IDENTIFICATION OF WASHINGTON COASTAL DUNE SYSTEMS AND ASSOCIATED WETLANDS

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Introduction

The sand dune areas adjacent to the sea in southwestern Washington can be divided into three distinct areas on the basis of geomorphology and vegetation: Primary dunes; dry dune meadows and dune ridges; and wetlands. In the following report these areas are described and mapped. The report also includes a review of the pertinent legislative and regulatory criteria for wetlands associated with the dune system.

Methods

The specific areas were mapped in the field, using 1:24,000 scale air photos as a base. The data from these photos were transferred to the same scale orthophoto maps (where available) for the final map. The field work was done during July and August, a time when the vegetation was most recognizable from the aerial view, because the plants of the drier areas have not ceased growing and the wetland plants have emerged enough to commence their growing season. Also during this time, the wetland soils are still noticeably damper than the adjoining dry areas.

In this report, the vegetation in each area was characterized by a few index species rather than an exhaustive list of plants.

General Geomorphic Conditions and Processes

The beaches of southwestern Washington are accretional features composed of sand, primarily from the Columbia River. Most of this sand accreted behind North Head, forming the Long Beach Peninsula, while to the north, lesser accumulations formed at Twin Harbors and the North Beaches (with additional sand from sea cliff erosion).

Dune ridges grew as part of this beach building process. These dune ridges are formed by wind-blown sand entrapped by dune grasses and other vegetation. Over the centuries, many dune ridges were formed as the beach prograded and the sea regressed. The lower areas between the ridges became dry meadows or wetlands.

Since the introduction of marram grass from Europe, in plantings since 1910, the natural vegetation has been altered considerably. Even so, the existence of the many older dune ridges suggests that the original vegetation was capable of producing ridges. The processes described in this report pertain to the formation of older dune ridges as well as the modern ones.

The marram grass tends to grow in clumps and thus, initially, the dunes are a series of clumps or hummocks that are aligned with the existing water line. If the water line does not move for some time, these hummocks will gradually coalesce into a continuous ridge (Cooper, 1958).

If the shoreline moves outward slowly, a series of parallel ridges will be formed, as at Ocean Park on Long Beach. If the shoreline moves seaward in a series of jumps, then ridges with intervening wider troughs will be formed, as at Grayland on Twin Harbors Beach. If the shoreline progrades rapidly, it will develop a series of dune clumps without appreciable ridge lines, as just north of Connor Creek.

Little or no beach sand is blown past the first dune ridge, once it is established. Under present conditions on the local beaches, only the first ridges are nourished by the beach sand. The older ridges, landward of the initial ones, have apparently not changed significantly. In fact, it was our observation that generally there were no natural changes in the dune topography beyond the initial dune ridge. With minor exceptions, we would like to emphasize that the land forms of the dune systems of southwestern Washington are aggradational rather than erosional.

As adjacent dune ridges are built, intervening low areas or troughs are formed. If these troughs are low enough to intersect the ground water table for part of the year, they develop a distinctive wetland vegetational community. If the areas between dune ridges are high enough to remain above the water table, they develop a distinctive dry meadow vegetation. It should be noted that the level of the water table is naturally dynamic, and that man-made perturbations can also increase or decrease the wetland areas. Low areas may also fill by downslope movement from large dune ridges or dune hummocks.

General Botanical Conditions and Processes

The plant communities are good indicators of the different dune areas described in this report, because they reflect the micro-climatic and edaphic factors that characterize each of these areas. In fact the major boundaries for the three areas described in this report can perhaps best be defined in terms of the plant communities.

The dune areas described also provide elegant examples of plant successions. As the sand upon which the communities grow gets older eastward, so does the vegetation. Thus the entire process of one plant community replacing another can be observed from a suitable vantage point in the dunes.

Two different successional series develop landward depending upon the presence or absence of saturated soil. These series are described as a dry dune meadow succession and a wetland succession.

In the first, the pioneer plants are the dune grasses and a few forbs that inhabit the primary dune. These are replaced by non-dune grasses, mosses, lichens and other upland plants that can tolerate sharp drainage of the dry dune meadows or older dune ridges. These, in turn, are gradually replaced by shrubs and trees to form a dry or mesic climax or sub-climax forest.

In the second series, the wetland successions, sedges rushes, silverweed and other pioneers that can withstand prolonged saturation form in the wet areas behind the primary dunes. Farther back, these plants are gradually replaced by wetland shrubs and trees to form a swampy forest.

The Primary Dunes

The primary dunes are the first series of dunes east of the bare sand of the beach. They are formed by wind-blown sand from the beach that is trapped by vegetation. These dunes may be built into a single continuous high ridge or more commonly, a series of dune hummocks that only vaguely resemble a ridge. The landward (eastern) boundary of this area is identified by several criteria: First, the break in the slope at the bottom of the dune ridge; or second, the change in vegetation from dune to wetland; and third where the above criteria are absent, the subtle change in vegetation from primary dune to dry dune meadow can be used.

The plants that characterize the primary dune can include several species. They all must tolerate moving sand, high wind velocities, salt spray, and, in the late summer months, little preciptation. Two dune grasses dominate and typify this community. Marram grass (Ammophila arenaria) is a tall plant that proliferates by underground stems and tends to produce clumps. Sea-lyme grass (Elymus mollis) is a tall, broader-leaved, native plant that is second only to marram grass in its soil-binding ability.

Seaward of the primary dune, berms and hummocks (embryo dunes) may be populated by either of two species of sea rocket (Cakile spp.) or by silver beach-weed (Ambrosia chamissonis). These broad-leaved plants may be removed by winter storms or may prepare the way for the more permanent dune grasses by accumulating additional sand.

Landward of the primary dune, the usual transition is to wetland. This transition is marked by vegetation that changes dramatically within a few inches of elevation. Some primary dune areas may not be bounded landward by wetland, but may merge gradually into the dry dune meadow community.

The Wetlands

The wetland areas lie east of the primary dune area and are low enough to be covered with water for a large part of the year. They are formed in the troughs between successive primary dune ridges. The wetlands are easily marked by a distinctive vegetation which can be used to denote the boundaries of this area.

The plants in the wetlands reflect the fact that submergence or wet soils precludes the growth of typical primary dune plants or typical dry dune meadow plants. Wetland plants must be able to tolerate submergence for up to several months each year, either by seeds or vegetative parts. Plants that are only found in this area and are widespread are: the sickle-leaved rush (Juncus falcatus), the slough sedge (Carex obnupta), Pacific

silverweed (Potentilla pacifica), and the coast willow (Salix hookeriana). Other species occur in the wetlands but are less widespread, or may also inhabit drier areas. There is some indication that low, but dry areas in the primary dunes are becoming "wet". Dead or dying marram grass was present at the edges of flat, wet spots within the primary dune area. This is an indication that vegetational communities change from dry to wet successions as hydrologic conditions change.

Dry Dune Meadows

In the absence of wetlands dry dune meadows occur east of the primary dune area. These meadows are relatively flat with only a few hummocks on them, which can be formed in several ways. Generally these areas appear to be fields of hummock dunes that have been cut off from their sand supply (the beach) by a newer primary dune ridge. These areas may also be simply a dune trough that is not low enough to be flooded part of the year.

Thus, dry dune meadows occur in the same general geomorphic location as the wetland; that is, in the troughs between successive dune ridges. The basic difference between them (wetlands and dry dune meadows) is that the wetlands are slightly lower.

This component of the dune systems is termed "dry" to distinguish it from adjacent flat, but lower, wetlands that can also take on a meadow-like appearance.

This vegetational community varies sharply from the wetlands community. The lack of prolonged submergence allows plants with drier preference or requirements to dominate. More typical grasses, such as: red fescue (Festuca rubra), little hair grass (Aira praecox), and sweet vernal grass (Anthoxanthum odoratum) are common indicators. Additionally, herbs such as seaside tansy (Tanacetum douglasil), seashore lupine (Lupinus littorallis) are found in these drier areas.

It should be noted that the two commonest pioneer trees in the dune system, the coast or lodgepole pine (Finus contorta), and the Sitka spruce (Picea sitchensis) can be found in either the wetlands or the dry dune meadows, and are thus not good indicators for either system.

It should be further noted that marram grass and sea-lyme grass can be found in the dry dune meadow community. This apparently reflects some secondary cause of soil instability such as wind blowouts, human works, or possibly rodent burrowing.

In certain areas, south of Ocean Park, for instance, the dry meadow merges seaward with the primary dunes area, with no intervening wetlands. This may reflect a rapidly prograding beach, with no time for dune hummocks to coalesce into a continuous primary dune ridge.

Dry dune meadow vegetation also is found on older dune ridges. Although the mapping separates dry dune meadows from older dune ridges, the separation is geomorphic, rather than botanical.

Review of Shoreline Act Criteria

The wetlands described and mapped in these documents relate to the criteria and definition in the Shoreline Management Act RCW 90.58.030 and accompanying regulation in several ways.

In Sec. (2)(b) of RCW 90.58.030 wetlands are related to as "ordinary high water mark on all lakes, streams, and tidal waters. . ." (Sec. (2)(b) goes on to define the high water mark as the line where "the presence and action of water is so common and usual as to mark upon the soil a character different from that of the abutting uplands. . ."

In the dune wetlands identified in this study, the transition from primary dune or dry dune meadow vegetation is easily discernible at all times. Dune wetlands are subject to seasonal flooding and the vegetation faithfully reflects the conditions of an "ordinary high water mark." On the other hand, this is not a high water mark on a lake, stream or tidal water. So dune wetlands are not specifically mentioned in Section (2)(b).

Section (2)(d) talks about". . . all the waters of the state,. . ., and their associated wetlands." Certainly, the ocean qualifies as a "water area" or a "tidal water" of the state. Since the entire dune system is formed by the ocean, owing its origin and existence to it, one might argue that it is certainly associated. Or as stated in WAC 173-22-030, Sec. 2, they are "influenced and are in proximity to, any, . . ., . . ., or tidal water."

Finally, the dune wetlands can qualify as marshes as described in RCW 90.58.040. They are low, flat areas on which the vegetation consists mainly of herbaceous plants such as sedges and other aquatic or semi-aquatic plants. Also, shallow water stands upon them for a considerable part of the year. As in other marshes, they tend to merge or develop into "swamps" with trees and shrubs replacing some of the herbaceous wetland plants.

Although the dune wetlands as described in this study can be construed to fall under the Shoreline Management Act's criteria, the Act could certainly be written or interpreted to specifically include dune wetlands as:

a) associated with tidal waters

b) marshes and/or swamps

c) shorelines of statewide significance

d) all of the above

The language could also provide more explicitly for natural development or changes within the dune system. For instance, a dry dune meadow area could become wetland due to changes in the water table.

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