Management Recommendations for

Buellia oidalea (Nyl.) Tuck.

version 2.0

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SUMMARY

Species: *Buellia oidalea* (Nyl.) Tuck.
Taxonomic Group: Lichens (Rare Oceanic Influenced)
ROD Components: 1, 3

Other Management Status: Oregon Natural Heritage Program: List 3 (more information is needed before status can be determined, but may be threatened or endangered in Oregon or throughout their range); Natural Heritage Networks Rank: Global Rank G4 (not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences); State Rank S1 (critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extirpation in Oregon, typically with 5 or fewer occurrences) (Oregon Natural Heritage Program 1998). BLM Tracking Status (USDI Bureau of Land Management 1998).

Range: In the range of the Northwest Forest Plan, *B. oidalea* is known from six locations. Two are in Washington: Narbeck Creek and Squalicum Mountain. Two are in Oregon: Sixes River, and ocean-side of Carter Lake, Oregon Dunes National Recreation Area on the Siuslaw National Forest. Two are in California: Lanphere Dunes Unit (Humboldt Bay National Wildlife Refuge, USFWS) on the Samoa Peninsula, and Patricks Point State Park.

Specific Habitat: *Buellia oidalea* is found from sea level to 200 m (700 ft) along the Pacific Coast, usually within 3 km (2 mi) of the ocean. It is corticolous and lignicolous on a wide variety of coniferous and deciduous trees and shrubs. In the area of the Northwest Forest Plan, it has been collected from red alder, Monterey cypress, Sitka spruce, shore pine, Douglas-fir, willow, on redwood posts, and shrubs. In southern California, it has been reported on a variety of substrates.

Threats: The major threat to *B. oidalea* is loss of populations from activities that adversely affect the population, habitat or potential habitat, including future declines in air quality.

Management Recommendations:
- Manage known sites and their habitat areas.
- Develop practices to route human use away from habitat areas.
- Prevent fire in the population; manage fire in habitat areas.
- Restrict removal of trees, shrubs, or other vegetation from the habitat area.
- Consider opportunities for managing known sites during Forest Plan and Resource Management Plan revisions, such as administratively withdrawn designations, or by prescribing special standards and guidelines.

Information Needs:
- Visit known sites to determine the extent of local populations and improve habitat descriptions.
- Determine if *B. oidalea* is closely associated with late-successional and old-growth forests.
- Determine if additional populations exist in areas identified as potential suitable habitat.

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Management Recommendations for *Buellia oidalea*

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Buellia oidalea (Nyl.) Tuck. was originally described in 1857 by Nylander as *Lecidea aliena* Nyl. Other synonyms have included:

Lecidea oidalea Tuck, Proc. Am. Acad. Arts and Sci. 4: 405. 1860.
Buellia aliena (Nyl.) Herre, Bryologist 20:84. 1917.
Rhizocarpon oidaleum (Nyl.) Fink, Mycologia 21:306. 1919.
Buellia oidalea (Tuck.) Tuck., Lich. Californ. p. 26. 1866.

B. oidalea may consist of two or more distinct taxa. Anders Nordin of Sweden is working on this species, but his revisions are not available yet.

B. Species Description

1. Morphology and Chemistry

Buellia oidalea is a thin yellowish to grayish-green crustose lichen growing on the trunks, branches and twigs of trees and stumps (Figure 1). Individual thalli have a black perimeter (the hypothallus) and small black apothecia lacking margins. The identity of *B. oidalea* must be verified from microscopic characters of the fruiting bodies (see below). *Buellia oidalea* is distinguished from other corticolous species in the genus by the yellowish, frequently rugose or verrucose, P- thallus; an exceptionally thick (>100 µm) hymenium containing abundant oil drops; and the occasional occurrence of only two spores per ascus. The spores are the largest of North American species of *Buellia* (Imshaug 1951). The species is most frequently confused in appearance with *Rhizocarpon penichrum*, but that species differs in habitat, preferring more inland locations and higher elevations on the Coast Range, Sierra Nevada Mountains, and Cascade Range. *Rhizocarpon penichrum* also has smaller spores: (17) 21-34 (41) x (10) 11-17 (21) µm, overlapping the lower range of *B. oidalea* (Imshaug 1951).

<u>Technical description</u>: Thallus yellowish-glaucescent, contiguous, from thin, cartilaginous and smoothish, soon rimulose, thickened and rugose-verrucose to pronouncedly warty, limited by a black hypothallus. Apothecia round, adnate, 0.8-2.0 mm across; the disk black, at first plane but soon strongly convex or tumid (inflated, swollen); the margin concolorous, thin, soon excluded by the tumid disk. Hypothecium brown-black, not extending as a tail into the thallus. Exciple continuous with the hypothecium, concolorous. Hymenium colorless, interspersed with oil drops, 140-230 µm thick; the paraphyses semi-distinct, lax, branched, septate, fusco-capitate, apical cell enlarged; the asci swollen clavate, 2-, 3-, 6- or 8- spored. Spores oblong-ellipsoid, brown, muriform, 6-10 septate transversely and 2-5 septate longitudinally, (28) 32-55 (78) x (12) 14-21 (24) µm ; the walls thin and uniform (Imshaug 1951). Photobiont chlorococcoid (Dobson 1992). Chemical reactions: Thallus P-, K+ (sordid yellow); hymenium I+ (deep blue).

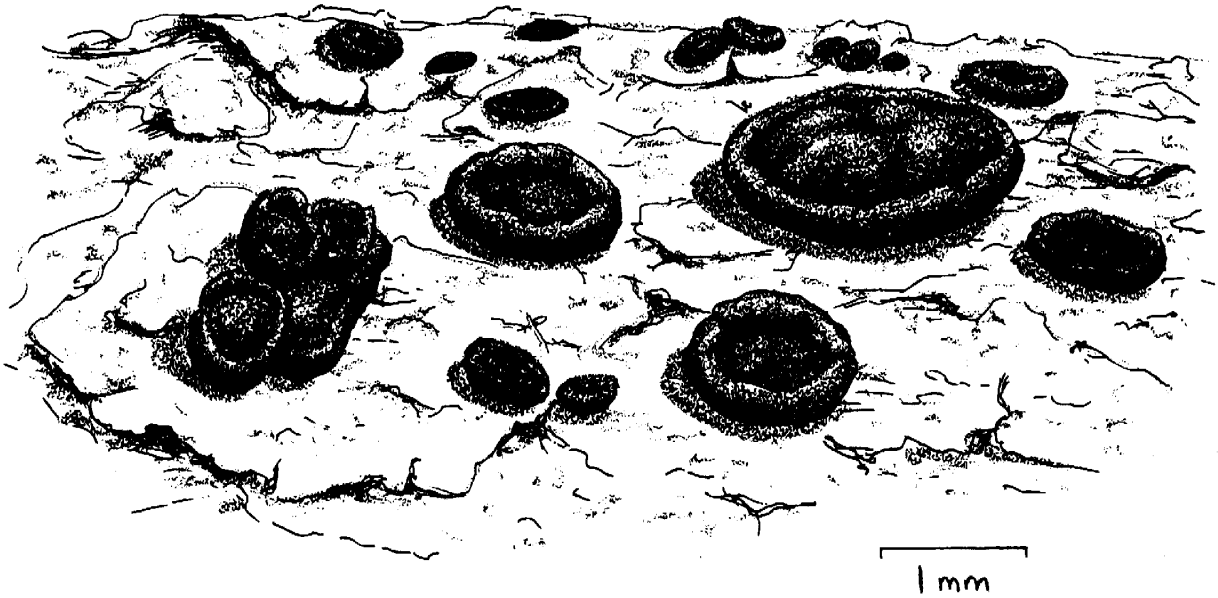

Figure 1. Line drawing of *Buellia oidalea* by Alexander Mikulin.

2. Reproductive Biology

Buellia oidalea reproduces sexually by producing ascospores in apothecia. Vegetative reproduction is unknown (McCune *et al.* 1997). The microscopic size of the reproductive propagules should enable them to be carried long distances by wind, animals or birds. Birds in particular are thought to enhance arrival rates of rare oceanic species like *B. oidalea* by dispersing lichen propagules along coastal migratory routes of the Pacific Northwest (McCune *et al.* 1997).

3. Ecological Roles

Little is known about the ecological roles of *B. oidalea*. Various molluscs and insects (for example bristletails, barklice, katydids, grasshoppers, webspinners, butterflies, moths, lacewing larvae, mites, spiders, snails, slugs, and many beetles) live on or mimic lichens, or graze upon the algal rich layer and reproductive structures (Gerson and Seaward 1977).

C. Range and Known Sites

Buellia oidalea is endemic to the Pacific Coast of North America, ranging from Baja California, Mexico, north to Vancouver Island, British Columbia. Primarily known from California, it has been collected from scattered locations northwards. In his treatment of lichen-forming members of the genus *Buellia* in North America, Imshaug (1951) reported *B. oidalea* as endemic to Baja California and California south of San Francisco Bay. He examined more than 50 collections from Alameda, Los Angeles, Marin, Monterey, Orange, Sacramento, San Diego, San Francisco, San Luis Obispo, Santa Barbara, Santa Cruz, and Ventura counties.

In the range of the Northwest Forest Plan, *B. oidalea* is known from six locations. Two are in Washington (Narbeck Creek, Snohomish County; and Squalicum Mountain, Whatcom County). Two locations are in Oregon: Sixes River (Curry County); and ocean-side of Carter Lake, Oregon Dunes National Recreation Area, Siuslaw National Forest (Douglas County). The last two sites were reported by McCune *et al.* (1997). There are two locations in California: Lanphere Dunes Unit Humboldt Bay National Wildlife Refuge, USFWS (Samoa Peninsula, Humboldt County); and Patricks Point State Park (Humboldt County). Only two sites are on federally-managed lands: Carter Lake in Oregon Dunes National Recreation Area and the Lanphere Dunes Unit. Two additional reports in Oregon: Coburg Hills Relict Forest Island Area of Critical Environmental Concern (ACEC) on Eugene District BLM (Linn County) and Medford District BLM Picnic Area at Howard Prairie Lake (Jackson County) are not coastal and identifications from these sites should be verified.

D. Habitat Characteristics and Species Abundance

Buellia oidalea is found from sea level to 200 m (700 ft) along the Pacific Coast, usually within a km (0.6 mile) of the ocean. It grows on the bark and wood of a wide variety of coniferous and deciduous trees and shrubs (Imshaug 1951). In southern California, it has been found on *Adenoctonia, Audibertia,* manzanita (*Arctostaphylos*), ceanothus (*Ceanothus*), mountain-

mahogany (*Cercocarpus*), ocotillo (*Fouquieria*), *Iriglams*, toyon (*Heteromeles*), *Opuntia*, pine (*Pinus*), apple (*Pyrus*), oak (*Quercus*), sumac (*Rhus*), coast redwood (*Sequoia*), and California laurel (*Umbellularia*). In the range of the Northwest Forest Plan, it has been collected from red alder (*Alnus rubra*), Monterey cypress (*Cupressus macrocarpa*), Sitka spruce (*Picea sitchensis*), shore pine (*Pinus contorta*), Douglas-fir (*Pseudotsuga menziesii*), and willow (*Salix*), on redwood posts, and on shrubs. Its occurrence on young shore pine on the deflation plain coastward from Carter Lake (Douglas County) suggests that it is more common north of California than the few records would indicate (McCune *et al.* 1997). No information on species abundance is available.

Buellia oidalea is confined to low elevation, coastal sites, especially south of the San Francisco Bay. Although the specific habitat preferences of *B. oidalea* have not yet been identified, this and other rare lichen species of coastal Oregon are not randomly distributed. Certain areas, topographic positions, and landforms have unusual concentrations of the rare species. Some lichens are most common on the major headlands and capes, but others are found among dune vegetation. Two kinds of dune vegetation seem to hold the most species: old, open conifer stands with a broken ericaceous understory and wetlands with large old shrubs (McCune *et al.* 1997).

II. CURRENT SPECIES SITUATION

A. Why Species Is Listed Under Survey and Manage Standard and Guideline

Buellia oidalea was considered at risk under the Northwest Forest Plan because of its rarity and limited distribution in the range of the northern spotted owl (USDA and USDI 1994a, 1994b). At the time, it was only known from two populations world-wide, both in the range of the northern spotted owl (USDA and USDI 1994a, 1994b). The viability ratings reflected a high level of concern for this species. The rare oceanic influenced lichens as a group received the lowest viability ratings among all the lichens considered (USDA and USDI 1994a).

Because of the low viability ratings and high level of concern, this species was identified as a Survey and Manage strategy 1 and 3 species (USDA and USDI 1994c), with the dual objectives of managing known sites and conducting extensive surveys to locate additional populations and identify other high-priority sites for species management.

B. Major Habitat and Viability Considerations

Frequent fog along the coast, combined with moderate temperatures, create a suitable environment for ocean influenced lichens such as *B. oidalea*. The major concerns for this lichen are the limited amount of suitable habitat on federal land and loss of populations from management and recreational activities that adversely affect the remaining habitat or populations.

Climate change and air pollution are secondary threats. Degradation or change in these or any other habitat conditions mentioned above could affect the vigor of this species, possibly resulting in an even more restricted distribution or contributing to local extirpation.

C. Threats to the species

Threats to *B. oidalea* are those actions that disrupt stand conditions necessary for its survival, such as treatments that reduce populations by removing colonies; adversely affecting integrity of habitat areas; reducing or fragmenting potential habitat; altering the light, moisture, or temperature regimes; or degrading air quality.

Other threats to the integrity of habitat and potential habitat areas include logging, grazing, agriculture, and activities which alter local hydrology, or increase fire frequency (Christy *et al.* 1998). Concern about fire varies--many different plant communities and successional stages exist among the coastal dunes and headlands; fire is beneficial to some communities but damaging to others. Invasion or planting of exotics such as Scots broom (*Cytisus scoparium*), European beachgrass (*Ammophila arenaria*), tree lupine (*Lupinus arboreus*), birdsfoot-trefoil (*Lotus corniculatus*), and iceplant (*Mesembryanthemum* spp.) can have profound effects on nitrogen-poor dune soils by increasing nitrogen and soil moisture. These conditions foster invasion of other weeds, eventually disrupting native plant communities (Christy *et al.* 1998) and reducing plant and animal diversity (USDI 1997).

Although air quality is generally good at known sites, rising pollution emissions from increased traffic (mainly NO_x) and new or expanded point sources (SO_x and NO_x) in the Arcata/Eureka vicinity, and elsewhere along the coast, might threaten this species in the future. The primary habitat of this lichen is the coastal fog belt, and fog significantly concentrates pollutants--especially acidic forms of SO_x and NO_x to which lichens are most sensitive. The air pollution sensitivity of *B. oidalea* is not known.

D. Distribution Relative to Land Allocations

Climate change affecting coastal fog patterns could be expected to affect the vigor of this species, possibly resulting in an even more restricted distribution or contributing to local extirpation.

Only two sites are known on federal lands. Carter Lake is part of the Oregon Dunes National Recreation Area, which is administratively withdrawn. Lanphere Dunes Unit is part of Humboldt Bay National Wildlife Refuge (USFWS). The Sixes River collection was made near a public landing in the Cape Blanco vicinity and may be state-owned. Patricks Point is a state park. The remaining sites are on private lands or of unknown ownership at this time.

III. Management Goal and Objectives

A. Management Goal for the Species

The goal for managing *Buellia oidalea* is to assist in maintaining species viability.

B. Objectives

Manage populations at all known sites on federal lands by maintaining habitat and potential habitat immediately surrounding known populations.

IV. Habitat Management

A. Lessons From History

Habitat destruction or alteration has made a significant contribution to the decline of lichens world-wide (Seaward 1977). Rare lichens, that occur in habitats optimal for human activities, such as the immediate coast, are especially vulnerable. In coastal Oregon, activities of the past 140 years including increased logging, recreation, agriculture and grazing, fire, and changes in hydrology have significantly altered plant succession (Christy *et al.* 1998). For example, at Sand Lake dunes of Oregon, an area of high lichen diversity, off-road vehicles have destroyed nearly all the fragile shore pine woodland habitat in just thirty years (Wiedemann 1984, 1990 as cited by Christy *et al.* 1998).

Lichens have been known to be sensitive to air pollution more than a century. Populations of many species in Europe (Hawksworth and Rose 1976) and eastern United States have declined precipitously from exposure to sulfur dioxide and other air pollutants. In the United States, lichens are one of the components used to indicate stress to forests from air pollution (McCune *et al.* 1996), and dozens of studies in the United States have used lichens as air-quality indicators (see bibliography in USDA 1998). In the Pacific Northwest, sensitive species are already declining in some areas (Denison and Carpenter 1973, Taylor and Bell 1983) and lichens are identified as air quality related values in USDA Forest Service regional guidelines (Peterson *et al.* 1992).

B. Identifying Habitat Areas for Management

All known sites of *B. oidalea* on federal land administered by the Forest Service and BLM in the range of the Northwest Forest Plan are identified as areas where these management recommendations should be implemented. A habitat area for management is defined as suitable habitat occupied by or near a known population.

C. Managing in Habitat Areas

The objective of managing in habitat areas is to maintain the habitat conditions for *B. oidalea.* Specific recommendations are to:

- Determine the extent of the local population and habitat area with a site visit.
- Maintain suitable habitat around the current host trees and shrubs, so that the lichen may have adequate new substrate as current substrates decline.
- Develop practices to route human use away from the populations in habitat areas (for example, divert roads, trails and off-road vehicles). Trampling shrubs or cryptogam mats, compacting roots, damaging trees or branches that serve as substrates, introducing non-native species by seed dispersal or planting, can all adversely affect habitat integrity.
- Avoid harvesting trees, shrubs, or other vegetation from the population and the habitat area unless these actions would do no harm to, or would improve, the habitat for *B. oidalea* (for example, by preventing deeply shaded conditions or by removing invasive exotics).
- Prevent fire in the population, but utilize or prevent fire in habitat areas, depending on the role of fire in the plant community. Consider recommendations by Christy *et al.* (1998) for fire management in coastal plant communities.

D. Other Management Issues and Considerations

- Information from reported sites suggests that *B. oidalea* may not meet the criteria for being closely associated with late-successional and old-growth forests. This issue should be addressed by a regional coordinating body.
- Consider opportunities for managing known sites during Forest Plan and Resource Management Plan revisions, such as Botanical Special Interest Areas, Areas of Critical Environmental Concern, or other administratively withdrawn designations, or by prescribing special standards and guidelines.
- Share information with state and private sectors to further activities directed at conserving *B. oidalea.*
- Continue to work with state and federal regulatory agencies to protect air quality on federally-managed lands from on- or off-site emissions, especially of nitrogen- and sulfur-containing pollutants.
- Provide information about conserving rare lichens at visitor centers or other locations along the coast to build public support of conservation efforts and to discourage collection of specimens.

V. RESEARCH, INVENTORY, AND MONITORING NEEDS

The objective of this section is to identify opportunities to acquire additional information which could contribute to more effective species management. The content of this section has not been prioritized or reviewed as to how important the particular items are for species management. The inventory, research, and monitoring identified below are not required. These recommendations should be addressed by a regional coordinating body.

A. Data Gaps and Information Needs

- Determine if *B. oidalea* meets the criteria for being closely associated with late-successional and old-growth forests.
- Visit known sites to determine the extent of local populations, and improve habitat descriptions.
- Determine whether additional populations exist in areas identified as potentially suitable habitat. Places where other rare coastal lichens have been found include: Siuslaw National Forest's Sutton Creek, Gwynn Creek, and the Oregon Dunes National Recreation Area; and BLM parcels adjacent to Cape Lookout, or other coastal BLM parcels.

B. Research Questions

- What are the dispersal rates and mechanisms of *B. oidalea*?
- Which habitat and microclimate characteristics are necessary for establishing *B. oidalea* thallus fragments and survival of established thalli?
- What is the genetic diversity of *B. oidalea* within local populations and across the region?
- What is the air pollution sensitivity of *B. oidalea*? Can historic collections in now urbanized areas of southern California be relocated?
- What are the minimum and optimum patch sizes of colonized habitat necessary to provide for *B. oidalea* ?

C. Monitoring Needs and Recommendations

- Monitor known sites for changes in microclimatic conditions, successional changes, and for inadvertent habitat damage from human activities or wildfire.
- Monitor dispersal and population trends.

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