W.P.

Oregon's Coastal Beaches & Dunes:

Uses, Impacts

&

Management Considerations

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*

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OREGON'S COASTAL BEACHES AND DUNES:

IMPACTS, USES AND MANAGEMENT CONSIDERATIONS

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PREFACE

The following report presents the results of an in-depth analysis of appropriate uses and potential impact of activities within beach and dune areas as conducted by the Oregon Coastal Zone Management Association, Inc. 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.

This report was prepared by Carl A. Lindberg, OCZMA Beaches and Dunes Study Team Project Director and Christianna Crook, OCZMA Beaches and Dunes Study Team Research Associate, with assistance from other Study Team members composed of Wilbur Ternyik, Project Coordinator, Arlys Bernard, Project Secretary, and Kathy Fitzpatrick, Project Administrator.

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The determination of appropriate uses is the final planning procedure identified within the Oregon Beaches and Dunes Goal. After completing inventories of existing beach and dune types and characteristics, coastal jurisdictions are then directed to:

> "establish policies and uses for these [beach and dune] areas consistent with the provisions of this goal." (LCDC, 1977)

Furthermore:

> "Uses shall be based on the capabilities and limitations of beach and dune areas to sustain different levels of use or development, and the need to protect areas of critical environmental concern, areas having scenic, scientific, or biological importance, and significant wildlife habitat." (Ibid)

The purpose of this report is to provide extracts of information from a wide range of sources that focus both on the impact of uses in beaches and dunes and on considerations for designing such uses so as to minimize negative impacts on the beach and dune systems. However, it is important to note that when planning for beach and dune areas, attention must be given to Oregon's eighteen other statewide planning goals prior to making the ultimate determination of appropriate land uses for land parcels. In other words, after a beach and dune area is determined to be urban or rural (Goal #14-Urbanization) planned for general land use categories (Goal #3-Agricultural Lands, Goal #4-Forest Lands, Goal #5-Open Spaces, Scenic and Historic Areas, and Natural Resources, Goal #8-Recreational Needs, Goal #9-Economy of the State, Goal #10-Housing, and Goal #17-Coastal Shorelands), then other considerations (Goal #6-Air, Water and Land Resources Quality, Goal #7-Areas Subject to Natural Disasters and Hazards, Goal #11-Public Facilities and Services, Goal #12-Transportation, Goal #13-Energy Conservation, Goal #16-Estuarine Resources, and Goal #18-Beaches and Dunes) are applied to determine the necessary or appropriate levels of uses and supporting services.

Rather than portray uses which are generally appropriate for various beach and dune formations utilizing a matrix, it was felt to be more valuable to present the rationale for why various uses and activities are, or are not, appropriate for beach and dune areas. Matrices have been prepared in the past, however, to assist with appropriate location of activities within Oregon's coastal beaches and dunes, and are included in Appendix A preceded by a conversion table which correlates the various dune classification systems developed to date. Additionally the USDA Soil Conservation Service soil interpretations for active dune land, stabilized dunes and older stabilized dunes is included in Appendix B. Actual implementation of various dune

designations and associated permissible activities may be enunciated within the local comprehensive plan policies, be addressed within implementing ordinances, and/or be reviewed on an individual basis utilizing site investigation report requirements.

II. MAJOR USE OR ACTIVITY

A. Agriculture and Forestry

Agriculture and forestry practices can have direct impact(s) on sand stabilizing vegetation as well as on the quality of surface and groundwater in beach and dune areas.

Considerations:

1. Forestry

1. All logging activities should be performed in such a manner as to protect sand stabilizing vegetation (Clark, 1977, p. 377).
2. Buffer strips of natural vegetation should be required along coastal beach and dune systems and water bodies (Clark, p. 377).
3. Slash burning should not be allowed in active or surface stabilized dune areas due to the possibilities of vegetation destruction and subsequent sand activation (Ternyik, 1978).

2. Agriculture

1. Farm operations should be monitored to protect beach and dune vegetation and groundwater from damage by fertilizers, biocides, erosion, altered runoff and sedimentation (Clark, pp. 291-296).
2. The grazing of domestic animals on foredunes should be prohibited to minimize damage to stabilizing vegetation.

B. Residential Development

The demand for shorefront residential property is constantly increasing. The residential land buyer seeks only a small parcel for which many are willing to pay dearly. In the past, residential subdivisions have been approved with little regard for natural beach and dune processes. As these developments begin to fill in, and as developmental pressures increase, the impact on beaches and dunes accelerates producing potentially deliterious results (Olsen and Grant, 1972, p. 39).

Considerations:

1. Residential development should be prohibited from locating in foredunes because they are subject to wave overtopping and/or undercutting.
2. Residential development should be discouraged from locating in deflation plains because (1) they are commonly subject to flooding, and (2) they have naturally high water tables.
3. Residential density should be based on the carrying capacity of the site and adjoining area, and should take into consideration the aesthetic qualities of the site. The carrying capacity would be a function of the physical and biological characteristics of the landform as addressed in a site investigation report or as identified during the inventory process.
4. Residential development should ensure access to beach areas. Public rights-of-way should be designed at frequent intervals and should be posted (Clark, p. 270; Olsen and Grant, p. 39).
5. Residential development proposed for flood prone areas must comply with the federal flood insurance program if the jurisdiction is a participating entity. Non-participating jurisdictions should have authority to regulate housing within flood prone areas to minimize structural damage and water pollution problems.
6. In areas of known geologic hazard, special constraints such as set-backs, etc., should be developed to minimize unnecessary protection programs. Where beachfront protection measures cannot be avoided, beach protection programs for existing waterfront development should be incorporated into a comprehensive, coordinated plan and not left up to individual waterfront residents (Battelle, 1971, p. I-35; Clark, p. 477).
7. Because the Oregon Department of Transportation, Parks and Recreation Branch, has jurisdiction over beachfront protection only in areas west of the beach zone, local jurisdictions may wish to enact provisions giving them authority to regulate beachfront protection structures outside DOT's purvue. Additionally, jurisdictions should coordinate closely with DOT on permit issuance for beachfront protection structures to ensure compatibility with adjacent areas.
8. Jurisdictions should consider designating areas for cluster developments designed so as to maximize open space in sensitive beach and dune areas (Battelle, p. I-34 and I-36).

C. Commercial Development

Commercial development along the Oregon coast provides general retail/wholesale services to developed areas and often is associated with tourist-related development. Such development can become a problem when it reaches concentrations that preclude other necessary and desired uses that seek or require an oceanfront location within a beach and dune area or when it is located in hazardous areas (Olsen and Grant, p. 40).

Considerations:

1. Commercial uses of beach and dune areas which do not require or are not substantially enhanced by an oceanfront location should be discouraged (Olsen and Grant, p. 40).
2. Land use controls should place limitations and standards on oceanfront commercial development consistent with the Shorelands Goal.
3. Commercial development should be prohibited from locating in foredunes because they are subject to wave overtopping and/or undercutting.
4. Commercial development should be discouraged from locating in deflation plains because (1) they are commonly subject to flooding, and (2) they have naturally high water tables.
5. Attention should be given to the various impacts of locating commercial development within dune areas. Such impacts include: aesthetic, pedestrian, parking lots and roads, etc. Additionally, plans should address dune stabilization and maintenance.

D. Industrial Development

For the most part, industrial development along the Oregon coast is related to agriculture, fisheries and timber. Most of these industries are located in conjunction with operating ports and transform raw materials into semi-finished materials.

Considerations:

1. Water-dependent industry should be located within or adjacent to areas presently occupied and committed to industrial use wherever possible (Clark, p. 392). Such areas should include room for expansion of industrial facilities.
2. A site investigation report should address potential impact(s) in ecologically sensitive areas. Likewise, the site investigation report should consider possible impact(s) on dune landforms such as (1) reactivation, (2) pollution of groundwater from chemical and industrial effluent (sand is a poor filtering agent for such compounds), and (3) groundwater withdrawal if appropriate. Additionally, development plans should address dune stabilization and maintenance.

E. Recreational Activities

Recreation is a necessary and valuable use of the beach and dune areas of the Oregon coast. Recreational pressures on the coast have doubled in the last decade; tourism has become the number three industry in the State. The State's coastal park and wayside day user count for 1978 exceeded twelve million people. The coastal jurisdictions containing these recreational attractions face continuing demands on the limited natural resources.

Considerations:

1. Recreational use in surface stable, conditionally stable or active prone dunes should be limited if it is the desire to maintain stable landforms. Access to beaches and dunes which traverse sensitive areas should be provided via raised boardwalks. Paved trails and parking lots are not suitable for unconsolidated sand areas as they are susceptible to inundation and undermining due to deposition and erosion activities. Access areas should be posted with explanations describing the importance of limited access routes.
2. Jurisdictions may wish to consider regulation of driftwood fires adjacent to beach grass areas to avoid destruction of beach grass resulting in reactivation of unconsolidated sands and possible erosion of sand in areas of human habitation.
3. Federal, state and local jurisdictions should cooperate to develop efficient traffic flow patterns, parking arrangements and policing requirements for areas on and adjacent to beach and dune areas, especially parks and access areas (Olsen and Grant, p. 40). This is especially important in areas of off-road vehicle use.
4. Multiple use of an area by clustered compatible recreational facilities should be encouraged to permit joint use of ancillary facilities and provide a wide range of recreational choice among users. Such clusters should not overload the carrying capacity of the area (Battelle, p. I-3).

F. Sand and Driftwood Removal

Indiscriminate removal of sand (for mining or mineral extraction) or driftwood from the beach and dune area can disrupt the natural system and initiate or accelerate erosion. Removal of driftwood diminishes the amount available for incorporation in, and frontal protection of, the foredune resulting in increased vulnerability of the foredune to erosion.

Considerations:

1. Tourists and residents should be informed of the protective qualities of driftwood in foredune stabilization. This could be accomplished through the posting of information signs (Phipps and Smith, 1977, p. 44). Additionally, citizens and jurisdictions should be aware of the Oregon Department of Transportation's Beach Log Removal Policy (Appendix C) which regulates removal of driftwood for commercial endeavors. Through the state's coordination program between local governments and state agencies as required by the Land Conservation and Development Commission, jurisdictions should participate as appropriate in reviewing such permit requests.
2. When sand removal activities are proposed, the accompanying site investigation report should address the following potential impacts (Lindberg, 1979):

   a. sand flow patterns
   b. sand formed lakes
   c. groundwater supplies
   d. aesthetics
   e. wildlife habitats
   f. adjacent property and associated structures.
3. Development plans should address site reclamation, dune stabilization, and maintenance. While the Department of Transportation, Division of State Lands and Department of Geology and Mineral Industries all bear some responsibility for sand removal activities, their mandates are limited. Therefore, jurisdictions may be well-advised to develop techniques allowing them the opportunity to regulate sand removal activites falling outside the scope of legislative mandate. Further, jurisdictions should consider coordination with the appropriate state agencies in the review of sand removal activities affecting their locale.
4. Jurisdictions should endeavor to ensure the safety of residents and workers in areas of sand removal by requiring the maintenance of moderate slope within excavation sites.

G. Fish and Wildlife

There are many areas of significant wildlife habitat in beach and dune areas. Although the stabilized dune forests contain the greatest species diversity, deflation plains and wet interdune areas provide unique habitat values (Burley, 1978; Pinto, et al., 1972).

Considerations:

1. The beach and dune nesting and breeding habitats should be protected during identified breeding and nesting seasons by temporary restriction of access wherever possible (Clark, p. 34; The Conservation Foundation, 1977, p. 111). (For example, pedestrian and vehicular traffic should be limited during the nesting season of the snowy plover [April - June] in appropriate beach areas.)
2. Site investigation reports should be required for developments proposed near identified critical habitats to assist in evaluating development impact and in modifying design criteria as appropriate.
3. Attention should be given to the enhancement and/or restoration of fish and wildlife habitats, particularly with regard to deflation plain areas (e.g., seeding to provide improved food and habitat for migrating and resident waterfowl).

III. ACCESSORY USES OR ACTIVITIES

A. Transportation

Transportation includes roadways (vehicular and rail), pedestrian and equestrian paths and accesses. Such traffic can disrupt the dune vegetation resulting in activation of unconsolidated sands and erosion. Additional problems associated with transportation include trespass, litter and vandalism.

Considerations:

1. In areas of unconsolidated sand, foot traffic should be serviced by wood walkways, preferably elevated (Clark, p. 270; Koppelman, 1978, p. 98). Vehicular traffic should be serviced by wood or paved roads and protected by vegetation (Clark, p. 270).
2. The use of common access pathways over dune areas by shorefront property owners should be encouraged.
3. Control the number of vehicle access points to beach areas and select access points which can maintain the natural form and profile of the beach and dune so impacted (Ruef, 1975, pp. 20-21).
4. Identify existing public access points to the beach and post these routes with explanations as to why such paths are necessary (Olsen and Grant, p. 29).
5. Provide adequte parking, disposal and sanitary facilities at heavily used access points (Olsen and Grant, p. 29).
6. Establish clear responsibility for beach litter removal and vandalism repair (Office of Coastal Zone Management, NOAA, and Department of Natural Resources, Commonwealth of Puerto Rico, 1978, pp. 88-89). Provide litter and vandalism reduction methods including (Office of Coastal Zone Management, NOAA, and Department of Natural Resources, Commonwealth of Puerto Rico, pp. 88-89; Olsen and Grant, p. 29):
    a. persuasion: there should be a continuing public education campaign.
    b. assistance: trash containers should be placed at beach access points, convenient to the public; arrangements for emptying should be made.
    c. enforcement: anti-litter and anti-vandalism laws should be enacted and strictly enforced by cooperation between appropriate local, state and federal agencies.
7. Roadways should not impinge on floodplain areas except under strict environmental constraints, such as elevated causeways to allow for movement of flood waters.
8. Roadway design should not require inordinate amounts of landfill. The natural water flow should be maintained through the use of culverts and bridges.
9. Roadways should be planned and located so as to avoid encroachment by dunes.

B. Beachfront Protection and Management

It is a natural process for sand to erode from dune and sea cliff areas. Such erosion acts to replenish beaches which are the first line of defense from storm wave attack. Consequently, protecting dunes and cliffs from erosion in one area will necessarily result in beach starvation and associated erosion problems in another. The problems and impacts of beachfront protection strategies are well explained in the Oregon Soil and Water Conservation Commission's two volume work, "Oregon Coastal Management Program: Shoreline Erosion Management Policies and Procedures," (1978). Additional information on beachfront protective devices and their impacts can be obtained from the Oregon Department of Transportation and the U.S. Army Corps of Engineers, both of which maintain regulatory authority for placement and design of such activities under certain conditions (Appendix D).

Considerations:

1. Federal, state and local agencies with shoreline construction permit and review powers should consider removal or modification of protective structures when such structures are not performing their intended functions (Koppelman, p. 103).
2. Design coastal erosion protection plans so as to allow, to the maximum extent possible, the continuation of natural geomorphic processes responsible for the maintenance of coastal landforms. It should be recognized, however, that such plans for culturally manipulated and developed shorelines may result in an adjustment of the natural processes (Koppelman, p. 96). Such coastal erosion protection plans should be developed on the basis of shoreline type, use and extent of cultural development.
3. Emphasis should be directed toward non-structural solutions to erosion control problems; structural solutions should be advanced only as supplements to a non-structural program and where there is no other alternative (Clark, p. 322; Koppelman, p. 97).
4. Jurisdictions may want to enact provisions giving them review authority for beachfront protection activities outside the purvue of the Oregon Department of Transportation and/or the U.S. Army Corps of Engineers. In some instances, jurisdictions may want to adopt certain minimum standards for beachfront protection, similar to those of ODOT and the Corps, or may wish to require certification of protection activities from a registered engineer at the developer's expense.

C. Groundwater, Sewage Disposal and Other Utilities

For the most part, human development activities require a range of support activities generally labelled as utilities. These utilities include such services as public water and sewer, telephone, electricity, natural gas and cable television. In some areas, water and/or sewage disposal is handled on site.

The placement of utility lines either above or under ground can accelerate erosion at the site if stabilizing vegetation is not properly replaced. Furthermore, temporary stabilization practices should be used during construction. Buried lines are vulnerable to wind or wave excavation at any time in the future should stabilizing vegetation be destroyed or not maintained. Other development problems, such as flooding, flotation and failure of subsurface structures, can be encountered in areas of high water tables (Crook, 1979). Some quicksand areas occasionally occur in high water table areas resulting from subsurface hydrostatic pressure and the precipitation of sand into ponded sites. The construction of underground utility lines parallel to the beach may harrass or eliminate wildlife species and habitats. Construction activites in general can harrass snowy plover if conducted during periods of nesting (April - June). Harrassment of deflation plain wildlife will also result from construction adjacent to foredunes, within the deflation plain, or in adjacent hummock dune areas. Finally, utility lines located above ground are not compatible with the natural landscape and can be detrimental to the enjoyment of the scenic values characteristic of beach and dune areas.

On site water and sewage disposal require additional consideration. High density development dependent on local wells could deplete the groundwater table and damage or kill surface stabilizing vegetation; saltwater intrusion may destroy stabilizing vegetation as well as contaminate the water supply (Ruef, p. 19). Domestic wastes in sufficient volumes can lead to eutrophication of dune lakes and marshes and may contaminate the limited groundwater supply including wells. Dune sand manifests some serious limitations as a medium for septic tank drainfields. While bacteria are adequately filtered by sand, viruses, non-natural chemical compounds, and nitrate nitrogens may not be adequately dealt with. Subsurface facilities should avoid areas of high water table. Flooding, flotation, uneven settlement, and rupture of structures is likely to occur. Further, the potential for septic tank failure is extremely high at such sites.

Considerations:

1. Utilities
   a. All utilities should be located under ground wherever possible.
   b. Utility easements should be permitted and timed to coordinate with site preparation and construction.
   c. Areas of quicksand and high groundwater tables should be avoided.

2. Water Supplies
   a. Piped water should be provided whenever possible (Clark, p. 268).
   b. When permitting private wells, the water table level necessary to sustain the stabilizing vegetation and prevent saltwater intrusion should be determined and water withdrawals limited accordingly. Controls on groundwater withdrawal should be addressed in a comprehensive water management program where appropriate (Battelle, p. I-16; Brower, et al., 1976, p. 37; Beaulieu & Hughes, 1975, p. 58; Clark, pp. 269 & 384; Ruef, p. 21; Schlicker, et al., 1974, p. 87).
3. Sewage Disposal
   a. A municipal sewer service should be used whenever possible.
   b. Sewer lines should not be located so as to be vulnerable to storm wave action.
   c. Residential density should be contolled when sewer service is not provided (Clark, p. 269).
   d. Septic tank systems should be located and maintained so as to avoid water pollution (Ruef, p. 21; Clark, p. 502).
   e. Septic tank systems should be installed only when the highest annual groundwater level is at least six feet below the absorption field. (Refer to Oregon Department of Environmental Quality subsurface sewage disposal systems for further information.)

D. Site Preparation and Construction

Man-made changes to a site are considered under this broad topical category to be one of three activities:

(1) Activities related to studying, analyzing and siting the development prior to development. Such activities include exploration, investigation, surveying and site planning. For the most part these activities are accomplished on foot with a minimum impact on the site.
(2) Activities relating to preparing the site for development such as clearing, grading, excavating and filling. These activities can affect the entire site and beyond, and generally are accomplished with the use of heavy, earth moving machinery.
(3) Activities relating to the actual construction that most developments have in common, such as stock piling of construction materials, traffic of construction personnel and equipment, and the construction of foundation and vehicle access and parking.

The construction of any development typically requires that the natural setting be modified in preparing the site. When preparing a site on a sand landform the actions involved often destroy the stabilizing vegetative cover exposing the underlying sand to the forces of erosion.

This erosion weakens the structure of the sand landform and decreases its value as a sand reservoir and buffer (Olsen and Grant, p. 31). Examples of specific actions and impacts are:

(1) The lowering of foredune increases the washover potential, salt spray kill-off and wind erosion;
(2) The disruption of dune vegetation can result in destabilization and blow-outs.
(3) The construction on certain foundations in this windblown environment may cause erosion/accretion activities similar to those of jetties by having sand accumulate on the lee side and eroded on the windward side. Certain alignment of structures may also alter wind flows causing similar erosion/accretion activities in the immediate vicinity.

The exact design of a development should be consistent with the features and limitations of a particular site. Additional information on elevated residential structures is available in "Elevated Residential Structures," (U.S.D.H.U.D., Federal Insurance Administration, 1977).

Considerations:

1. The potential impacts of erosion and accretion should be considered within the framework of the site plan (Koppelman, p. 105).
2. Developers should be required to obtain the advice of a qualified sand expert concerning minimizing the impact of the proposed development by the use of erosion control measures, such as stabilization and improved site designs (Koppelman, p. 71).
3. Schedule construction phases to avoid critical periods of hazard (storm season), important biological activity (snowy plover nesting season) and other impacts (excavation during planting season) (Clark, p. 268; Ruef, p. 20; Ternyik, 1978).
4. Restrict construction to areas inland of the foredune; where construction is permitted or exists in the foredune area, require planting and concomitant maintenance of open sand areas (Clark, p. 268; Schlicker, et al., 1973, p. 132; Ternyik, 1978).
5. Provide technical assistance and convenient information on sources of beach grass and other stabilizing measures to property owners (Clark, p. 268; Olsen and Grant, p. 31; Ternyik, 1978).
6. Require additional stabilization around existing and proposed development when needed to avoid hazard (Clark, p. 268; Olsen and Grant, p. 31).
7. Encourage secondary plantings in areas where beach grass has been used for initial stabilization to reduce fire hazards and subsequent erosion potential.
8. Review the cumulative impact of the linear arrangement of structures along the shoreline. Such alignments could lead to large scale variations in the local dynamics of ground level airflow that could likely have negative erosive effects on adjacent areas (Ruef, p. 20).

9. Exercise strict controls on erosion during site preparation and construction (Clark, p. 534). Buffer strips of natural vegetation and artificial temporary stabilization retention systems should be used to control erosion (Clark, p. 535). Ground surfaces should be stabilized immediately after any action that destroys or removes the vegetative cover and leaves the underlying unconsolidated sands exposed to erosion (Clark, p. 537; Ruef, p. 20).
10. Buildings should be built on inactive dunes, and then only if sand movement patterns and vegetation are not seriously affected. Disturbance to the surface should be minimized and stabilizing vegetation should be established and maintained (The Conservation Foundation, pp. 95 and 109).
11. The filling or draining of wetland areas in deflation plains should be restricted due to loss of wildlife habitat, water problems, and associated construction problems. If deflation plains are drained, it is likely that wetland vegetation will no longer be able to survive, and erosion potential will be increased due to wind scouring of the area.
12. Restrict development on beaches, foredunes and deflation plains. Establish building setbacks based on topographic, geologic, and meteorologic characteristics. Setbacks should be entirely landward of the shifting foredunes. They should also be far enough inland to allow for the recession of the shoreline. Development in areas of eroding shorelines should be set back to allow for safe occupancy of the structure during its estimated life. Setback requirements should not be relaxed without a favorable site investigation report in those instances where new structures are proposed at sites along a partially developed shoreline. Existing structures located seaward of the setback line should be designated as non-conforming and criteria and regulations should be developed to limit reconstruction, and/or expansion when the structure is damaged or destroyed.
13. The adverse impacts of sand erosion and accretion can be minimized by restricting developments and topographical alterations in areas of high wave and wind energy. Site investigation reports in beach and dune areas should include consideration of:

    (1) the potential for wind and wave erosion and deposition;
    (2) foundation specifications; and,
    (3) sewage disposal.

    Prospective developers and buyers should be informed of the hazard potential; a disclosure of all known hazards and likelihood of obtaining building permits should be made available to all potential purchasers of land within foredune and deflation plain areas (Beaulieu, and Hughes, 1975, p. 109; Koppelman, p. 98; Olsen and Grant, p. 31; Schlicker, et al., 1972, pp. 128-130; Schlicker, et al., 1973, p. 132; Schlicker, et al, 1974, p. 53).

14. In areas of older dunes containing iron or clay banding and/or buried soils, ponding, high water table, septic tank failures, and slumping are common problems which must be addressed and dealt with.

E. Stabilization and Restoration

Restoration and stabilization programs may be desired to:

(1) stabilize a site prior to, during, or following construction;
(2) to repair storm damage in foredune and deflation plain areas;
(3) to enhance and maintain an area undergoing constant impact such as a park or an area that was developed some time ago without regard for the need to maintain control over moving sands.

Considerations:

1. Stabilization activities within active sand areas to accommodate construction should always be encouraged if the construction activity is within the limitations of the local comprehensive plan. However, it should be noted that attempts to build dunes to unnatural heights or in unnatural configurations can be counter-productive as such features may interfere with, rather than facilitate, natural processes (The Conservation Foundation, p. 97).
2. Stabilization should be performed within accepted planting seasons, utilizing accepted planting procedures and followed by an accepted maintenance schedule (Ternyik, 1979). Again, the adequacy of stabilization proposals should be evaluated within the site investigation report.

F. Aesthetics and Design

The greatest attraction of the beach and dune areas is its natural scenic beauty. Therefore a real concern is the impacts of developments on this basic attraction (Ruef, p. 21). "High-rise buildings built adjacent to a beach were found to be physchologically dominating thus detracting from the beach's appeal as a natural recreation site. A subjective element to determine when buildings dominate beaches by their height was found. Because of an individual's normal cone of vision, a building set back 2.5 times its height would not appear to confine or dominate the beach." (Office of Coastal Zone Management, NOAA, and Department of Natural Resources, Commonwealth of Puerto Rico, 1978, p. 83).

Considerations:

1. Setback: The greater the setback for development from beach and dune features (beach, foredune, bluff crest, etc.) the less is the likelihood of adverse aesthetic impact upon all shore users.
2. Height: Generally, the higher the structure (especially ones of rigid geometry), the more prominent and obtrusive it will appear. The most compatible structures would be those of one to two stories in height depending on topography.
3. Spacing: The more uneven and irregular the spacing of dwellings along the shoreline, the greater the degree of harmony with the natural setting. The clustering of dwellings surrounded by open natural areas is suggested.
4. Roof types: Roofs having ridges and slopes best mirror and harmonize with the undulating topography of the coast.
5. Exterior materials and colors: Depending on site conditions and the urban/rural context, exteriors and colors keeping with those associated with or found naturally along the coast are preferable.
6. Site landscape: Natural or re-constructed (following excavation, construction, etc.) dunes can effectively mask low and medium profile structures as well as enhance the natural setting. Site layout of buildings within given property boundaries may be varied to permit the preservation of fragile beach and dune features. Site conditions should be carefully studied to determine optimum plan alternatives. Shore vegetation should be retained for aesthetic, as well as ecological values, and for landform stability (Battelle, pp. I-17 and I-48 to I-53).

G. Off-road Vehicles

All recreational uses of the beach and dune areas can have impacts, but off-road vehicle (ORV) users have a far greater impact than their pedestrian counterparts. The ORV impacts are greater because:

(1) ORVs are of greater weight and power,
(2) the area of impact is multiplied due to the speed and range of the ORV, and
(3) the noise of the ORV's engine expands the real and perceived impact beyond the range of its physical presence.

ORV's have been observed to have the following impacts on beach and dune landforms and ecosystems:

(1) Alteration of the topography of affected dunes by increasing the down slope sand transport.

(2) Loss of stabilizing vegetation due to ORV activity, which in turn leads to increased wind erosion and sand migration. Few vehicle passes are required to begin destroying beach grasses and other plant species. Once removed, other ORV users feel the open area is a "legitimate" trail, and vegetation removal progresses. The loss of stabilizing vegetation is especially critical on the foredune because such activities can leave the foredune susceptible to winter storm wind and wave damage and erosion.
(3) During dry periods on the dunes the fire hazard in beach grass areas is extremely high and the added risk of fires from ORV emission sparks constitutes a likely ignition source (Ternyik, 1978).
(4) Excessive stress may be placed on local wildlife, livestock and residential inhabitants by unruly ORV use (Burley, 1978; Fowler, 1978, pp. 20-22).

Generally speaking, ORV traffic has the least environmental impact when it is restricted to the summer berm and intertidal zone of the beach or to existing open sand areas. ORV traffic also creates problems when it becomes so intense as to interfere with other users. ORV use can be used as a management tool where a stabilized area is planned for re-activation, or active sand landforms are the management objective. The use of ORVs can be a relatively inexpensive and harmless way of removing vegetation, and will negate the need for herbicides and/or other costly mechanical means (Olsen and Grant, p. 28).

Considerations:

1. Work with the ORV recreationalist to select ORV sites and management programs (Fowler, p. 71).
2. The access corridors to ORV areas should be controllable. The capacity to control access is important to:

    (1) limit the density of the users to the carrying capacity of the site for reasons of safety, public health, resource damage, and law enforcement;
    (2) obtain accurate user counts; and,
    (3) facilitate distribution of important information for users (Fowler, pp. 22-27; Koppelman, p. 107; Olsen and Grant, p. 28; Phipps and Smith, p. 42).

3. ORV areas should be chosen with the ability to be delineated by natural or man-made boundaries that are easily recognized and controlled (Fowler, pp. 22-27).
4. ORV activities adjacent to estuaries should be carefully montiored and controlled because such activities can result in deposition of sand into estuaries, and can conflict with habitat values (noise and harrassment). Additionally, ORV activity within estuarine areas should be consistent with the Estuarine Resources Goal and the LCDC Estuarine Classification system.

5. ORV areas, trails and beach access routes should be monitored. If a site exhibits harmful deterioration, the trail or access should be relocated and consideration given to relocation of the activity (Fowler, p. 33; Koppelman, p. 108).
6. During periods of extreme high tide, discourage ORV use of beach areas to prevent ORVs from driving up on the foredune resulting in possible reactivation of stabilized foredune areas (Koppelman, p. 108).
7. Identify nesting areas of birds considered as being a critical resource. Traffic near such areas during breeding and nesting seasons should be discouraged. Warning signs could be posted at least 300 feet from the outer perimeters of such areas (Burley, 1978; Fowler, pp. 20-22; Koppelman, pp. 108-109).
8. Consideration should be given to requiring registration of ORVs, or requiring ORV permits for ORV use within beach and dune areas. This should include fees to be used for beach and dune restoration projects, enforcement costs, and an educational program for ORV users as to their responsibilities toward the sensitivities of the beach and dune environment and other beach and dune users (Fowler, p. 72; Olsen and Grant, p. 28).

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APPENDIX A

Matrices of Uses For Oregon's Coastal Beaches and Dunes

BEACH AND DUNE CLASSIFICATION CONVERSION TABLE

Currently there are three major beach and dune classification systems developed for the Oregon coast. The first classification was produced in 1972 by the Pacific Northwest Region of the U.S. Forest Service. This document was a resource inventory of the Oregon Dunes National Recreation Area and included both a system (called mapping units) of thirty eight classifications and a detailed set of management considerations.

The second system, published in March of 1975 by the U.S. Soil Conservation Service for the Oregon Coastal Conservation and Development Commission, contained thirteen classifications along with two matrix tables demonstrating compatibility and tolerance for managing the use of beaches and dunes.

The third classification system is a product of the Beaches and Dunes Study commissioned by the Oregon Land Conservation and Development Commission and conducted by the Oregon Coastal Zone Management Association in 1979. The system was developed to meet the requirements of the Beaches and Dunes Goal (Goal #18) and local planning needs.

In addition to the aforementioned classification systems, the U.S. Army Corps of Engineers developed a matrix for recreational uses on beaches and dunes of the Pacific Northwest in 1974.

In order to assist local decision-makers, planners and citizens in utilizing the management information generated to date, a classification conversion table is presented in Table 1. Following the conversion table are copies of the three matrices developed to date:

Table 1. Beach and Dune Classification Conversion Table

OCZMA System	LCDC Dune Form Goal Designations	NRA Classification Symbols	SCS Classification Symbols
Beach	Beach	Beach	B
Foredune	Active/recently stabilized	FD	FD, FDA
Interdune Forms			
Deflation Plain	Interdune Forms	"D" Series	WDP
Occasionally Wet Interdune	Interdune Forms	"D" Series	W
Vegetated Interior Dunes			
Hummock	Active/recently stabilized	"H" Series	H
Surface Stabilized	Recently stabilized	"DS" Series	DS
Older Stable Dune	Older Stabilized	"DS" Series	ODS
Parallel Ridge	Recently Stabilized	HWS	IFD
Open Sand Interior Dunes			
Transverse-ridge	Active	"T" Series	OS
Oblique-ridge	Active	OA	OS
Recently reactivated:			
Blow Out	Active	--	--
Parabola	Active	PA	OS

Discussion of Mapping Units Which Include Geomorphic Feature, Plant Community, Wildlife, and Visual Resource Descriptions and Interpretations*

A. Introduction

In this section, a description of each mapping unit with its geomorphic features and physical characteristics, associated plant community(ies), wildlife species, and visual resources can be found. Factors important to management of these units of land are also listed. Following this narrative description are photographs of typical sites, and tables of interpretation for each mapping unit. Each table of interpretation lists the different facilities or activities (i.e., road construction, horse cross-country travel, etc.) which might occur on the unit. The major considerations or limitations that the geomorphic feature, plant community, wildlife or visual resource has upon the facility, use, or activity is briefly listed. To aid the planning team, some possible alternatives or treatments are given to overcome these limitations or considerations. These are a guide or sampling of some alternatives which could be considered and are not intended to be absolute or the only alternatives or treatments! Possible negative results from the specific alternatives or treatments are also given where applicable.

Delineations which encompassed similar geomorphic features, (landforms of similar development or erosional processes), plant communities and the related wildlife habitats were made on aerial photographs. In some cases, a mapping unit has an exclusive plant community; in others the mapping unit has two or more plant communities; or in some instances, a specific plant community grows on different mapping units. Wildlife species are more closely related to the plant communities to the geomorphic features. The delineated areas were coded and briefly described as to their physical characteristics. These, then, served as a basis, or point of reference, for all resource data collection and interpretations. Interpretations important to the management and recreational development of the area were based on an understanding of the processes and interrelationship of the sand supply, shoreline and dune topography, climatic regime, permanent and seasonal water table, vegetation, and wildlife.

In the process of making interpretations, a variety of man-caused activities, facilities or uses were observed, cause and effect relationships were established, and the interpretation and/or predictions of man's activities were then made. Three rating systems for each expected activity, facility, or use, such as road construction or campground developments, were then developed through the observations, interpretations and knowledge of each of the specialists involved.

The physical suitability ratings are based on the physical ability of the geomorphic feature and plant community to absorb the impact of a specific activity, use, or facility. The tolerance ratings are based on the ability of the wildlife or visual resource to withstand the impact of a specific facility and/or man's influence.

*From Pinto, et al., 1972.

These ratings range from 1 (most suitable or most tolerant) to 5 (least suitable or least tolerant).

B. Activity, Facility or Use Elements, Column 1:

1. Road Construction: This is a consideration of the effect of a road upon the land. A double-lane width, hard-surfaced road, resting on a minimal ballast import (5") and/or minimal culvert spacing and designed on less than 4 percent gradient was considered as a standard.

   "Turnpiking" was not considered as basic design but is recognized later as an "alternative or treatment" since it represents added road construction and design costs.

2. Parking Lots: This facility is defined as having paved spaces for no more than 50 cars. In addition to the effect which the parking lot has on the land, the reverse was also considered. Wind direction, deposition, submergence, erosion, etc., were factors that were recognized.

   Parking lots increase people concentrations on adjacent areas. This is reflected by the Human Occupancy - Day Use Activity. Both must be considered when determining the effect of a parking lot.

3. Drainfields: Specifications for drainfields established by county, State and Federal regulations served as the basis for this facility evaluation. Water tables, bedrock and/or impervious layers in excess of 8 feet below the surface were considered as suitable conditions. The contamination hazard of the ground water reservoir or estuary was also considered. It should be emphasized that this facility requires intensive onsite investigations beyond the scope of this inventory.

4. Campgrounds: This facility is defined as an overnite recreation development, exclusive of sanitation features or buildings. Natural vegetation protection and maintenance were also recognized where they applied. Plantings were considered as an "alternative or treatment." The measure of man's influence becomes the impact created by 15 people per acre during a time period of 4 hours or more.

5. Human Occupancy - Day Use: This considers concentrated day use activities and their impact on the land, waters and related resources. The measure of man's influence becomes the impact created by 50 or more people/acre during active period of 1 to 4 hours.

6. Human Occupancy - Pedestrian Access: The impact of pedestrian access, from one point to another, including cross-country and/or trail traffic, and dispersed activity was considered here. The measure becomes the impact created by 5 people per acre during the time period of 1 to 5 hours.

7. Cross-country Travel - Horses: This is defined as saddle horse movement from one point to another. "Trailing" can be expected in the densely vegetated and steeper portions of the area, while dispersion can be expected in the open sand and possibly the deflation plain areas. Where "trailing" was expected, notations were made on each geomorphic-plant community type.

8. Cross-country Travel - Vehicles: It is defined as vehicle movement (particularly Dune Buggies) from one point to another. The tendency for trailing was recognized. The establishment of trails through sensitive or densely vegetated areas was considered only as an alternative or treatment.

9. Buildings, Continuous Foundation: These are defined as being one-story, wood frame structures secured to a concrete or similar foundation.

10. Buildings, Pole Foundation: These are defined as being similar to above except secured to poles or stilts.

11. Powerline Tower Installations: This facility considered the clearing swath necessary (60-80' width), erosional status, service road, and the foundation capabilities of the soil mantle.

12. Buried Pipeline Installations: This facility considered all subsurface utility installations including water, electricity (up to 38,000 volts) and sewage. Water table levels, salt water erosion, clearing swaths (60-80' width) erosional status of the soil mantle and service road were considered.

13. Vegetative Stabilization: This facility was considered as an area suitable for "dune grass" plantations, which includes the European beachgrass, scotch broom and shorepine species.

C. Considerations and Limitations, Column 2: This column includes brief statements of the naturally occurring conditions which act as limitations to the specific activities, facilities, or uses. Recreational opportunities, such as viewing wildlife, where applicable, are also listed.

Some of the conditions mentioned are severe limitations or constraints, while others can be overcome by increased construction costs, engineering expertise, or maintenance, etc. The rating value in Column 3, provides an overall evaluation of the degree of severity of the conditions listed based on the physical resource. The rating values in columns 4 and 5 indicate the degree of severity of the conditions listed based on the wildlife or visual resource.

D. Physical Suitability Ratings, Column 3:

All physical suitability ratings were based on a projected 10-year period, including expected visitor use, average climatic events, and the usual level of man-caused impact to the soil and native plant resources

within the limits of reasonable use. All ratings were based on the physical resource considerations, only.

Most Suitable . . . . . Least Suitable

1 5

At the "most" suitable end of the range, it was felt that no severe or irreversible resource damage would occur as the result of a specific activity.

At the "least" suitable end of the scale:

1. Additional or sophisticated treatment measures would need to be employed to protect the site or prevent excessive damage to the resource, or

2. The site is too sensitive to survive without incurring irreversible damage, or

3. Damages to the improvement or facility could be expected.

The "least suitable" rating is not meant to be construed as "impossible" but only serves as the means to "red-flag" certain activities.

E. Wildlife Tolerance Ratings, Column 4:

The tolerance rating for wildlife indicates the impacts a proposed facility(ies) and/or activity(ies) would have on the wildlife species utilizing a habitat. The tolerance rating was assigned to the habitat type (the unit with which the land manager works). The tolerance ratings range from 1 (no significant effect on wildlife anticipated) to 5 (a significant detrimental effect on wildlife).

The following major considerations were used to develop the tolerance ratings:

1. The nature, magnitude and trends in present and anticipated recreational use of the Oregon Coast and N.R.A. A 5-percent average annual rate of increase (probably a minimal estimate) in recreational use of the N.R.A. was anticipated during the next 10 years.

2. The acreage, shape, and location of habitat types.

3. The life histories and behavior of wildlife species utilizing the habitats, especially endangered, rare and unique species. Tolerance ratings of 5 and 4 emphasize the need to (1) avoid the development of recreational facilities in all or certain portions of these habitats, (2) limit the type and magnitude of recreational use these habitats receive, and (3) develop sophisticated treatments and procedures when it becomes absolutely necessary to develop portions of these habitat types (work closely with wildlife biologist on a case-by-case basis).

F. Visual Tolerance Ratings, Column 5:

The tolerance ratings for the visual resource indicates the anticipated impact of proposed facilities or activities on the characteristic landscape. The entire N.R.A. is used as a base of reference. The impacts the proposed facility or activity would have on the dominant factors (form, line, texture, color and in some cases, motion) were considered. The degree of visual harmony a facility or activity has with the dominant features of the characteristic landscape is rated on a scale of 1 (generally compatible with the characteristic landscape) to 5 (starkly incongruous with the dominant features of the characteristic landscape).

G. Some Alternatives or Treatments, Column 6:

Listed here, as a guide, are some possible alternatives or treatments that correspond to the limitations and considerations listed in Column 2.

H. Possible Negative Results, Column 7:

These are the expected negative results of the alternatives or treatments listed in Column 6. Where the results are unknown, a question mark is used. In those cases where no particular negative results are expected, a dashed line is used.

MAPPING UNIT LEGEND

Map Symbol	Description
FD	Foredune
HWS	Hummocks, Occ. Wet, Stabilized
HW	Hummocks, Occ. Wet
HA	Hummocks, Dry
DG	Deflation Plain; grasses, rushes and sedges
DGL	Deflation Plain; low shrubs
DT	Deflation Plain; tall shrub thicket
DST	Deflation Plain; shorepine forest
TW	Transverse Ridge, Occ. Wet
TDA	Transverse Ridge, Dry
OA	Oblique Ridge System
PA	Parabola, Active
DS/TF	Stabilized Dune Surface; transition forest
DS/TFO	Stabilized Dune Surface; transition forest, old-growth
DS/TFC	Stabilized Dune Surface; transition forest, clearcut, 2-12 years
DS/TFS	Stabilized Dune Surface; transition forest, second-growth, 12-50 yrs.
DS/SFR	Stabilized Dune Surface; shorepine forest of stabilized dunes
DSA/TF	Stabilized Dune Surface, Eroding; transition forest
DSA/TFS	Stabilized Dune Surface, Eroding; transition forest, second-growth
DSA/SFR	Stabilized Dune Surface, Eroding; shorepine forest of stabilized dunes
PRS/TF	Precipitation Ridge - Slip Face; transition forest
PRS/SFR	Precipitation Ridge - Slip Face; shorepine forest of stabilized dunes
PRA	Precipitation Ridge - Active Slip Face
PRX	Precipitation Ridge - Active Slip Face, Threatening
SC	Conditionally Stable Slip Face
RS	Rolling, Partially Stabilized Dune Surface
FA	Flood Plain, Active
FA/SM	Flood Plain, Active; salt marsh - meadow
FS/SFR	Flood Plain, Stabilized; shorepine forest of stabilized dunes
FS/TF	Flood Plain, Stabilized; transition forest
MSM	Mountain Front; shoreline marsh
MMV	Mountain Front: marshy valley fill
MDW	Mountain Front; narrow drainageway
MSS/TF	Mountain Front, Steep side slope; transition forest
MSS/TFO	Mountain Front; Steep side slope; transition forest, old-growth
MSS/TFC	Mountain Front, Steep side slope; transition forest, clearcut
MSS/TFS	Mountain Front, Steep side slope; transition forest, second-growth
MTL/TFS	Mountain Front, Tableland; transition forest, second-growth
\!/	Marsh
L or Lake	Lakes and Ponds
—·—·—	Beach
Named	Rivers and stream courses
PLANT	Plantations, with years since planted
—·—	Land-use boundary
— —	Gradation boundary between plant communities
	Approximate N.R.A. boundary
	Mass movement, headwall escarpment

Foredune (FD)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Road Construction	a. "Unstable" - subject to wave erosion & log jams	5			a. Riprap seaward side	a. Potential for undercutting - visual impact
	b. Uneven and abrupt relief - requires cuts				b. Fill depressions with ballast	b. Erosion on adj. areas-visual impact
	c. Opens beach to vehicle access				c. Enforce reg. & construct barriers	c. Neg. visual impact and admin. require.
	d. Not compatible with char. landscape			5	d. None	d. --
	e. Excessive snowy plover* harassment (rare species in State) when located parallel to beach		5		e. Locate perpendicular to beach	e. Some harassment will persist
Parking lots	a. "Unstable"	5			a. Riprap seaward side	a. Potential for undercutting persists - visual impact
	b. Uneven and abrupt relief				b. Fill depressions with ballast	b. Erosion on adj. areas
	c. Inadequate size of area				c. Landfill on inland side	c. Increased runoff - neg. visual impact
	d. Increased airflow problem				d. Plant larger species	d. --
	e. Not compatible with char. landscape			5	e. None	e. --
	f. Snowy plover harassment (rare species in State)		5		f. None	f. --
Drainfields	a. Slope, relief & shape unsuitable	5			a. Provide vault or sew. collection system	a. Disposal site limitations
	b. Inadequate size of absorption area				b. Landfill	b. Neg. visual impact
	c. Pollution hazard estuaries, ground water & wildlife		?	1	c. Sewage collection system	c. Disposal site limitations
Campgrounds (24 hr. occup.)	a. Neg. visual impact	5		5	a. None	a. --
	b. Inhospitable recreat. environ. (wind & moisture)			4	b. Construct artificial windscreen	b. Neg. visual impact
	c. Inadequate size of area				c. Landfill	c. Extend scouring action to adj. land
	d. Hazard of wave breaching				d. Riprap	d. Potential for unsafe cond. persists
	e. Snowy plover* harassment (rare species in State)		5		e. None	e. --
Human Occupancy (Day use)	a. Inhospitable environment (wind & moisture)	5		3	a. None	a. --
	b. Low carrying capacity				b. Provide reinforcement	b. Neg. visual impact
	c. Snowy plover* harassment (rare species in State)		5		c. Identify & protect areas April-June; I&E program	c. Reduction of recreat. land base
	d. Vegetation sensitive to trampling				d. None	d. --
Human Occupancy (Ped. access)	a. Vegetation sensitive to trampling	4			a. Provide bridging or paving	a. Slight change in visual
	b. Trail-rutting susceptible			1	b. " " " "	b. " " " "
	c. Low carrying capacity				c. " " " "	c. --
	d. Snowy plover* harassment (rare species in State)		3		d. Identify & protect areas Apr-June; I&E	d. Reduction of recreation base; some harassment will persist

*The snowy plover does not use the foredune itself. It uses the driftwood tangle on the beach and the sand spits of the river and streams. Both of these areas are adjacent to the foredune. Any activity on the foredune would directly affect the snowy plover.

Foredune (FD)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Cross-country travel (horses)	a. Low carrying capacity b. Tendency for trailing c. Trail-rutting susceptible d. Snowy plover harassment (rare species in State)	4	5	2	a. Provide bridging or pave b. " " " " c. " " " " d. Identify & protect areas Apr.-June; I&E program	a. Visual impact b. Slight change in visual c. " " " " d. Reduction of recreation base; some harassment will persist
Cross-country Travel (Vehicles)	a. Vegetation sensitive to wheel traffic b. Tendency for trailing - visual c. Snowy plover harassment (rare species in State)	5	5	4	a. Bridging b. Barrier c. Identify & protect areas April-June; I&E program	a. Negative visual impact b. Modification of visual character. c. Reduction of recreation base; some harassment will persist
Buildings (Contin. founda-tion)	a. "Unstable" due to wave erosion b. Sand deposition on lee side c. Wind scouring on windward side d. Not compatible with charact. landscape	5		5	a. Riprap b. Maintenance c. Plantings d. None	a. Potential for undercutting persists; visual impact b. -- c. -- d. --
Buildings (Pole founda-tion)	a. Not compatible with char. landscape b. "Unstable" due to wave erosion c. Highest velocity wind exposure	5		4	a. None b. Riprap c. None	a. -- b. Potential for undercutting persists; visual impact c. --
Powerline Tower Install.	a. Not compatible with char. landscape b. "Unstable" due to wave erosion c. Highest velocity wind exposure d. Excessive loss of wildlife habitat and harassment if located parallel to beach, especially snowy plover.	5	5	5	a. Buried pipe b. Riprap c. None d. None	a. -- b. Potential for undercutting persists; visual impact c. -- d. --
Buried Pipeline Install.	a. "Unstable" due to wave erosion b. Excessive loss of wildlife habitat and harassment if located parallel to beach, especially snowy plover	5	5	1	a. Riprap b. None	a. Potential for undercutting persists b. --
Vegetative Stabiliz. (dunegrass)		1		1		

Hummocks, Occ. Wet, Stable (HWS)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Road Construction	a. High water table (annual consid.) occ. flooding b. Increased turbulence & wind veloc.(effect on visitor) c. Marginally compatible w/char. landscape d. Alignment difficult to maintain w/o excess cuts e. Excessive loss of wildlife habitat & harassment if parallel to beach.	2	 5	5 3 4 	a. Turnpike or seasonal restrictions b. Plantings on adj. areas; sand removal program c. Design to fit landscape d. Low-speed roads fit to landscape e. Locate perpendicular to beach, restrict use Oct-May; I&E Program	a. Neg. visual impact b. -- c. -- d. Safety hazard e. Some loss of habitat & harassment will occur
Parking Lots	a. High water table b. Increased turbulence & wind veloc. (effect on visitor) c. Sand deposition (onsite) d. Marginally compat. with char. landscape e. Loss of habitat & harassment of wildlife	2	 4	 3 4 	a. Land fill b. Plantings, on adj. acres, of wind screen species c. Sand removal program d. None e. Limit number of visitors; restrict use Oct-May; I&E	a. Possible subsurface drainage impeden. b. -- c. -- d. -- e. Some habitat loss & harass.will occur
Drainfields	a. High water table b. Ground water contamination hazard c. Pollution hazard to estuaries & deflation plain	4	 5	 1 	a. Sewage collection system b. " " " c. " " "	a. Disposal site limitations b. " " " c. " " "
Campgrounds (24-hr. occup.)	a. High water table (seasonal consid.) b. Inhospitable environment (wind) c. Veg. sensitive to trampling d. Loss of habitat & harassment of wildlife	4	 4	 5 	a. Land fill b. Construct artificial wind screens c. Barriers - plant with stronger spec d. Limit number of visitors; restrict use Oct-May; I&E	a. Slight visual impact b. Neg. visual impact c. -- d. Reduction of recreation base; some harassment will persist
Human Occupancy (Day use)	a. Veg. sensitive to trampling b. High water table c. Inhospitable environment d. Loss of habitat & harassment of wildlife	4	 4	 4 	a. Barriers, fertilization & stronger species b. Land fill c. ? d. Limit number of visitors; restrict use Oct.-May - I&E	a. -- b. Slight visual impact c. -- d. Reduct. of recreat. base; some harassment will persist
Human Occupancy (Ped. access)	a. Veg. sensitive to trampling b. Trail rutting on steeper portions c. Wildlife harassment	3	 2	 2 	a. Provide bridging or paving b. " " " c. I&E program	a. Slight visual impact b. " " " c. Some harassment will persist

Hummocks, Occ. Wet, Stable (HWS)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Cross-country Travel (horses)	a. Tendency for trailing b. Trail-rutting on steeper portions c. Vegetation sensitive to trampling d. Loss of habitat & harassment of wildlife	3	 5	2 3 3	a. Provide bridging & paving b. " " " c. " " " d. Restrict to trails; I&E; zone activity*	a. Slight visual impact b. " " " c. " " " d. Some harassment will persist
Cross-country Travel (vehicles	a. Trail-rutting on steeper portions b. Veget. sensitive to wheel traffic c. Conflict in recreat. experience d. Loss of habitat & harassment of wildlife	4	 5	3 4 4	a. Provide bridging & paving b. " " " c. Zone specific areas d. Restrict to trails;I&E;zone act.*	a. Slight visual impact b. " " " c. " " " d. Some harassment will persist
Buildings (Cont. found.)	a. High water table b. Subject to high veloc. winds & turbulence c. Wind-scouring & deposition hazard	4		4	a. Land fill b. None c. Plantings	a. Slight visual impact b. -- c. --
Buildings (Pole found.)	a. Subject to high veloc. winds & turbulence	3		4	a. None	a. --
Powerline Tower Install	a. Not compatible with char. landscape b. Subject to salt water corrosion near estuaries c. Subject to high-veloc. wind d. Excessive loss of wildlife habitat & harassment if parallel to beach	3	 5	5	a. Buried pipe b. Buried, corros.-resistant pipe c. None d. Locate perpendicular to beach; restrict use of service road; I&E	a. Temporary destruction of wildlife habitat b. ? c. -- d. Some loss of habitat & harassment will occur
Buried Pipeline Install.	a. Subject to salt water corrosion near estuaries b. High water table c. Excessive loss of wildlife habitat & harassment if parallel to beach	3	 5	1	a. Corrosion-resistant pipe b. Pumping & corros-resistant pipe c. Locate perpendicular to beach-restrict use of service road; I&E	a. -- b. Safety hazard c. Some loss of habitat & harassment will occur
Vegetat. Stabiliz. (Dunegrass)		1		1		

*See wildlife overlays for critical habitat areas.

Hummocks, Occ. Wet (HW)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Road Construction	a. High water table (annual consid.), flooding	4			a. Turnpike or seasonal restrictions	a. Slight visual impact
	b. Wind-scouring to water table level (offsite)				b. Plantings on adjacent area	b. Modification of charac. landscape
	c. Sand deposition				c. Plantings on adjacent areas & sand removal program	c. --
	d. Alignment difficult to maintain without excess. cuts			3	d. Low-speed roads; fit to landscape	d. Safety hazard
	e. Increased wind velocities & turbulence (effect on visitor)			3	e. Wind-screen plantings on adj. areas	e. --
	f. Excessive loss of wildlife habitat & harassment when located parallel to beach *		5		f. Locate perpendicular to beach; I&E program	f. Some loss of habitat & harassment will occur
Parking Lots	a. High water table (annual consid.), flooding	4		3	a. Landfill	a. Medium visual impact
	b. Increased wind velocities & turbulence (effect on visitor)			3	b. Wind-screen plantings	b. Change in characteristic landscape
	c. Wind-scouring hazard (offsite)				c. Plantings on adjacent areas	c. --
	d. Sand deposition (onsite)				d. Sand removal program	d. --
	e. Loss of habitat & harassment of wildlife		3		e. Limit number of visitors; I&E	e. Some habitat loss & harass.will occur
Drain-fields	a. High water table	5		1	a. Sewage collection system	a. Disposal site limitation
	b. Ground water contamination hazard				b. " " "	b. " " "
	c. Pollution hazard to estuaries		5		c. " " "	c. " " "
	d. "Quicksand" areas				d. None	d. --
Camp-grounds (24-hr. occup.)	a. High water table (annual consid.), flooding	5		3	a. Landfill	a. Slight visual impact
	b. Veg. sensitive to trampling (on hummocks)				b. Barriers; plant hardier species, fertilize	b. --
	c. "Quicksand" areas				c. Signing; seasonal restrictions	c. --
	d. Inhospitable environment (wind)			4	d. Construct artificial wind screens	d. Slight visual impact
	e. Loss of habitat & harassment of wildlife		3		e. Limit number of visitors; I&E	e. Some habitat loss & harassment will occur
Human Occupancy (day-use)	a. Veg. on hummocks sensitive to trampling	4			a. Barriers; plant hardier species, fertilize	a. --
	b. High water table (annual consid.), flooding				b. Landfill	b. Slight visual impact
	c. Inhospitable environment (wind and water)			3	c. Construct artificial wind screens	c. " " "
	d. "Quicksand" areas				d. Signing; seasonal restrictions	d. --
	e. Loss of habitat & harassment of wildlife		3		e. Limit number of visitors; I&E	e. Some habitat loss & harass.will occur
Human Occupancy (Ped. access)	a. Quicksand areas	2			a. Signing; seasonal restrictions	a. --
	b. Veg. on hummocks sensitive to trampling			1	b. Barriers; plant hardier species, fertilize	b. --
	c. High water table				c. Bridging or seasonal restriction	c. --
	d. Harassment of wildlife				d. I&E program	d. Some harassment will persist

* See wildlife overlays for critical habitat areas.

Hummocks, Occ. Wet (HW)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Cross-country Travel (horses)	a. Seasonal high water table b. "Quicksand" areas c. Veg. on hummocks sensitive to trampling d. Loss of habitat & harassment of wildlife	2	3	1	a. Seasonal restriction b. Signing; seasonal restriction c. Barriers d. Restrict to trails; I&E. Zone* activity	a. -- b. Maintenance c. " d. Reduct. of rec. land base; some harassment will persist
Cross-country Travel (vehicles)	a. Seasonal high water table b. "Quicksand" areas c. Loss of habitat & harassment of wildlife	2	3	2	a. Seasonal restriction b. Signing; seasonal restriction c. Restrict to trails; I&E. Zone activity *	a. -- b. Maintenance c. Reduct.of rec. land base; some harassment will persist
Buildings (Contin. found.)	a. High water table b. Wind-scouring hazard & sand deposition c. Subject to high velocity winds & turbulence d. Marginally compatible w/charac. landscape	5		4	a. Landfill b. Plantings & sand removal program c. None d. Design to fit landscape	a. Modification of charac. landscape b. -- c. -- d. --
Buildings (Pole found.)	a. Subject to high velocity winds & turbulence b. Marginally compatible w/charac. landscape	4		3	a. None b. Design to fit landscape	a. -- b. --
Powerline Tower Install.)	a. High water table b. Quicksand area c. Not compatible w/charac. landscape d. Excessive loss of wildlife habitat & harassment if parallel to beach	4	5	4	a. Buried pipeline b. None c. Buried pipeline d. Locate perpendicular to beach; I&E	a. -- b. -- c. -- d. Some loss of habitat & harassment will occur
Buried Pipeline Install.)	a. High water table b. "Quicksand areas" c. Excessive loss of wildlife habitat & harassment if parallel to beach	3	5	1	a. Pumping, corros. resist. pipe b. None or avoid c. Locate perpendicular to beach; I&E	a. Safety hazard b. -- c. Some loss of habitat & harassment will occur
Vegeta. Stabiliz. (dunegrass)	a. Lack of nutrients on hummocky portion	2		1	a. Fertilize	a. --

* See Wildlife overlays for critical habitat areas.

Hummocks, Dry (HA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Road Construction	a. Wind-scouring hazard (offsite)	4			a. Plantings on adjacent areas	a. Reduction of open sand areas
	b. Undulating relief; requires cuts				b. Balanced cut & fill to fit landsc.	b. --
	c. Marginally compatible with characteristic landsc.			2	c. Design to fit landscape	c. --
	d. Occas. areas of high water table & flooding				d. Fill; seasonal closure	d. Reduced recreation opportunities
	e. Sand deposition (onsite)				e. Sand removal program	e. --
	f. Increased wind velocities & turbulence (effect on visitor)			3	f. Windscreen plantings on adj. areas	f. ?
	g. Some loss of wildlife habitat & harassment		3		g. None	g. --
Parking Lots	a. Increased wind veloc. (effect on visitors)	4			a. Plantings, on adj. areas of wind-screen species	a. Reduction of open sand areas
	b. Sand deposition (onsite)				b. Sand removal program	b. " " " " "
	c. Creates runoff area & wind-scouring (offsite)			3	c. Plantings on adjacent areas	c. " " " " "
	d. Marginally compatible with charac. landscape				d. Design to fit landscape	d. " " " " "
	e. Occasional area of high water table & flooding				e. Land fill	e. --
	f. Loss of habitat & harassment of wildlife		2		f. Limit number of visitors; I&E prog.	f. Some habitat loss & harass. will occur
Drain-fields	a. Wind-scouring hazard	5		1	a. Plantings	a. Reduction of open sand areas
	b. Ground water contamin. hazard-some locations		1		b. Fill 6-12'	b. Visual impact
Camp-grounds (24-hr. occup.)	a. Veget. on hummocks sensitive to trampling	4			a. Plantings with fertilizer treatment	a. Reduction of open sand areas
	b. Harsh environment (wind)			4	b. Construct artificial windscreens	b. Negative visual impact
	c. Wind-scouring hazard & sand deposition				c. Plantings & sand removal program	c. Reduction of open sand areas
	d. Loss of habitat & harassment of wildlife		2		d. Limit number of visitors; I&E prog.	d. Some habitat loss & harass. will occur
Human Occupancy (day use)	a. Veget. on hummocks sensitive to trampling	3			a. Barriers, plantings	a. Reduction of open sand areas
	b. Wind-scouring hazard & sand deposition				b. Plantings & sand removal program	b. " " " " "
	c. Inhospitable environment (wind)			3	c. Construct artifical windscreen	c. Negative visual impact
	d. Low carrying capacity (whole area)				d. Restrict numbers of visitors	d. Administrative problem
	e. Loss of habitat & harassment of wildlife		2		e. Limit number of visitors: I&E prog.	e. Some habitat loss & harassment will occur
Human Occupancy (Ped. access)	a. Veget. on hummocks sensitive to trampling	2			a. Barriers, plantings	a. Reduction of open sand areas
	b. Trail or path-rutting suscept. on steeper port.			2	b. Plantings	b. " " " " "
	c. Some harassment of wildlife		1		c. I&E program	c. Some harassment will persist

Hummocks, dry (HA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Cross-Country Travel (horses)	a. Low carrying capacity	2			a. Restrict numbers	a. Administrative problem
	b. Tendency for trailing			2	b. Provide paved trails	b. Negative visual impact
	c. Trail-rutting on steeper portions			3	c. Plantings & barriers	c. --
	d. Some loss of habitat & harassment of wildlife		2		d. Restrict to trails; I&E	d. Reduct. of rec. landbase; some harassment will persist
Cross-country Travel (vehicles)	a. Veget. on nummocks & grassy areas sensitive to wheel traffic	2		3	a. Barriers & paving	a. Negative visual impact
	b. Some loss of habitat & harassment of wildlife		2		b. Restrict to trails; I&E	b. Reduct. of rec. land base; some harassment will persist
Buildings (Cont. found.)	a. Wind-scouring hazard & sand deposition	5			a. Plantings	a. Reduction of open sand areas
	b. Occas. area of high water table				b. Land fill	b. Visual impact
	c. Subject to high velocity wind & turbulence			4	c. None	c. --
	d. Marginally compatible with charac. landscape			3	d. Design to fit landscape	d. --
Buildings (Pole found.)	a. Subject to high velocity winds & turbulence	4		4	a. None	a. --
	b. Increase wind turbulence & scouring			3	b. Plantings	b. Reduction of open sand areas
	c. Marginally compatible with charac. landscape				c. Design to fit landscape	c. --
Powerline Tower Install.)	a. Not compatible with charac. landscape	5		4	a. Buried pipeline	a. --
	b. Subject to high velocity winds & turbulence				b. None	b. --
	c. Wind-scouring hazard & high water table				c. Plantings	c. Reduction of open sand areas
	d. Some loss of wildlife habitat & harassment		2		d. None	d. --
Buried Pipeline	a. Wind-scouring hazard	4		1	a. Plantings	a. Reduction of open sand areas
	b. Occas. wet area				b. Pumping & corrosion-resist. pipe	b. Safety hazard during construction
	c. Clearing would accelerate deflation plain process				c. Avoid destruction of hummocky portions	c. --
	d. Some loss of wildlife habitat; harassment		2		d. None	d. --
Vegetative Stabiliz. (dune-grass)	a. Fertility & moisture lacking	2		1	a. Fertility & plant adaptab. species	a. --

Deflation Plain, grasses, rushes, sedges (DG)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. High water table(annual consid.), flooding b. Interference with water movement (when located perpendicular to beach) c. Excessive loss of wildlife habitat & harassment if located parallel to beach d. Not visually compatible	3	5	5	a. Turnpike, seasonal restriction b. Construct on causeway c. Locate perpendicular to beach, I&E program d. None	a. Impede subsurface drainage; vis.impact b. Negative visual impact c. Some habitat loss & harassment will occur d. --
Parking Lots	a. High water table (annual consid), flooding b. Not compatible with charac. landscape c. Subsurface drainage restrictions d. Loss of wildlife habitat; harassment	4	5	5	a. Land fill b. None c. Design through-flow d. None	a. Impede subsurface drainage; visual impact b. -- c. ? d. --
Drain-fields	a. High water table (annual consid.) b. Ground water contamination hazard c. Pollution hazard to estuaries & wildlife	5 5		1	a. Sewage collection system b. " " " c. " " "	a. Disposal site limitations b. " " " c. " " "
Camp-grounds (24-hr. occup.)	a. High water table (annual consid.), flooding b. Mosquito habitat c. Loss of wildlife habitat d. Inhospitable environment (wind)	5	5	3 4	a. Land fill b. Biological control c. None d. Construct artifical windscreens	a. Slight visual impact b. -- c. -- d. Susceptible to wind damage; modification of charac. landscape
Human Occupancy (day use)	a. High water table, (annual consid.), flooding b. Mosquito habitat c. Loss of wildlife habitat; harassment d. Modification of charac. landscape	4	3 5	3	a. Land fill b. Biological control c. None d. Specialized design	a. Slight visual impact b. -- c. -- d. --
Human Occupancy (Ped. access)	a. High water table, flooding (seasonal consid.) b. Wildlife harassment	3	4	2	a. Land fill or boardwalks b. Restrict use Oct-May; I&E Program	a. Possible negative visual impact b. Reduction of recreat. base; some harassment will persist

Deflation Plain, grasses, rushes, sedges (DG)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Cross-country Travel (horses)	a. High water table, flooding (seasonal consid.) b. Wildlife harassment	3	4	2	a. Seasonal restriction b. Restrict use Oct-May; confine to estab. trails; I&E	a. -- b. Reduction of recreation base; some harassment will persist
Cross-country Travel (vehicles)	a. High water table, flooding (seasonal consid.) b. Veg. sensitive to to wheel traffic - rutting c. Wildlife harassment	3	4	3	a. Seasonal restriction b. Confine to estab. improved trails c. Restrict use Oct-May; confine to estab. trails; I&E	a. -- b. Interference with water movement c. Reduction of recreation base; some harassment will persist
Buildings (Cont. found.)	a. High water table (annual consid.) b. Subject to high velocity winds c. Not visually compatible d. Loss of wildlife habitat & harassment	5	4	5	a. Land fill b. None c. None d. None	a. Impede subsurface drainage b. -- c. -- d. --
Buildings (Pole found.)	a. Subject to high velocity winds b. Not visually compatible c. Loss of wildlife habitat & harassment	4	4	5	a. None b. None c. None	a. -- b. -- c. --
Powerline Tower Install.	a. Not compatible with charac. landscape b. High water table c. Excessive loss of wildlife habitat if located parallel to beach; harassment	3	5	5	a. Buried pipeline b. " " c. Locate perpendicular to beach, construct July to Sept.; restrict use of service road; I&E	a. -- b. -- c. Some loss of habitat & harassment will occur
Buried Pipeline Install.	a. High water table b. Excessive loss of wildlife habitat if located parallel to beach; harassment	2	5	1	a. Pumping required - corros-resis.pipe b. Locate perpendicular to beach: construct July-Sept., restrict use of service road, I&E	a. -- b. Some loss of habitat & harassment will occur
Vegetative Stabiliz. (Dunegrass)	a. Undesirable plant composition b. Loss of shorebird & waterfowl habitat by speeding up plant succession	4	5	3	a. Plant with native or adapt. species b. Plant with grasses other than beachgr	a. -- b. --

Deflation Plain, low shrubs(DGL)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. High water table (annual consid), flooding b. Interference with water movement (when located perpendicular to beach) c. Excessive loss of wildlife habitat & harassment if located parallel to beach d. Not visually compatible	3	5	5	a. Turnpike, seasonal restriction b. Construct on causeway c. Locate perpendicular to beach, I&E program d. None	a. Impede subsurface drainage b. Negative visual impact c. Habitat loss & harassment will occur d. --
Parking Lots	a. High water table (annual consid.), flooding b. Not compatible with charac. landscape c. Subsurface drainage restriction d. Loss of wildlife habitat & harassment	3	4	5	a. Land fill b. None c. Design through-flow d. None	a. Impede subsurface drainage b. -- c. ? d. --
Drain-fields	a. High water table (annual consid.) b. Ground water contamination hazard c. Pollution hazard to estuaries & wildlife	5	5	2	a. Sewage collection system b. " " " c. " " "	a. Disposal site limitations b. " " " c. " " "
Camp-grounds (24-hr. occup.)	a. High water table (annual consid.), flooding b. Mosquito habitat c. Loss of wildlife habitat & harassment d. Inhospitable environment (wind)	4	4	4	a. Land fill b. Biological control c. None d. Construct windscreen	a. Slight visual impact b. -- c. -- d. Susceptibility to wind damage
Human Occup. (day use)	a. High water table (annual consid.),flooding b. Mosquito habit c. Loss of wildlife habitat; harassment	3	4	3	a. Land fill b. Biological control c. None	a. Slight visual impact b. -- c. --
Human Occup. (ped. access)	a. High water table, flooding (seasonal consid.) b. Wildlife harassment	2	3	2	a. Land fill or boardwalks b. Restrict use certain areas Oct-May, I&E program	a. Possible negative visual impact b. Reduction of recreation base; some harassment will persist

Deflation Plain, low shrubs(DGL)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Cross-country Travel (horses)	a. High water table, flooding (seasonal consid.) b. Wildlife harassment	2	3	2	a. Seasonal restriction b. Restrict use of certain areas Oct-May; confine use to estab. trails; I&E program	a. -- b. Reduction of recreation base; some harassment will persist
Cross-country Travel (vehicles)	a. High water table, flooding (seasonal consid.) b. Vegetation sensitive to wheel traffic-rutting c. Wildlife harassment	3	4	3	a. Seasonal restrictions b. Confine to established, improved trails c. Restrict use of certain areas Oct-May; confine to est. trails; I&E	a. -- b. Interference with water movement c. Reduction of recreation base; harassment will persist
Buildings (Cont. found.)	a. High water table (annual consid.) b. Subject to high velocity winds c. Not visually compatible d. Loss of wildlife habitat	5	4	5	a. Land fill b. None c. None d. None	a. Impede subsurface drainage b. -- c. -- d. --
Buildings (Pole found.)	a. Subject to high velocity winds b. Not visually compatible c. Loss of wildlife habitat	4	4	5	a. None b. None c. None	a. -- b. -- c. --
Powerline Tower Install.	a. Not compatible with charac. landscape b. High water table c. Excessive loss of wildlife habitat if located parallel to beach; harassment	3	5	5	a. Buried pipeline b. " " c. Locate perpendicular to beach, construct July-Sept; restrict use of service road; I&E	a. -- b. -- c. - Some loss of habitat & harassment will occur
Buried Pipeline Install.	a. High water table b. Excessive loss of wildlife habitat if located parallel to beach; harassment	2	5	2	a. Pumping required corros.-resis.pipe b. Locate perpendicular to beach; construct Jul-Sept.; restrict use of service road; I&E	a. Safety hazard during construction b. Some loss of habitat & harassment will occur
Vegetat. Stabiliz. (dunegrass)	a. Undesirable plant composition b. Accelerate loss of shore-bird-waterfowl habitat by speeding up plant succession	4	5	3	a. Plant with native or adapt. species b. Plant with grasses other than beachg.	a. - b. --

Deflation Plain, tall shrub thicket(DT)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Road Construction	a. High water table (annual consid.), flooding b. Interference with water movement (when located perpendicular to beach) c. Excessive loss of wildlife habitat & harassment if located parallel to beach d. Questionable visual compatibility	3	5	3	a. Turnpike, seasonal restriction b. Construct on causeway c. Locate perpendicular to beach; I&E Program d. Sensitive location & design	a. Interference with subsurface drainage b. Slight visual impact c. Some habitat loss & harassment will occur d. --
Parking Lots	a. High water table (annual consid.), flooding b. Marginally compatible with charac. landscape c. Loss of wildlife habitat & harassment d. Interference with subsurface drainage	3	3	3	a. Land fill b. Design & locate to fit vegetation c. Limit number of visitors; I&E prog. d. Design through-flow	a. Impede subsurface drainage b. -- c. Reduction of recreation base; some harassment will persist d. ?
Drain-fields	a. High water table (annual consid.) b. Ground water contamination hazard c. Pollution hazard to estuaries	5 5	5	3	a. Sewage collection system b. " " " c. " " "	a. Disposal site limitations b. " " " c. " " "
Camp-grounds (24-hr occup.)	a. High water table (annual consid) flooding b. Pine pitch moth infestation susceptibility c. Western gall rust susceptibility d. Marginal recreat. envir. opportunity for wildlife viewing e. Loss of wildlife habitat & harassment	3	3	3	a. Land fill b. Individual tree treatment c. Tree removal or treatment d. Trails required e. Limit numbers of visitors; I&E prog.	a. -- b. Aesthetic loss c. " " d. -- e. Some habitat loss & harassment will occur
Human Occupancy (day use)	a. High water table b. Mosquito habitat c. Pine pitch moth & western gall rust & suscept. d. Loss of wildlife habitat & harassment e. Opportunity for wildlife viewing	3	3	3	a. Land fill b. Biological control c. Tree removal or treatment d. None - I&E program e. Trails required	a. -- b. -- c. Aesthetic loss d. Some harassment will persist e. --
Human Occup. (ped. access)	a. High water table (seasonal consid.) b. Wildlife harassment c. Opportunity for wildlife viewing	2	2	2	a. Land fill b. I&E Program c. Trails required	a. -- b. Some harassment will persist c. --

Deflation Plain, tall shrub thicket (DT)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Cross-country Travel (horses)	a. High water table (seasonal consid.) b. Tendency to trail c. Wildlife harassment	2	2	2	a. Land fill b. Reinforce trails c. I&E Program	a. -- b. Slight visual impact c. Some harassment will persist
Cross-country Travel (vehicles)	a. High water table (annual consid.) b. Tendency to trail c. Wildlife harassment	4	2	4	a. Land fill b. Restrict or confine to reinforced trail c. I&E Program	a. -- b. Slight visual impact c. Some harassment will persist
Buildings (Cont. found.)	a. High water table (annual consid.) b. Subject to wind turbulence c. Marginally compatible	4		3	a. Land fill b. Utilize natural windscreening c. Design & locate to fit vegetation	a. -- b. -- c. Custom design required for each building complex
Buildings (Pole found.)	a. Subject to wind turbulence b. Marginally compatible	2		2	a. Utilize natural windscreening b. Design & locate to fit vegetation	a. -- b. Custom design each bldg. complex
Powerline Tower Install.	a. High water table b. Not compatible with charac. landscape c. Excessive loss of wildlife habitat if parallel to beach; harassment	2	5	5	a. Buried pipeline b. " " c. Locate perpendicular to beach; I&E	a. Slight visual impact b. -- c. Some habitat loss; harassment will occur
Buried Pipeline Install.	a. High water table b. Clearing required c. Excessive loss of wildlife habitat if parallel to beach	2	5	4	a. Pumping required ; corros-resis.pipe b. -- c. Locate perpendicular to beach; I&E	a. Safety hazard during construction b. -- c. Some habitat loss & harassment will occur
Vegeta. Stabil. (dunegrass)	a. Undesirable plant composition	4		3.	a. Plant with native or adapt. species	a. --

Deflation Plain, shorepine forest (DST

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. High water table (annual consid.) flooding	3			a. Turnpike; seasonal restriction	a. Impede subsurface drainage; not compatible with charac. landscape
	b. Interference with water movement (when located perpendicular to beach)		5		b. Construct on causeway	b. Slight negative visual impact
	c. Excessive loss of wildlife habitat, especially snags, if located parallel to beach; harassment				c. Locate perpendicular to beach; retain snags; I&E Program	c. Some habitat loss & harassment will occur
	d. Modification of characteristic landscape			3	d. Alignment	d. Cost, construction problems
Parking Lots	a. High water table (annual consid), flooding	3			a. Land fill	a. Visual impact
	b. Alteration of characteristic landscape			4	b. --	b. --
	c. Loss of wildlife habitat, especially snags; harassment		4		c. Retain snags; limit number of parking lots; I&E Program	c. Reduction of recreation base; some harassment will persist
Drainfields	a. High water table (annual consid.)	5			a. Sewage collection system	a. Disposal site limitations
	b. Ground water contamination hazard				b. " " "	b. " " "
	c. Pollution hazard to estuaries		5		c. " " "	c. " " "
	d. Noncompatible with charac. landscape			4	d. None	d. " " "
Campgrounds (24 hr. occup.)	a. High water table, flooding	3		3	a. Land fill	a. Impede subsurface drainage; visual impact
	b. Mosquito habitat				b. Biological control	b. --
	c. Loss of wildlife habitat, especially snags; harassment		4		c. Retain snags; limit number of campgrounds; I&E	c. Reduction of recreation base; some harassment will persist
Human Occupancy (day use)	a. High water table, flooding	3			a. Land fill	a. Impede subsurface drainage; visual impact
	b. Inhospitable environment			3	b. None	b. --
	c. Loss of wildlife habitat, especially snags; harassment		4		c. Retain snags; limit number of facilities; I&E	c. Reduction of recreation base; some harassment will persist
Human Occupancy (ped. access)	a. High water table, flooding (seasonal consid.)	2			a. Land fill or turnpike trails	a. Poss. subsurface drainage interference; visual impact
	b. Impenetrable vegetation			2	b. Paths & trails required with reinf.	b. Negative visual impact
	c. Possibility for nature trail development				c. --	c. --
	d. Wildlife harassment		1		d. I&E Program	d. Some harassment will persist

Deflation Plain, shorepine forest (DST)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis.		
Cross-country Travel (horses)	a. High water table (seasonal consid.) b. Vegetation is a natural barrier c. Wildlife harassment	2	2	2	a. Landfill or turnpike trails b. Provide reinforced trails c. I&E Program	a. Possible subsurface drainage imped.; visual impact b. -- c. Some harassment will persist
Cross-country Travel (vehicles)	a. Vegetation is a natural barrier b. Water table (annual consid.) c. Visual impacts from trailing d. Wildlife harassment	5	2	3	a. Trails required with reinforcement b. Turnpike c. -- d. I&E Program	a. Negative visual impact. b. Possible subsurface drainage impedence c. -- d. Some harassment will persist
Building (Contin. found.)	a. High water table (annual consid.) b. Slight visual impact	4		2	a. Land fill b. Custom design, careful placement	a. Visual impact b. --
Buildings (pole found.)	a. Slight visual impact	2		2	a. Custom design, careful placement	a. --
Powerline Tower Install.	a. Not compatible with charac. landscape b. High water table c. Quantity of clearing required d. Excessive loss of wildlife habitat, especially snags, if located parallel to beach; harassmnt	2	5	5	a. Buried pipe b. " " c. Fit to landscape d. Locate perpendicular to beach; retain snags; I&E	a. Slight visual impact b. -- c. -- d. Some habitat loss & harassment will occur
Buried Pipeline Install.	a. High water table b. Quantity of clearing required c. Excessive loss of wildlife habitat when located parallel to beach, especially snags	2	5	4	a. Pumping required; corros.-res.pipe b. Fit to landscape c. Locate perpendicular to beach; retain snags; I&E	a. Safety hazard during construction b. Increased construction cost c. Some habitat loss & harassment will occur
Vegetative Stabiliz. (dunegrass)	a. Undesirable plant composition	4	3	4	a. Plant with natives or adapt. species	a. --

Transverse Dunes, Dry (TDA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Regul
			Biol.	Vis		
Cross-Country Travel (Horses)		1		1		
Cross-Country Travel (Vehicles)		1		1		
Buildings (Contin. founda-tion)	a. Actively eroding landscape b. Creates wind turbulence (scouring & deposition) c. Not compatible w/char. landscape	5		5	a. Plantings b. Plantings & sand removal program c. None	a. Reduction of open sand area b. Reduction of open sand area c. -
Buildings (Pole Founda-tion)	a. Actively eroding landscape b. Creates wind turbulence (scouring) c. Not compatible w/char. landscape	4		5	a. Planting b. " c. None	a. Reduction of open sand area b. " " " " " c. -
Powerline Tower Installa-tion	a. Wind excavation b. Not compatible w/char. landscape	5		5	a. Plantings b. Buried pipelines	a. Reduction of open sand area b. --
Buried Pipeline Installa-tion	a. Wind excavation	2		1	a. Plantings - place below water table level	a. Reduction of open sand areas
Vegetative Stabiliza. (Dunegrass)	a. Lack of moisture & fert. b. Loss of open sand area c. Not compatible w/char. landscape	3		5	a. Fert. & possibly irrigation b. None c. I & E Program	a. -- b. -- c. Loss of open sand

Transverse Dunes, Dry (TDA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. Actively eroding landscape b. Wind scouring hazard (offsite) c. Increased surface runoff, ditch eros. (off-site) d. Sand deposition (on-site) e. Not compatible w/char. landscape	5	*	 5	a. Planting b. " c. Planting, and lined ditch d. Sand removal progress e. None	a. Reduction of open sand area b. " " " " " c. " " " " " d. - e. -
Parking lots	a. Sand deposition (on site) b. Actively eroding landscape c. Not compatible w/char. landscape d. Increase in wind velocity and sand blasting (effect on visitor)	5		 5	a. Sand removal progress b. Planting c. None d. Plantings and artif. wind screen	a. - b. Reduction of open sand area c. - d. Neg. visual impact
Drain-fields	a. Wind excavation hazard b. Excessive slopes in some areas	5		1	a. Plantings b. Sew. Collection system	a. Reduction of open sand area b. Disposal site limitation
Camp-grounds (24-hr. occup.)	a. Actively eroding landscape b. Inhospitable environ. (wind & sand blasting) c. Not compatible w/char. landscape d. Sand deposition (on-site)	5		 5 5	a. Plantings b. Construct artif. wind screens c. None	a. Reduction of open sand area b. Neg. visual impact c. -
Human Occupancy (day-use)	a. Actively eroding landscape b. Inhospitable environ. (wind & sand blasting) c. Not compatible w/char. landscape	4		 4 5	a. Plantings b. Construct artif. wind screens c. None	a. Reduction of open sand area b. Neg. visual impact c. -
Human Occupancy (Ped. access)		1		1		

* No biological tolerance levels were deemed necessary for these geomorphic units. Their wildlife value can only be meaningful when studied with neighboring geomorphic units.

Oblique Ridge System (OA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. Actively eroding landscape b. Wind scouring hazard (off-site) c. Increased surface run off, ditch eros. (off-site) d. Sand deposition (on-site) e. Steep slopes, requires ext. cuts, activ. failures f. Not compatible w/char. landscape	5	*	5	a. Plantings b. Plantings c. Plantings & ditch lining d. Sand removal program e. Plantings & retaining walls f. None	a. Reduction of open sand area b. Reduction of open sand area c. Reduction of open sand area d. Reduction of open sand area e. Reduction of open sand area; visual impact f. --
Parking lots	a. Wind scouring hazard (off-site) b. Steep slopes, requires extensive excavation c. Increased surface run-off (off-site) d. Sand deposit in (on-site) e. Not compatible w/char. landscape	5		5	a. Plantings b. Plantings c. Plantings and dispersal system d. Sand removal e. None	a. Reduction of open sand area b. Reduction of open sand area c. Reduction of open sand area d. -- e. --
Drainfields	a. Wind excavation b. Excessive slope in most locations	5		1	a. Plantings b. Sew. collection system	a. Reduction of open sand area b. Disposal site limitation
Campgrounds (24-hr. occup.)	a. Wind scouring hazard (off-site) b. Sand deposition (on-site) c. Inhosp. environment (wind & sandblasting) d. Not compatible w/char. landscape	5		5	a. Plantings b. Sand removal program c. Construct artif. wind screens d. None	a. Reduction of open sand area b. -- c. Neg. visual impact d. --
Human Occupancy (day-use)	a. Windscouring hazard (off-site) b. Inhosp. envirn. (wind & sandblasting) c. Sand deposition (on-site) d. Not compatible w/char. landscape	5		5	a. Plantings b. Construct artif. wind screens c. Sand removal program d. None	a. Reduction of open sand area b. Neg. visual impact c. -- d. --
Human Occupancy (Ped. access)		1		1		

* No biological tolerance levels were deemed necessary for these geomorphic units. Their wildlife value can only be meaningful when studied with neighboring geomorphic units

Oblique Ridge System (OA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Cross Country Travel (Horses)		1		1		
Cross-Country Travel (Vehicles)		1		1		
Buildings (Contin. foundation)	a. Wind excavation b. Sand deposition & scouring c. Not compatible w/char. landscape	5		5	a. Plantings b. Plantings c. None	a. Reduction of open sand area b. Reduction of open sand area c. --
Buildings (Pole Foundation)	a. Wind excavation b. Not compat. w/char landscape	5		5	a. Plantings b. None	a. Reduction of open sand area b. --
Powerline Tower Installation	a. Wind excavation b. Not compatible w/char. landscape	5		5	a. Plantings b. None	a. Reduction of open sand area b. --
Buried Pipeline Installation	a. Wind excavation b. Steep slopes - machinery limitation	4		1	a. Plantings b. Limit mach. size	a. Reduction of open sand area b. --
Vegetative Stabiliza. (Dunegrass)	a. Loss of open sand area b. Lack of moisture & fert. c. Not compatible w/char. landscape	2		5	a. None b. Fert. & possibly irrig. c. I & E Program	a. -- b. Modification of charac. landscape c. Loss of open sand area

Parabola, active (PA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. Actively eroding landscape b. Slope & relief often excessive requiring ext. cuts c. Wind scouring hazard (off-site) d. Sand deposition (on-site) e. Increased surface runoff, ditch eros. (offsite) f. Not compatible w/chan. landscape	5	*	5	a. Plantings b. Plantings c. Plantings d. Plantings e. Plantings & ditch lining f. None	a. Reduction of open sand area b. " " " " " c. " " " " " d. " " " " " e. " " " " "; f. -- slight visual impact
Parking lots	a. Actively eroding landscape b. Slope & relief often excessive, require. ext. excavator c. Increased surface run-off (off-site) d. Sand deposition (on-site) e. Wind scouring hazard (off-site) f. Not compatible w/char. landscape	5		5	a. Plantings b. " c. Plantings & Dispersal system d. Plantings e. " f. None	a. Reduction of open sand area b. " " " " " c. " " " " " d. " " " " " e. " " " " " f. --
Drain-fields	a. Wind excavation hazard b. Slope & relief excession, most locations	5		1	a. Plantings b. Sew. collection system	a. Reduction of open sand area b. Disposal site limitation
Camp-grounds (24-hr. occup.)	a. Actively eroding landscape b. Slope & relief excessive, most locations c. Harsh site (wind & sand blasting) d. Veg. on fringe sensitive to trampling e. Not compatible w/char. landscape	5		5	a. Plantings b. Locate on more than 10% slopes c. Construct artificial wind screen d. Barriers & plantings e. None	a. Reduction of open sand area b. Decrease in density, inc. in cost c. Slight Neg. visual impact d. Interference w/natural process e. --
Human Occupancy (day-use)	a. Actively eroding landscape b. Slope & relief excessive, most locations c. Harsh site (wind & sand blasting) d. Veg. on fringe sensitive to trampling e. Not compatible w/char. landscape	5		5	a. Plantings b. Locate on 10% slope c. Construct artif. wind screen d. Barriers & plantings e. None	a. Reduction of open sand area b. Decrease in density, inc. in cost c. Slight neg. visual impact d. Interference w/natural process e. --
Human Occupancy (Ped. access)	a. Veg. on fringe sensitive to trampling	1		1	a. Barriers & plantings	a. Interference w/natural process; slight visual impact

*No biological tolerance levels were deemed necessary for these geomorphic units. Their wildlife value can only be meaningful when studied with neighboring geomorphic units.

Parabola, active (PA)

Facility or Activity	Considarations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Cross-country Travel (horses)	a. Veg. on fringe sensitive to trampling	1		1	a. Signing or barriers	a. Slight visual impact
Cross-country Travel (vehicles)	a. Veg. on fringe sensitive to trampling	1		1	a. Signing or barriers	a. Slight visual impact
Buildings (Contin. found.)	a. Actively eroding landscape b. Subject to high velocity winds (venturi effect) c. Not compatible with charac. landscape	5		5	a. Plantings b. None c. None	a. Reduction of open sand areas b. -- c. --
Buildings (Pole found.)	a. Subject to high velocity winds b. Actively eroding landscape c. Not compatible with charac. landscape	5		4	a. None b. Plantings c. None	a. -- b. Reduction of open sand areas c. --
Powerline Tower Install.	a. Actively eroding landscape (wind excavation) b. Not compatible with charac. landscape c. Burial of powerlines	5		5	a. Plantings b. None c. Plantings	a. Reduction of open sand areas b. -- c. Slight visual impact; potential sand movement acceleration
Buried Pipeline Install.	a. Actively eroding landscape (wind excavation)	5		1	a. Plantings	a. Reduction of open sand areas
Vegeta. Stabil. (Dune-grass)	a. Moisture-limiting b. Undesirable plant composition c. Not compatible with charac. landscape	3		5	a. Irrigate, possibly b. Plant with natives or adapt. species c. I&E Program	a. -- b. Modification of charac. landscape c. Loss of open sand

Stabilized dune surface, transition forest $\frac{(DS)}{(TF)}$

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. Slope & relief require extensive cuts (some areas)	2		4	a. Design to fit landscape	a. --
	b. Creates surface runoff, ditch erosion				b. Line ditches; keep below 6% grad.	b. --
	c. Airflow velocities increase when located parallel to prevailing winds				c. Vary alignment	c. Safety hazard
	d. High water tables in some areas				d. Turnpike	d. Visual impact
	e. Loss of wildlife habitat; especially snags		4		e. Limit number of visitors; retain snags	e. Reduction of recreation base
Parking Lots	a. Size limitation due to slope & relief in some areas (> 15%)	2		4	a. Specialized design	a. Decrease parking stalls; increase in land base loss
	b. High water table in some areas				b. Turnpike or land fill	b. Visual impact
	c. Loss of wildlife habitat, especially snags		4		c. None	c. --
Drainfields	a. Slope & relief variable, often excessive (>7%)	3	1		a. Other collection system	a. Increased O&M costs
	b. High water table in some areas				b. Sewage collection system	b. Disposal site limits
	c. Visual impact from clearing			4	c. Limited clearing	c. Decreased efficiency
Campgrounds (24-hr. occup.)	a. Areal size limitations due to slope & relief, some areas	2			a. Locate on more than 10% gradients	a. Decrease in density of units; increase in cost
	b. High water table in some areas				b. Land fill	b. Visual impact
	c. Moderate visual impacts			3	c. Careful design	c. --
	d. Loss of wildlife habitat, especially snags		4		d. None	d. --
Human Occupancy (Day use)	a. Areal size limitations due to slope & relief, some areas	2			a. Locate on more than 10% gradients	a. Decrease in density of units, increase in cost
	b. Vegetation dense & impenetrable				b. Provide clearings	b. Visual impact
	c. Trails required				c. Provide reinforced paths	c. Visual impact
	d. Moderate visual impact			3	d. Careful design	d. --
	e. Loss of wildlife habitat, especially snags		4		e. None	e. --
Human Occupancy (Ped. access)	a. Vegetation is natural barrier	2		2	a. Provide reinforced paths	a. Source of surface runoff; visual impact
	b. Wildlife harassment		2		b. I&E Program	b. Some harassment will persist

Stabilized dune surface, transition forest (DS)/(TF)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Cross-country Travel (horses)	a. Vegetation is a natural barrier b. Wildlife harassment	2	3	2	a. Provide reinforced trails b. I&E Program	a. Source of runoff; slight visual impact b. Some harassment will persist
Cross-country Travel (vehicles)	a. Vegetation is a natural barrier b. Conflict in recreational experience c. Wildlife harassment	5	3	4	a. Provide reinforced & drained running surface (see Road Construction) b. None c. I&E Program	a. Source of runoff; visual impact b. -- c. Some harassment will persist
Buildings (Contin. found)	a. Slope & relief variable & steep (>15%) some areas b. High water table in some areas c. Visual impact	1		3	a. Custom planning b. Land fill c. Custom design	a. ? b. Visual impact c. --
Buildings (Pole found.)	a. Visual impact	1		2	a. Custom design	a. --
Powerline Tower Install.	a. Quantity of clearing required b. Occasional area of high water table c. Loss of wildlife habitat, especially snags; harassment	3	4	5	a. Design to fit landscape b. Buried pipe c. Locate perpendicular to stand; restrict use of service road; I&E	a. Loss of aesthetic values b. Visual impact c. Some habitat loss & harassment will occur
Buried Pipeline Install.	a. Quantity of clearing required b. Occasional area of high water table c. Loss of wildlife habitat, especially snags, & harassment	3	4	3	a. Design to fit landscape b. Corros-resist. pipe; pumping req. c. Locate perpendicular to stand; restrict use of service road; I&E	a. Loss of aesthetic values b. Safety hazard during construction c. Some habitat loss & harassment will occur.
Vegeta. Stabiliz. (Dunegrass)	a. Undesirable plant composition b. Shading & plant composition	4	3	4	a. Plant with natives or adapt. species b. --	a. -- b. --

Rolling, partially stabilized dune surface (RS)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. Some areas of high water table	2			a. Turnpike	a. Visual impacts
	b. Rolling, with considerable relief				b. Design to fit landscape	b. --
	c. Some snag areas - critical habitat for cavity nesters		4		c. Identify and protect specific areas	c. Reduction of recreation base
	d. Visual impacts			3	d. Design to fit landscape	d. --
Parking Lots	a. Some areas of high water table	2			a. Land fill	a. Visual impact
	b. Rolling, variable relief				b. Major excavations	b. Resource loss, visual impact
	c. Some snag areas - critical habitat for cavity nesters		4		c. Identify and protect specific areas	c. Reduction of recreation base
	d. Visual Impact			4	d. Design to fit landscape	d. Limited parking volume
Drain-fields	a. Onsite invest. needed (high water table, slopes)	3			a. --	a. --
	b. Some snag areas - critical habitat for cavity nesters		4		b. Identify & protect specific areas	b. Reduction of recreation base
	c. Visual impact from clearing			4	c. Limited clearing	c. Limit efficiency
Camp-grounds (24-hr. occup.)	a. Veg. sensitive to trampling	4	4	2	a. Reinforce pathways; barriers	a. Admin. & enforcement; visual impact
	b. Gall rust susceptibility				b. See I&DC for treatments	b. --
	c. Some areas of high water table				c. Land fill	c. Visual impact
	d. Surface area lacking				d. Specialized design	d. Decrease in density; increase in cost
	e. Some snag areas-critical habitat for cavity nest.		4		e. Identify & protect specific areas	e. Reduction of recreation base
Human Occupancy (Day use)	a. Veg. sensitive to trampling	3	4	2	a. Reinforce pathways, barriers	a. Admin. & enforcement; visual impact
	b. Gall rust susceptibility				b. See I&DC for treatments	b. --
	c. Some areas of high water table				c. Land fill	c. Visual impacts
	d. Some snag areas-critical habitat for cavity nest.		4		d. Identify & protect specific areas	d. Reduction of recreation base
Human Occupancy (Ped. access)	a. Veg. sensitive to trampling	2	2	1	a. Reinforce pathways, barriers	a. Admin. & enforcement; slight vis.impact
	b. Wildlife harassment		2		b. I&E Program	b. --

Rolling, partially stabilized dune surface (RS)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Cross-country Travel (horses)	a. Veg. sensitive to trampling b. Wildlife harassment	3	5 3	2	a. Reinforce pathways, barriers b. I&E Program	a. Admin. & enforcement; slight vis.impact b. --
Cross-country Travel (vehicles)	a. Veg. sensitive to wheel traffic b. Wildlife harassment	4	5 4	4	a. Provide reinforced & drained running surface (See Road Construction) b. I&E Program	a. Source of runoff (some areas; visual impact) b. --
Buildings (Contin. found.)	a. Some areas of high water table b. Some snag areas - critical habitat for cavity nesters c. Visual impact	2	 2	 3	a. Land fill b. Identify & protect specific areas c. Custom design	a. Destruction of snag areas; critical habitat; visual impact b. Reduction of recreation base c. --
Buildings (Pole found.)	a. Some snag areas - critical habitat for cavity nesters b. Visual impact	1	2	 3	a. Identify & protect specific areas b. Custom design	a. Reduction of recreation base b. --
Powerline Tower Install.	a. Clearing swath required b. Marginally compatible with charac. landscape c. Some snag areas--critical habitat for cavity nesters	4	 4	4	a. Design to fit landscape b. None c. Identify & protect specific areas	a. Destruction of snag areas--crit.habitat b. -- c. --
Buried Pipeline Install.	a. Clearing swath required b. Loss of sensitive & pioneering plant cover c. Some snag areas--critical habitat for cavity nesters	3	 4	4	a. Design to fit landscape b. None c. Identify & protect critical areas	a. -- b. -- c. --
Vegetative Stabiliz. (Dunegrass)	a. Undesirable plant community	3	3	4	a. Restore with natives or adapt.species	a. --

Flood plain, Active (FA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Road Construction	a. Loss of critical wildlife habitat & harassment	5	5		a. None; I&E program	a. --
	b. Flooding & water erosion hazard				b. Binwalls, gabions & riprap	b. Loss of critical wildlife habitat; visual impact
	c. Water table (poor bearing strength)			5	c. Ballast & land fill	c. Loss of critical wildlife habitat; visual impact
	d. Modification of charac. landscape				d. None	d. --
Parking Lots	a. Loss of critical wildlife habitat & harassment	5	5		a. None; I&E Program	a. --
	b. Flooding & water erosion hazard				b. Binwalls, gabion & riprap	b. Loss of critical wildlife habitat; visual impact
	c. Water table (poor bearing strength)				c. Ballast & land fill	c. Loss of critical wildlife habitat; visual impact
	d. Modification of charac. landscape			5	d. None	d. --
Drain-fields	a. Estuary pollution hazard (high water table)	5	5		a. Sewage collection system	a. Limited disposal sites
	b. Critical wildlife habitat, destruction			1	b. " " "	b. " " "
	c. Subject to water erosion				c. " " "	c. " " "
Campgrounds (24-hr. occupancy)	a. Flooding & water erosion hazard	5			a. Binwalls, gabion, riprap	a. Loss of critical wildlife habitat
	b. Water table				b. Land fill	b. " " " "; visual impact
	c. Loss of critical wildlife habitat & harassment		5		c. None; I&E Program	c. --
	d. Modification of charac. landscape			5	d. None	d. --
Human Occupancy (day use)	a. Flooding & water erosion hazard	5			a. Binwalls, gabions, riprap	a. Loss of critical wildlife habitat
	b. Water table				b. Land fill	b. " " " " visual impact
	c. Loss of critical wildlife habitat & harassment		5		c. None; I&E Program	c. --
	d. Modification of charac. landscape			5	d. None	d. --
Human Occupancy (ped. access)	a. Subject to flooding (seasonal limitations)	1		1	a. Seasonal restriction (natural)	a. --
	b. Low carrying capacity				b. Signing & regulation	b. Admin. & enforcement
	c. Critical wildlife habitat, harassment		3		c. Restrict access; I&E	c. Reduct. of rec. land base; some harassment will persist

Flood Plain, active (FA)

Facility or Activity	Considerations and Limitations	Physical Suitability Rating	Biological & Visual Tolerance Levels		Some Alternatives or Treatments	Possible Negative Results
			Biol.	Vis		
Cross-country Travel (horses)	a. Subject to flooding (seasonal limitation) b. Critical wildlife habitat, harassment	1	5	1	a. Seasonal restriction (natural) b. Restrict access; I&E Program	a. -- b. Reduct. of rec. land base; some harassment will persist
Cross-country Travel (vehicles)	a. Subject to flooding (seasonal limitation) b. Critical wildlife habitat, harassment	1	5	1	a. Seasonal restriction (natural) b. Restrict access; I&E Program	a.-- b. Reduct. of rec. land base; some harassment will persist
Buildings (Contin. found.)	a. Flooding & water erosion hazard b. Water table c. Loss of critical wildlife habitat d. Modification of charac. landscape	5	5	5	a. Binwalls, gabions, riprap b. Land fill c. None d. None	a. Loss of critical wildlife habitat b. " " " ", visual impact c. -- d. --
Buildings (Pole found.)	a. Flooding & water erosion hazard b. Water table c. Loss of critical wildlife habitat d. Modification of charact. landscape	5	5	5	a. Binwalls, gabions, riprap b. Land fill c. None d. None	a. Loss of critical wildlife habitat b. " " " "; visual impact c. -- d. --
Powerline Tower Install	a. Flooding & water erosion hazard b. Water table c. Loss of critical wildlife habitat d. Not compatible with charac. landscape	5	5	5	a. Binwalls, gabions, riprap b. Land fill c. None d. None	a. Loss of critical wildlife habitat b. " " " ; visual impact c. -- d. --
Buried Pipeline Install	a. Flooding & water erosion hazard b. Water table c. Loss of critical wildlife habitat	5	5	1	a. Binwalls, gabions, riprap b. Land fill c. None	a. Loss of critical wildlife habitat b. " " " " ; visual impact c. --
Vegeta. Stabiliz.	a. Flooding & water erosion hazard b. Loss of critical wildlife habitat	5	5	5	a. None b. None	a. -- b. --

MAJOR IMPACTS IN MANAGEMENT*

Mapping Units		Wildlife			General		Urban Development			Recreation				Water Table	Subsurface
							Density			Undeveloped			Developed		
Symbol	Name	Habitat	Mining	Grazing	Agriculture	Logging	Low	Med.	High	Pedestrian	ORV	Equestrian		Alteration	Disposal
B	Beach	3	2A	-	-	-	0	0	0	3	3	3	0	-	0
DC	Dune complex of OS, OSC, DS, and W	2	0	0	0	0	1	0	0	1	0	0	0	1	2A
DS	Younger stabilized dunes	3	2	2	2	1	3	2	2	3	1	3	3	1	2A
FD	Recently stabilized foredunes	3	0	0	0	0	1	0	0	2	0	1	0	1	1
FDA	Active foredune	3	0	0	0	0	0	0	0	3	0	1	0	1	1
H	Active dune hummocks	3	0	0	0	0	0	0	0	3	0	3	0	1	0
ODS	Older stabilized dunes	3	2	2	2	2	3	3	3	3	2	3	3	2	1A
OS	Open dune sand	1	3	-	-	-	0	0	0	3	3	3	0	2	3A
OSC	Open dune sand conditionally stable	1	0	0	0	0	1	0	0	1	0	0	0	1	2A
W	Wet interdune	3	1	1	1	1	1A	0	0	2C	0	1	1A	1A	0
WDP	Wet deflation plain	3	0	1	3B	-	1A	0	0	2C	0	1	1A	0	0
IFD	Inland foredune	3	0	2	1	1	2	0	0	3	1	1	-	1	2A
OFD	Older foredune	3	0	2	3A	3A	3	2	1	3	2	3	-	2	1-2A

- Not applicable
0 No tolerance
1 Tolerance level low
2 Tolerance level medium
3 Tolerance level high
A Site Specific
B Specialty Crop
C Seasonal

*From U.S.D.A., Soil Conservation Service and OCCDC, 1975.

MAJOR IMPACTS IN MANAGEMENT (continued)

Mapping Units Symbol*	Name	Filling	Road Construction	Vegetative Removal	Fire Hazard	Deep Excavation	Stream Undercutting	Ocean Undercutting	Debris Removal (driftwood)	Vegetative Stabilization Enhancement (Chance of success0
B	Beach	0	0	-	1A	-	-	3A	3A	-
DC	Dune complex of OS, OSC, DS, and W	-	0	0	1	1	0	0	-	2
DS	Younger stabilized dunes	2	2	2A	2	1	1	1	-	3
FD	Recently stabilized foredunes	-	1A	0	1	0	0	1	0	3
FDA	Active foredune	-	0	0	1	0	0	1	0	1
H	Active dune hummocks	-	1	0	2	0	0	0	-	1
ODS	Older stabilized dunes	2	3	2A	2	2	2	2	-	3
OS	Open dune sand	-	0	-	-	3	0	0	-	1-2
OSC	Open dune sand conditionally stable	-	0	0	1	1	0	0	-	3
W	Wet interdune	0	1A	2	2	0	0	-	-	3
WDP	Wet deflation plain	0	1A	2	2	0	0	-	2A	3
IFD	Inland foredune	-	2A	1A	2	2A	0	0	-	3
OFD	Older foredune	-	3A	3A	2	3A	2	1	-	3

- Not applicable
0 No tolerance
1 Tolerance level low
2 Tolerance level medium
3 Tolerance level high
A Site Specific
B Specialty Crop
C Seasonal

ACTIVITY COMPATIBILITY OR CONDITION*

COMPETING CONDITION	Wildlife Habitat / Mining (Surface)	Grazing / General Agriculture	Logging / Low Density Urban	Medium Density Urban / High Density Urban	Undeveloped Ped. Rec. / Undeveloped ORV Rec.	Undeveloped Equ. Rec. / Developed Recreation	Water Table Alteration / Subsurface Disposal	Filling / Road Construction	Vegetative Removal / Fire Hazard	Deep Excavations / Stream Undercutting	Ocean Undercutting / Driftwood Removal	Vegetative Stabilization
Wildlife Habitat	0	1 1	1 1	1 0	2 1	1 0	- -	1 1	0 0	0 0	0 1	1
Mining (Surface)	0	0 0	0 0	0 0	2 1	2 0	1 1	1 1	2 -	2 1	1 2	0
Grazing	1 1	1	1 0	0 0	2 0	2 0	- -	0 0	0 1	1 0	0 2	1
General Agriculture	0 0	2	0 0	0 0	2 0	2 1	- 2	0 1	1 1	0 0	0 2	1
Logging	1 1	1 0	0	0 0	2 1	2 0	- 2	1 1	2 0	1 1	1 2	0
Low Density Urban	1 0	1 1	1	- -	1 1	1 1	1 1	1 1	1 0	0 0	0 1	1
Medium Density Urban	0 0	0 0	0 -	-	1 0	1 1	1 1	1 1	1 0	0 0	0 1	1
High Density Urban	0 0	0 0	0 -	-	1 0	0 1	1 1	1 1	1 0	0 0	0 1	0
Undeveloped Ped. Rec.	2 2	2 2	2 2	- -	1	2 2	- -	- 1	1 0	1 0	0 2	1
Undeveloped ORV Rec.	0 0	1 0	1 0	0 0	1	1 0	- -	1 1	1 0	0 0	0 0	0
Undeveloped Equ. Rec.	2 2	2 1	2 1	1 0	2 1	1	- -	1 1	1 0	1 0	0 2	0
Developed Recreation	0 0	0 0	0 1	0 0	2 0	1	- 1	1 1	1 0	0 0	0 1	1
Water Table Alteration	1 1	1 1	1 1	1 1	1 1	1 1	1	- 1	1 1	0 -	- 2	1
Subsurface Disposal	2 1	2 2	2 1	1 1	2 2	2 1	1	1 1	1 -	1 0	0 2	2
Filling	0 0	1 1	1 1	1 1	2 1	2 1	- 1	1	1 1	0 0	0 0	0
Road Construction	1 1	1 1	1 1	1 1	1 1	1 1	1 1	1	1 1	1 0	0 1	1
Vegetative Removal	1 2	1 1	1 1	1 1	1 1	1 1	1 -	- 1	1	1 0	0 1	0
Fire Hazard	0 1	0 0	0 0	0 0	0 0	0 0	0 -	- 0	2	- -	- -	0
Deep Excavations	1 1	0 0	0 0	0 0	2 1	2 0	0 0	0 1	2 -	0	0 0	0
Stream Undercutting	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 -	0	- -	0
Ocean Undercutting	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 -	0 -	0	0
Driftwood Removal	1 0	1 1	1 1	1 1	1 0	1 1	- -	0 1	1 0	0 0	0	1
Vegetative Stabilization	1 0	1 0	0 1	1 1	1 0	0 1	1 -	0 1	0 0	0 0	0 1	

DESIGNATED ACTIVITY OR CONDITION

- = Not Applicable
0 = Activities which conflict with the designated uses.
1 = Activities which may conflict with the designated use depending upon site characteristics and use intensities.
2 = Activities which do not hinder the designated use.

*From U.S.D.A., Soil Conservation Service and OCCDC, 1975.

Habitat Tolerance to Recreation Use*

Activity	Activity Intensity Level	Habitat Types: BEACH				DEFLATION PLAIN			UPLAND DUNE				HEADLAND			INLAND WATER		ESTUARINE						MARINE	
		Bare Sand	Driftwood	Beach Grass		Marsh	Shrub	Forest	Bare Sand	Grass-Forb	Shrub	Forest	Bare	Shrub	Forest	Lake	Swamp	Bay	Jetty	Mud Flat	Rocky Shore	Sand Flat	Marsh	Ocean	Sand Flat
Camping (Informal)	L	0	1	1		1	-	-	-	3	1	-	-	1	1	-	-	-	-	-	-	-	-	-	-
	M	0	1	1		2	-	-	0	3	2	-	-	2	2	-	-	-	-	-	-	-	-	-	-
	S	0	1	2		-	-	-	0	3	2	-	-	2	2	-	-	-	-	-	-	-	-	-	-
Picnicking (Informal)	L	0	1	1		1	-	-	0	3	1	-	-	1	1	-	-	-	0	-	0	-	-	-	-
	M	0	1	1		2	-	-	0	3	2	-	-	2	2	-	-	-	0	-	1	-	-	-	-
	S	0	1	2		-	-	-	0	3	2	-	-	2	2	-	-	-	0	-	2	-	-	-	-
Sunbathing	L	0	0	0		1	-	-	0	1	1	-	-	1	-	-	-	-	0	-	0	0	-	-	0
	M	0	0	1		1	-	-	0	2	1	-	-	1	-	-	-	-	0	-	1	0	-	-	0
	S	0	0	1		-	-	-	0	3	2	-	-	2	-	-	-	-	0	-	2	0	-	-	0
Viewing	L	0	0	1			-	-	0	3	3	-	0	3	2	-	-	-	0	-	3	0	-	-	0
	M	-	-	-			-	-	0	-	-	-	0	3	2	-	-	-	0	-	3	-	-	-	-
	S	-	-	-		-	-	-	0	-	-	-	0	3	2	-	-	-	0	-	3	-	-	-	-
Outdoor Games	L	0	0	1		0	-	-	0	3	-	-	-	1	-	-	-	-	-	-	-	0	-	-	0
	M	0	-	1		1	-	-	0	3	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	S	0	-	2		-	-	-	0	3	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
Beachcombing	L	0	1	-		-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	-	0
	M	0	2	-		-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	0	1	-	0
	S	0	2	-		-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	2	0	2	-	0
Hunting and Trapping	L	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
	M	0	0	0		0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	S	0	0	0		0	1	1	-	1	1	1	0	1	1	0	1	0	0	0	1	0	1	0	0
Fishing	L	0	-	-		-	-	-	-	-	-	-	-	-	-	0	-	0	0	0	0	0	-	0	0
	M	0	-	-		-	-	-	-	-	-	-	-	-	-	1	-	0	0	1	1	1	-	0	0
	S	0	-	-		-	-	-	-	-	-	-	-	-	-	1	-	0	0	1	2	1	-	0	0
Swimming	L	-	-	-		-	-	-	-	-	-	-	-	-	-	0	-	0	-	-	-	-	-	0	-
	M	-	-	-		-	-	-	-	-	-	-	-	-	-	0	-	0	-	-	-	-	-	0	-
	S	-	-	-		-	-	-	-	-	-	-	-	-	-	0	-	0	-	-	-	-	-	0	-
Motorized Boating*	L	-	-	-		-	-	-	-	-	-	-	-	-	-	0	-	0	-	-	-	-	-	0	-
	M	-	-	-		-	-	-	-	-	-	-	-	-	-	1	-	0	-	-	-	-	-	0	-
	S	-	-	-		-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	0	-
Hiking	L	0	0	0		0	-	0	0	2	0	-	0	0	0	-	-	-	0	1	0	0	0	-	0
	M	0	0	1		0	-	1	0	3	1	-	0	1	1	-	-	-	0	-	1	0	1	-	0
	S	0	0	1		1	-	2	0	3	2	-	0	1	1	-	-	-	0	-	2	0	0	-	0
Nature Walking	L	0	0	0		0	0	0	0	1	0	0	0	0	0	-	0	-	0	0	0	0	0	-	0
	M	0	0	0		0	1	1	0	2	1	1	0	1	1	-	1	-	0	0	1	0	1	-	0
	S	0	0	1		1	2	1	0	2	2	1	0	1	1	-	1	-	0	0	2	-	2	-	0
Walking for Pleasure	L	0	0	1		0	-	1	0	2	1	-	-	1	1	-	-	-	0	-	1	0	-	-	0
	M	0	0	1		1	-	2	0	3	2	-	-	1	2	-	-	-	0	-	2	0	-	-	0
	S	0	1	2		2	-	2	0	3	3	-	-	2	2	-	-	-	0	-	3	0	-	-	0
Bicycling	L	0	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	M	0	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0
	S	0	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Motor Vehicle Riding	L	1	-	3		2	-	-	1	3	1	-	-	1	-	-	1	-	-	1	2	1	1	-	1
	M	1	-	3		3	-	-	2	3	2	-	-	-	-	-	-	-	-	1	-	1	2	-	1
	S	1	-	3		3	-	-	2	3	3	-	-	-	-	-	-	-	-	1	-	1	3	-	1
Motorcycling	L	1	-	3		2	-	-	1	3	1	-	-	1	-	-	-	-	-	-	1	1	1	-	1
	M	1	-	3		3	-	-	2	3	2	-	-	2	-	-	-	-	-	-	-	1	2	-	1
	S	1	-	3		3	-	-	2	3	3	-	-	3	-	-	-	-	-	-	-	1	3	-	1

*Non-motorized boating is considered to have no detectable impact.

KEY: 0 = No detectable impact
1 = Slight impact--detectable impact but habitat recovers easil (<12 months)
2 = Moderate impact--recovers slowly (1 to 3 years)
3 = Severe impact--setback in succession
- = Not applicable
L = large spacing between participants
M = moderate spacing between participants
S = small spacing between participants

*From U.S. Army Corps of Engineers, 1974.

APPENDIX B

Soil Conservation Service
Soil Interpretations:
Active Dune Land, Westport and
Netarts Series

OR-SOILS-1 12/72
FILE CODE SOILS 12

SOIL INTERPRETATIONS FOR OREGON U.S.D.A. SOIL CONSERVATION SERVICE

DATE: January, 1974 GBT, GEO *Active Dune Land* SERIES SOILS: 1. *Active Dune Land*

This land type consists of wind-drifted sand in the form of dunes, ridges, or hummocks. The material is not stabilized and has no vegetation established on it. Dunes are generally 5 to 40 feet high; they have a maximum elevation of about 180 feet. The relief is a succession of irregularly distributed dunes and ridges, which rise above the intervening wind-formed valleys and swales. Dunes are bare of vegetation or the growth is not dense enough to protect the sand and to prevent it from blowing. The dunes are constantly shifting under the influence of strong ocean winds. Elevation is 0 to about 180 feet. Average annual precipitation is 60 to 80 inches, average annual temperature is 50 to 52°F.; and the frost-free period is about 202 days. Active Dune Land consists of grayish-brown, single grained, porous sand and fine sand.

This land type is used primarily for wildlife habitat and recreation. This soil occurs in the Coast Range and Valley Resource Area (A1).

(Classification: Entisol)

ESTIMATED SOIL PROPERTIES

DEPTH FROM SURFACE (in.)	CLASSIFICATION			COARSE FRACT. OVER 3 IN.	% OF MATERIAL PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX	PERMEABILITY (in/hr)	AVAIL. WATER CAP. (in/in)	SOIL REACTION (pH)	SHRINK SWELL POTENTIAL
	USDA TEXTURE	UNIFIED	AASHO		#4	#10	#40	#200						
0-72	Fine sand or sand	SM-SP	A-2	0	100	100	60-75	10-30	Nonplastic		6.0>20.0	.05-.07	4.6-5.0	Low

DEPTH (in.)	CONDUCTIVITY (mmhos/cm)	CORROSIVITY		EROSION FACTORS		WIND EROD. GROUPS	FLOODING			HIGH WATER TABLE			HYDROLOGIC GROUP
		STEEL	CONCRETE	K	T		FREQUENCY	DURATION	MONTHS	DEPTH (ft.)	KIND	MONTHS	
0-72	-	Low	High	-	5	1	None			> 6			A

CEMENTED PAN		BEDROCK		FROST ACTION	REMARKS
DEPTH (in.)	HARDNESS	DEPTH (in.)	HARDNESS		
-		> 60		-	

SANITARY FACILITIES AND COMMUNITY DEVELOPMENT				SOURCE MATERIAL AND WATER MANAGEMENT			
USE	SOIL	RATING	RESTRICTIVE FEATURES	USE	SOIL	RATING	RESTRICTIVE FEATURES
SEPTIC TANK ABSORPTION FIELDS	1	Severe	Percolates rapidly	ROADFILL	1	Good	
SEWAGE LAGOONS	1	Severe	Percolates rapidly	SAND	1	Fair	Excess fines
SANITARY LANDFILL (TRENCH)	1	Severe	Percolates rapidly	GRAVEL	1	Unsuited	Excess fines
SANITARY LANDFILL (AREA)	1	Severe	Percolates rapidly	TOPSOIL	1	Poor	Too sandy
DAILY COVER FOR LANDFILL	1	Poor	Too sandy	POND RESERVOIR AREA	1	Severe	Percolates rapidly
SHALLOW EXCAVATIONS	1	Severe	Too sandy	EMBANKMENTS DIKES AND LEVEES	1	Severe	Low strength, piping, percolates rapidly
DWELLINGS WITHOUT BASEMENTS	1	Slight to severe	Slope	DRAINAGE	1		Not needed
DWELLINGS WITH BASEMENTS	1	Slight to severe	Slope, soil blowing	IRRIGATION	1		Not needed
SMALL COMMERCIAL BUILDINGS	1	Slight to severe	Slope, soil blowing.	TERRACES AND DIVERSIONS	1		Not needed
LOCAL ROADS AND STREETS	1	Severe	Soil blowing	GRASSED WATERWAYS	1		Not needed

CONTINUATION SHEET OR-SOILS-1 12/72 Active Dune Land SERIES

RECREATION

USE	SOIL	RATING	RESTRICTIVE FEATURES	USE	SOIL	RATING	RESTRICTIVE FEATURES
CAMP AREAS	1	Severe	Too sandy, soil blowing	PLAYGROUNDS	1	Severe	Too sandy, soil blowing
PICNIC AREAS	1	Severe	Too sandy, soil blowing	PATHS AND TRAILS	1	Severe	Too sandy, soil blowing

CAPABILITY AND PREDICTED YIELDS - CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

SOIL	CAPABILITY														REMARKS
	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	
1	VIIIe														

WOODLAND SUITABILITY

SOIL	POTENTIAL PRODUCTIVITY		WOOD SUIT. GROUP	MANAGEMENT PROBLEMS					NATIVE SPECIES
	SPECIES	SITE INDEX		EROSION HAZARD	EQUIPMENT LIMIT.	SEEDLING MORTALITY	WINDTHROW HAZARD	PLANT COMPET.	
	None								

WINDBREAKS

SOILS	SPECIES	HT. AGE 20	PERFOR-MANCE	SPECIES	HT. AGE 20	PERFOR-MANCE	SPECIES	HT. AGE 20	PERFOR-MANCE
	None								

WILDLIFE HABITAT SUITABILITY

SOIL	POTENTIAL FOR HABITAT ELEMENTS								POTENTIAL AS HABITAT FOR:			
	GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLAND WILDLIFE	WOODLAND WILDLIFE	WETLAND WILDLIFE	RANGELAND WILDLIFE
1	Very poor	Very poor	Poor	-	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	-

RANGELAND

RANGE SITE NAME	SOIL	KEY SPECIES AND % COVER	POTENTIAL YIELDS		NORMAL SEASON	
			TOTAL lb/Ac	USABLE Ac/AUM	GROWING	GRAZING
		None				

FOOTNOTES

OR-SOILS-1 12/72
FILE CODE SOILS 12

SOIL INTERPRETATIONS FOR OREGON U.S.D.A. SOIL CONSERVATION SERVICE

DATE: 1/74 GBT-GEO WESTPORT SERIES SOILS:

1. Westport fine sand, 0 to 12 percent slopes
2. Westport fine sand, 0 to 20 percent slopes
3. Westport fine sand, 12 to 30 percent slope
4. Westport fine sand, 30 to 70 percent slope
5. Westport loamy sand, 0 to 12 percent slope
6. Westport loamy sand, 12 to 30 percent slop
7. Westport-Yaquina loamy sands, 0 to 30 percent slopes
8. Westport-Duneland complex, 12 to 30 percen slopes

The Westport series consists of deep, excessively drained soils that formed in wind-deposited material on nearly level to steep stabilized dunes. The vegetation is Sitka spruce, shore pine, manzanita, evergreen huckleberry, dune grass, forbs and other shrubs. Elevation is 0 to 300 feet. Average annual precipitation is 60 to 100 inches; average annual air temperature is 50 to 53° F. The frost-free period at 32° F. is 200 to 250 days.

A mat of mosses, litter and roots is on top of the mineral soil. Typically, the surface layer is very dark grayish-brown and dark grayish-brown fine sand to loamy fine sand about 16 inches thick. The subsoil is brown to olive gray fine sand to depths greater than 60 inches.

Permeability is very rapid. Runoff is slow from all units. The erosion hazard is high for all units, assuming the vegetation is removed. The total available water holding capacity is 3 to 4 inches. The water supplying capacity is 18 to 20 inches. Effective rooting depth is over 60 inches.

Westport soils are used for homesites, wildlife habitat, and recreation. These soils are in the Northern Pacific Coast Range and Valleys Land Resource Area (MLRA-A1).

(Classification: Typic Udipsamments; mixed, mesic family)

ESTIMATED SOIL PROPERTIES

DEPTH FROM SURFACE (in.)	CLASSIFICATION			COARSE FRACT. OVER 3 IN.	% OF MATERIAL PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX	PERMEABILITY (in/hr)	AVAIL. WATER CAP. (in/in)	SOIL REACTION (pH)	SHRINK SWELL POTENTIAL
	USDA TEXTURE	UNIFIED	AASHO		#4	#10	#40	#200						
0-60	fine sand	SM	A-2	0	100	100	65-80	20-35	non-plastic		6.0->20.0	.05-.07	5.1-6.0	low

DEPTH (in.)	CONDUCTIVITY (mmhos/cm)	CORROSIVITY		EROSION FACTORS		WIND EROD. GROUPS	FLOODING			HIGH WATER TABLE			HYDROLOGIC GROUP
		STEEL	CONCRETE	K	T		FREQUENCY	DURATION	MONTHS	DEPTH (ft.)	KIND	MONTHS	
0-60	-	Low	Moderate	-	5	1	none			> 6			A

CEMENTED PAN		BEDROCK		FROST ACTION	REMARKS
DEPTH (in.)	HARDNESS	DEPTH (in.)	HARDNESS		
-		> 60		-	

SANITARY FACILITIES AND COMMUNITY DEVELOPMENT			
USE	SOIL	RATING	RESTRICTIVE FEATURES
SEPTIC TANK ABSORPTION FIELDS 1/	1,5 2,7 3,4,6,8	Slight-Mod Slight to Severe Severe	Slope Slope Slope
SEWAGE LAGOONS 1/	1,2,3,4, 5,6,7,8	Severe	Percolates rapidly, slope
SANITARY LANDFILL (TRENCH) 1/	1,2,3,4, 5,6,7,8	Severe	Percolates rapidly, too sandy, slope
SANITARY LANDFILL (AREA) 1/	1,5 2,3,4,6, 7,8	Severe Severe	Percolates rapidly Percolates rapidly, slope
DAILY COVER FOR LANDFILL	1,5 2,3,4,6, 7,8	Poor Poor	Too sandy Too sandy, slope
SHALLOW EXCAVATIONS	1,2,5 3,4,6,7, 8	Severe Severe	Too sandy Too sandy, slope
DWELLINGS WITHOUT BASEMENTS	1,2,5 3,4,6,7, 8	Moderate Severe	Slope Slope
DWELLINGS WITH BASEMENTS	1,2,5 3,4,6,7, 8	Moderate Severe	Slope Slope
SMALL COMMERCIAL BUILDINGS	1,2,3,4, 5,6,7,8	Severe	Slope
LOCAL ROADS AND STREETS	1,5 3,6 2,4,7,8	Slight Moderate to Severe Severe	- Slope Slope

SOURCE MATERIAL AND WATER MANAGEMENT			
USE	SOIL	RATING	RESTRICTIVE FEATURES
ROADFILL	1,5 3,6 2,4,7,8	Good Fair-Poor Poor	- Slope Slope
SAND	1,2,3,4, 5,6,7,8	Poor	Excess fines
GRAVEL	1,2,3,4, 5,6,7,8	Unsuited	Excess fines
TOPSOIL	1,2,3,4, 5,6,7,8	Poor	Too sandy
POND RESERVOIR AREA	1,2,3,4, 5,6,7,8	Severe	Percolates rapidly
EMBANKMENTS DIKES AND LEVEES	1,2,3,4, 5,6,7,8	Severe	Piping, percs rapidly
DRAINAGE	1,2,3,4, 5,6,7,8	-	Not needed
IRRIGATION	1,2,3,4, 5,6,7,8	-	Not needed
TERRACES AND DIVERSIONS	1,2,3,4, 5,6,7,8	-	Not needed
GRASSED WATERWAYS	1,2,3,4, 5,6,7,8	-	Not needed

CONTINUATION SHEET OR-SOILS-1 12/72 WESTPORT SERIES

RECREATION

USE	SOIL	RATING	RESTRICTIVE FEATURES	USE	SOIL	RATING	RESTRICTIVE FEATURES
CAMP AREAS	1,5 2,3,4,6,7,8	Moderate Severe	Too sandy Slope	PLAYGROUNDS	1,2,3,4,5,6,7,8	Severe	Too sandy, slope
PICNIC AREAS	1,5 2,3,4,6,7,8	Moderate Severe	Too sandy Slope	PATHS AND TRAILS	1,2,3,5,6,7,8 4	Severe Severe	Too sandy Slope, too sandy

CAPABILITY AND PREDICTED YIELDS - CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

SOIL	CAPABILITY		Pasture AUM/Ac												REMARKS
	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	
1,5	VIe		1	3											
2,3,4,6,7,8	VIIe		-	1											

WOODLAND SUITABILITY

SOIL	POTENTIAL PRODUCTIVITY		WOOD SUIT. GROUP	MANAGEMENT PROBLEMS					NATIVE SPECIES
	SPECIES	SITE INDEX		EROSION HAZARD	EQUIPMENT LIMIT.	SEEDLING MORTALITY	WINDTHROW HAZARD	PLANT COMPET.	
1,2,3,4,5,6,7,8	Sitka spruce	-	-	Severe	Severe	High	High	Slight	Sitka spruce, shore pine

WINDBREAKS

SOILS	SPECIES	HT. AGE 20	PERFOR-MANCE	SPECIES	HT. AGE 20	PERFOR-MANCE	SPECIES	HT. AGE 20	PERFOR-MANCE
1,2,3,4,5,6,7,8	Shore pine	30	Fair	Sitka spruce	30	Fair			

WILDLIFE HABITAT SUITABILITY

SOIL	POTENTIAL FOR HABITAT ELEMENTS								POTENTIAL AS HABITAT FOR:			
	GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLAND WILDLIFE	WOODLAND WILDLIFE	WETLAND WILDLIFE	RANGELAND WILDLIFE
1,2,3,5,6,7,8	Poor	Poor	Fair	-	Poor	Poor	V.poor	V.poor	Poor	Poor	V.poor	-
4	V.poor	V.poor	Fair	-	Poor	Poor	V.poor	V.poor	Poor	Poor	V.poor	-

RANGELAND

RANGE SITE NAME	SOIL	KEY SPECIES AND % COVER	POTENTIAL YIELDS		NORMAL SEASON	
			TOTAL lb/Ac	USABLE Ac/AUM	GROWING	GRAZING
None						

FOOTNOTES

1/ Ground water pollution hazard

OR-SOILS-1 12/72
FILE CODE SOILS 12

SOIL INTERPRETATIONS FOR OREGO . U.S.D.A. SOIL CONSERVATION SERVICE

DATE: March 1974 GEO Netarts SERIES

SOILS:
1. Netarts fine sandy loam, 7-30% slopes
2. Netarts sandy loam, 0-12% slopes
3. Netarts sandy loam, 12-40% slopes
4. Netarts loamy fine sand, 0-30% slopes

The Netarts series consists of well drained soils formed on old stabilized sand dunes. Slopes are 7 to 30 percent. Where not cultivated, the vegetation is shore pine, sitka spruce, salal, huckleberry, rhododendron and manzanita. Elevation is 50 to 200 feet. Average annual precipitation is 80 to 100 inches, average annual air temperature is about 52°F. and the frost-free period is about 180 to 210 days.

The surface layer is fine sandy loam and loamy fine sand about 13 inches thick. The subsoil is fine sand about 39 inches thick. The substratum is fine sand many feet thick.

Permeability is moderately rapid. Runoff is slow; the wind erosion hazard is severe. The total available water holding capacity is 3.5 to 5.0 inches. Water supplying capacity is 20 to 24 inches. The effective rooting depth is over 60 inches.

These soils are used mainly for forestry, homesites, and recreation. They are in the Coast Range and Valleys Resource Area (A1).

(Classification: Entic Haplorthods; sandy, mixed, mesic family).

ESTIMATED SOIL PROPERTIES

DEPTH FROM SURFACE (in.)	CLASSIFICATION			COARSE FRACT. OVER 3 IN.	% OF MATERIAL PASSING SIEVE				LIQUID LIMIT	PLASTICITY INDEX	PERMEABILITY (in/hr)	AVAIL. WATER CAP. (in/in)	SOIL REACTION (pH)	SHRINK SWELL POTENTIAL
	USDA TEXTURE	UNIFIED	AASHO		#4	#10	#40	#200						
0-13	Loamy fine sand	SM	A-2	0	100	85-100	65-80	20-35	-	NP	2.0-6.0	.09-.10	4.5-5.0	Very low
13-52	Fine sand	SM	A-2	0	100	85-100	55-70	15-30	-	NP	2.0-6.0	.05-.07	5.1-5.5	Very low
52-65	Fine sand	SM	A-2	0	100	100	60-75	20-30	-	NP	6.0->20.0	.05-.07	5.1-5.5	Very low

DEPTH (in.)	CONDUCTIVITY (mmhos/cm)	CORROSIVITY		EROSION FACTORS		WIND EROD. GROUPS	FLOODING			HIGH WATER TABLE			HYDROLOGIC GROUP
		STEEL	CONCRETE	K	T		FREQUENCY	DURATION	MONTHS	DEPTH (ft.)	KIND	MONTHS	
0-13	-	High	High	.17	5	2	None			> 6			A
13-52	-	High	High	.20			CEMENTED PAN		REDROCK		FROST ACTION	REMARKS	
52-65	-	High	High	.20			DEPTH (in.)	HARDNESS	DEPTH (in.)	HARDNESS			
							-		> 60		-		

SANITARY FACILITIES AND COMMUNITY DEVELOPMENT

USE	SOIL	RATING	RESTRICTIVE FEATURES
SEPTIC TANK ABSORPTION FIELDS 1/	2	Slight to moderate	- Slope
	1,4	Moderate to severe	- Slope
	3	Severe	- Slope
SEWAGE LAGOONS 1/	1,2,3,4	Severe	Slope, percolates rapidly
SANITARY LANDFILL (TRENCH) 1/	2	Severe	Percolates rapidly
	1,3,4	Severe	Slope, percolates rapidly
SANITARY LANDFILL (AREA) 1/	2	Severe	Percolates rapidly
	1,3,4	Severe	Slope, percolates rapidly
DAILY COVER FOR LANDFILL	2	Fair	Slope, too sandy
	1,4	Fair to poor	Slope, too sandy
	3	Poor	Slope
SHALLOW EXCAVATIONS	2	Slight to moderate	- Slope
	1,3	Moderate to severe	- Slope
	4	Severe	Too sandy, slope
DWELLINGS WITHOUT BASEMENTS	2	Slight to moderate	Slope
	1,3,4	Moderate to severe	Slope
DWELLINGS WITH BASEMENTS	2	Slight to moderate	Slope
	1,3,4	Moderate to severe	Slope
SMALL COMMERCIAL BUILDINGS	2	Slight to severe	Slope
	1,3,4	Severe	Slope
LOCAL ROADS AND STREETS	2	Slight	
	1,3,4	Moderate to severe	Slope

SOURCE MATERIAL AND WATER MANAGEMENT

USE	SOIL	RATING	RESTRICTIVE FEATURES
ROADFILL	2	Slight	
	1,3,4	Moderate to severe	Slope
SAND	1,2,3,4	Poor	Excessive fines
GRAVEL	1,2,3,4	Unsuited	Excessive fines
TOPSOIL	1,2,3,4	Poor	Too sandy
POND RESERVOIR AREA	1,2,3,4	Severe	Percolates rapidly
EMBANKMENTS DIKES AND LEVEES	1,2,3,4	Moderate	Piping, percolates rapidly
DRAINAGE	1,2,3,4		Not Needed
IRRIGATION	1,2,3,4	Unsuited	Droughty
TERRACES AND DIVERSIONS	1,2,3,4		Not Needed
GRASSED WATERWAYS	1,2,3,4		Not Needed

CONTINUATION SHEET OR-SOILS-1 12/72 Netarts SERIES

RECREATION

USE	SOIL	RATING	RESTRICTIVE FEATURES	USE	SOIL	RATING	RESTRICTIVE FEATURES
CAMP AREAS	2	Slight to moderate	- Slope	PLAYGROUNDS	2	Slight to severe	Slope
	1,4	Moderate to severe	- Slope, too sandy		1,3,4	Severe	Slope
	3	Severe	Slope				
PICNIC AREAS	2	Slight to moderate	- Slope	PATHS AND TRAILS	2	Slight	
	1,4	Moderate to severe	- Slope, too sandy		1,3,4	Moderate to severe	Slope
	3	Severe	Slope				

CAPABILITY AND PREDICTED YIELDS - CROPS AND PASTURE (HIGH LEVEL MANAGEMENT)

SOIL	CAPABILITY														REMARKS
	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	NIRR	IRR	
1,3,4	VIIe														
2	VIe														

WOODLAND SUITABILITY

SOIL	POTENTIAL PRODUCTIVITY		WOOD SUIT. GROUP	MANAGEMENT PROBLEMS					NATIVE SPECIES
	SPECIES	SITE INDEX		EROSION HAZARD	EQUIPMENT LIMIT.	SEEDLING MORTALITY	WINDTHROW HAZARD	PLANT COMPET.	
1	Sitka spruce	150 (est)	20	Severe	Slight	Slight to moderate	Slight to moderate	Slight	Sitka spruce, shore pine

WINDBREAKS

SOILS	SPECIES	HT. AGE 20	PERFOR-MANCE	SPECIES	HT. AGE 20	PERFOR-MANCE	SPECIES	HT. AGE 20	PERFOR-MANCE
1,2,3,4	Shore Pine	35-40	Fair	Sitka Spruce	35-40	Fair	Western Red Cedar	35-40	Fair

WILDLIFE HABITAT SUITABILITY

SOIL	POTENTIAL FOR HABITAT ELEMENTS								POTENTIAL AS HABITAT FOR:			
	GRAIN & SEED	GRASS & LEGUME	WILD HERB.	HARDWD TREES	CONIFER PLANTS	SHRUBS	WETLAND PLANTS	SHALLOW WATER	OPENLAND WILDLIFE	WOODLAND WILDLIFE	WETLAND WILDLIFE	RANGELAND WILDLIFE
1	Very poor	Very poor	Fair	-	Poor	Good	Very poor	Very poor	Poor	Poor	Very poor	-

RANGELAND

RANGE SITE NAME	SOIL	KEY SPECIES AND % COVER	POTENTIAL YIELDS		NORMAL SEASON	
			TOTAL lb/Ac	USABLE Ac/AUM	GROWING	GRAZING
	1	None				

FOOTNOTES

1/ Ground water pollution hazard

APPENDIX C

Oregon Transportation Commission
Beach Log Removal Policy

State of Oregon TRANSPORTATION COMMISSION

BEACH LOG REMOVAL POLICY - Adopted March 30, 1976

Ocean Shore Management Goal

To assure continuation of scenic and recreational values for public enjoyment at the ocean shore and to protect marine life and intertidal resources, beach logging as a general practice shall be prohibited unless such removal can be shown to provide a significant public benefit.

Proposals for beach log removal shall be considered in light of the following beach management objectives:

1. Management to protect scenic and recreational use values of driftwood. Enhance recreation by opening access routes where necessary, improving scenic values or providing needed beach use area.
2. Management to protect the traditional practice of gathering firewood and ornamental driftwood as long as these activities are compatible with the overall recreation and scenic uses of the beach.
3. Management to provide for the orderly retrieval of branded logs by the legal owner(s).
4. Management to protect shorelines subject to erosion.
5. Management to protect clam beds, intertidal marine life and wildlife habitats.
6. Management to promote public safety by reducing critical fire hazards, reducing critical hazards to shoreline structures or eliminating other public hazards.
7. Management to assist in fish passage or flood control.

BEACH LOG REMOVAL POLICY (continued)

8. Management to provide opportunities for public participation in decision making on proposed projects.
9. Management to protect legal interest of upland property owners and the state.
10. Management to minimize adverse impacts of log loading and hauling operations.

Individual beach areas where log removal would be permitted and the time period allowed for such removal will be determined by the state after evaluation by the State Parks and Recreation Branch, consultation with local government, the upland property owner and affected state agencies (State Land Board, State Fish Commission, State Wildlife Commission, State Geology and Mineral Industries, State Department of Environmental Quality, State Department of Forestry, State Land Conservation and Development Commission) to establish interests to be protected and considered.

Adequate public notice and provision for hearings will be handled in the same manner as beach improvement applications under the State Beach Law, as set forth in ORS 390.650.

The granting of emergency permits necessary to ensure public safety or the emergency retrieval of branded logs or lumber will be handled in the same manner as emergency beach improvements under the State Beach Law, as set forth in ORS 390.650.

Removal permits would be planned and executed to minimize adverse operational impacts and with adequate provisions for public safety, liability insurance and consideration of private property rights. Regulations and supervisory control in this regard will be determined by the State.

APPENDIX D

Oregon Transportation Commission
Beach Improvement Standards

BEACH IMPROVEMENT STANDARDS

The overall policies and guidelines for the protection of public rights and interests at Oregon's ocean shore have been described by the State Legislature in the Oregon Beach Law (ORS 390.605 -- 390.770) which was passed in 1967 and revised in 1969. The law identifies existing state rights in the ocean shore areas seaward of a surveyed beach zone line which are to be protected for the free and uninterrupted use of the public.

The State Highway Division (whose State Parks Branch has jurisdiction over ocean beaches as recreation areas) was given the responsibility for considering applications and issuing permits for construction seaward of the beach zone line. Because of some concurrent jurisdictions, the Highway Division includes the Division of State Lands in such beach permit reviews. Reviews may also include the State Dept. of Geology, the State Fish and Wildlife Commission, Local Government, and other governmental agencies where applicable.

The Oregon Beach Law provides basic standards to be considered in the evaluation of beach improvement permit applications. These standards are presented in ORS 390.655 as follows:

> The standards shall be based on the following considerations, among others:
>
> (1) The public need for healthful, safe, esthetic surroundings and conditions; the natural scenic, recreational and other resources of the area; and the present and prospective need for conservation and development of these resources.
>
> (2) The physical characteristics or the changes in the physical characteristics of the area and the suitability of the area for particular uses and improvements.
>
> (3) The land uses, including public recreational use, if any, and the improvements in the area, the trends in land uses and improvements, the density of development and the property values in the area.
>
> (4) The need for recreation and other facilities and enterprises in the future development of the area and the need for access to particular sites in the area.

Supplementary to the standards presented in the Oregon Beach Law, the Oregon Land Conservation and Development Commission's Beaches and Dunes Goal (Goal No. 18, Implementation Requirements, Sec. 5) prescribes the following beach improvement criteria:

> (5) Permits for beach front protective structures shall be issued under ORS 390.605 - 390.770, only where development existed on January 1, 1977. The

> Oregon Department of Transportation, cooperating with local, state and federal agencies shall develop criteria to supplement the Oregon Beach Law (ORS 390.605 - 390.770) for issuing permits for construction of beach front protective structures. The criteria shall provide that:
>
> (a) visual impacts are minimized;
>
> (b) necessary access to the beach is maintained;
>
> (c) negative impacts on adjacent property are minimized; and
>
> (d) long-term or recurring costs to the public are avoided.

In accordance with ORS 390.650, the State Highway Engineer shall grant the permit if approval would not be adverse to the public interest.

To aid in the review of these standards, the following definitions as presented in ORS 390.605 and the State Planning Goals and Guidelines apply:

> An "improvement" includes a structure, appurtenance or other addition, modification or alteration constructed, placed or made on or to the land. (ORS 390.605)
>
> "Ocean shore" means the land lying between extreme low tide of the Pacific Ocean and the line of vegetation as established and described by ORS 390.770. (ORS 390.605)
>
> "Develop" - To bring about growth or availability to construct or alter a structure, to conduct a mining operation, to make a physical change in the use or appearance of land, to divide land into parcels, or to create or terminate rights of access. (State Planning Goals and Guidelines)
>
> "Development" - The act, process, or result of developing. (State Planning Goals and Guidelines)

Pursuant to the above directives and the evaluation of more than 100 permit applications since 1967, the State Parks Branch has formulated beach improvement standards. These standards are presented in the form of concerns to be evaluated prior to reaching a decision on permit approval or denial.

BEACH IMPROVEMENT STANDARDS

Each site on the ocean shore presents different conditions and applicants have varying project needs. Evaluations point up the relative significance of the general, scenic, recreational, safety, and other interests of the public.

The physical characteristics or the changes in the area which are important to the project will be reviewed. (These may include bank alignments, topography, shoreline materials and stability, width of the beach, past erosion, storm water levels, sand movement, water currents, adjoining structures, beach access, land uses, etc.)

Public opinion in response to public notice or hearings on the subject will be considered in evaluating each of the following concerns.

Considered together, these assist in the overall decision for granting, denying, or modifying the beach permit application in accordance with the intent of the legislature.

A. GENERAL CONCERNS EVALUATED - The following general concerns will be considered:

1. PROJECT NEED - There must be a critical need or adequate justification for the project to come seaward of the beach zone line and alter the ocean shore area.

2. PROTECTION OF PUBLIC RIGHTS - Public ownership or use easement rights seaward of the beach zone line will be adequately protected.

3. PUBLIC LAWS - The applicant must comply with federal, state, and local laws and regulations affecting the project.

4. PROJECT MODIFICATIONS - There are no reasonable project modifications that would better protect the public rights, reduce or eliminate problems, or avoid long term cost to the public.

5. PUBLIC COSTS - There are no reasonable special measures which might reduce or eliminate significant public costs. Alternatives such as nonstructural solutions, provision for ultimate removal responsibility for structures when no longer needed, reclamation of excavation pits, mitigation of project damages to public interests, or a time limit on project life to allow for changes in public interest have been considered.

6. COMPLIANCE WITH LCDC GOALS - In accordance with the Statewide Land Conservation and Development Commission Goal #18 for Beaches and Dunes, permit applications for beachfront protective structures seaward of the beach zone line will be considered only where development existed on January 1, 1977. The proposed project will be evaluated against the applicable criteria included within Goal #18 and other appropriate statewide planning goals.

   The project must be consistent with local comprehensive plans where such plans have been approved by LCDC.

B. SCENIC CONCERNS EVALUATED - Projects seaward of the beach zone line should be designed to minimize damage to the scenic attraction of the ocean shore area.

1. NATURAL FEATURES - The project should retain the scenic attraction of key natural features. (Beaches, headlands, cliffs, sea stacks, streams.)

2. SHORELINE VEGETATION - The project should retain or restore existing vegetation seaward of the beach zone line when vital to scenic values.

3. VIEW OBSTRUCTION - The project should avoid or minimize obstruction of existing views of the ocean and beaches from adjacent properties.

4. COMPATIBILITY WITH SURROUNDINGS - The project should blend in with the existing shoreline scenery. (Type of construction, color, etc.)

C. RECREATION USE CONCERNS EVALUATED - The project should not eliminate significant public recreation use or access within the ocean shore area.

1. RECREATION USE - The project should avoid eliminating significant public recreation use opportunities within the ocean shore area.

2. RECREATION ACCESS - The project should avoid blocking off or obstructing important public access routes within the ocean shore area.

D. SAFETY CONCERNS EVALUATED - The project should be designed to avoid or minimize safety hazards to the public and shoreline properties.

1. STRUCTURAL SAFETY - The project should not be a safety hazard to the public due to inadequate structural foundations, lack of bank stability, or the use of weak materials subject to rapid ocean damage.

2. OBSTRUCTIONAL HAZARDS - The project should not be an obstruction to pedestrians or vehicles going onto or along the ocean shore area.

3. NEIGHBORING PROPERTIES - The project should be designed to avoid or minimize ocean erosion or safety problems for neighboring properties.

4. PROPERTY PROTECTION - Beachfront property protection projects should be designed to accomplish a reasonable degree of increased safety for the on-shore property to be protected.

E. OTHER RESOURCE CONCERNS EVALUATED - Projects seaward of the beach zone line should avoid or minimize damage to especially significant resource sites or ocean shore conditions for the following where it is applicable:

1. SIGNIFICANT FISH AND WILDLIFE HABITATS
2. ESTUARINE VALUES AND NAVIGATION INTERESTS
3. SIGNIFICANT HISTORIC AND ARCHEOLOGICAL SITES
4. SIGNIFICANT NATURAL AREAS (Vegetation or Aquatic Features)
5. AIR AND WATER QUALITY OF THE OCEAN SHORE AREA.

RIM:aw
3/28/78