

BIOLOGICAL ASSESSMENT

**TWOMILE CREEK property and southern BANDON STATE
NATURAL AREA, COOS COUNTY, OREGON**



Report to Michael Keiser

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October 2007

Acknowledgements

The author is grateful to Janet Rogers for her able assistance in the field and extensive knowledge about the natural history of the Bandon area. Noel Bacheller (Oregon Parks and Recreation Department) provided important background on gorse in Bandon State Natural Area. Eleanor Gaines, Eric Scheueuring, and Claudine Tobalske (ORNHIC) provided help with wildlife data.



Sitka spruce - Shore pine forest forest on stabilized sand dunes (map unit 5).

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Executive Summary

The assessment area covered about 710 acres composed of portions of three properties—the Keiser property (219 ac), a portion of the Stein property (11 acres, with permission), and part of the south half of Bandon State Natural Area (480 ac). The area is composed of stabilized and unstabilized sand dunes forming two ridges parallel to the beach, separated by seasonally-flooded wetlands in the trough between the dunes. Elevations range from 20 to 90 feet above sea level. Most use of the area is limited to infrequent recreational entry by the public and adjoining landowners. Observed uses include off-road vehicle (ORV) riding, horseback riding, hunting, hiking, skeet shooting, and wildlife viewing. Much of the land immediately of the area has been intensively developed for commercial cranberry production. Twelve habitat map units were identified. About 340 acres of the area are upland and 80 acres of wetland are confirmed with an additional undetermined amount occurring on deflation plain that was not accessible. Primary rare elements are coho salmon, steelhead, silvery phacelia, and rare sand dune plant associations. Wildlife species are extremely diverse but plants species are limited in the dune habitats. Much of the area is overrun with gorse and serves as a center of dispersal for this invasive species. Conservation can be accomplished by protecting the entire target area or by establishing a reserve for the most important site. A scenario for development of part of the area includes control of gorse and establishment of an additional reserve to maintain habitat connectivity.

Introduction

Janet Rogers, representing owner Michael Keiser, engaged the author to conduct a site assessment of (a) property owned by Michael Keiser just south of Twomile Creek, Coos County, Oregon, and (b) the inland dune sheet in the south half of Bandon State Natural Area (formerly Bandon State Park). Objectives of the assessment were to (1) identify the composition and condition of existing habitats on the site, (2) identify existing land use, (3) locate species or plant associations of conservation concern, (4) identify potential management problems, and (5) assess the potential for habitat restoration.

Target area

This biological assessment covered an area of about 710 acres, composed of portions of three properties—the Keiser property (219 ac), a portion of the Stein property (11 acres, with permission), and part of the south half of Bandon State Natural Area (480 ac; Figure 1). The Keiser property extends for 1.5 miles along the dune sheet just south of Twomile Creek, about five miles south of the city of Bandon. The tract is located in Township 29 South, Range 15 West and is composed of tax lot 1903 in Section 13, lots 100 and 201 in Section 24, and lot 900 in Section 25. The portion of the Stein property examined is located south of Twomile Creek in tax lot 600, Township 29 South, Range 15 West, Section 13. The portion of Bandon State Natural Area examined occurs in sections 14, 23, 26, and 35 in Township 29 South, Range 15 West.

The target area is composed of stabilized and unstabilized sand dunes forming two ridges parallel to the beach, separated by seasonally-flooded wetlands in the trough between the dunes. The Twomile Creek floodplain, estuary, and old deflation plain just east of the creek were not included in the project area. Stabilized dunes and the old deflation plain are covered with either dense stands of conifers and shrubs of various ages or dense stands of European beachgrass and gorse. Less stabilized dunes are covered by native grasses, European beachgrass, or are nearly devoid of vegetation. Most of the trough between the dune ridges is covered by dense conifers or shrubs. Small to extensive seasonal wetlands occur throughout the target area, but the only permanent water is along Twomile Creek. The highest dunes have expansive views of the New River area to the south and the Pacific Ocean to the west, with limited views east to foothills of the Klamath Mountains.

1. Geomorphology. The target area is part of the Coos Bay dune sheet that extends 60 miles from Cape Blanco to Florence. The sand originated from sediments transported to the coast by major rivers draining the interior of the region, as well as ongoing erosion and deposition along the immediate coastline. Sand is transported along the coast by seasonal ocean currents and prevailing winds. Elevations in the target area range from about 20 to 90 feet above sea level. Twomile Creek is the only stream in the vicinity that cuts across the dune sheet to the beach. East of the dune sheet is an ancient marine terrace

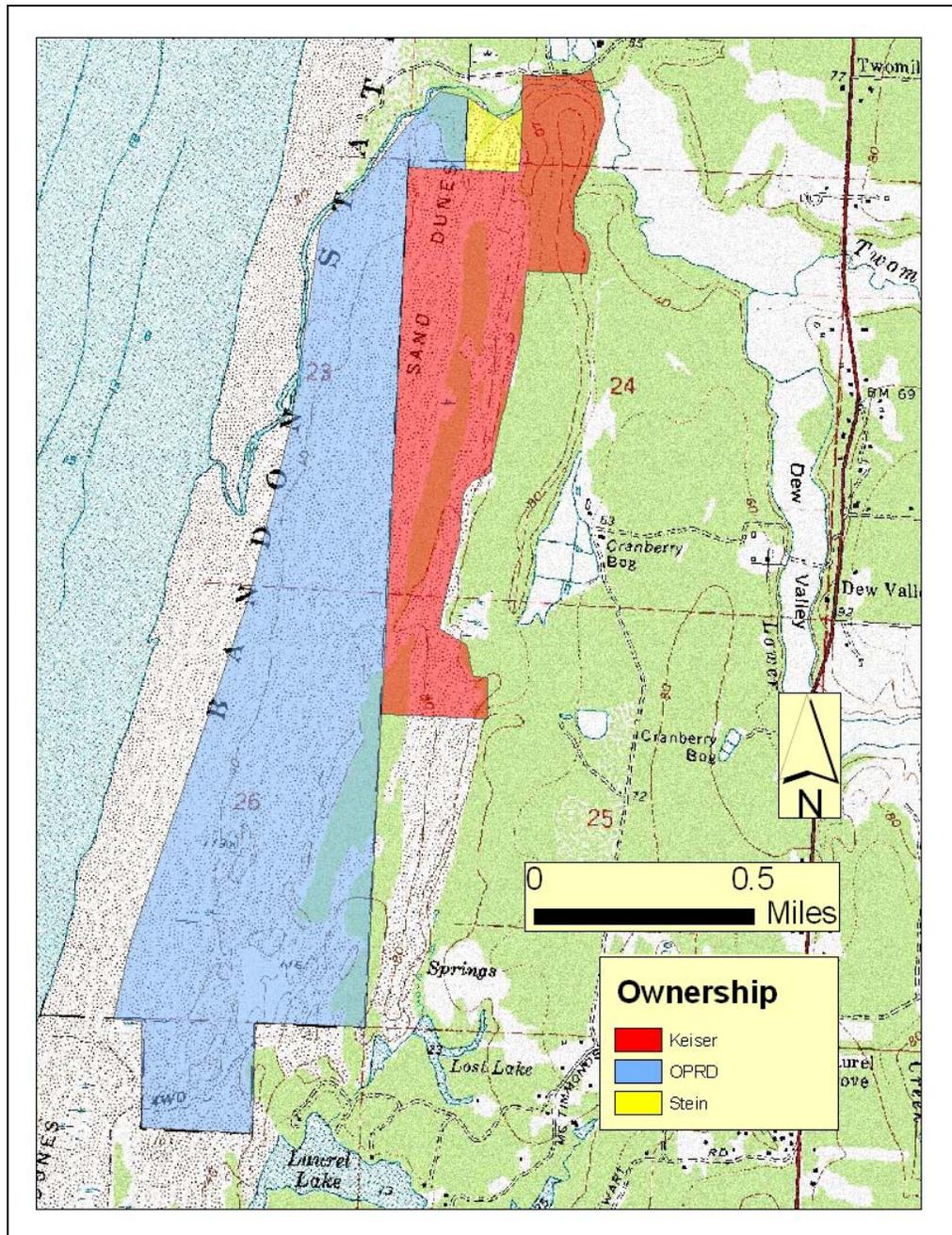


Figure 1. Twomile Creek target area. Colored areas delineate properties or portions of properties examined in the target area

extending 4-6 miles inland and forming a level surface. The marine terrace is ideal for growing cranberries and the Bandon area is the epicenter of cranberry cultivation on the Pacific Coast of North America. The terrace is bounded on the east by the foothills of the Klamath Mountains.

2. Adjacent Ownership. The target area is bounded on the north by Bandon State Natural Area and private land owned by Stein and Fugate, on the west by Bandon State

Natural Area, on the south by Puhl, and on the east by Kranick. The portion of Bandon State Natural Area in the target area is bordered on the east by Stein, Keiser, Puhl, and Fraser, and on the south by the Bureau of Land Management's (BLM) New River Area of Critical Environmental Concern (ACEC).

3. Land Use. The target area in the dunes is remote and nearly surrounded by private land. The only public access to the south half of Bandon State Natural Area is through the New River ACEC or along the beach from the north or south. Consequently, most use of the area is limited to infrequent recreational entry by the public and adjoining landowners. Observed uses include off-road vehicle (ORV) riding, horseback riding, hunting, hiking, skeet shooting, and wildlife viewing. An old fence line on the Keiser property recently exposed by shifting dunes indicates that the area was once suitable for livestock grazing. Immediately east of the Kaiser property much of the marine terrace has been intensively developed for commercial cranberry production.

The Bandon area is destined to change from agricultural, forestry, and rural residential use to suburban land use as the Oregon coast continues to attract settlement and development. Most of the area east of the target properties will infill with commercial cranberry bogs and residential development. Properties with views of the ocean will be in high demand.

Methods

Background information on natural features and biota of the target properties was obtained from the Oregon Natural Heritage Information Center (ORNHIC), whose resources include the Biotics database, historical Geographic Manual Files, its listing of rare species (ORNHIC 2007), and information developed by ORNHIC for ODFW's Oregon Comprehensive Wildlife Conservation Strategy (Oregon Department of Fish and Wildlife 2005). Information on historical vegetation was obtained from Hawes et al. (2004). The tracts were assessed by a combination of site visits and remote sensing using available data from ORNHIC. Site work was conducted with Janet Rogers on 18-19 May 2007 and with Janet Rogers and Ashton Christy on 2 July 2007.

Historical Habitats

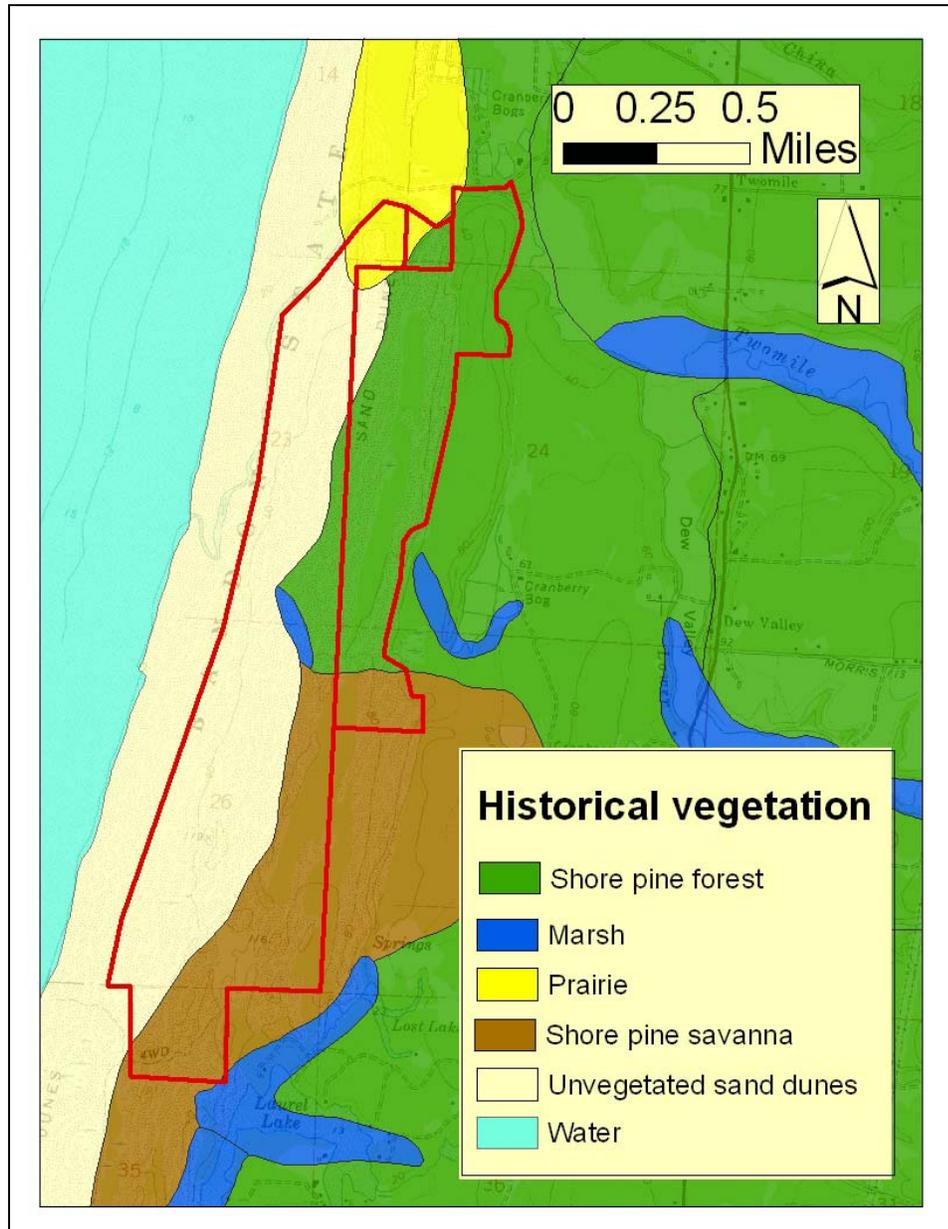


Figure 2. Historical vegetation of the Twomile Creek target area, 1857. Target area is in red. Source: Hawes et al. 2004.

Historical vegetation for the Twomile Creek area was mapped by Hawes et al. (2004) using the earliest land survey notes as a point of reference (Figure 2). The target area was surveyed by Daniel and Mathew Murphy in July 1857. In their general description of the township they described the target area as "poor sandy barrens...There is however a strip

of good grass land bordering on the ocean in the southwest corner of the township and extending north for about 2 miles and about a half mile wide. The timber is scrubby pine and spruce." Heading north along the survey line between sections 25 and 26, they surveyed through "pine openings" (savanna) and entered pine forest with spruce, huckleberry, and salal. Between sections 23 and 24 they left the pine and spruce forest and entered "sandy barrens." Just south of Twomile Creek they entered "rolling prairie." Today's tall foredune and adjacent deflation plain are largely an artifact of European beachgrass and may not have existed in their present form when the area was first surveyed (Christy et al. 1998). The west half of Bandon State Natural Area is still sand dunes but part of the area mapped as open sand in 1857 is now dunes covered with trees. The pine savanna in the southeastern quarter of Bandon State Natural Area and a small part of the Keiser property would have contained pockets of dune grassland. The northeastern part of the target area was mapped as pine forest but the survey records indicate that Douglas fir, Sitka spruce, western hemlock, madrone, Port Orford cedar, and chinquapin were also present. These vegetation types would have developed on stabilized sand and probably looked very similar to types seen today in the area, except for the presence of gorse. The "rolling prairie" near Twomile Creek was probably stabilized sand dunes with a sod of beach fescue and possibly tufted hairgrass.

At some point after the 1857 survey, moving sand buried the shore pine savanna and forest along the eastern portion of the target area, covering an area one quarter to one half mile wide. This area is where wind has recently excavated a sand dune to reveal a long-buried fence line, indicating that the area once had been suitable for livestock grazing. Although details are lacking from the survey notes, it would appear that today's habitat for the rare vegetation types and silvery phacelia in map unit 1 are no older than about 150 years.

Existing Habitat and Species Assessment

Existing habitats

Twelve habitat map units were identified in the target area (Figures 3 and 4). These units are included in ODFW's strategy habitats for coastal dunes (Oregon Department of Fish and Wildlife 2005).

Map units

1. Sand dunes with beach fescue and seashore bluegrass (19 ac; Figures 9 and 10). This unit extends along the northeastern edge of the Keiser property and includes the southeastern quarter of the Stein property. It occurs on unstabilized to partially-stabilized parabola dunes along the east edge of the dune sheet and contains primarily native vegetation. It contains the rare beach fescue and seashore bluegrass plant associations and

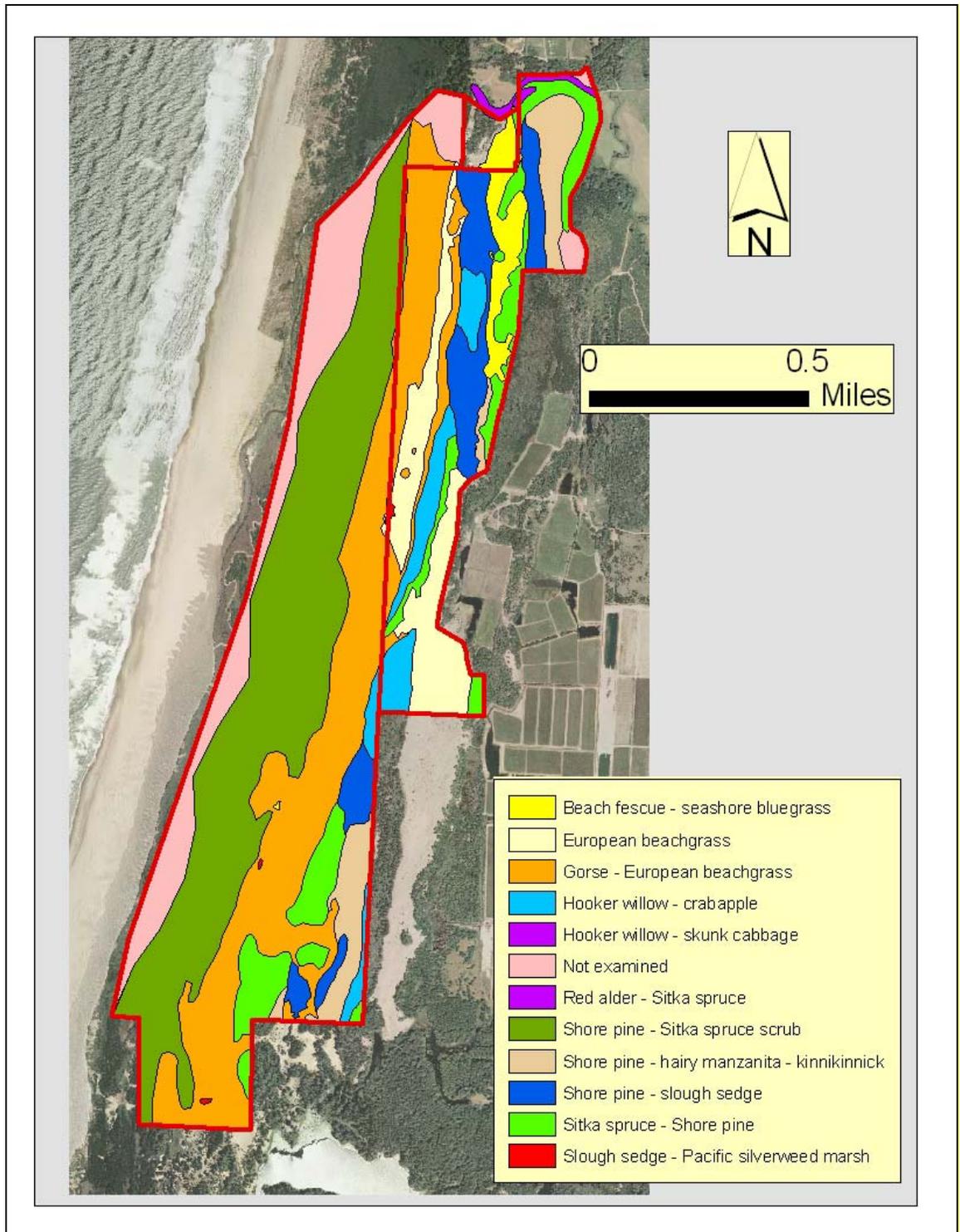


Figure 3. Habitats in the Twomile Creek target area. Red lines delineate properties or portions of properties examined in the target area (see Figure 1). 2005 NAIP imagery.

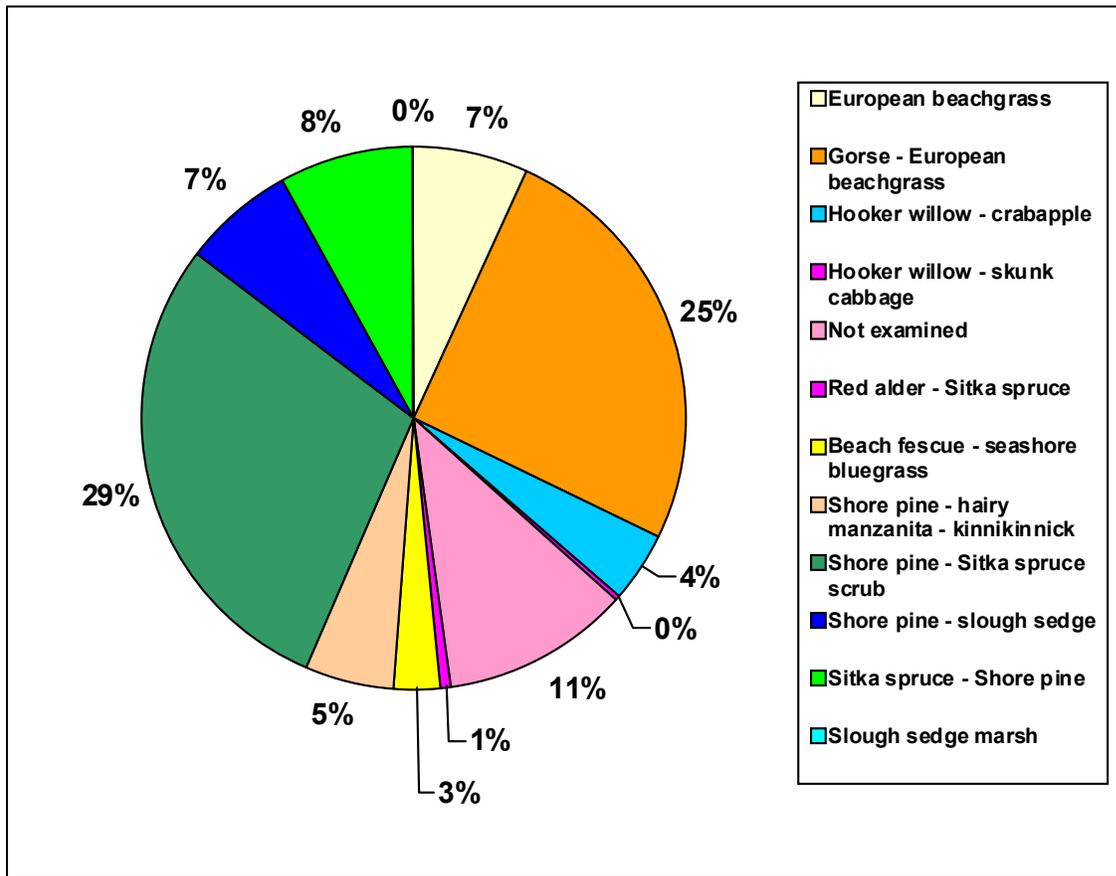


Figure 4. Percentage of acreage in habitat map units, Twomile Creek target area.

up to 1,000 plants of silvery phacelia. Gorse is mostly restricted to the forested edges and European beachgrass is scarce. In contrast to map unit 4, this unit contains little or no European beachgrass, is more diverse with a large component of native species, and sand movement is less active. This is the most important map unit in the target area because it is in good to excellent condition and contains the greatest number of rare elements.

2. Shore pine woodland with hairy manzanita and kinnikinnick (37 ac; Figures 20 and 21). This map unit occurs along the border between open dunes and forests, with one 18-acre stand in the northeastern corner of the Keiser property and another near the south end of Bandon State Natural Area. The early seral stage of this map unit is characterized by fragile mats of lichens and kinnikinnick that are readily destroyed by recreational traffic (Christy et al. 1998). This stage is favored for collecting matsutake mushrooms. The later seral stage of the map unit is dominated by hairy manzanita and evergreen huckleberry, with small openings containing remnants of the earlier lichen - kinnikinnick stage. The lichen flora on the shrub layer is diverse and may include several rare species. This map unit is of

primary importance because rangewide it may be declining from dune stabilization and the absence of stand-replacing fire.

3. Seasonally-flooded shore pine - slough sedge swamp (46 ac; Figure 15)—may include Hooker willow, spiraea, bog blueberry. This map unit occurs in the trough between the two dune ridges on the Keiser property and near the south end of Bandon State Natural Area. Air photos indicate that patches of this vegetation are also present in the dense shore pine - Sitka spruce scrub (map unit 12) that was difficult to access and not examined in detail. Old-growth stands are rare but stands in the 30-75 year age class are more common and are presumably an artifact of the expansion of deflation plain after the advent of European beachgrass. Older stands whose shore pine canopy has died may intergrade with Hooker willow - crabapple swamp (map unit 6). This map unit is of primary importance because of its wetland status and good to excellent condition.
4. Sand dunes with European beachgrass (50 ac; Figures 12 and 13). On the Keiser property this map unit includes the western dune ridge and the south end of the eastern dune ridge. Another 35 to 40 acres occur on the Puhl and Fraser properties to the south and extend south to the ACEC. This map unit delineates dunes dominated by nearly monotypic stands of European beachgrass but they may have up to 75 percent bare sand. Introduced weedy species such as false dandelion, little hairgrass and silver hairgrass are frequent. Native dune species such as American dunegrass, seashore lupine and coast strawberry are also present. Silvery phacelia occurs sparingly in this map unit (Figure 8). Woody species are nearly absent except along the forested edges. Topography of this unit is often broad and undulating, with active blowout troughs and shifting slip faces. In contrast to map unit 1, this unit contains little or no beach fescue or seashore bluegrass, is less diverse with few native species, and sand movement is more active. It is of secondary importance in the target area because it contains the fewest number of rare elements and is a widespread and common dune community.
5. Sitka spruce - Shore pine forest—may include shore pine, Douglas fir, western hemlock, Port Orford cedar, salal, and evergreen huckleberry (57 ac; inside cover photo). This map unit occurs on slopes and tops of stabilized dunes and may face any compass direction. It occurs as continuous forest or as tree islands that have been cut off from adjacent forest by wind erosion. Vegetation is extremely dense and often deformed by wind, and older trees develop fantastically contorted forms. A variety of age classes are present and some old-growth Port Orford cedars were noted on tree islands. The map unit was not examined in detail, but higher dunes have the best views in the target area. Most of this unit is in excellent condition but some gorse occurs along the edges.
6. Seasonally-flooded Hooker willow - crabapple swamp—may include shore pine, Sitka spruce, Douglas spiraea, and Labrador tea (30 ac; Figure 16). This map unit occurs in the trough between the two dune ridges on the Keiser property and near

the south end of Bandon State Natural Area. Air photos indicate that patches of this vegetation are also present in the dense shore pine - Sitka spruce scrub (map unit 12) that was difficult to access and not examined in detail. This map unit is of primary importance because of its wetland status and good to excellent condition.

7. Seasonally-flooded slough sedge - Pacific silverweed marsh—may include Hooker willow (0.5 ac; Figure 14). This unit occurs in small amounts in interdunal swales on the Keiser property and on old deflation plain at the south end of Bandon State Natural Area. Air photos indicate that patches of this vegetation are also present in the dense shore pine - Sitka spruce scrub (map unit 12) that was difficult to access and not examined in detail. It floods seasonally and often dries in midsummer. This map unit is of primary importance because of its wetland status and good to excellent condition. It is a widespread wetland type and important for wildlife but a tiny component of the target area.
8. Sand dunes with gorse and European beachgrass (178 ac; cover photo, Figures 17, 18, and 19). This map unit occurs along the western dune ridge extending from the Keiser property to the south end of Bandon State Natural Area. On the Keiser property it occurs around the periphery of map unit 4, but in the state park it covers most of the target area. This map unit delineates formerly open dunes now covered by nearly monotypic stands of invasive gorse. Shore pine and Sitka spruce survive if they can overtop the gorse, but otherwise few other species can compete with gorse. European beachgrass is present in remnant areas of open sand that are actively being invaded by gorse. Sand movement ceases once gorse becomes established, and the nitrogen-fixing capacity of gorse alters soil chemistry in the dunes. Topography of this map unit is broad and undulating, preserving the character of the former open sand dunes but under a blanket of gorse. In contrast to map unit 4, this unit is dense monotypic shrubland with occasional small conifers and pockets of European beachgrass with open sand. It provides dense cover for certain species of wildlife but excludes others. It is of secondary importance in the target area because it contains no rare elements and is a center of gorse dispersal.
9. Perennially-wet Hooker willow - skunk cabbage swamp (0.6 ac). This map unit was observed in the extreme northeastern corner of the Keiser property and was not examined closely. It is perennially wet, with the water coming from either Twomile Creek or groundwater discharge from the adjacent stabilized dune. Running water was audible, indicating a beaver dam and probable connection to Twomile Creek. Groundwater discharge from the dune seems unlikely because an adjacent seasonally-flooded interdunal trough was dry. This map unit is of primary importance because of its wetland status and good to excellent condition. It is a widespread wetland type and a minor component of the target area, but important because it is perennial wetland and part of the Twomile Creek floodplain that supports runs of steelhead and coho salmon.

10. Riparian corridor with red alder and Sitka spruce—may include salmonberry, thimbleberry, Armenian blackberry, Hooker willow (4 ac). This map unit occurs along the north edge of the target area and delineates the riparian zone of Twomile Creek. It is a widespread vegetation type and a minor component of the target area, but important because it is part of the Twomile Creek floodplain that supports runs of steelhead and coho salmon. A portion of the unit on the Stein property is mowed and some alder trees have been removed, exposing the creek to solar heating.
11. Not examined as part of project area (80 ac). These portions of the target area were peripheral and include the area around the existing house on the Keiser property, the Twomile Creek floodplain, and the deflation plain of Bandon State Natural Area. Much of the Twomile Creek floodplain and deflation plain in the park is inaccessible because of gorse.
12. Deflation plain with dense young shore pine - Sitka spruce scrub (205 ac). This map unit is almost entirely on Bandon State Natural Area and was not examined in detail because much of it is inaccessible because of gorse. Air photos indicate that it is interspersed with a significant amount of wetlands, particularly map units 3, 6, and 7. It is a widespread vegetation type along the coast but is an important habitat in the target area where it has not been overrun with gorse. Trees in this habitat grow quickly and will eventually outcompete the gorse.

Wetlands

About 11 percent (80 ac) of the target area is confirmed wetland, comprised of map units 3, 6, 7 (Figure 5). In addition, air photos indicate that an undetermined portion of map unit 12 is interspersed with patches of wetlands, particularly map units 3, 6, and 7. These wetlands flood during winter and early spring when high seasonal precipitation raises the water table, and are used intensively by waterfowl off and on throughout the year. Map unit 9 is perennially wet and probably fed by Twomile Creek. Wetlands and permanent lakes in the BLM ACEC were not mapped as part of this study because they were not part of the target area.

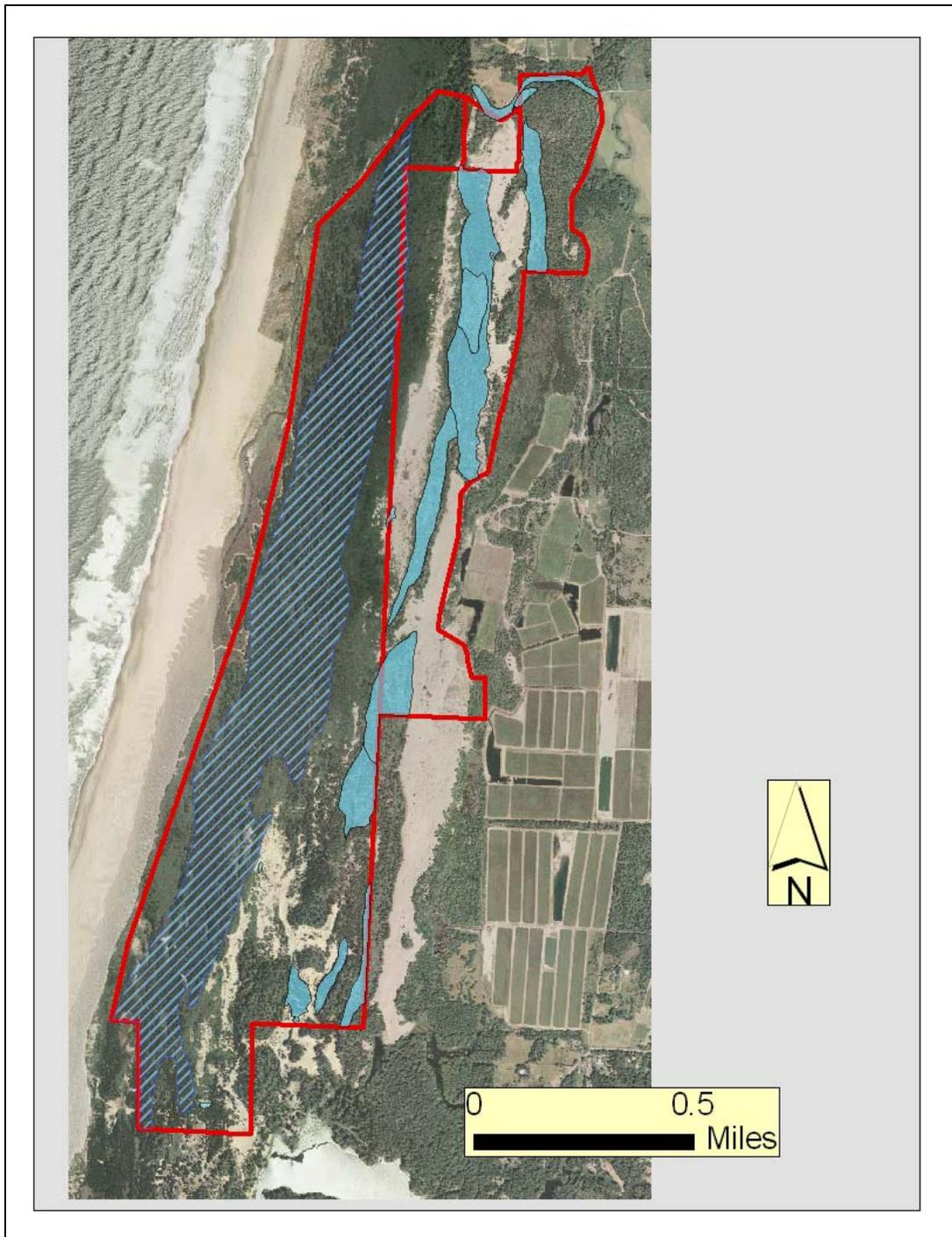


Figure 5. Extent of wetlands in the Twomile Creek target area. Crosshatched area is shore pine – Sitka spruce scrub (map unit 12) on deflation plain that contains an undetermined amount of wetlands. 2005 NAIP imagery.

Rare, threatened, and endangered species

ORNHIC's Biotics database identified eleven known occurrences of rare, threatened and endangered species from within a two-mile radius of the target area (Table 1).

Silvery phacelia (*Phacelia argentea*; Figure 11). The database contained records for two occurrences of silvery phacelia, a federal and state-listed rare plant, from Bandon State Natural Area. One occurrence was just south of Twomile Creek and the other was at the south end of the park. These plants were last seen in 1984 and 2001, respectively, and were mapped as occurring on sand dunes and deflation plain. Both areas are today covered by a dense growth of shore pine and Sitka spruce that cannot possibly support silvery phacelia. A search with Janet Rogers of the northernmost and easternmost dune sheet on the Keiser property and the adjacent Stein property yielded an estimated 1000 or more plants of silvery phacelia, one of the two largest known populations of the species. Most plants occur in map unit 1 (Figure 3) as a component of high-quality dune associations composed of beach fescue and seashore bluegrass (Figure 8; Table 5). With permission of Janet Rogers, GPS data for these occurrences of silvery phacelia were provided to Jennifer Kalt, a consultant under contract with the U.S. Fish and Wildlife Service to write a status report for silvery phacelia. Jennifer Kalt and Janet Rogers subsequently examined the populations on the Keiser property in June 2007 and collected detailed demographic data. The populations from 1984 and 2001 that were mapped in the ORNHIC database may have been extirpated because of reduced sand movement due to the expansion of European beachgrass, gorse, or shore pine and Sitka spruce scrub.

Russet cotton-grass (*Eriophorum chamissonis*) was last seen in 2001 in a *Darlingtonia* fen on the ACEC at Lost Lake. This kind of habitat is not known to occur in the target area.

Aleutian Canada goose (*Branta hutchinsii leucopareia*). Fifteen geese were observed on the ACEC at Lost Lake in 1995. These geese frequently feed on open deflation plains, but most of this habitat in the target area is too overgrown with shrubs and trees to receive much use from geese.

Humped bladderwort (*Utricularia gibba*) was reported from the ACEC at Lost Lake in 1997. Suitable habitat for this species does not occur in the target area because there are no permanent lakes or ponds.

Breeding populations of **Western snowy plover (*Charadrius alexandrinus nivosus*)** are active along New River and Twomile Creek, particularly around the foredune on the spit west of the river and creek. These are managed under a cooperative Habitat Conservation Plan by BLM, the Oregon Department of Fish and Wildlife, and the Oregon Parks and Recreation Department (OPRD). It is unlikely that the target area examined for this project contains suitable habitat for plovers because of dense vegetation and distance from the beach.

Western lily (*Lilium occidentale*) was reported in 1988 from the marine terrace east of the project area. This is an area of impeded drainage on Blacklock soils and such habitat does not occur in the target area. The population sighted in 1988 was estimated to have poor viability and may no longer exist.

Yellow sandverbena (*Abronia latifolia*) was reported in 2001 from dunes west of Lost Lake, and populations were seen in 2007 in map unit 1 (Figure 3). The species has no state or federal status but is on the ORNHIC watch list because of a general decline in open dune habitat caused by European dunegrass.

Both **steelhead (*Oncorhynchus mykiss* pop. 31)** and **coho salmon (*Oncorhynchus kisutch* pop. 3)** occur in Twomile Creek along the northern end of the target area.

Janet Rogers and Dave Pitkin found turtle tracks and a nest on the western dune ridge. Although no turtle was sighted, the most likely species would be the **western pond turtle (*Clemmys marmorata*)** that is known from the region. ORNHIC currently has no record of western pond turtle from the target area. The turtle most likely came from wetlands along the Twomile Creek floodplain or on the deflation plain along the western edge of the target area. To reach the open dune and lay its eggs the turtle would have had to crawl several hundred feet through dense stands of gorse.

Existing wildlife

A list of wildlife confirmed or potentially occurring within the target area is given in Table 2. It includes 14 amphibians, 12 reptiles, 125 birds, and 52 mammals. The fauna is diverse because of the wide variety of habitats present on site. The fauna is species-rich because of the diversity of habitats present in the target area, particularly the dense concentration of edge effect around open dunes, forest, and wetlands.

About ten miles of New River have been designated as an important Bird Area (IBA) that is known for its concentrations of Aleutian Canada geese and thousands of migrating birds (Audubon Society of Portland 2006). Similar wildlife use also occurs along the Twomile Creek floodplain in the target area.

Existing vegetation

The habitat map units delineated in Figure 3 indicate the extent and composition of major vegetation units in the target area. Sand dunes dominated by native plant associations cover about 68 percent of the target area, while those dominated by European beachgrass and gorse cover about 32 percent of the target area (Figures 3 and 4). The primary native vegetation types on upland dunes include beach fescue, seashore bluegrass, shore pine with hairy manzanita and kinnikinnick, and forest composed of shore pine, Sitka spruce,

Port Orford cedar, Douglas fir, and western hemlock. About 11 percent of the target area is covered by freshwater wetland plant associations and an undetermined portion of map unit 12 is also wetland. Primary wetland types are various successional stages on old deflation plain and in interdunal swales, and include slough sedge marsh, Hooker willow – crabapple swamp, and shore pine – slough sedge swamp.

Rare native plant associations present in the target area are listed in Table 3. These are of conservation concern because of cumulative losses resulting from a variety of factors that disrupt dune ecosystem processes: (a) sand stabilization and resulting plant succession initiated by European beachgrass and Scots broom, (b) an absence of periodic disturbance by fire, (c) excessive ORV traffic at many localities, and (d) intense commercial and residential construction at many localities. In the target area, the rare beach fescue and seashore bluegrass associations are concentrated on the Keiser and Stein properties in map unit 1.

Table 4 lists 50 vascular plant species observed in the target area. This is not a diverse flora because the project focused on open sand dunes that are relatively species-poor. Additional species are no doubt present in the forest, wetland, and shore pine - Sitka spruce map units that were not closely examined as part of this study.

Exotic and invasive species

Of the 50 species of vascular plants reported in Table 4, only 6 (12%) are exotic. These numbers are typical for open dune habitats where species diversity is naturally low. In open sand, major pest species are limited to gorse, Scots broom, and European beachgrass. Unfortunately, these three species are capable of disrupting dune processes and can alter habitats to the detriment of native species (Christy et al. 1998).

Gorse is the primary pernicious weed present in the target area. It is most abundant in Bandon State Natural Area but also widespread and common on the Keiser property. The lack of management in this isolated area has enabled gorse to reach epidemic proportions and serve as a center of dispersal for the species. Today it covers about 180 acres of the target area and probably 200-250 acres in the entire southern end of the park. Based on comparison with air photos from the 1970s to the 1990s, expansion of gorse has been rapid, obstructing large areas of dunes that were open sand just ten years ago. At the current rate of expansion it is not unreasonable to estimate that most of the dune sheet along the west half of the target area will be completely covered by gorse in 2020. About 100 acres are now essentially inaccessible to humans without mechanical assistance.

European beachgrass is well established in map units 4 and 8 and efforts must be made to keep it out of the native dune associations in map unit 1.

Potential management challenges

Control of gorse in the target area is the most pressing management challenge. Under current conditions, expansion of gorse is unchecked and exponential because no management is occurring. Treatment for the south half of Bandon State Natural Area will require a major commitment of time and resources if gorse is to be brought under control. It will require a large investment in hand cutting or controlled burning, and follow-up treatment with herbicides. Use of heavy equipment for mowing, scarification, or ripping would require regrading of many acres for best results. Gorse sprouts readily after burning or cutting, and the large seed bank in the soil causes rapid recovery. Gorse spider mites (*Tetranychus lintearius*), introduced for biological control of gorse, were seen at the south end of Bandon State Natural Area in 2007 but were not plentiful.

Off-road vehicle (ORV) damage occurs primarily in map units 1, 2, and 4. It is not particularly heavy compared to other dune areas more accessible to the public. Access is mostly through private land and cannot be easily controlled under current conditions.

Other human uses such as camping, hunting, and target practice are occasional and under existing conditions will continue to occur until a local stewardship or management presence is established.

Recommendations for habitat protection and restoration

The target area at Twomile Creek contains approximately 340 acres of upland on both stabilized and unstabilized dune ridges. Some of these are up to 90 feet above sea level and have expansive views of the New River area to the south, the Pacific Ocean to the west, and the Klamath Mountains to the east. An additional 80 acres are confirmed wetlands and an unknown portion of map unit 12 also contains wetlands. Design of any land allocations or potential development in the target area is constrained by topography and tax lots that correspond to narrow, linear landscape features—deflation plain, parallel dune ridges, and linear wetlands in the trough between the dunes. The following alternative scenarios for habitat protection treat the target area as (1) a single unit and (2) by separate ownerships.

1. Alternatives for entire target area. As a unit, the target area forms a contiguous block of 1,338 acres of undeveloped land valuable for open space and habitat connectivity (Figure 6). The 219-acre Keiser property adjoins 1,053 acres in Bandon State Natural Area. The state park has four miles of ocean frontage and connects with BLM's 65-acre ACEC on the south end. Protection of the target property as a block of conservation lands would benefit the known populations of steelhead and coho salmon in Twomile Creek, and the populations of silvery phacelia and yellow sandverbena on the Keiser and Stein properties. It would also benefit the myriad species of wildlife listed in Table 2 that occupy the many habitats present on the site.

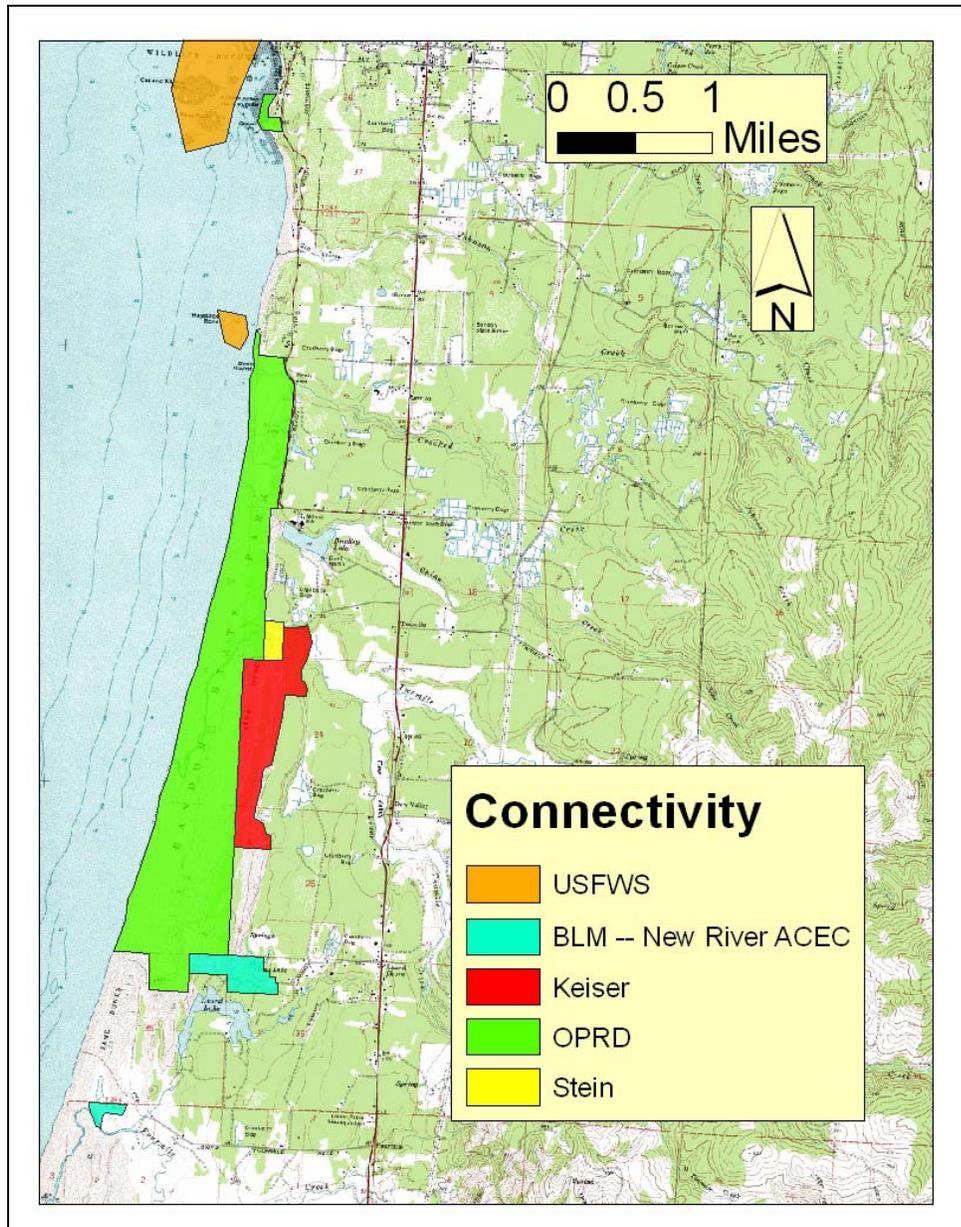


Figure 6. Connectivity of Keiser and Stein properties to existing protected lands.

2. Alternatives by ownership. An alternative approach to protecting the entire target area is to look at each property separately. Wetlands are all of conservation importance regardless of ownership, but upland map units in the three properties differ markedly in quality. In this case, the uplands on private land have considerably more conservation value than those on public land. The Keiser and Stein properties contain what may be one of the two largest known populations of silvery phacelia. Most of these plants occur in map unit 1 that also contains rare plant associations. Aside from wetlands, map unit 1 is

the most critical resource present in the target area. In contrast to the Keiser and Stein properties, dune habitat in Bandon State Natural Area is in very poor condition because of the pervasive infestation of gorse, and no rare elements are known to occur there. Although the value of open space, habitat connectivity, and public ownership in this portion of the park is considerable and not to be discounted, habitat value for many species is compromised by the gorse and the property will continue to be a center of gorse dispersal unless a major investment is made to bring gorse under control.

A. Primary conservation reserve. No matter how the target area is partitioned, a reserve of about 95 acres should be considered to protect map unit 1 and the largest population of silvery phacelia, and buffer it with contiguous high-priority wetlands, shore pine woodland, and upland forest (Figure 7). Rare elements occur on both the Keiser and Stein properties and the lines are drawn independent of ownership. This would require acquisition or easements in the tax lot owned by Stein. If development is to be contemplated on lands adjoining the primary conservation reserve, poorly-placed access roads could threaten the viability of the rare elements by exposing them to increased wind and sand movement. Rather than cutting roads through the eastern dune ridge to access adjacent areas, it would be better to avoid the reserved land entirely by following the existing grade of Boak Lane and the Stein driveway.

B. Development with gorse control. Development could occur on map units 4 and 8 on the west side of the Keiser property, and potentially could be extended into map unit 8 in Bandon State Natural Area (Figure 7). These map units contain few or no rare elements and have significant infestations of European beachgrass and gorse. The only way that development of land could occur in what is currently state park would be through land exchange or purchase. A commitment to aggressive private-sector control of gorse in the heart of the infested area would be a possible incentive to state parks and the public.

C. Mitigation for development with secondary conservation reserve. Development of map unit 8 in Bandon State Natural Area would destroy the contiguity of the park by carving out a large area in its center, although habitat values of surrounding areas would benefit from removal of gorse. Impacts of development could be mitigated by creation of a secondary conservation reserve that would link the primary reserve in the north with the BLM ACEC and the undeveloped portion of Bandon State Natural Area in the south. This would protect the entire eastern dune ridge, including additional populations of silvery phacelia on Keiser and Fraser ownership in map unit 4. It would require acquisition or easements in tax lots owned by Puhl and Fraser. The result would be an expanded protected area with development in the middle and ongoing control of gorse. Development in Bandon State Natural Area would fragment the existing block of public land and would be unacceptable to many people. However, undeveloped corridors would be retained on each side of the development and the worst areas of gorse infestation in the center would be removed. Given the current problems of access to the site and poor prospects for any major public investment to control this center of gorse dispersal, the scenario outlined here might provide an imperfect but workable solution.

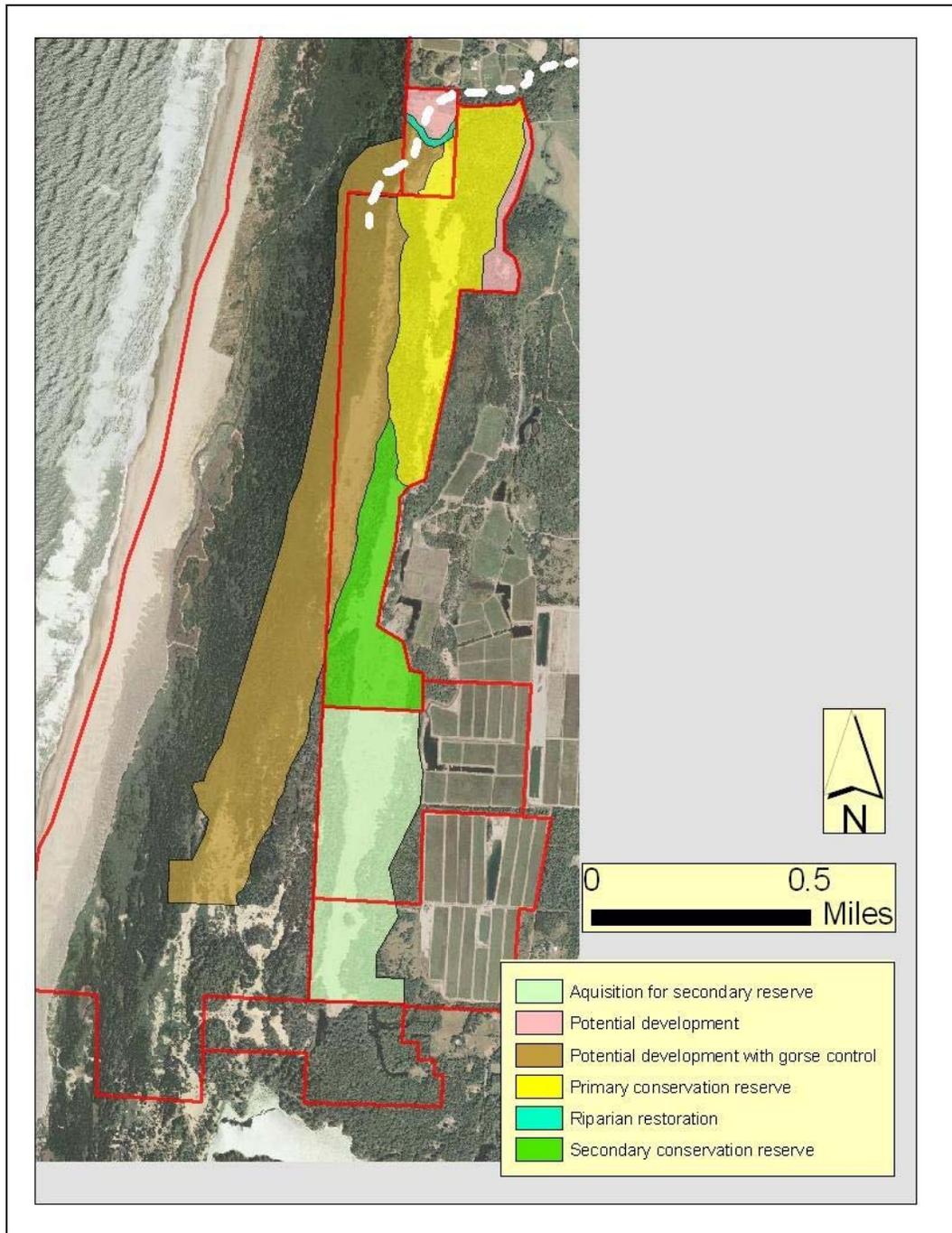


Figure 7. Potential conservation and development scenario for Twomile Creek target area. Red lines—current property boundaries. White dashed line is access to potential development area that avoids conservation reserves.

D. Habitat restoration. Control of European beachgrass and gorse in reserve areas would maintain suitable habitat for silvery phacelia and other native dune vegetation. Aggressive and persistent control of gorse in map unit 8 would reduce its potential for

expansion and would improve habitat values in surrounding map units. It would also be advisable to extend gorse control as far as is feasible into adjoining tracts of land to maximize the control effect. Finally, funding is readily available for riparian restoration along Twomile Creek on the Stein property. Planting of more trees and a wider streamside buffer will benefit known populations of coho salmon and steelhead.

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Tables

Table 1. Records of rare, threatened, and endangered species from within two miles of the Twomile Creek target area. Source: ORNHIC Biotics database and ORNHIC (2007).

Scientific name	Common name	Location	Last seen	Federal status	State status	ORNHI C rank	ORNHC list
<i>Phacelia argentea</i>	Silvery phacelia	Bandon State Park, just NW of Bradley Lake	1984	SOC	LT	G2S2	1
<i>Eriophorum chamissonis</i>	Russet cotton-grass	Lost Lake, 6 mi S of Bandon, Darlingtonia bog at NW end of lake.	2001			G5S1	2
<i>Branta hutchinsii leucopareia</i>	Aleutian Canada goose	Lost Lake, 6 mi S of Bandon	1995			G5T4S2 N	2
<i>Utricularia gibba</i>	Humped bladderwort	Lost Lake, 6 mi S of Bandon, submerged just N of shoreline of SE arm of lake	1997			G5S1	2
<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	From China Creek to mouth of New River	2003	PS:LT	LT	G4T3S2	2
<i>Phacelia argentea</i>	Silvery phacelia	Lost Lake, 6 mi S of Bandon, on sand dunes W of lake	2001	SOC	LT	G2S2	1
<i>Lilium occidentale</i>	Western lily	W of Dew Valley	1988	LE	LE	G1S1	1
<i>Abronia latifolia</i>	Yellow sandverbena	Lost Lake, 6 mi S of Bandon, W of lake into sand dunes	2001			G5S3	4
<i>Oncorhynchus mykiss</i> pop. 31	Steelhead (Oregon Coast ESU, winter run)	Twomile Creek and tributaries	pre-1993	SOC	SV	G5T2T3 QS2S3	1
<i>Charadrius alexandrinus nivosus</i>	Western snowy plover	From mouth of New River to approximately 2 mi S of New Lake	2003	PS:LT	LT	G4T3S2	2
<i>Oncorhynchus kisutch</i> pop. 3	Coho salmon (Oregon Coast ESU)	Twomile Creek	2000		SC	G4T2Q S2	1

Federal, state, and ORNHIC status and rank codes

1. Federal (USFWS)

LT = Listed threatened
P = Partial
PS = Partial Status
SOC = Species of Concern

2. State (ODFW, ODA)

LT = Listed threatened
SC = Sensitive critical
SU = Status undetermined
SV = Sensitive vulnerable

3. ORNHIC

ORNHIC participates in an international system for ranking rare, threatened and endangered species and plant associations throughout the world. The ranking is a 1-5 scale, primarily based on the number of known occurrences, but also includes threats, sensitivity, area occupied, and other biological factors. The Global Rank begins with a "G" and the State Rank begins with the letter "S." Details are available at:

<http://www.natureserve.org/explorer/ranking.htm#global>

- 1= Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences.
- 2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences.
- 3 = Rare, uncommon or threatened, but not immediately imperiled, typically with 21-100 occurrences.
- 4 = Not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences.
- 5 = Demonstrably widespread, abundant, and secure.
- Q = Taxonomic questions
- T = Rank for subspecies or variety

Table 2. Wildlife confirmed or potentially occurring within the Twomile Creek target area. Source: ORNHIC. See Table 1 for definitions of federal, state, and ORNHIC status and rank codes.

Scientific Name	Common Name	ORNHIC rank	ORNHIC element track	Federal status	State status
AMPHIBIANS					
AMBYSTOMA GRACILE	NORTHWESTERN SALAMANDER	G5S5	N		
ANEIDES FERREUS	CLOUDED SALAMANDER	G3S3	Y		SU
ENSATINA ESCHSCHOLTZII	ENSATINA	G5S5	N		
PLETHODON DUNNI	DUNN'S SALAMANDER	G4S4	N		
PLETHODON VEHICULUM	WESTERN REDBACK SALAMANDER	G5S5	N		
TARICHA GRANULOSA	ROUGHSKIN NEWT	G5S5	N		
DICAMPTODON TENEBROSUS	PACIFIC GIANT SALAMANDER	G5S4			
RHYACOTRITON VARIEGATUS	SOUTHERN TORRENT SALAMANDER	G3G4S3	N	SOC	SV
ASCAPHUS TRUEI	COASTAL TAILED FROG	G4S3	Y	SOC	SV
BUFO BOREAS	WESTERN TOAD	G4S4	N		SV
HYLA REGILLA	PACIFIC TREEFROG	G5S5	N		
RANA AURORA	RED-LEGGED FROG	G4S3	N		
RANA BOYLII	FOOTHILL YELLOW-LEGGED FROG	G3S2	Y	SOC	SV
RANA CATESBEIANA	BULLFROG	G5SE	N		
BIRDS					
PODILYMBUS PODICEPS	PIED-BILLED GREBE	G5S5	N		
PHALACROCORAX AURITUS	DOUBLE-CRESTED CORMORANT	G5S5	N		
BOTAURUS LENTIGINOSUS	AMERICAN BITTERN	G4S4	N		
ARDEA HERODIAS	GREAT BLUE HERON	G5S4	N		

BUTORIDES VIRESCENS	GREEN HERON	G5S4	N		
BRANTA CANADENSIS	CANADA GOOSE	G5S5	N	(PS)	
AIX SPONSA	WOOD DUCK	G5S4	N		
ANAS PLATYRHYNCHOS	MALLARD	G5S5	N		
ANAS DISCORS	BLUE-WINGED TEAL	G5S4	N		
ANAS CYANOPTERA	CINNAMON TEAL	G5S5	N		
LOPHODYTES CUCULLATUS	HOODED MERGANSER	G5S4	N		
MERGUS MERGANSER	COMMON MERGANSER	G5S4	N		
CATHARTES AURA	TURKEY VULTURE	G5S5	N		
PANDION HALIAETUS	OSPREY	G5S4	N		
ELANUS LEUCURUS	WHITE-TAILED KITE	G5S1B,S3N	Y		
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	G4S3B,S4N	Y	LT-P	LT
CIRCUS CYANEUS	NORTHERN HARRIER	G5S5	N		
ACCIPITER STRIATUS	SHARP-SHINNED HAWK	G5S4	N		
ACCIPITER COOPERII	COOPER'S HAWK	G5S4	N		
BUTEO LINEATUS	RED-SHOULDERED HAWK	G5S3N	N		
BUTEO JAMAICENSIS	RED-TAILED HAWK	G5S5	N		
FALCO SPARVERIUS	AMERICAN KESTREL	G5S5	N		
PHASIANUS COLCHICUS	RING-NECKED PHEASANT	G5SE	N		
DENDRAGAPUS OBSCURUS	BLUE GROUSE	G5S4	N		
BONASA UMBELLUS	RUFFED GROUSE	G5S4?	N		
MELEAGRIS GALLOPAVO	WILD TURKEY	G5SE	N		
CALLIPEPLA CALIFORNICA	CALIFORNIA QUAIL	G5SE4	N		

OREORTYX PICTUS	MOUNTAIN QUAIL	G5S4?	N	SOC	SU
RALLUS LIMICOLA	VIRGINIA RAIL	G5S4	N		
PORZANA CAROLINA	SORA	G5S4	N		
FULICA AMERICANA	AMERICAN COOT	G5S5	N		
CHARADRIUS VOCIFERUS	KILLDEER	G5S5	N		
ACTITIS MACULARIA	SPOTTED SANDPIPER	G5S4	N		
GALLINAGO GALLINAGO	COMMON SNIPE	G5S4	N		
LARUS OCCIDENTALIS	WESTERN GULL	G5S4	N		
COLUMBA LIVIA	ROCK DOVE	G5SE	N		
COLUMBA FASCIATA	BAND-TAILED PIGEON	G4S4	N	SOC	
ZENAIDA MACROURA	MOURNING DOVE	G5S5	N		
TYTO ALBA	BARN OWL	G5S4?	N		
OTUS KENNICOTTII	WESTERN SCREECH-OWL	G5S4?	N		
BUBO VIRGINIANUS	GREAT HORNED OWL	G5S5	N		
GLAUCIDIUM GNOMA	NORTHERN PYGMY-OWL	G5S4?	N		SC
STRIX VARIA	BARRED OWL	G5SU	N		
ASIO OTUS	LONG-EARED OWL	G5S4?	N		
AEGOLIUS ACADICUS	NORTHERN SAW-WHET OWL	G5S4?	N		
CHORDEILES MINOR	COMMON NIGHTHAWK	G5S5	N		SC
CHAETURA VAUXI	VAUX'S SWIFT	G5S5	N		
CALYPTE ANNA	ANNA'S HUMMINGBIRD	G5S4?	N		
SELASPHORUS RUFUS	RUFOUS HUMMINGBIRD	G5S4	N		
CERYLE ALCYON	BELTED KINGFISHER	G5S4	N		

SPHYRAPICUS RUBER	RED-BREASTED SAPSUCKER	G5S4	N		
PICOIDES PUBESCENS	DOWNY WOODPECKER	G5S4	N		
PICOIDES VILLOSUS	HAIRY WOODPECKER	G5S4	N		
COLAPTES AURATUS	NORTHERN FLICKER	G5S5	N		
DRYOCOPUS PILEATUS	PILEATED WOODPECKER	G5S4?	N		SV
CONTOPUS COOPERI	OLIVE-SIDED FLYCATCHER	G4S4	N	SOC	SV
CONTOPUS SORDIDULUS	WESTERN WOOD-PEWEE	G5S4	N		
EMPIDONAX TRAILLII	WILLOW FLYCATCHER	G5S4	N	(PS)	
EMPIDONAX HAMMONDII	HAMMOND'S FLYCATCHER	G5S4	N		
EMPIDONAX DIFFICILIS	PACIFIC SLOPE FLYCATCHER	G5S4	N		
SAYORNIS NIGRICANS	BLACK PHOEBE	G5S3B,S3N	N		
TYRANNUS VERTICALIS	WESTERN KINGBIRD	G5S5	N		
EREMOPHILA ALPESTRIS	HORNED LARK	G5S5	N		
PROGNE SUBIS	PURPLE MARTIN	G5S3B	Y	SOC	SC
TACHYCINETA BICOLOR	TREE SWALLOW	G5S5	N		
TACHYCINETA THALASSINA	VIOLET-GREEN SWALLOW	G5S5	N		
STELGIDOPTERYX SERRIPENNIS	NORTHERN ROUGH-WINGED SWALLOW	G5S4	N		
PETROCHELIDON PYRRHONOTA	CLIFF SWALLOW	G5S5	N		
HIRUNDO RUSTICA	BARN SWALLOW	G5S5	N		
CYANOCITTA STELLERI	STELLER'S JAY	G5S5	N		
APHELOCOMA CALIFORNICA	WESTERN SCRUB-JAY	G5S5	N		
CORVUS BRACHYRHYNCHOS	AMERICAN CROW	G5S5	N		
CORVUS CORAX	COMMON RAVEN	G5S4	N		

POECILE ATRICAPILLA	BLACK-CAPPED CHICKADEE	G5S5	N		
POECILE RUFESCENS	CHESTNUT-BACKED CHICKADEE	G5S5	N		
PSALTRIPARUS MINIMUS	BUSHTIT	G5S5	N		
SITTA CANADENSIS	RED-BREASTED NUTHATCH	G5S5	N		
SITTA CAROLINENSIS	WHITE-BREASTED NUTHATCH	G5S4	N		
CERTHIA AMERICANA	BROWN CREEPER	G5S4	N		
THRYOMANES BEWICKII	BEWICK'S WREN	G5S4	N		
TROGLODYTES AEDON	HOUSE WREN	G5S4	N		
TROGLODYTES TROGLODYTES	WINTER WREN	G5S4	N		
CISTOTHORUS PALUSTRIS	MARSH WREN	G5S5	N		
CINCLUS MEXICANUS	AMERICAN DIPPER	G5S4	N		
REGULUS SATRAPA	GOLDEN-CROWNED KINGLET	G5S4	N		
SIALIA MEXICANA	WESTERN BLUEBIRD	G5S4B,S4N	N		SV
CATHARUS USTULATUS	SWAINSON'S THRUSH	G5S5	N		
TURDUS MIGRATORIUS	AMERICAN ROBIN	G5S5	N		
IXOREUS NAEVIUS	VARIED THRUSH	G5S4	N		
CHAMAEA FASCIATA	WRENTIT	G5S5	N		
BOMBYCILLA CEDRORUM	CEDAR WAXWING	G5S5	N		
STURNUS VULGARIS	EUROPEAN STARLING	G5SE	N		
VIREO HUTTONI	HUTTON'S VIREO	G5S4	N		
VIREO GILVUS	WARBLING VIREO	G5S5	N		
VIREO CASSINII	CASSIN'S VIREO	G5S4?B	N		
VERMIVORA CELATA	ORANGE-CROWNED WARBLER	G5S5	N		

DENDROICA PETECHIA	YELLOW WARBLER	G5S4	N		
DENDROICA CORONATA	YELLOW-RUMPED WARBLER	G5S5	N		
DENDROICA NIGRESCENS	BLACK-THROATED GRAY WARBLER	G5S5	N		
DENDROICA OCCIDENTALIS	HERMIT WARBLER	G4G5S4	N		
OPORORNIS TOLMIEI	MACGILLIVRAY'S WARBLER	G5S4	N		
GEOTHLYPIS TRICHAS	COMMON YELLOWTHROAT	G5S5	N		
WILSONIA PUSILLA	WILSON'S WARBLER	G5S5	N		
ICTERIA VIRENS	YELLOW-BREASTED CHAT	G5S4?	N	SOC	SC
PIRANGA LUDOVICIANA	WESTERN Tanager	G5S4	N		
PHEUCTICUS MELANOCEPHALUS	BLACK-HEADED GROSBEAK	G5S5	N		
PASSERINA AMOENA	LAZULI BUNTING	G5S4	N		
PIPILO MACULATUS	SPOTTED TOWHEE	G5S5	N		
SPIZELLA PASSERINA	CHIPPING SPARROW	G5S4	N		
POECCETES GRAMINEUS	VESPER SPARROW	G5S4B	N		SC
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW	G5S5	N		
MELOSPIZA MELODIA	SONG SPARROW	G5S5	N		
ZONOTRICHIA LEUCOPHRYS	WHITE-CROWNED SPARROW	G5S5	N		
JUNCO HYEMALIS	DARK-EYED JUNCO	G5S5	N		
AGELAIUS PHOENICEUS	RED-WINGED BLACKBIRD	G5S5	N		
STURNELLA NEGLECTA	WESTERN MEADOWLARK	G5S5	N		SC
EUPHAGUS CYANOCEPHALUS	BREWER'S BLACKBIRD	G5S5	N		
MOLOTHRUS ATER	BROWN-HEADED COWBIRD	G5S5	N		
CARPODACUS PURPUREUS	PURPLE FINCH	G5S4	N		

CARPODACUS MEXICANUS	HOUSE FINCH	G5S5	N		
LOXIA CURVIROSTRA	RED CROSSBILL	G5S4	N		
CARDUELIS PINUS	PINE SISKIN	G5S5	N		
CARDUELIS PSALTRIA	LESSER GOLDFINCH	G5S4	N		
CARDUELIS TRISTIS	AMERICAN GOLDFINCH	G5S4	N		
PASSER DOMESTICUS	HOUSE SPARROW	G5SE	N		
MAMMALS					
DIDELPHIS VIRGINIANA	VIRGINIA OPOSSUM	G5SE	N		
SOREX VAGRANS	VAGRANT SHREW	G5S4	N		
SOREX BENDIRII	PACIFIC WATER SHREW	G4S4	N		
SOREX TROWBRIDGII	TROWBRIDGE'S SHREW	G5S4	N		
SOREX SONOMAE	FOG SHREW	G5SU			
NEUROTRICHUS GIBBSII	SHREW-MOLE	G5S4	N		
SCAPANUS TOWNSENDII	TOWNSEND'S MOLE	G5S4	N		
SCAPANUS ORARIUS	COAST MOLE	G5S5?	N		
MYOTIS LUCIFUGUS	LITTLE BROWN MYOTIS	G5S4	N		
MYOTIS YUMANENSIS	YUMA BAT	G5S3	N	SOC	
MYOTIS EVOTIS	LONG-EARED BAT	G5S3	N	SOC	SU
MYOTIS THYSANODES	FRINGED BAT	G4G5S2?	Y	SOC	SV
MYOTIS VOLANS	LONG-LEGGED BAT	G5S3	N	SOC	SU
MYOTIS CALIFORNICUS	CALIFORNIA MYOTIS	G5S4	N		
LASIONYCTERIS NOCTIVAGANS	SILVER-HAIRED BAT	G5S4?	N	SOC	SU
EPTESICUS FUSCUS	BIG BROWN BAT	G5S4	N		

LASIURUS CINEREUS	HOARY BAT	G5S4?	N		
CORYNORHINUS TOWNSENDII	TOWNSEND'S BIG-EARED BAT	G4S3	N	(PS)	SC
SYLVILAGUS BACHMANI	BRUSH RABBIT	G5S5	N		
TAMIAS TOWNSENDII	TOWNSEND'S CHIPMUNK	G5S4	N		
SPERMOPHILUS BEECHEYI	CALIFORNIA GROUND SQUIRREL	G5S5	N		
SCIURUS GRISEUS	WESTERN GRAY SQUIRREL	G5S4?	N		SU
TAMIASCIURUS DOUGLASII	DOUGLAS' SQUIRREL	G5S5	N		
GLAUCOMYS SABRINUS	NORTHERN FLYING SQUIRREL	G5S4	N		
CASTOR CANADENSIS	AMERICAN BEAVER	G5S5	N		
PEROMYSCUS MANICULATUS	DEER MOUSE	G5S5	N		
NEOTOMA FUSCIPES	DUSKY-FOOTED WOODRAT	G5S4	N		
NEOTOMA CINEREA	BUSHY-TAILED WOODRAT	G5S5	N		
CLETHRIONOMYS CALIFORNICUS	WESTERN RED-BACKED VOLE	G5S4	N		
MICROTUS TOWNSENDII	TOWNSEND'S VOLE	G5S4	N		
MICROTUS LONGICAUDUS	LONG-TAILED VOLE	G5S5	N		
MICROTUS OREGONI	CREEPING VOLE	G5S4	N		
ONDATRA ZIBETHICUS	MUSKRAT	G5S5	N		
RATTUS RATTUS	BLACK RAT	G5SE	N		
RATTUS NORVEGICUS	NORWAY RAT	G5SE	N		
MUS MUSCULUS	HOUSE MOUSE	G5SE	N		
ZAPUS TRINOTATUS	PACIFIC JUMPING MOUSE	G5S4	N		
ERETHIZON DORSATUM	COMMON PORCUPINE	G5S5	N		
CANIS LATRANS	COYOTE	G5S5	N		

UROCYON CINEREOARGENTEUS	COMMON GRAY FOX	G5S4	N		
URSUS AMERICANUS	BLACK BEAR	G5S4	N		
PROCYON LOTOR	COMMON RACCOON	G5S5	N		
MARTES AMERICANA	AMERICAN MARTEN	G5S3	N		SV
MUSTELA ERMINEA	ERMINE	G5S5	N		
MUSTELA FRENATA	LONG-TAILED WEASEL	G5S5	N		
MUSTELA VISON	MINK	G5S5	N		
SPILOGALE GRACILIS	WESTERN SPOTTED SKUNK	G5S4	N		
MEPHITIS MEPHITIS	STRIPED SKUNK	G5S5	N		
LYNX RUFUS	BOBCAT	G5S4	N		
CERVUS ELAPHUS	ELK	G5S5	N		
ODOCOILEUS HEMIONUS	BLACK-TAILED DEER	G5S5	N		
	REPTILES				
CLEMMYS MARMORATA	WESTERN POND TURTLE	G3G4S2	N		SC
ELGARIA COERULEA	NORTHERN ALLIGATOR LIZARD	G5S5	N		
SCELOPORUS OCCIDENTALIS	WESTERN FENCE LIZARD	G5S5	N		
EUMECES SKILTONIANUS	WESTERN SKINK	G5S5	N		
CHARINA BOTTAE	RUBBER BOA	G5S4	N		
COLUBER CONSTRICTOR	RACER	G5S4?	N		
DIADOPHIS PUNCTATUS	RINGNECK SNAKE	G5S4?	N		
PITUOPHIS CATENIFER	GOPHER SNAKE	G5S5	N		
THAMNOPHIS ELEGANS	WESTERN TERRESTRIAL GARTER SNAKE	G5S5	N		
THAMNOPHIS ORDINOIDES	NORTHWESTERN GARTER SNAKE	G5S5	N		

THAMNOPHIS SIRTALIS	COMMON GARTER SNAKE	G5S5	N		
THAMNOPHIS ATRATUS	PACIFIC COAST AQUATIC GARTER SNAKE	G5S4?	N		

Table 3. Rare native plant associations in the Twomile Creek target area. Source: Kagan et al. (2004).

Association	ORNHIC rank
Beach fescue dunes	G1S1
<i>Festuca rubra</i> var. <i>arenicola</i>	
Seashore bluegrass dunes	G2S1
<i>Poa douglasii</i> ssp. <i>macrantha</i>	
Shorepine / kinnikinnick stabilized dunes	G1S1
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Arctostaphylos uva - ursi</i>	
Shorepine / slough sedge swamp	G2S1
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Carex obnupta</i>	
Shorepine / hairy manzanita stabilized dunes	G1S1
<i>Pinus contorta</i> var. <i>contorta</i> / <i>Arctostaphylos columbiana</i>	

Table 4. Common vascular plant species observed on sand dunes in the Twomile Creek target area.

Scientific Name	Common Name	Exotic
<i>Abronia latifolia</i>	yellow sandverbena	
<i>Achillea millefolium</i>	yarrow	
<i>Aira caryophylla</i>	silver hairgrass	Exotic
<i>Aira praecox</i>	little hairgrass	Exotic
<i>Alnus rubra</i>	red alder	
<i>Ambrosia chamissonis</i>	silver burweed	
<i>Ammophila arenaria</i>	European beachgrass	Exotic
<i>Anaphalis margaritacea</i>	pearly everlasting	
<i>Anthoxanthum odoratum</i>	sweet vernal grass	Exotic
<i>Arbutus menziesii</i>	madrone	
<i>Arctostaphylos columbiana</i>	hairy manzanita	
<i>Arctostaphylos uva-ursi</i>	kinnikinnick	
<i>Boschniakia hookeri</i>	ground-cone	
<i>Camissonia cheiranthifolia</i>	beach primrose	
<i>Carex obnupta</i>	slough sedge	
<i>Chamaecyparis lawsoniana</i>	Port Orford cedar	
<i>Claytonia spathulata</i>	pale montia	
<i>Eleocharis palustris</i>	creeping spikerush	
<i>Festuca rubra</i> var. <i>arenicola</i>	beach fescue	
<i>Frangula purshiana</i>	casacara	
<i>Garrya elliptica</i>	silk tassel	
<i>Gaultheria shallon</i>	salal	
<i>Glehnia littoralis</i> ssp. <i>leiocarpa</i>	beach silver-top	
<i>Goodyera oblongifolia</i>	western rattlesnake-plantain	
<i>Hypochaeris radicata</i>	hairy cat's-ear	Exotic
<i>Juncus ensifolius</i>	dagger-leaved rush	
<i>Juncus falcatus</i>	sickle-leaved rush	
<i>Juncus lesueurii</i>	salt rush	
<i>Lathyrus littoralis</i>	beach pea	
<i>Lonicera involucrata</i>	black twinberry	
<i>Lupinus littoralis</i>	seashore lupine	
<i>Lysichiton americanum</i>	skunk cabbage	
<i>Malus fusca</i>	crabapple	
<i>Morella californica</i>	wax myrtle	
<i>Phacelia argentea</i>	silvery phacelia	
<i>Picea sitchensis</i>	Sitka spruce	
<i>Pinus contorta</i> var. <i>contorta</i>	shore pine	
<i>Poa douglasii</i> ssp. <i>macrantha</i>	seashore bluegrass	
<i>Polygonum paronychia</i>	beach knotweed	
<i>Pseudotsuga menziesii</i>	Douglas fir	
<i>Pteridium aquilinum</i>	bracken fern	
<i>Ranunculus flammula</i>	creeping buttercup	
<i>Rhododendron macrophyllum</i>	western rhododendron	

<i>Salix hookeriana</i>	coast willow	
<i>Spiraea douglasii</i>	Douglas spiraea	
<i>Tsuga heterophylla</i>	western hemlock	
<i>Typha latifolia</i>	common cattail	
<i>Ulex europaeus</i>	gorse	Exotic
<i>Vaccinium ovatum</i>	evergreen huckleberry	
<i>Vaccinium uliginosum</i>	bog blueberry	

Table 5. GPS points for silvery phacelia on the Twomile Creek target area, 2007. Datum is WGS 84. Accuracy ranged from 15-27 feet and readings were not averaged.

Site	Point	Date	Position
Twomile Cr	221	05-18-07 9:39	N43 03.140 W124 25.775
Twomile Cr	222	05-18-07 9:52	N43 03.142 W124 25.814
Twomile Cr	223	05-18-07 10:10	N43 03.201 W124 25.834
Twomile Cr	224	05-18-07 10:31	N43 03.042 W124 25.811
Twomile Cr	225	05-18-07 10:56	N43 02.877 W124 25.809
Twomile Cr	226	05-18-07 12:32	N43 02.474 W124 25.972
Twomile Cr	227	05-18-07 12:46	N43 02.423 W124 25.930
Twomile Cr	228	05-18-07 13:04	N43 02.349 W124 25.937
Twomile Cr	229	05-18-07 13:18	N43 02.351 W124 26.034

With permission of Janet Rogers, these GPS points for occurrences of silvery phacelia were provided to Jennifer Kalt, a consultant under contract with the U.S. Fish and Wildlife Service to write a status report for silvery phacelia. Jennifer Kalt and Janet Rogers examined these populations in June 2007 and collected detailed demographic data.

Appended Figures and Photographs

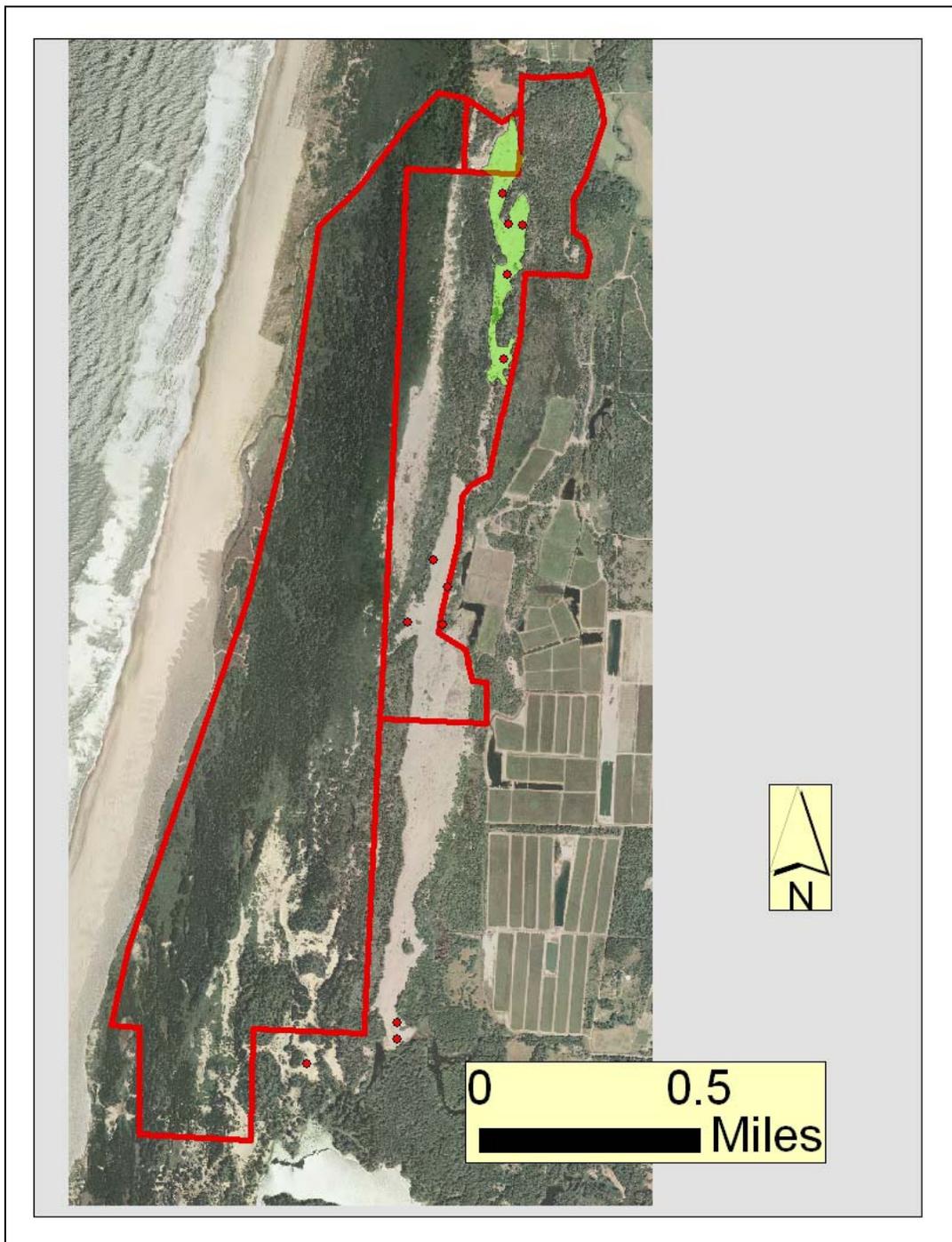


Figure 8. Distribution of silvery phacelia (red dots) in target area at Twomile Creek. Property lines are approximate. The green polygon shows the extent of the largest population of silvery phacelia on the Kaiser and Stein properties, coincident with map unit 1. 2005 NAIP imagery

Photographs



Figure 9. High-quality sand dune habitat with beach fescue and seashore bluegrass (map unit 1). Keiser property, looking north to Stein property with Stein house in distance. Note gorse around edges.



Figure 10 High-quality sand dune habitat with beach fescue and seashore bluegrass (map unit 1). Keiser property, looking north.



Figure 11. Silvery phacelia forming prominent mound in beach fescue - seashore bluegrass dunes (map unit 1). Keiser property, looking north.



Figure 12. Medium-quality sand dune habitat with European beachgrass (map unit 4). Keiser property, looking north.



Figure 13. Medium-quality sand dune habitat with European beachgrass (map unit 4). Keiser property, looking north.



Figure 14. Slough sedge marsh on old deflation plain (map unit 7). Keiser property, looking north.



Figure 15. Shore pine - slough sedge wetland on old deflation plain and in interdunal troughs (map unit 3). Keiser property, looking east.



Figure 16. Hooker willow - crabapple swamp on old deflation plain (map unit 6). Keiser property, looking east.



Figure 17. Low-quality sand dune habitat with European beachgrass and gorse (map unit 8). Keiser property, looking northwest.



Figure 18. Low-quality sand dune habitat covered by gorse (map unit 8). Keiser property and Bandon State Natural Area, looking north.



Figure 19. Low-quality sand dune habitat covered by gorse, with shore pine – Sitka spruce scrub on deflation plain in background (map unit 8). Keiser property, looking west.



Figure 20. Shore pine woodland with kinnikinnick (early seral stage of map unit 2). Bandon State Natural Area.



Figure 21. Shore pine woodland with hairy manzanita (late seral stage map unit 2) beyond slipface of shifting dune. Stein property, looking northeast onto Keiser property.