DELINEATION OF ACTIVE DUNES AND CONDITIONALLY STABILIZED DUNES IN CANNON BEACH

FOR
CITY OF CANNON BEACH
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PROJECT DESCRIPTION

PROJECT: Delineation of the Active Dunes and Conditionally Stabilized Dunes in Cannon Beach.

PURPOSE: Conduct an inventory of beach and dune areas within the Cannon Beach urban growth boundary for the purpose of identifying the location of active dunes and conditionally stabilized dunes.

PROCEDURE: A field study was conducted on April 18, 19, and 28, 1993 following a series of spring rain storms. TheNational Weather Service office in Astoria, Oregon, the closest official weather station, recorded peak wind velocities of 23 mph on April 14, 1993; 31 mph on April 15, 1993; 26 mph on April 16 and 33 mph on April 17, 1993 from a South and Southwest direction. (Footnote Ref. 1) Beaches and dunes at Cannon Beach may have sustained wind velocities of this magnitude, or even higher, coming unobstructedly from the ocean.

MAPPING: The results of the field investigation were recordedon aerial photographs of Cannon Beach. The photographs were flown in April, 1990 and have a scale of 1" = 200'. The delineations are in the form of a line separating active dunes from conditionally stable dunes. (NOTE: The mapping is titled "Delineation of Active Dunes in Cannon Beach, 1993")

DESCRIPTION OF BASIS FOR MAPPING ACTIVE DUNES

The following definitions and descriptions of active dune, conditionally stable dune and uplands were used in the delineation of active dune areas. These definitions and descriptions reflect the terminology used in the following documents: State-wide Planning Goals; Beaches and Dune Handbook for the Oregon Coast, A System of Classifying Oregon's Coastal Beaches and Dunes; and Beaches and Dunes of the Oregon Coast.

ACTIVE DUNES:

Sand dunes are in an active state when they possess insufficient vegetative cover to retard wind erosion. In this condition, the sand dune is experiencing active accretion and/or erosion. Active dunes include mapping units of open dune sand, active dune hummocks and active foredunes. They may be free of vegetation or be covered with vegetation that can survive frequent and extensive sand covering. (Footnote Ref. 2, p 12; Ref. 6, p 24)

CONDITIONALLY STABLE DUNES:

When foredunes exhibit sufficient vegetative cover to retard the erosive effects of the wind, they are defined as conditionally stable. Obviously, the stability of a given foredune is conditional upon the maintenance of the vegetative cover, sand supply and velocity of the wind. Any conditionally stable sand dune is prone to reactivation upon disturbance of the vegetative cover. Conditionally wind stable dunes are still subject to water erosion.

UPLANDS:

The upland soils consist of Walluski silt loam (terrace), Humitropepts-Tropaquepts complex (terrace escarpments), Coquille-Clatsop Complex Silt loams (protected tidal flood plains), and dune lands. (Footnote Ref. 3)

These soils are well vegetated and are wind stable. Vegetation consists of native and ornamental plantings of grass, shrubs, and trees.

CONSIDERATIONS BASED ON FIELD INVESTIGATIONS

Cannon Beach oceanfront lies in a basically north and south direction so that the southwest storm winds essentially blow sand parallel with the beach front. A few exceptions are noted where headlands and building projections create a different wind pattern and larger volumes of sand collect; such areas are located just south of Ecola Court, at Breakers Point, and south of the Center Street beach access. These areas project oceanward from the general shoreline. When the wind encounters one of these projections, it loses velocity causing sand to be deposited.

In some cases the wind is funneled between buildings, a venturi effect is created increasing the wind velocity between the buildings, and the sand is moved farther inland.

On a static or accreting beach, an active dune will commonly evolve toward a conditionally stable state as vegetation is established and the dune raises in elevation. European beach grass is the primary initial stabilizing plant along the Oregon Coast. It will survive with as much as 2-3 ft. of accumulated sand in a single winter season. (Footnote Ref. 5) During the spring and summer, vegetation will grow up through the sand and form a lush growth that can be covered with sand again during the following winter. (Footnote Ref. 6, p. 24)

As the dune height rises due to the sand being collected in the beach grass and the vegetative area of sand collection enlarges beyond the capability of the wind to move the sand, then additional plant species become established. Indicator species for conditionally stable dunes are coast strawberry, pearly everlasting, false dandelion, yarrow, seashore lupine, purple beach pea, bristle hawkbit, salal and Indian paintbrush. These plants either do not occur or occur in only limited amounts on active dunes. (Footnote Ref. 2, p. 44)

Over a period of time, undercutting by waves from storms and ocean currents have caused selected sections of the uplands along Cannon Beach oceanfront to erode. This activity is particularly pronounced in winter months when storms and high tides cause wave erosion at the toe of the uplands and heavy rainfall saturates the soil and renders the uplands unstable when undermined by ocean waves. (Footnote Ref. 4)

To protect these areas, many private and public landowners have resorted to building seawalls of concrete, wooden planking and rock rip rap to reduce the rate of erosion of these uplands. In some cases, windblown sand has collected in the rip rap resulting in vegetation becoming established in the rock crevices and at the toe of the projects. This vegetation includes such plants as beach grass, evergreen and Himalaya blackberries, hooker bush willow, salal, and English ivy. While these plants are not primary stabilizer, other than beach grass, they can take a considerable amount of sand buildup once they are established.

It was noted that the active dune line usually extends from 5-10 ft. into this type of vegetation and may extend up the face of the protected area from 3-5 ft. in elevation. An exception to this general rule is at the public beach access trails. These trails form breaks in the vegetation line and therefore create a venturi effect which increases wind velocity and sand movement further inland at these sites.

GLOSSARY

Accretion:	The build-up of land along a beach or shore by the deposition of waterborne or airborne sand, sediment or other material.
Beach:	Gently sloping areas of loose material that extends landward from the low-water line to a point where there is a definite change in the material type or landform or the line of vegetation.
Dune:	A hill or ridge of sand built up by the wind along sandy coasts.
Dune, Active:	A dune that migrates, grows and diminishes from the effects of wind and supply of sand.
Dune, Conditionally Stable:	A dune which presently has sufficient vegetative cover to retard wind erosion but which is vulnerable to reactivation upon disturbance of this cover.

Terrace: A nearly level to undulating geomorphic surface formed mainly by wave erosion and beach deposition during a period when the land remained static, but which has subsequently been elevated above the beach.

Terrace Escarpment: The steep slope or cliff face of a terrace.

Plant Succession: The gradual and continuous replacement of one kind of plant by another until the community is replaced by another that is more complex.

REFERENCES CITED

(1) NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION NATIONAL WEATHER SERVICE OFFICE, ASTORIA, AIRPORT WARRENTON, OREGON.

(2) BEACHES & DUNES HANDBOOK OF THE OREGON COAST: A SYSTEM OF CLASSIFYING AND IDENTIFYING OREGON'S COASTAL BEACHES AND DUNES, OCZMA, 1979.

(3) SOIL SURVEY OF CLATSOP COUNTY, OREGON, USDA-SCS 1988 MAP 40 & 45.

(4) ENVIRONMENTAL GEOLOGY OF THE COASTAL REGION OF TILLAMOOK AND CLATSOP COUNTIES, OREGON, BULLETIN 74.

(5) CONTROLLING COASTAL SAND DUNES IN THE PACIFIC NORTHWEST USDA CIRCULAR NO. 660.

(6) BEACHES & DUNES OF THE OREGON COAST, USDA/OCCDC, March, 1975.