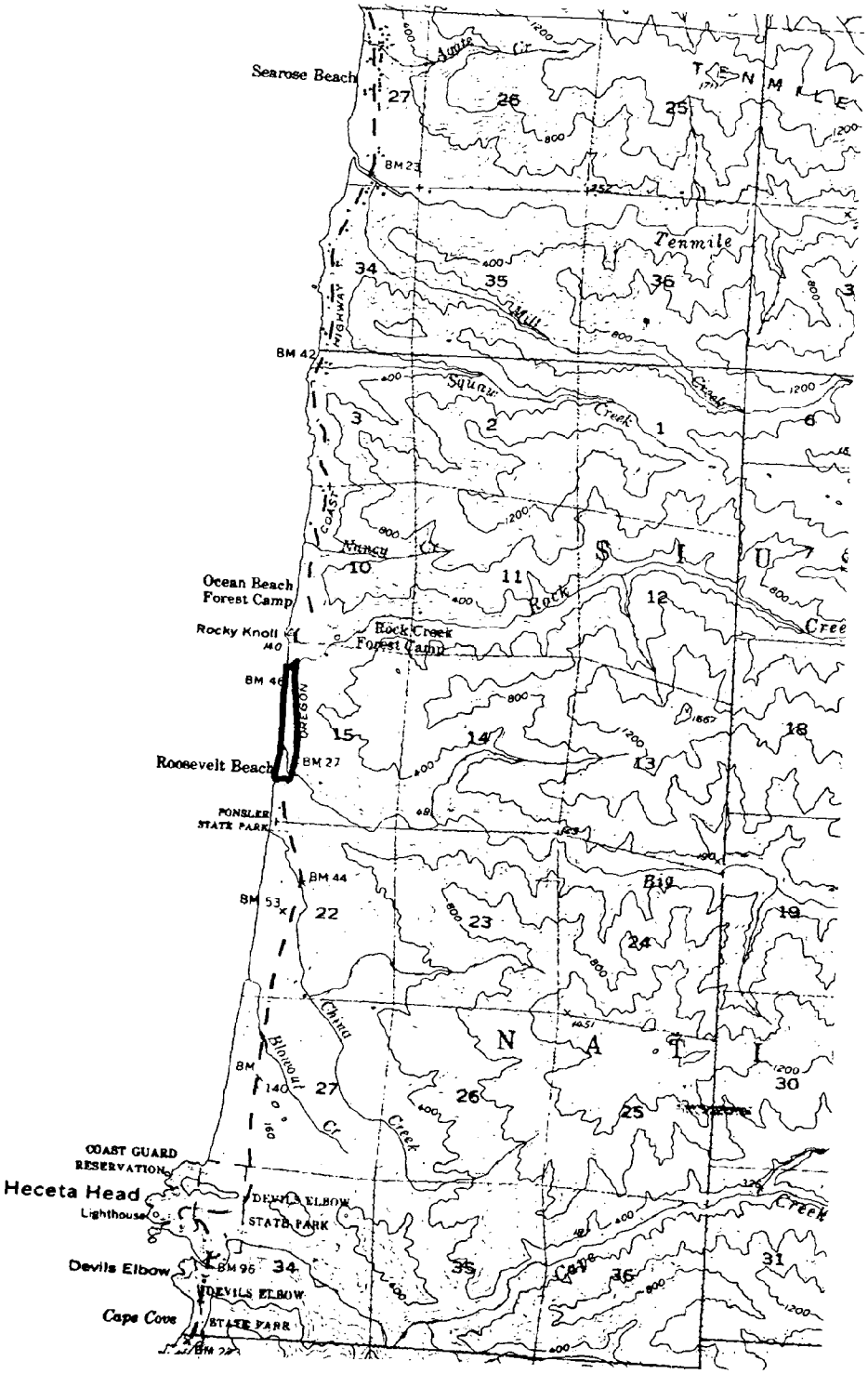
ELEMENTS AT SITE:

Two rare plant species occur on the main sea stack at the State Park: Lasthenia minor, ssp. maritima and Romanzoffia tracyi. They are likely to be found on additional rocks or stacks in the area.

PLANNING/MANAGEMENT CONSIDERATIONS:

The plants occur on the NW facing slope of an elongate stack; it is the southernmost of two main stacks at the end of the public access trail. Most public use presently occurs on the northernmost stack, and Parks Branch should encourage most tourist traffic in this direction. Climbing on the southern stack is hazardous under the best of conditions; posting the stack to discourage foot traffic would help ensure the preservation of both populations of these rare plants.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
---	CENPP 77-2602	State	Yaquina 15'



Map 9. Big Creek - Rock Creek Silverspot Butterfly site, Lane County.

SITE OR AREA:	COUNTY:
Big Creek - Rock Creek Silverspot Butterfly Site	Lane

LEGAL DESCRIPTION:

T. 16 S., R. 12W., Section 15

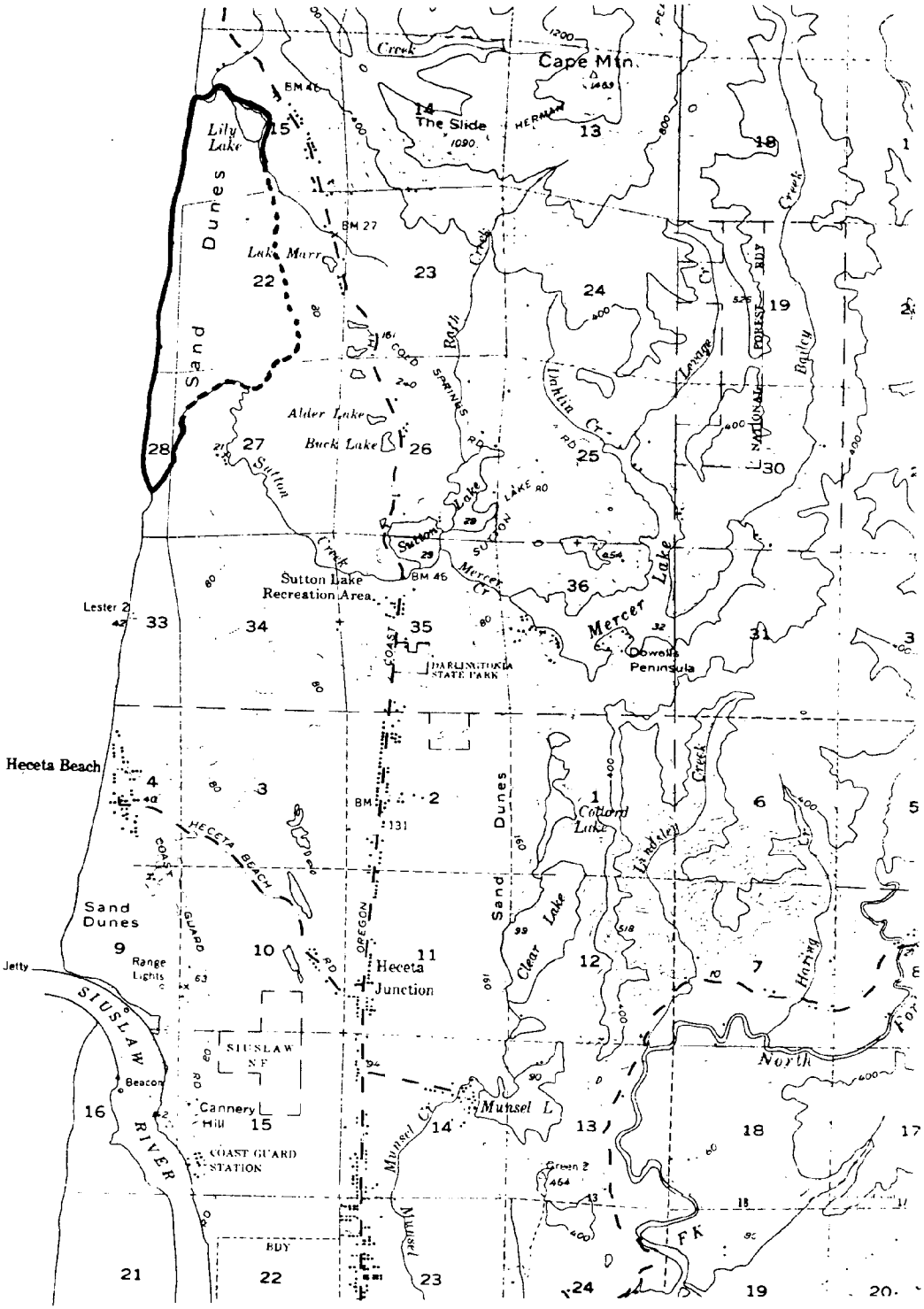
ELEMENTS AT SITE:

Coastal Silverspot Butterfly, Speyeria zerene ssp. hippolyta. This site is the most important site remaining for the Coastal Silverspot. Most other sites have been destroyed or intensively developed; good population remain at the mouth of Tenmile Creek (to the north) and at this site. The Tenmile site is under intense development pressure, however. The area is under consideration by the U.S. Fish and Wildlife Service and the U.S. Forest Service.

PLANNING/MANAGEMENT CONSIDERATIONS:

Almost no development would be compatible with maintenance of the meadow community and the butterfly population at this site. Passive recreational use, such as one or two foottrails, could be compatible with the natural values here, but any large amount of foot traffic would undoubtedly have a detrimental effect. The area is currently under consideration by the U.S. Fish and Wildlife Service and the U.S. Forest Service. The butterfly has been extensively studied and the site strongly recommended by Dr. David McCorkle of Oregon College of Education, in Monmouth.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
LN - 5	CENPP 77 - 2618	Mainly private	Heceta Head 15'



Map 10. Lily Lake to mouth of Sutton Creek, Lane County.

SITE OR AREA:	COUNTY:
Lily Lake to mouth of Sutton Creek	Lane

LEGAL DESCRIPTION:

T. 17 S., R. 12 W., portions of Sections 15, 21, 22, 27, and 28

ELEMENTS AT SITE:

This area has long been recognized as an outstanding scenic and ecological resource, and it has high potential as a research and educational facility. Lily Lake is one of the few remaining, undisturbed dune lakes; it is surrounded by extensive bulrush marsh. The lake contains native cutthroat trout and it is used by large populations of gulls, ducks, and other waterfowl.

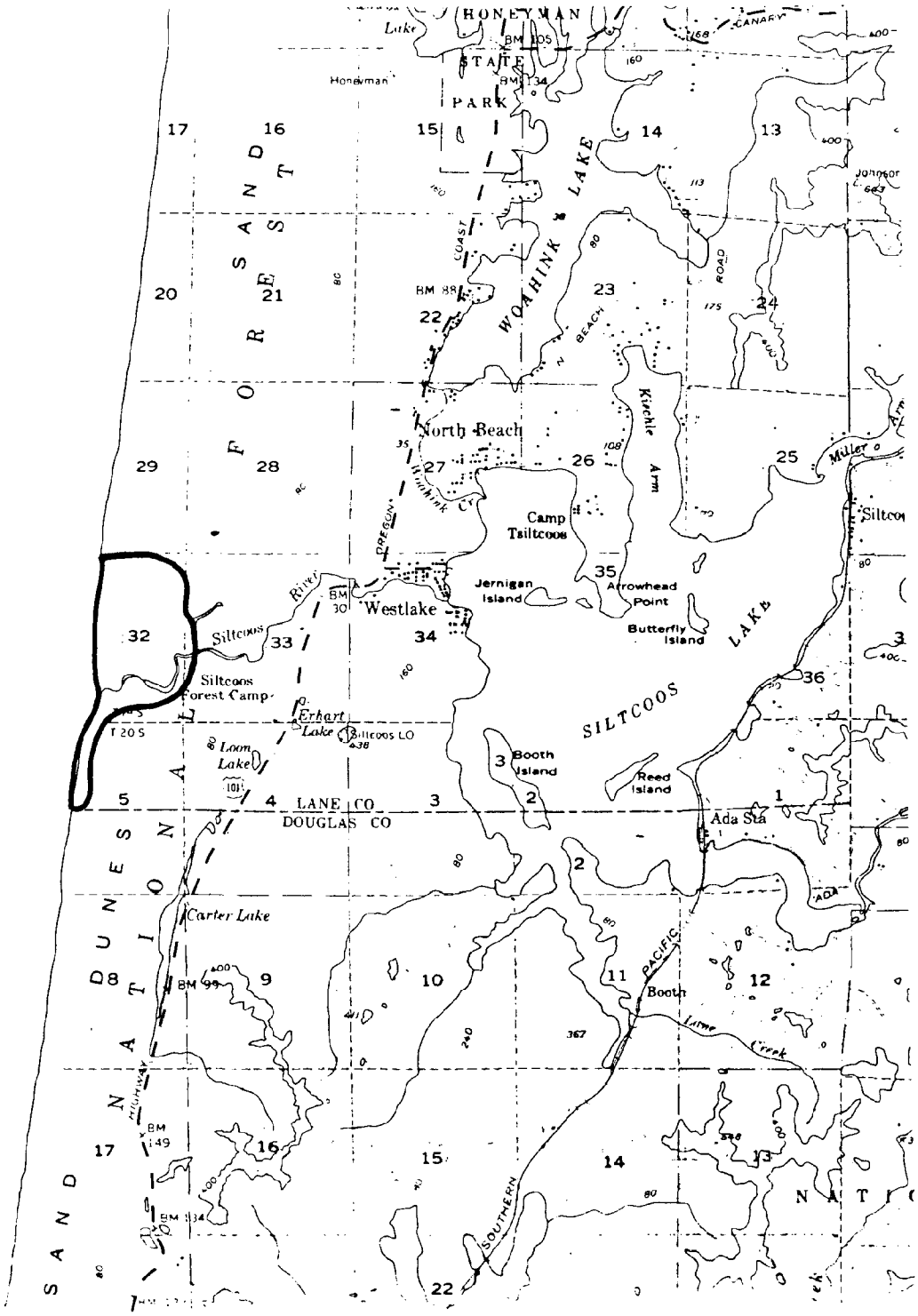
The dune complex to the south contains good representative examples of most of the dune plant community types. The north spit at the mouth of Sutton Creek is important snowy plover habitat, one of few good nesting areas along the coast.

PLANNING/MANAGEMENT CONSIDERATIONS:

The area receives some ORV use, especially in the dune area immediately south of Lily Lake. The coastal strip, most importantly the north spit area at the mouth of Sutton Creek, should be closed to ORV traffic, and the beach should be posted to alert the public to the presence of plovers. Posting, and ORV closure information, would need to be placed at the end of the Lily Lake road; this is the entrance point for most ORV's.

The main access point on the south side (deadend at parking area) is well-located for pedestrian use of the dunes and beach; maintenance of this access and continued foot traffic could be compatible with the plovers, especially if the area were to be posted (information signs.)

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
LN-4	CENPP 77-2623	Mixed	Heceta Head 15'



Map 11. Siltcoos River mouth and spits, Lane County.

SITE OR AREA:	COUNTY:
Siltcoos River mouth and spits	Lane

LEGAL DESCRIPTION:

T. 19 S., R. 12 W., Section 32

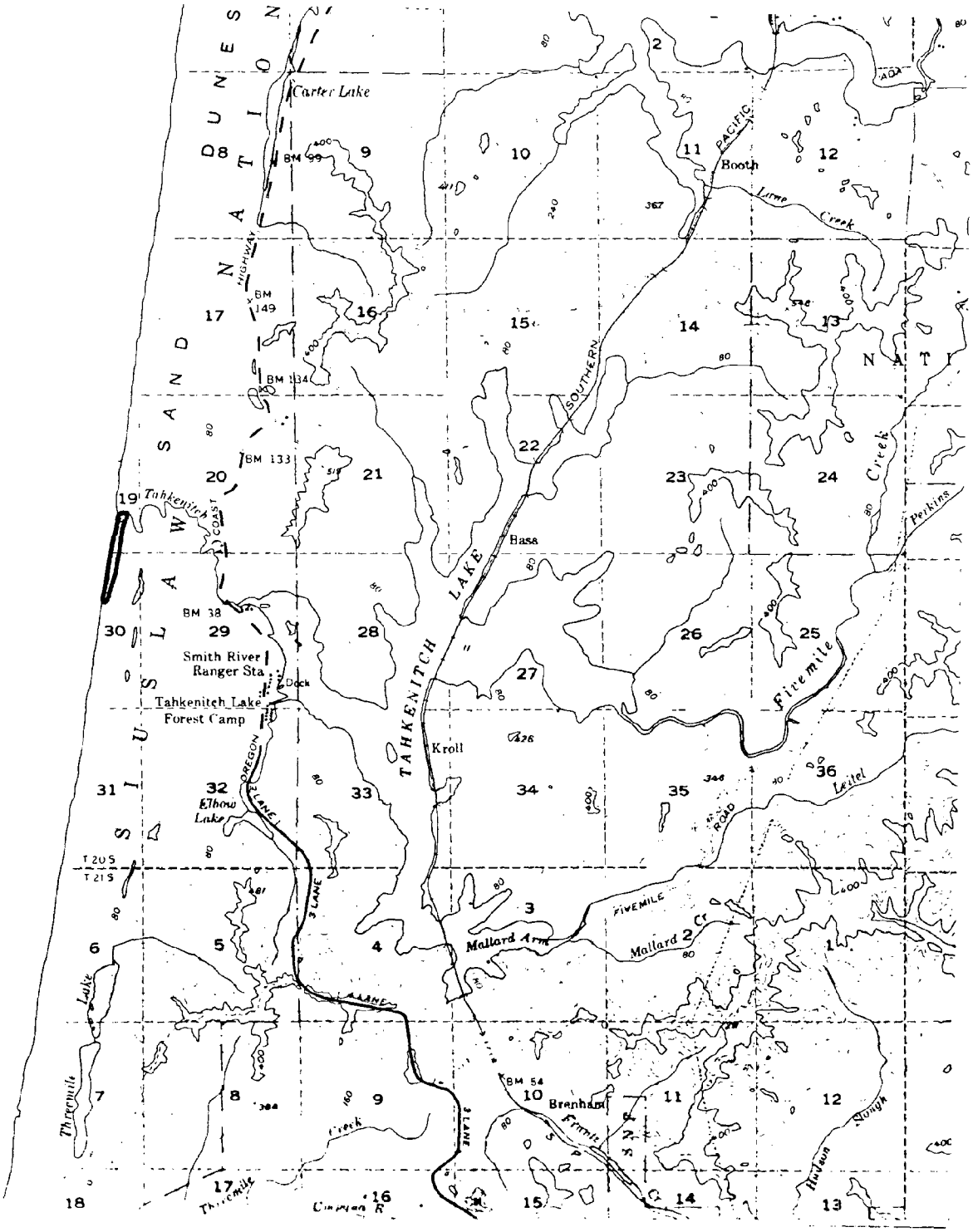
ELEMENTS AT SITE:

Snowy plover habitat and important nesting area, both sides of mouth of Siltcoos River. This is one of the four most important nesting sites on the coast.

PLANNING/MANAGEMENT CONSIDERATIONS:

The area receives heavy visitor use during the summer months. Vehicle closure should be continued on the south side of the creek, and the spit on the north side should be closed also; informational signs to alert the public to the presence of plovers should be used. Pedestrians should be encouraged to use the areas mainly north of the present terminal parking area, rather than encouraging foot traffic southward toward the spit.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
--	CENPP 77-2776	Mostly federal	Siltcoos Lake 15'



Map 12. Tahkenitch Spit, Douglas County.

SITE OR AREA:	COUNTY:
Tahkenitch Spit	Douglas

LEGAL DESCRIPTION:

T. 20 S., R. 12 W., portions of sections 19 and 30

ELEMENTS AT SITE:

Snowy plover habitat and nesting area; this is one of the four most important nesting areas on the Oregon coast.

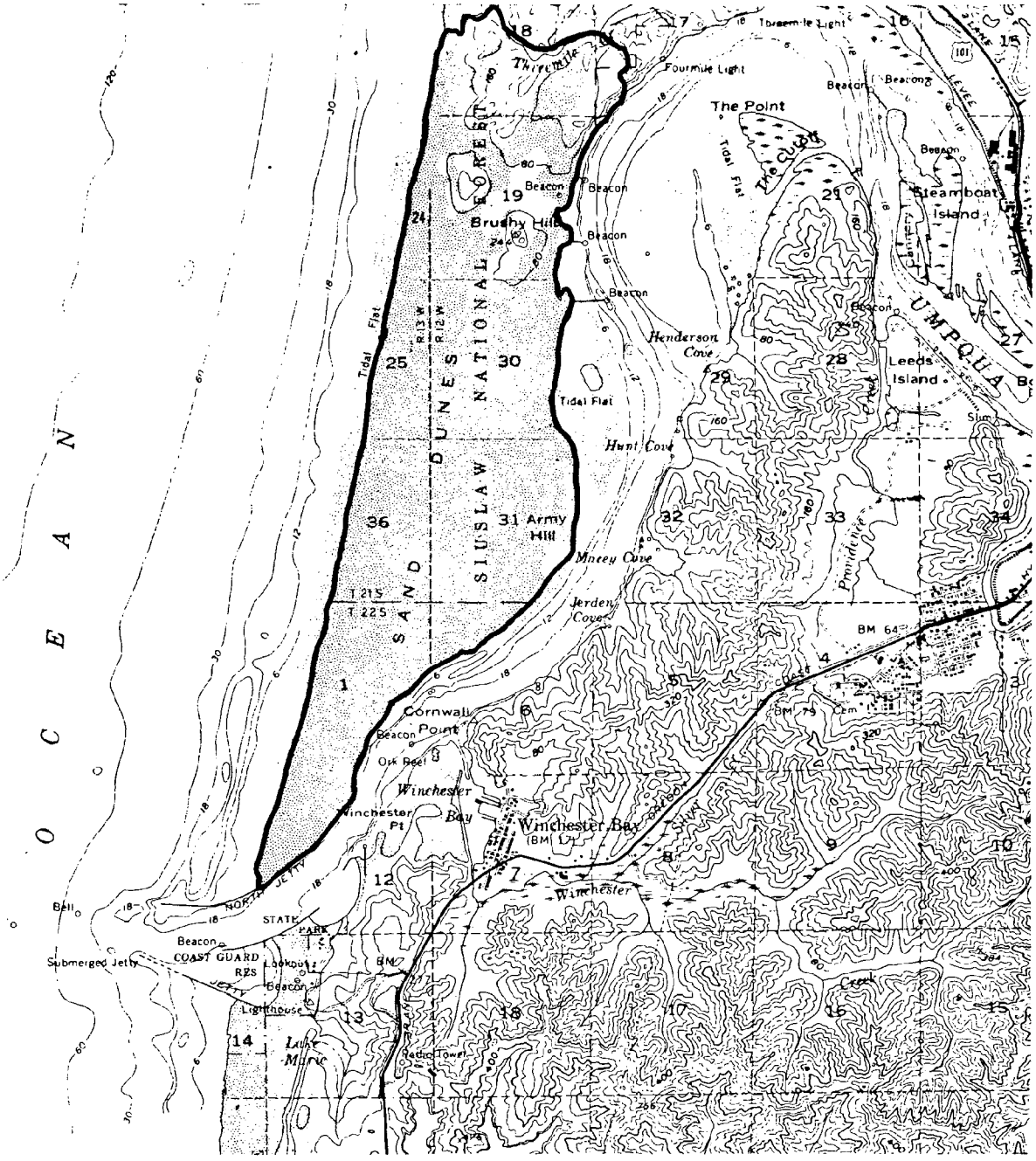
Good, representative beach and dune vegetation (most plant community types present) in the general area.

Dune creek, vernal pools, isolated islands of Sitka spruce and lodgepole pine forest.

PLANNING/MANAGEMENT CONSIDERATIONS:

The entire site is within the Dunes National Recreation Area and is presently closed to ORV's. This vehicle closure should be maintained. For pedestrians information signs should be erected to discourage foot traffic in the lower foredune area and to alert people to the presence of plover habitat and nests.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
56	CENPP 77-2773	Federal (Dunes NRA)	Siltcoos Lake 15'



Map 13. North Spit Umpqua River (Threemile Creek to North Jetty), Douglas County.

SITE OR AREA:	COUNTY:
North Spit Umpqua River (Threemile Creek to North Jetty)	Douglas

LEGAL DESCRIPTION:

T. 21 S., R. 12 W., portions of sections 18, 19, 30, and 31
T. 21 S., R. 13 W., portions of sections 24, 25, and 36
T. 22 S., R. 12 W., NW¼ of section 6
T. 22 S., R. 13 W., portions of sections 1 and 12

ELEMENTS AT SITE:

Snowy plover habitat; birds have been seen the entire length of the spit mainly on the ocean side and toward the south end.

Coastal dune mosaic of plant community types, especially the early successional stages, but also including forest "islands" of lodgepole pine and Sitka spruce, with characteristic shrub understory. Of all areas within the Dunes National Recreation Area, this is one of the most important for the preservation of plant community diversity. The spit has high potential as an educational and research site.

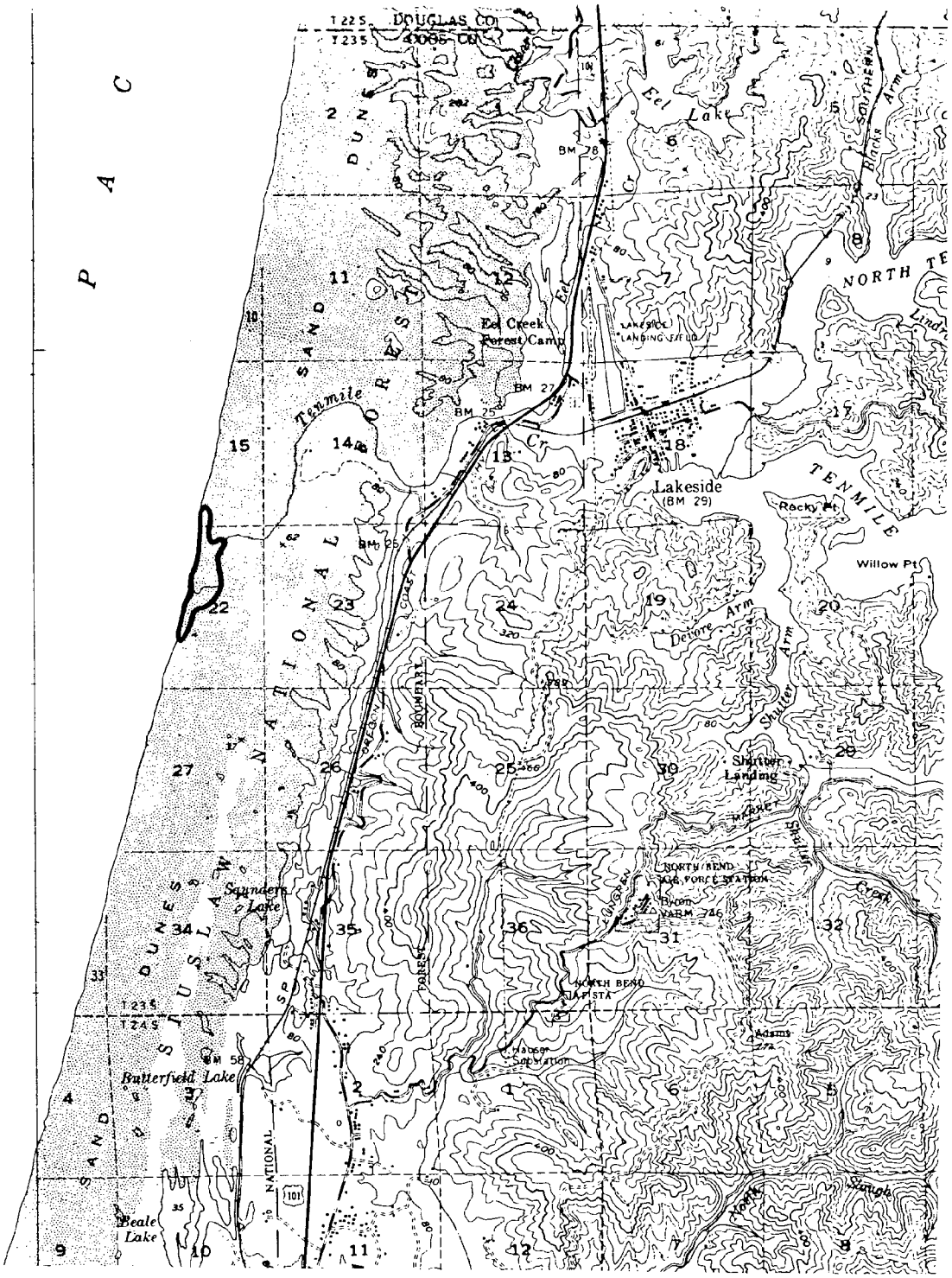
Two rare dune plants are to be expected here: silvery phacelia (Phacelia argentea) and pink sand-verbena (Abronia umbellata) should be searched for in all unvegetated or sparsely vegetated locations.

PLANNING/MANAGEMENT CONSIDERATIONS:

The site lies entirely within the Dunes National Recreation Area, and it is presently closed to ORV use. This closure should be maintained, and the corridor roads for beach access near Threemile Creek should be carefully posted to restrict ORV use southward on the spit. The ocean beach is open to vehicles "from seawall to water"; it should be posted to alert vehicle users and pedestrians to the presence of snowy plovers. Beach closure should be effected April through June to ensure success of any nesting birds.

Umpqua spit offers an unusual opportunity to observe the natural processes of sand erosion, accretion, and plant community succession. It is recommended that the entire area south of Threemile Creek be left undisturbed as a "natural laboratory" of Oregon's beaches and dunes.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
---	CENPP 77-2767 and 77-2769	Federal (Dunes NRA)	Reedsport 15'



Map 14. Mouth of Tenmile Creek, Coos County.

SITE OR AREA:	COUNTY:
Mouth of Tenmile Creek	Coos

LEGAL DESCRIPTION:

T. 23 S., R. 13 W., portion of section 22

ELEMENTS AT SITE:

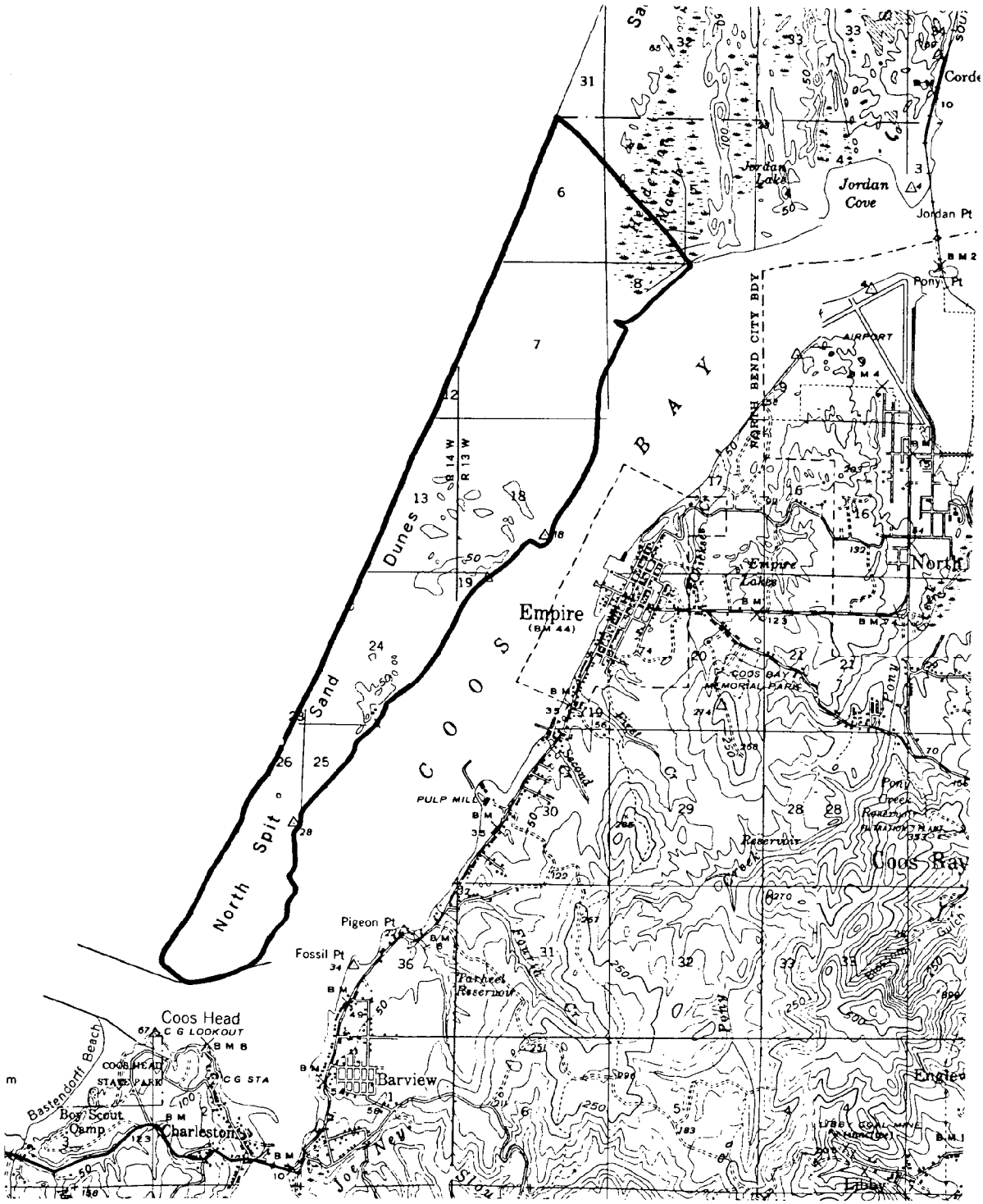
Snowy plover habitat, both sides of the mouth of Tenmile Creek.

Bald eagles have been seen at the river mouth.

PLANNING/MANAGEMENT CONSIDERATIONS:

The north side of the creek is presently closed to ORV use, while the south side of the creek is open. Both the north and south spits should be posted to protect the plovers and the beach area south of the creek should be closed to vehicles during the plover nesting season April-June.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
	CENPP 77-2633	Federal (Dunes NRA)	Reedsport 15'



Map 15. North Spit Coos Bay, Coos County.

SITE OR AREA:	COUNTY:
North Spit Coos Bay	Coos

LEGAL DESCRIPTION:

T. 25 S., R. 13 W., portions of the following sections:
6 - 8, 12, 13, 18, 19, 23 - 26, 35.

ELEMENTS AT SITE:

Snowy plover habitat, especially an area approximately 1.3 miles north of the north jetty on the ocean side, and another area on the estuary side SE of the Menasha pond.

Rare plant (Cordylanthus maritimus ssp. palustris) good population located on the east side of the spit (estuary side) south of the Ore-Aqua development.

Full representation of plant communities and flora characteristic of Oregon's beaches and dunes; two other rare plants to be expected at this site.

Osprey feeding area at SE corner of the spit.

Great blue heron rookery in south-central portion of the spit.

Henderson marsh on the NE side of the spit is extensive and relatively undisturbed.

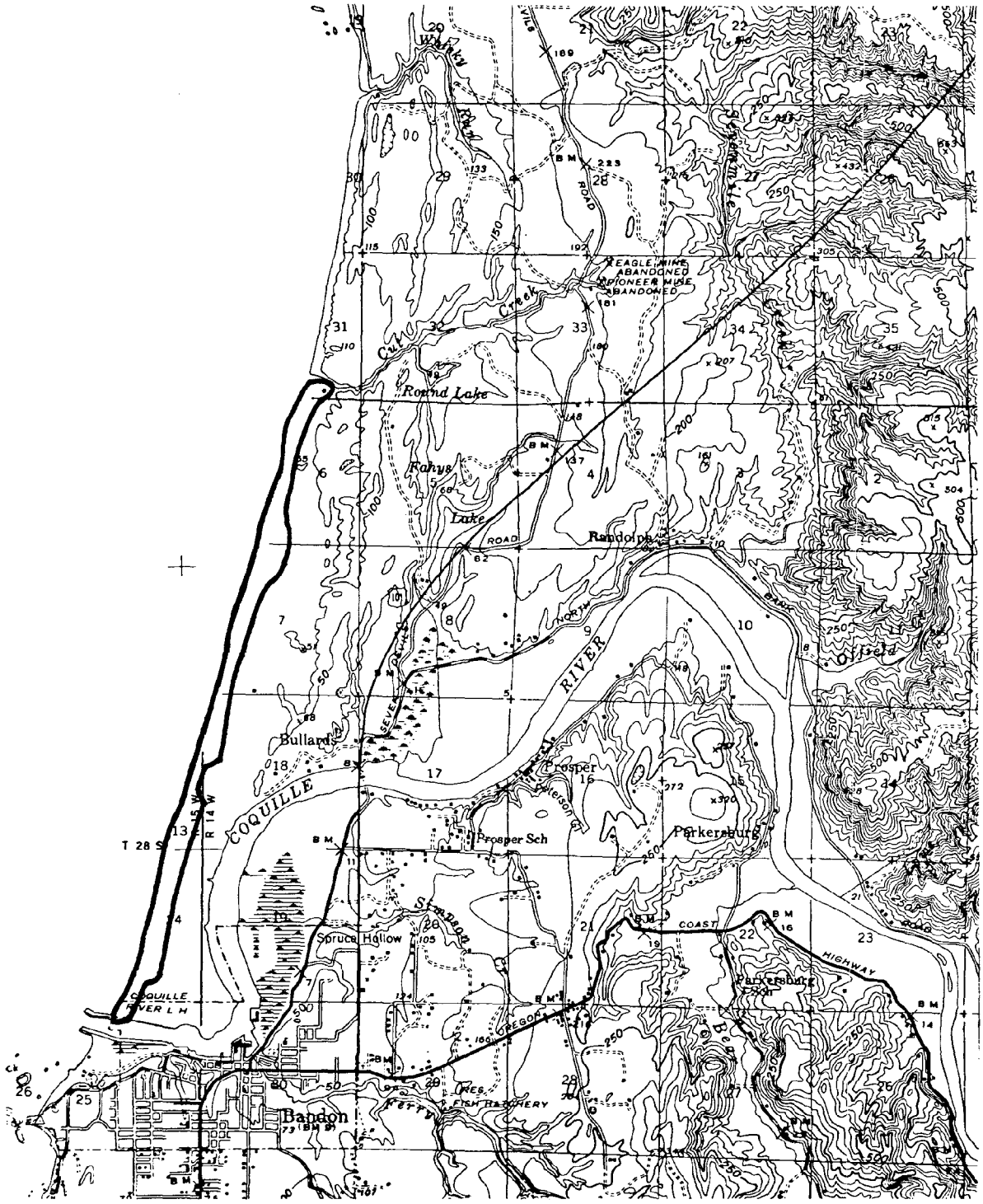
PLANNING/MANAGEMENT CONSIDERATIONS:

ORV activity should be excluded from the area, except on the open beach, which should be closed to vehicles April - June to protect any nesting plovers. ORV activity should be directed to the Horsefall area to the north and into the designated ORV areas of the Dunes National Recreation Area.

The beach should be posted to alert pedestrians to presence of plovers and to the need to protect them especially during nesting season.

Most of the spit is in federal ownership (Army Corps Engineers), and the Corps is presently developing a resource inventory to aid in the long-term management of the area.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
CS-49	CENPP 77-2645 to 77-2649	Mixed; mostly	Empire 15'



Map 16. Bullards Beach to North Jetty of Coquille River, Coos County.

SITE OR AREA:	COUNTY:
Bullards Beach to North Jetty of Coquille River	Coos

LEGAL DESCRIPTION:

T. 28 S., R. 14 W., portions of sections 6, 7, 18, 19
T. 28 S., R. 15 W., portions of sections 13, 24, 25

ELEMENTS AT SITE:

Rare plant, Phacelia argentea, found in the dunes here.

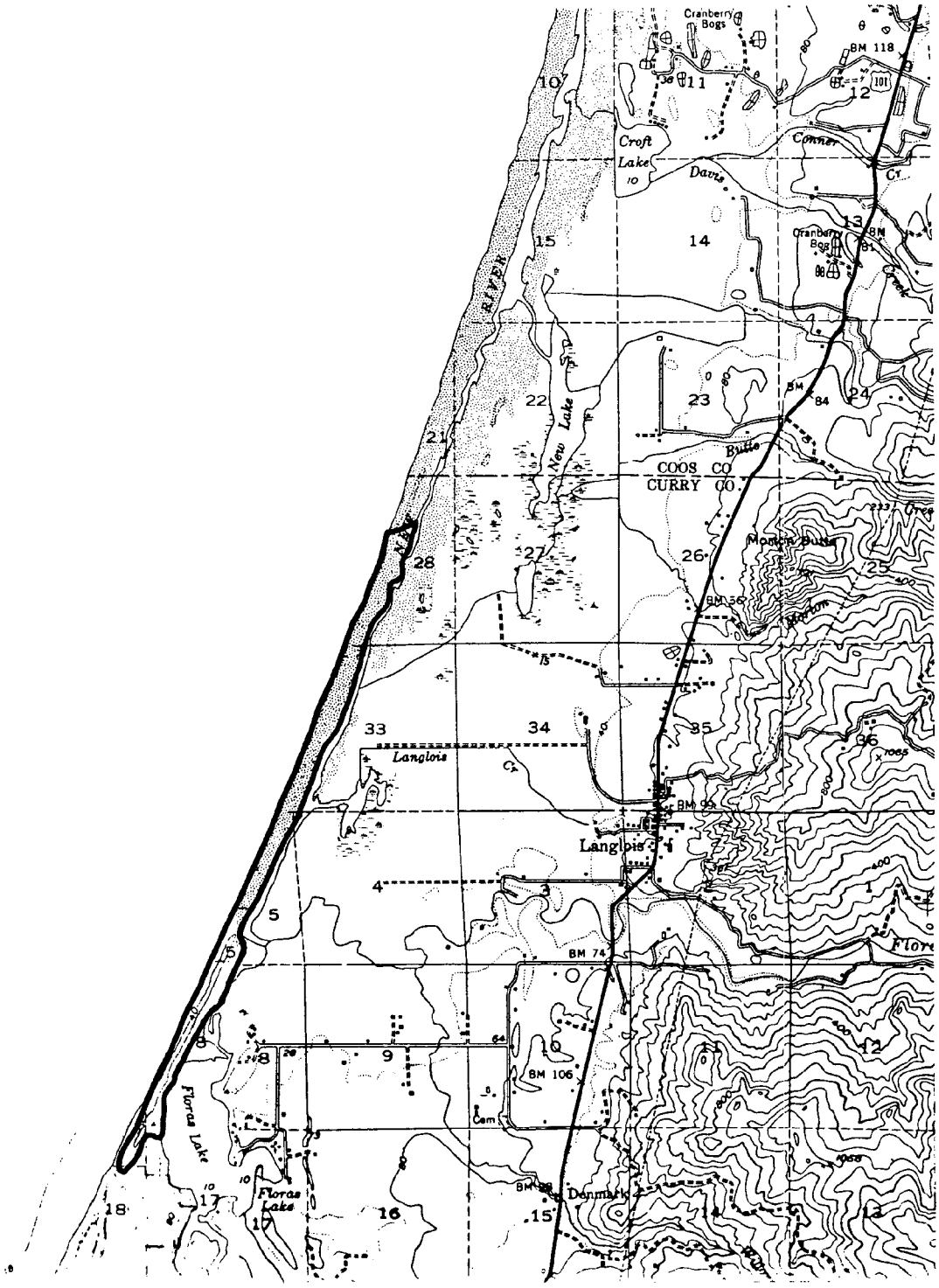
Snowy plover habitat on ocean side of the spit.

Stabilized foredunes, with representative plant community types.

PLANNING/MANAGEMENT CONSIDERATIONS:

Although the area has been disturbed, especially by ORV use, and planted extensively with European beachgrass, the potential natural area values are relatively high here; and many of the coastal dune communities are represented. The southern part of the site is in state park ownership; addition of some of the area to the north to the State Park should be considered. ORV use in the park is minimal at present; the beach should be posted to identify plover habitat to the public.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
CS-3	CENPP 77-2663 and 77-2665	Private and state	Bandon 15'



Map 17. New River Floras Lake, Curry County.

SITE OR AREA:	COUNTY:
Bullards Beach to North Jetty of Coquille River	Coos

LEGAL DESCRIPTION:

T. 28 S., R. 14 W., portions of sections 6, 7, 18, 19
T. 28 S., R. 15 W., portions of sections 13, 24, 25

ELEMENTS AT SITE:

Rare plant, Phacelia argentea, found in the dunes here.

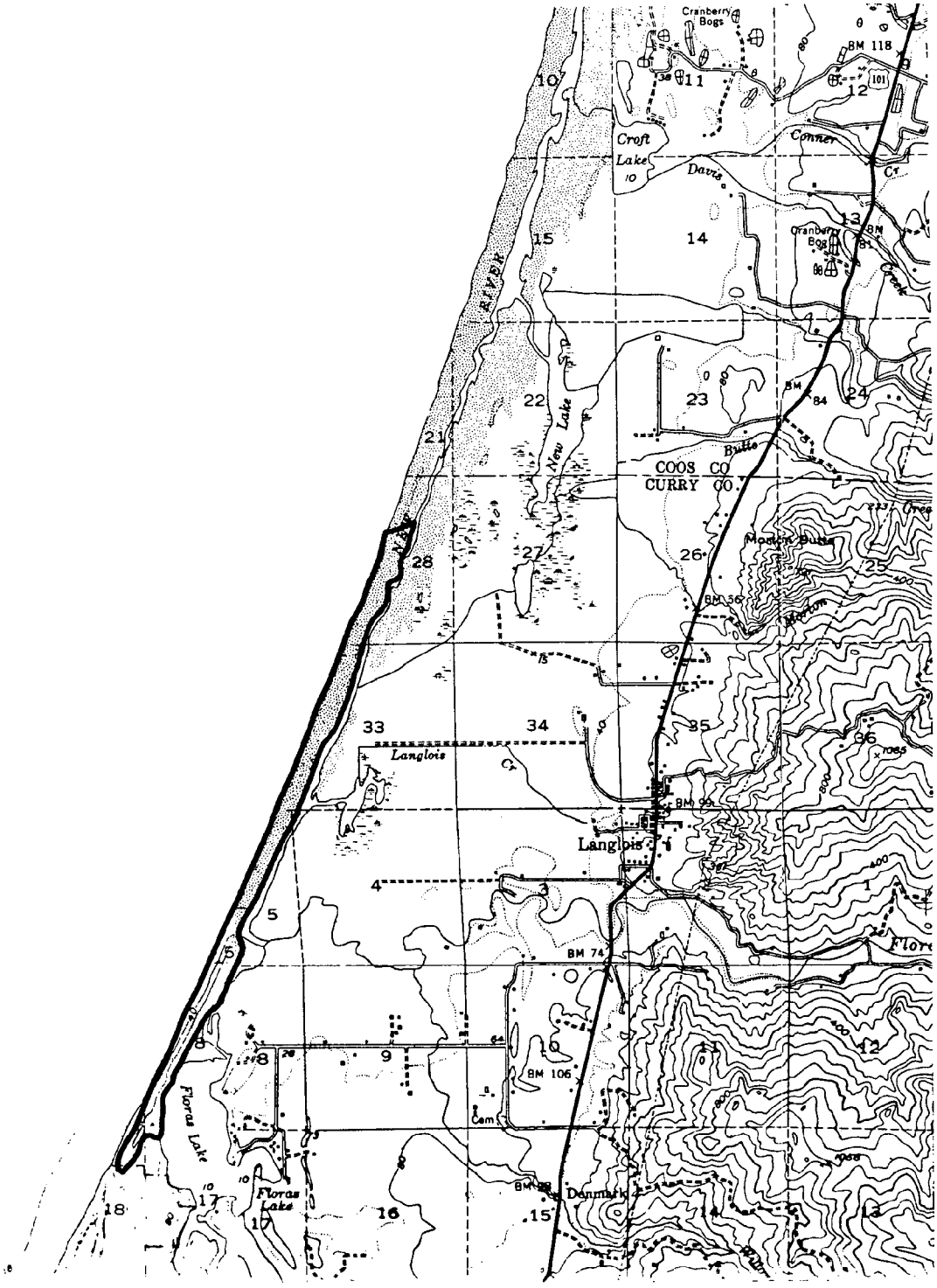
Snowy plover habitat on ocean side of the spit.

Stabilized foredunes, with representative plant community types.

PLANNING/MANAGEMENT CONSIDERATIONS:

Although the area has been disturbed, especially by ORV use, and planted extensively with European beachgrass, the potential natural area values are relatively high here; and many of the coastal dune communities are represented. The southern part of the site is in state park ownership; addition of some of the area to the north to the State Park should be considered. ORV use in the park is minimal at present; the beach should be posted to identify plover habitat to the public.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
CS-3	CENPP 77-2663 and 77-2665	Private and state	Bandon 15'



Map 17. New River Floras Lake, Curry County.

SITE OR AREA:	COUNTY:
New River Floras Lake	Curry

LEGAL DESCRIPTION:

T. 30 S., R. 15 W., portions of sections 28 and 33
T. 31 S., R. 15 W., portions of sections 5 and 8

ELEMENTS AT SITE:

Rare plant, Phacelia argentea.

Snowy plover habitat, one of the best sites on the coast; 22 birds sighted during the 1978 field season.

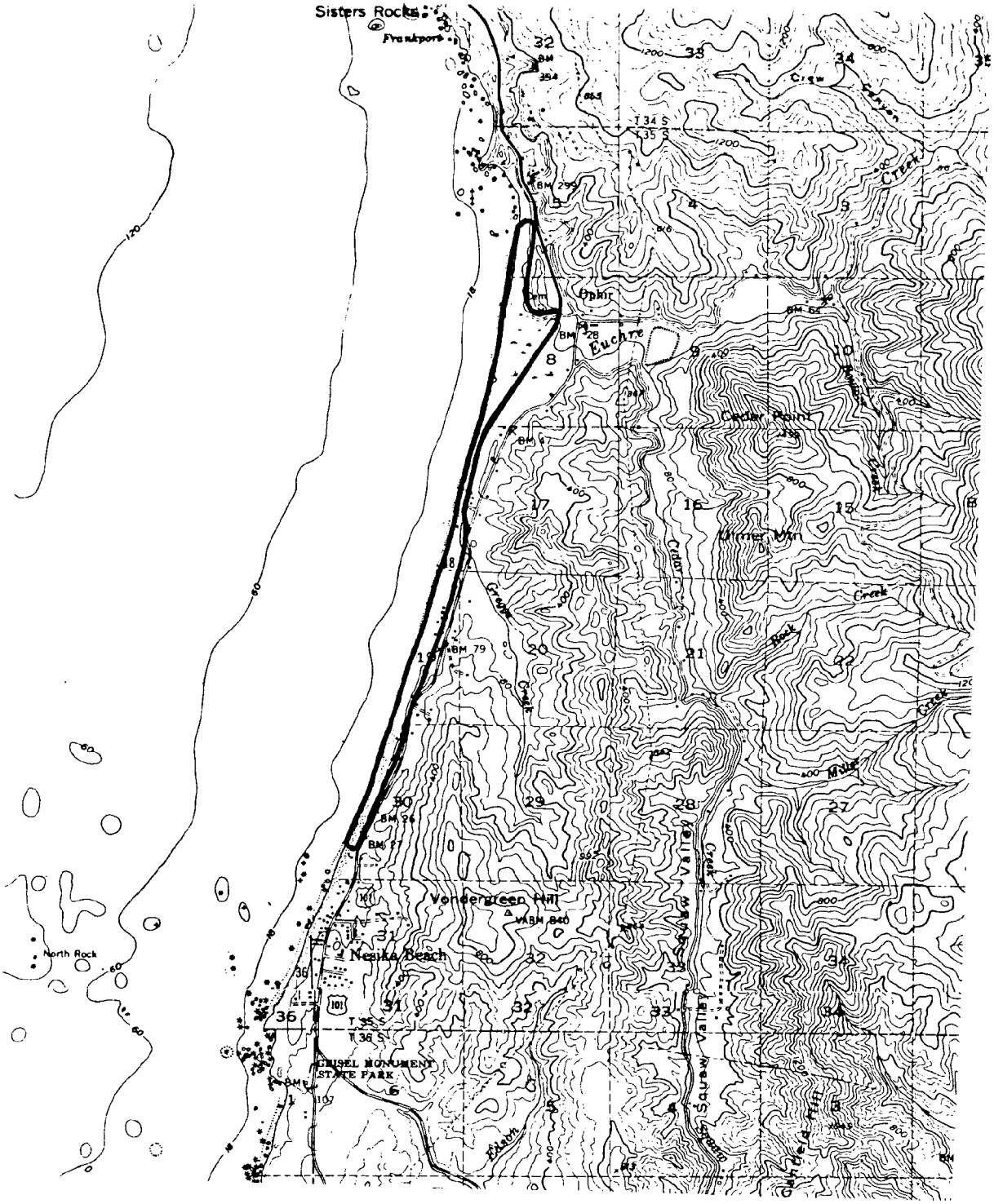
Another rare plant, Abronia umbellata, is expected to occur in this dune area, but has not been recorded to date.

PLANNING/MANAGEMENT CONSIDERATIONS:

Should be relatively easy to manage with New River forming a natural eastern boundary; how long the river course will remain in its present location is uncertain however. The dunes west of New River (narrow strip) appear to get little ORV use, which may account, in part, for the large number of plovers seen here.

The natural values here will likely remain undisturbed, if pedestrian and ORV use do not increase substantially. The Floras Lake area is being developed (residences) however, and this undoubtedly will increase use of the beach and dunes. Again, posting of the beaches to inform the public of the presence of plovers is recommended.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
39	CENPP 77-2679 and 77-2681	Mostly private	Langlois 15' & Cape Blanco 15'



Map 18. Euchre Creek to Nesika Beach, Curry County.

SITE OR AREA:	COUNTY:
Euchre Creek to Nesika Beach	Curry

LEGAL DESCRIPTION:

T. 35 S., R. 14 W., portions of sections 8, 17, 18, 19

ELEMENTS AT SITE:

Rare plant, Phacelia argentea, found at several locations along the beach at this site; good population at the State Rest Area along Highway 101 at mile 319½.

Snowy plover habitat: plovers have been known to use this beach for years, most recently near the mouth of Euchre Creek.

High diversity of beach and dune plant community types and dune flora in this short coastal strip.

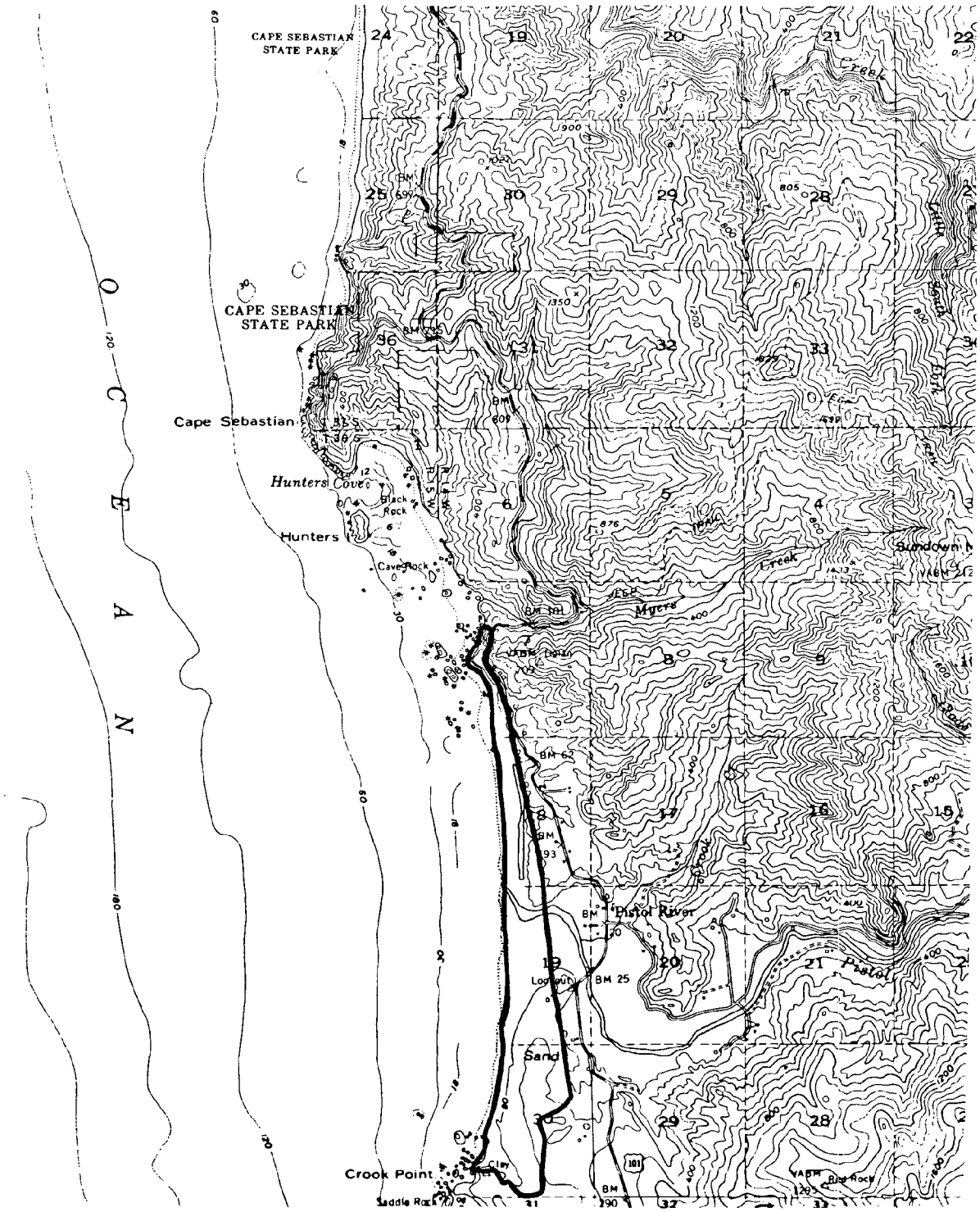
Another rare dune plant, pink sand-verbena, Abronia umbellata, is to be expected at this site, but has not yet been verified.

PLANNING/MANAGEMENT CONSIDERATIONS:

Management of this narrow strip between Highway 101 and the beach should be relatively easy; there is evidence of some ORV use near the mouth of Euchre Creek, but this could be minimized by posting the area. The several small creek drainages here discourage ORV travel on the beach, so ORV use probably will not become a major threat to the natural elements here.

Posting of the area to alert the public to the presence of plovers and rare plants is recommended; this could be done quite easily by first using the information kiosk at the State Rest Area at mile 319½. There should also be posting in the vicinity of the mouth of Euchre Creek however.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
CU-99 CU-100	CENPP 77-2718	Private and state	Port Orford 15'



Map 19. Myers Creek to Crook Point (Mouth of Pistol River), Curry County.

SITE OR AREA:	COUNTY:
Myers Creek to Crook Point (Mouth of Pistol River)	Curry

LEGAL DESCRIPTION:

T. 38 S., R. 14 W., portions of sections 7, 18, 19, and 30

ELEMENTS AT SITE:

Three rare plant species are found at this site: silvery phacelia, Phacelia argentea; pink sand-verbena, Abronia umbellata; and rein orchid, Habenaria greenei.

The Phacelia and sand-verbena are dune plants and will likely occur the length of this site.

The rein orchid has been found in more rocky, beachcliff locations especially in the northern portion of this site near the mouth of Myers Creek.

In the southern part of this site towards Crook Point, there is good representation of several of the coastal plant community types, one of few such locations on the southern Oregon coast.

PLANNING/MANAGEMENT CONSIDERATIONS:

Management considerations are similar to those at the Euchre Creek site further north: assuming no residential development occurs, the most likely problem would be unrestricted ORV use in the dune areas. There is some evidence of ORV use at present, but it is not yet excessive partly because this site is not close to any large population centers.

It is recommended that the area be posted however to inform the public of the presence of rare plants and of the need to protect the dune vegetation especially in the southern part of this site.

For long-term management, transplanting some of the dune plants to other locations within this site would likely ensure perpetuation of these species here; this could be accomplished with the aid of local botanists and natural history enthusiasts.

Heritage Prog. Number:	Army Corps Engineers Aerial Photo Number:	Ownership: (if known)	USGS Quad Map:
---	CENPP 77-2735 and 77-2736	Presumed to be mostly private	Gold Beach 15'

VIII. PLANNING AND MANAGEMENT CONSIDERATIONS FOR THE PROTECTION OF CRITICAL BIOLOGICAL HABITATS

A. Unplanned Development: A Threat to the Coastal Biota

Oregon's coastal area, like most coastal areas throughout the world, is experiencing rapid, if not explosive, growth. More and more people now are able to afford second homes on the coast, and as Oregon's population steadily expands, more goods and services are needed, which in turn expands the economy drawing more people into the coastal area. The growth of Lincoln City in the late sixties, and of Newport in the mid-seventies, is indicative of the growth potential of the entire coast. Fortunately, population levels still are relatively low at a time when land use planning has demanded attention to the impacts of growth and development.

But already, for various reasons, many areas have been developed which should have remained undeveloped entirely, developed less intensively, or developed in a different manner. The most effective method for safeguarding against inappropriate development is through state or federal ownership. However, putting land into public ownership and "setting it aside" in parks or natural areas is becoming increasingly controversial due to the impact on the local tax base. It appears certain that the days of large-scale public land acquisitions are past. Nonetheless, there are certain areas which contain unusual natural or public-use values which can best be managed under public ownership. For example, tourists and coastal residents marvel and enjoy the numerous public beaches, state parks, waysides and campgrounds that have given Oregon the reputation of being far-sighted and environmentally conscious. Increasingly, however, those who desire to protect such values must make use of techniques other than acquisition of full interest in land by public agencies.

B. Protection Methods Available

Oregon's natural heritage in general and the coastal "elements of special concern" in particular, can be protected only through cooperative actions of local, state and federal governmental agencies with private organizations and individuals joining the effort to use a wide variety of preservation techniques. These techniques range from the broadly applicable approach of advising landowners of the natural area values on their land and securing their cooperation, to the limited but effective method of land acquisition and legal dedication. All of these various mthods are valid and useful, but a carefully designed coastal program for the preservation of natural areas will use the full range of techniques in a way that matches the level and type of protection to the significance of the resource and to the political feasibility of

maintaining such protection over the long term. In brief, voluntary management on the part of a private landowner may be sufficient in one case, while in another case adequate protection of critical habitat may be gained only by acquisition and management of the site by a state or federal agency. The following protection methods are available:

(1) Landowner notification: may involve formal or informal notification. No formal program of landowner notification has been developed in Oregon. The Nature Conservancy is experimenting with this technique in Ohio and will apply the notification procedure to other states based on results.

(2) Voluntary agreement with landowner: a very flexible method especially effective with large corporate landowners. No formal program or procedure of voluntary agreement with landowners has been developed in Oregon. The Natural Heritage Bill[1] includes provisions for voluntary agreements associated with the register.

(3) Registration: formal recognition by the state through a registration procedure; not legally binding on landowner. The Oregon Register of Natural Areas was established by the State Natural Area Preserves Advisory Committee legislation of 1973, however, no sites have been registered to date. The Natural Heritage Bill proposes to modify the register for workability. The National Natural Landmarks Program of the Heritage Conservation and Recreation Service is a federal register of natural areas.

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[1]Natural Heritage Bill (SB 448)--a bill before the 1979 Oregon legislature. The bill would make certain changes in the State Natural Area Preserves Advisory Committee legislation of 1973 administered by the State Land Board. The bill proposes to:

1. establish a Natural Heritage Advisory Council to assist the State Land Board and land managing agencies in conducting the Natural Area Program;
2. designate a Natural Area officer and assign inventory and information banking functions; require preparation of a natural heritage plan;
3. establish a register of natural heritage resources and a process for voluntary registration of natural areas;
4. establish a process for voluntary dedication of conservation areas; define the Articles of Dedication.
5. repeal the State Natural Area Preserves Advisory Committee legislation.

(4) Conservation easement: restrictions can be simple or complex and are legally binding covenants which stay with the land and pass on to future landowners. Oregon law has provisions for conservation easements (ORS 271. 710-271.750) which can be acquired by public agency or nonprofit corporation. A conservation easement stipulates non-permitted uses of the land and becomes a part of the deed.

(5) Fee acquisition: outright purchase of land by an agency or conservation organization. Fee acquisition is practiced by public agencies and nonprofit conservation groups, such as The Nature Conservancy. The federal Land and Water Conservation Fund administered by the Heritage Conservation and Recreation Service of the Department of Interior can provide 50% match to local or state governments for acquisition.

(6) Designation: an administrative procedure used by public agencies to place some parcels of land in a "protection category"; de-designation can be done by the agency without public participation. The following are examples of designation programs:

Federal

Special Interest Areas (U.S. Forest Service)
Outstanding Natural Areas (BLM)

State

Primary Resource Protection Areas (Parks and Recreation Branch)
Research Natural Preserves (Parks and Recreation Branch)
Scientific and Educational Preserves (Board of Higher Education)
Scenic and Protective Conservancy Areas (Department of Forestry)
Areas of Critical State Concern (Department of Land Conservation and Development)
Wildlife Management Areas (Department of Fish and Wildlife)

Interagency Programs

Research Natural Areas

(7) Dedication: the highest level of protection for natural areas; accomplished by a public body outside the land-owning agency; de-dedication cannot be done by the land-owning agency itself. The following are examples of dedication programs:

Federal

National Parks and Monuments (National Park Service)
National Wildlife Refuge System (U.S. Fish and Wildlife Service)

State

Natural Area Preserves (State Land Board)

Interagency Programs

Wilderness Areas
Wild and Scenic Rivers

(8) Land use controls and comprehensive planning: a variety of methods including zoning, local ordinances written to include protection of natural areas, etc.

C. The Role of Federal and State Agencies

Over half of Oregon's land is owned and managed by public agencies, and this is no less true in the coastal beaches and dunes. The role of these agencies in protecting natural areas is of paramount importance. Good representative examples of most of the coastal ecosystems and elements of special concern could be protected in areas already in public ownership if the agency involved were to officially recognize and act on the need for, and desirability of, such natural area protection. Some coastal elements, such as the rare plant species and the snowy plover, are not necessarily adequately protected simply because they occur on sites which are in public ownership. At a particular site, it may be essential to protect the element(s), such as closing the beach to vehicles during the plover's nesting season (April-June), or tightly controlling and regulating public use of one portion of a state park which may contain a healthy but fragile plant community.

As an example of this further step, the Parks and Recreation Branch of the Department of Transportation has recently initiated the designation of Research Natural Preserves within State Parks. These areas will be portions of parks that will be managed specifically and primarily to protect and preserve one or more natural elements that occur there. An attempt will be made to allow low-impact visitor use in these RNP's, but where there is a conflict, the preservation of the natural values will take precedence. This is an excellent and laudatory example of agency cooperation to preserve natural diversity. Although such areas can be de-designated by simple administrative fiat, the effort represents an important step in the direction of protecting threatened elements. The Research Natural Preserve designation by the Parks and Recreation Branch should be seriously considered for portions of several of the sites discussed in this report: Fort Stevens, Netarts Spit, Seal Rock stack, Bullard's Beach, and Floras Lake.

Similarly, it is essential that several federal agencies, especially the U.S. Forest Service and the U.S. Army Corps of Engineers, recognize their important role and responsibility in protecting natural areas along the coast. Almost half of the nineteen areas discussed herein are wholly or partly owned by the federal government, and several of these are within the Dunes National Recreation Area. Although the DNRA was established primarily as a site for public recreation including the use of ORV's, several of the coast's most important natural areas lie within its boundaries. Opportunity is excellent for protecting representative coastal ecosystems, and the sites recommended could be managed in such a way that protection of the elements would be compatible with the primary *raison d'etre* of the National Recreation Area. Such protection would, however, require the curtailment of ORV activity in a few small areas, posting of signs to inform the public of plover habitat and fragile plant communities, and temporary closure of several beach areas during the April-June plover nesting season.

D. The Role of Local Jurisdictions and the Local Comprehensive Plan

The protection of the natural resources which are discussed in this report can be attained through formal or legal designation of lands for natural area use (e.g., acquisition, dedication, conservation easements, etc.) or through the prevention of incompatible land uses. Whereas it is the job of state and federal natural area programs, The Nature Conservancy and other conservation-oriented organizations to implement the first method, the county or city land use planning office will primarily be concerned with the second method.

At present, coastal counties and cities are required to address statewide Goal #5, in addition to Goal #18, which addressess "the need to protect areas of critical environmental concern" within beach and dune formations. Presently, each jurisdiction independently determines which areas contain natural heritage values and which are to receive some form of protection. Conspicuously absent is a statewide or larger review of natural area needs with recommendations based on a continuing inventory of the elements. Furthermore, implementation of protection methods is purely voluntary and depends primarily on the decision-makers and their planning staffs. Consequently, direct communication between the inventory process and the implementation mechanism is badly needed.

1. A Procedure for Local Involvement in the Identification and Conservation of Critical Biological Species and Habitats

The following recommendations, if followed by a county or city planning authority, will assist the jurisdiction in evaluating critical habitat values of lands under consideration. It is strongly suggested that such an analysis be conducted in cooperation with the State Natural

Heritage Data Bank since the relative value of one site must be considered in relation to other examples of the same or similar habitats throughout the state.

It is suggested that the planning authority maintain, or have access to, staff trained to conduct the necessary investigations[1]. Specifically it is suggested that:

(1) Each planning department should employ or have access to a staff member adequately trained in the following areas:

(a) The assessment of the biological characteristics of natural land in order to (1) determine the plant communities and aquatic systems according to a statewide classification system maintained by the State Heritage Program, and (2) identify a limited number of special plant and animal species as determined by the State Natural Heritage Program.

(b) The legal and financial methods of land conservation in Oregon, including a working knowledge and relationship with the agencies and organizations which are available to provide specific capabilities and expertise.

(2) Each land use plan should establish criteria and procedures for the determination of the level of significance of critical biological habitats located within that jurisdiction. The following are suggested components of those criteria:

(a) At least two levels of significance should be designated--statewide and local. Statewide significance should be based on consideration of the following factors:

1. Does the site under consideration include quality examples of a plant community or aquatic type, as compared to other examples of that same type on a statewide basis? If the type is not presently represented in a statewide conservation system, any high quality occurrence should be considered for conservation. If conservation does not appear feasible, it should be determined that adequate examples in other areas are available for conservation.

2. Does the site include a special plant or animal

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[1]Such expertise could be available by jurisdiction, or the result of sharing by jurisdictions such as through a Council of Governments or by other intergovernmental agreement.

species? If so, the status of that species should be determined on a statewide basis and the relative importance of the site under consideration for maintenance of a healthy population of that species should be assessed. If that site is important, all necessary action should be instituted to conserve the site through voluntary means.

(b) Local significance should consider, in addition to the above, the relative quality of that site for environmental education and nature interpretation. This consideration should include an analysis of the naturalness of the site in relation to other areas within easy travel distance of local schools and population centers. Such determinations of local significance should be made by the planning department with the assistance of the science departments of local high schools and local citizens.

(3) Each county and city land use plan should include a listing of the plant communities, aquatic types and special species which are known to occur in that province, and information about known examples of those types. All lands which are currently being protected should be designated as such in the plan.

(4) A staff member of each planning authority should establish and maintain contact with the agencies and organizations which can provide assistance in land conservation when needed. A close contact, both to share data and develop conservation strategies, should be maintained with the staff of the State Natural Heritage Program.

2. Use of the Site Investigation Report in the Identification and Conservation of Critical Biological Species and Habitats

It must be recognized that not all areas containing significant elements of Oregon's natural heritage have at this time been identified, nor is it reasonable to assume that all jurisdictions will have the benefit of trained and knowledgeable staff. Therefore a method which jurisdictions can use for privately owned lands is the requirement for a site investigation report for new development. Such a report should specifically address the potential impact of the development on critical biological species and/or habitats. One question that should be asked is "Has the site been investigated to determine whether the proposed development would seriously affect or destroy coastal plant or animal species known to be rare, or unusually good examples of coastal ecosystems, including plant community and aquatic types?". If critical biological habitats are identified, they should be surveyed by a competent scientist, and the significance of their occurrence should be compared to the state as a whole.

The responsibility for showing that the proposed development does not seriously impact any critical biological habitats should lie with the developer rather than with the decision-making body. It may be desirable to develop a process whereby any proposed coastal development would be investigated (with approval or denial recommended) by a biologist or other person knowledgeable of coastal critical habitats and under contract to the developer. The person doing the investigating should be in close contact with other inventory efforts in Oregon to ensure that a larger-than-local assessment of the development's impact can be made. Depending upon the results of such investigations, the appropriate agencies or organizations which may be able to assist in the conservation of a particular area should be contacted. Ultimately, the effectiveness of the entire process will depend in great part on the conscientious scrutiny of the local planning body--conflicts are least destructive when they are identified and addressed at an early stage, before a developer has invested heavily.

3. Open Space Lands Tax Assessment

In addition to the various methods of identifying and preventing conflicts between development and conservation, a jurisdiction should encourage and assist landowners who wish to conserve the natural values on their lands. Oregon law provides for the reduction in assessed value for lands which are committed to open space uses (ORS 308.740-.790). This law has been rarely used, due primarily to lack of familiarity with its provisions. It is recommended that jurisdictions better publicize the availability of this option and its benefits.

The Open Space Lands Tax Assessment Law provides for tax reduction on lands which are approved as worthy of special consideration because of their value to the public as open space. Application for this special assessment is made to the county assessor, and the benefits of preservation are weighed against the potential loss of revenue. However, applications may not be denied solely because of potential revenue loss, if the preservation of the lands will:

(1) conserve or enhance natural or scenic resources;

(2) protect air or streams or water supplies;

(3) promote conservation of soils, wetlands, beaches, or tidal marshes;

(4) conserve landscaped areas, such as public or private golf courses, which enhance the value of abutting or neighboring properties;

(5) enhance the value to the public of nearby parks, forests, wildlife preserves, nature reservations, sanctuaries, or other open spaces;

(6) enhance recreation opportunities;

(7) preserve historic sites; or

(8) promote orderly urban or suburban development.

The lands remain so classified until either a request to withdraw them is made by the landowner or land use has been changed to other uses not allowed under this classification. If Open Space Lands are declassified additional taxes equal to those at which the land would have been assessed, plus interest, are imposed on the land for each year the land was classified as Open Space. This method encourages preservation of undeveloped land by providing a tax break, but it does not stipulate any specific requirements for the preservation of natural values. As such, it can be considered only an interim form of protection at best. Depending on the specific situation, the landowner, and the natural values at the site, it may be entirely adequate as a natural area preservation method in the absence of stronger forms of protection.

IX. ADDITIONAL INFORMATION SOURCES: THE NATURAL HISTORY AND BIOLOGY OF BEACHES AND DUNES

Beaches and dunes are exciting areas because they are so dynamic. Environmental forces converge here to drastically affect the interactions between plants and animals, and between all life forms and their environment. For this reason, the coasts long have been favorite study areas for biologists and ecologists, and the natural history of the coastal beaches and dunes has been well-described in the technical and popular literature. No description will be added here. Instead, brief comments will be made on a few of the most useful references.

Al Wiedemann's book, Plants of the Oregon Coastal Dunes (Wiedemann, 1969) remains the single most useful and eminently readable layman's reference to date. It is being revised and expanded, with nomenclatural changes being made also. Half of the book describes succession in the coastal dunes--the inexorable changes in vegetation which occur through time if an area remains undisturbed. The other half of the text is a fieldguide to coastal plants, with keys, brief descriptions, and photographs. The book is an outgrowth of Wiedemann's earlier work on the plant ecology of the Oregon coastal sand dunes (Wiedemann, 1966).

Amos (1959) describes the natural history of the dunes in a widely available magazine article. He discusses many of the adaptations which plants and animals must have to survive the harsh environmental extremes of wind, salt spray, dessication, and temperature fluctuation.

Barbour et. al., (1973) have written an entire book about Bodega Head, a much-studied and once-controversial headland north of

San Francisco, in which they present an interesting account of the strand and dunes. Considerable technical information is presented in a way that any amateur naturalist can understand.

Those persons interested in identifying the plants of the dunes will wish to use Wiedemann's book (mentioned previously) and Munz's Shore Wildflowers of California, Oregon, and Washington (Munz, 1964). Eventually however, the plant enthusiast will need to turn to the standard floras, especially to Hitchcock and Cronquist (1973); Hitchcock et.al., (1955-1969); Abrams and Ferris (1923-1960); and Peck (1961). The coastal flora is not unusually complex or large, and by using the popular books mentioned above, the amateur can become familiar with most of the plants to be encountered in Oregon's beaches and dunes. The usual exception to this would be the grasses and "grasslike" plants, the sedges, and rushes.

The most comprehensive study of dune morphology has been that by Cooper (1958). He subsequently published a similar book on the California dunes (Cooper, 1967), and although neither of these books contains much information on plant and animal life, both contain a wealth of material on coastal physiography and dune succession. They are excellent background reading for anyone with an interest in dune natural history.

Many other documents have been published describing the plant communities and succession in the coastal dunes; some of these, in chronological order, are:

House (1914)

Egler (1934)

Cooper (1936)

Oosting and Billings (1942)

Byrd (1950)

Hanneson (1962)

Kumler (1963 and 1969)

Franklin and Dyrness (1973)

Macdonald and Barbour (1974)

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APPENDIX A

The Nature Conservancy's Background in Natural Area Inventory and Preservation

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Since the Conservancy was founded in 1950, it has devoted much effort to the acquisition of ecologically significant land. To date, this activity has led to the preservation of land in over 1800 projects in 48 states, Canada and the Caribbean totalling over 1,200,000 acres.

However, the organization's real origins go back to 1917, when a special Committee for the Preservation of Natural Conditions was established within the Ecological Society of America. The Committee's purpose was to inventory the remaining natural areas and ecosystems of the United States, and ultimately to preserve them. In 1926, the first product of this effort appeared in the publication of A Naturalist's Guide to the Americas. Several subsequent publications by Committee members extended the scope of this initial volume.

When it eventually became apparent that the Ecological Society could not be an effective force for actual preservation, the Committee split off to become the nucleus of the Nature Conservancy, but the inventory effort did not end. Through its staff, Board of Governors, and members, the Conservancy has continued its inventory activity and has played a major role in almost every significant ecological or natural area inventory conducted in the country.

The Conservancy in the last several years has initiated inventories of the coast of Maine, the Chesapeake Bay, Minnesota, the prairie biome, and the San Juan Islands. It has actively participated in the International Biological Program's Conservation of Ecosystems survey, the Federal Research Natural Areas program, the New England Inventory, the Reconnaissance Inventories of the Army Corps of Engineers, the Institute of Ecology's Survey of Experimental Ecological Reserves, the National Oceanic and Atmospheric Administration's search for estuarine sanctuaries, and a number of lesser efforts throughout the country.

The Conservancy has also been the chief advocate of the creation of a national natural areas data bank to collect and to synthesize all of this information as part of a National System of Ecological Preserves. Largely through these efforts, the Smithsonian Institution founded its Center for Natural Areas in 1972 (now a separate corporation). A year later, the Conservancy, the Center, and the Army Corps of Engineers Agency for Resource Inventories organized a conference which brought together specialists from all over the nation. The conference was to coordinate efforts toward the creation of a national network, and in furtherance of this, the Conservancy began a pilot project for development of a national data bank and registry in cooperation with

the Center and the International Biological Program.

The result of this experience has been a marked improvement of the effectiveness and comprehensiveness of the natural area inventory process, through the initiation of State Natural Heritage Programs in the states of Tennessee, Mississippi, South Carolina, North Carolina, New Mexico, Ohio, West Virginia, Oklahoma, Washington and Oregon and in the region managed by the Tennessee Valley Authority. In order to provide coordination of these programs and to continue the development of improved methodologies, the Conservancy maintains an interdisciplinary task force in its national office, including experts in the biological sciences, data management, computer programming, and the legal aspects of land preservation. This task force assists each state Heritage Program in initial set-up, inventory, early operation, and the eventual movement of that Program into state government. From the beginning, the Nature Conservancy has believed that Heritage Programs should become the responsibility of the people of each state; the participation of the citizens and agencies of that state is essential to an effective Heritage Program.

The Oregon Natural Heritage Program

A Conservancy chapter of volunteers was founded in 1956 and secured its first preserve, Cascade Head, in the same year. The Northwest Office of the Conservancy was established in Portland in 1972. In 1973, with private funding, the Northwest Office initiated the Oregon Natural Areas Inventory of private land. Initially it was designed to assist the Conservancy in setting land acquisition priorities. A pilot inventory of Clatsop County was produced in 1974 and culminated in the Clatsop County Inventory of Natural Areas on Private Lands.

The need for natural area data by the growing land-use planning effort, the development of data collection and management methodologies by the Conservancy's National Office, and the need for coordination of information on all land ownerships, led to the establishement of a state-funded OREGON NATURAL HERITAGE PROGRAM. Funding initially came from a State Parks Branch contract from January 1975 to October 1975, which resulted in the publication of Natural Areas Identification and Protection. A LCDC contract from October 1975 to January 1977, and a second contract from October 1977 to April 1978, led to the creation of the present natural heritage data bank, the publication of Oregon Natural Areas Data Summaries on a county basis, and the establishment of an Oregon Land Protection Office to implement the inventory.