

Management Recommendations for

Lobaria hallii (Tuck.) Zahlbr.

version 2.0

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SUMMARY

Species: *Lobaria hallii* Zahlbr.

Taxonomic Group: Lichens (Rare Nitrogen-fixing)

ROD Components: 1,3

Other Management Status: None

Range: *Lobaria hallii* is widespread in the area of the Northwest Forest Plan with nearly 100 reported sites. Known sites on federal land in Washington are on the Mt. Baker-Snoqualmie, Wenatchee and Gifford Pinchot National Forests; Mt. Rainier National Park; and Carson National Fish Hatchery. Federal sites in Oregon are on the Mt. Hood, Siuslaw, Willamette, Umpqua, Siskiyou, and Deschutes National Forests; BLM Camas Swale Research Natural Area; BLM Eugene District; and Finley National Wildlife Refuge. Known sites on federal land in California are on the Shasta-Trinity and Six Rivers National Forests, and BLM land at Black Oak Mountain.

Specific Habitat: In the area of the Northwest Forest Plan, *L. hallii* has a broad ecological distribution, and has been documented in a diversity of habitats and on various substrates. It is found in wetlands, swales and riparian areas, orchards, meadows and low elevation forests to dry upland forests and ridgetops, oak savannahs and rocky balds. This species is found in wet to dry sites, and ranges from 55 m to 1690 m (180-5540 ft) in elevation. *Lobaria hallii* grows in a wide range of stand ages and successional stages, from young to mature stands, and disturbed forests. It occasionally occurs in older stands, yet does not appear to be a species closely associated with late-successional/old-growth forests. It tends to be more restricted in its ecological amplitude to the east and south in the area of the Northwest Forest Plan, and has a broader ecological amplitude west of the Cascade crest in Oregon and Washington than on the east side of the Cascades.

Threats: Threats to *L. hallii* are those actions that disrupt stand conditions necessary for its survival, including treatments affecting populations, such as removing colonized substrate, stand treatments that change the microclimate or forest structure that make the site no longer suitable for *L. hallii* to survive, and possibly a deterioration in air quality. In northern California, a potential threat to local populations is the harvest of oak for firewood.

Management Recommendations:

- Manage populations of *L. hallii* at known sites by maintaining the ecological conditions associated with *L. hallii*, including forest structure, substrate and microclimate.
- Maintain a hardwood component in riparian stands where *L. hallii* occurs.

Information Needs:

- Determine if *L. hallii* is closely associated with late-successional and old-growth forests.
- Determine the air pollution sensitivity of *L. hallii*.

Management Recommendations for *Lobaria hallii*

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Lobaria hallii was described by Zahlbruckner in 1925 (Cat. Lich. Univ. 3:321). See Jordan (1973) for monographic treatment of *Lobaria* in North America. *Lobaria hallii* is in the order Lecanorales, suborder Peltigerineae, family Lobariaceae (Tehler 1996).

Synonyms: *Stictina hallii* (Tuck.) Stizenb. (Flora 81:126. 1895.)

Sticta hallii Tuck. (Proc. Amer. Acad. Arts 12:168. 1877.)

B. Species Description

1. Morphology and Chemistry

Lobaria hallii is a large, showy, gray to brownish-gray foliose lichen. The upper cortex is coarsely ridged and with sparse tomentum, especially near the lobe tips, the lower surface is mottled pale brown or whitish and tomentose (Figure 1). This species is characterized by the presence of a blue-green primary photobiont, production of soredia, and the absence of stictic, norstictic, and usnic acids. *Lobaria hallii* may be confused with *L. scrobiculata*, but differs in chemistry and the presence of tomental hairs on the upper surface. Chemistry of *L. hallii* is cortex K+ yellow, KC-, and all medulla tests are negative. The thalli of *L. hallii* are steel gray and lack the yellow-green tinge typical of *L. scrobiculata* (Jordan 1973:240).

Technical Description: Thallus up to 11 cm broad, central portion firmly attached, coriaceous-cartilaginous, scrobiculate, sometimes smooth or ribbed; smoke gray to grayish-olive when dry, much darker when wet. Lobes large, broadly rounded and approaching flabelliform, up to 4 cm across; tips tending to be free and reflexed, pulverulent. Margins crenulate-undulate thickened in sorediate areas. Fine pale tomentum present on dorsal surface of young lobes, quantity variable. Soredia abundant on the lamellae, less so on the margins, becoming dark colored; soralia punctiform when young, finally confluent. Lobules and isidia absent. Lower surface with irregularly shaped, flat, naked areas separated by tomentose veins, which are often raised and “peltigeroid” in older portions. Lower cortex cream colored to citrine-drab, prominent veins dark olive. Tomentum darkening, present to margin; clusters of dark rhizines often abundant, to 3 mm long (Jordan 1973:238).

2. Reproductive Biology

Lobaria hallii reproduces asexually by producing soralia, apparently its primary means of reproduction. It is rarely fertile; only 5 percent of the *L. hallii* thalli observed by Jordan (1973) for his North American monograph were fertile.

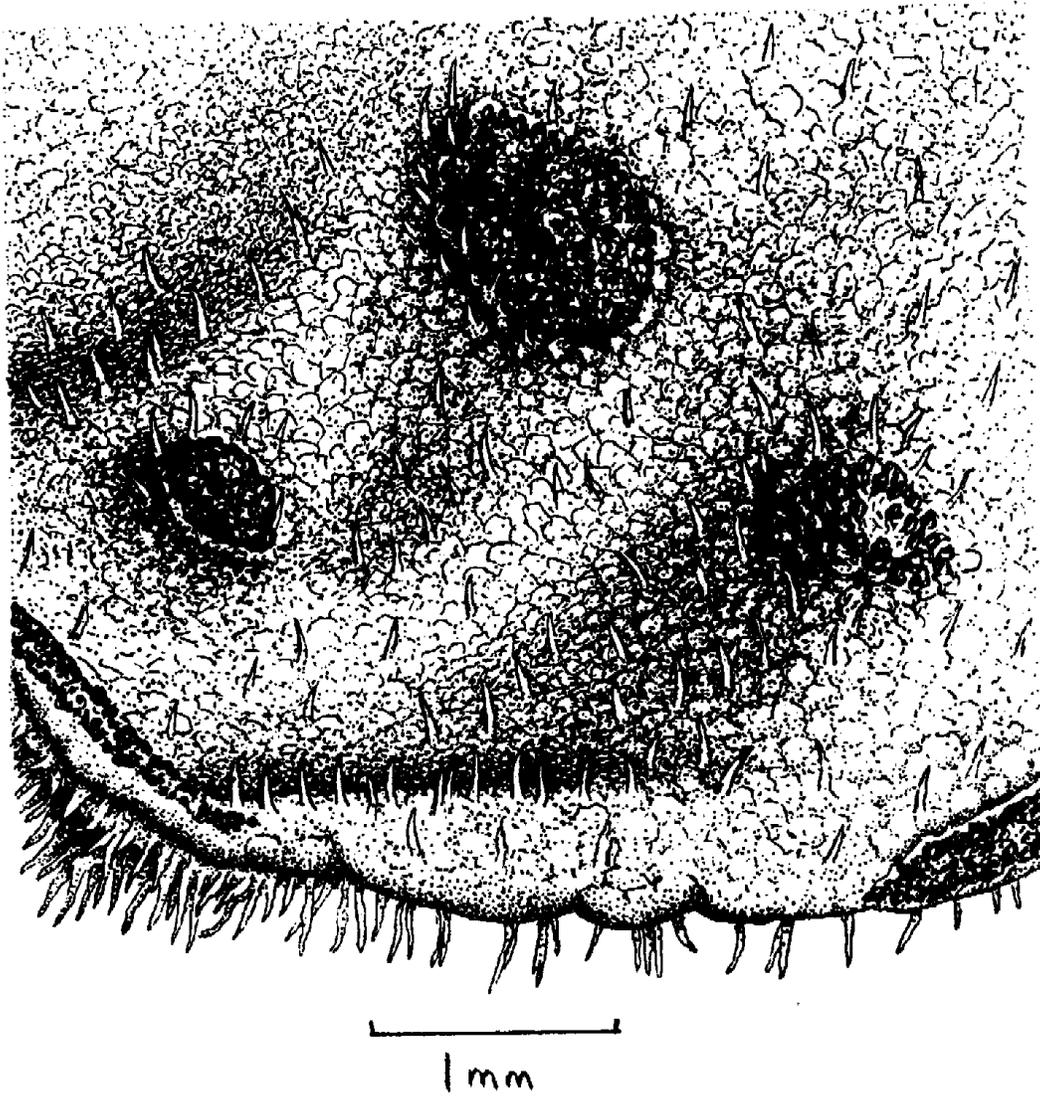


Figure 1. Line drawing of *Lobaria hallii* by Alexander Mikulin.

3. Ecological Roles

Little is known about the ecological roles of *L. hallii*, but it is known to fix atmospheric nitrogen.

C. Range and Known Sites

Lobaria hallii is found in North America from Alaska south to northern California and east to western Montana (McCune and Goward 1995), with disjunct populations in Scandinavia and Greenland (Jordan 1973). *Lobaria hallii* is widespread in the area of the Northwest Forest Plan with nearly 100 reported sites. It is reported from Washington in Whatcom, Skagit, Snohomish, Pierce, Lewis, Skamania, Klickitat, and Chelan counties; from Oregon in Clackamas, Hood River, Wasco, Jefferson, Deschutes, Yamhill, Benton, Marion, Lincoln, Jefferson, Linn, Lane, Douglas, and Josephine counties; and from California in Butte, Del Norte, Trinity, Humboldt, Mendocino, and San Mateo counties. Known sites on federal land in Washington are on the Mt. Baker-Snoqualmie, Wenatchee, and Gifford Pinchot National Forests; Mt. Rainier National Park; and Carson National Fish Hatchery. Federal sites in Oregon are documented on the Mt. Hood, Siuslaw, Willamette, Umpqua, Siskiyou, and Deschutes National Forests; BLM Camas Swale Research Natural Area; BLM Eugene District; and Finley National Wildlife Refuge. Known sites on federal land in California are on the Shasta-Trinity National Forest, Six Rivers National Forest, and BLM land at Black Oak Mountain.

D. Habitat Characteristics and Species Abundance

Lobaria hallii has a broad ecological distribution in the area of the Northwest Forest Plan. It is documented in a diversity of habitats and on various substrates throughout this region--from wetlands, swales and riparian areas, orchards, meadows and low elevation forests to dry upland forests and ridgetops, oak savannahs, and rocky balds. This species ranges from wet to dry sites and from 55 m to 1690 m (180-5540 ft) elevation. *Lobaria hallii* occurs in a wide range of stand ages and successional stages, from young to mature stands, and disturbed forests. It is sometimes found in older stands, yet it does not appear to be closely associated with late-successional and old-growth forests. Although widespread throughout this region, *L. hallii* is not common and may only be found in a portion of what appears to be suitable habitat. This species is generally rare where it occurs, but it may be locally abundant.

Lobaria hallii is an epiphyte on a variety of trees and shrubs, including both angiosperms and conifers. It is more commonly found on hardwoods: black cottonwood (*Populus trichocarpa*), California black oak (*Quercus kelloggii*), Oregon white oak (*Quercus garryana*), Oregon ash (*Fraxinus latifolia*), bigleaf maple (*Acer macrophyllum*), vine maple (*A. circinatum*), alder (*Alnus* spp.), willow (*Salix* spp.), hazelnut (*Corylus cornuta*), fruit trees and various shrubs. *Lobaria hallii* also grows on a variety of conifer species including Douglas-fir (*Pseudotsuga menziesii*), Pacific silver fir (*Abies amabilis*) and western white pine (*Pinus monticola*). This species has also been reported growing on an old wooden roof (probably western redcedar, *Thuja plicata*).

Lobaria hallii appears more restricted in its ecological amplitude to the east and south in the area of the Northwest Forest Plan. East of the Cascade crest, *L. hallii* is primarily in moist, lowland riparian areas, often on deciduous trees such as black cottonwood, bigleaf maple and alder, and typically in sheltered, moist sites. Farther south into northern California, *L. hallii* is documented primarily as an epiphyte on California black oak and Oregon white oak in habitats such as oak savannah and grassland areas, and in Douglas-fir dominated stands. In these habitats, *L. hallii* is generally found in the more mesic microsites, and is typically associated with moss mats (*Antitrichia californica*, *Dendroalsia abietina*) and other lichens species (e.g., *Lobaria pulmonaria*, *Pseudocyphellaria anthraxis*, *P. anomala*, *Nephroma helveticum*, *Peltigera collina*) on the lower boles of older California black oak (L. Hoover, pers. comm.). Habitats of *L. hallii* in northern California are in various plant associations within the Black Oak and White Oak Series, and within the following sub-series: Douglas-fir-Black-Oak, Douglas-fir-White Oak, Douglas-fir-Ponderosa Pine and White fir-Douglas-fir (L. Hoover, pers. comm.). Associated species include incense cedar (*Calocedrus decurrens*), hazelnut, madrone (*Arbutus menziesii*), ponderosa pine, bigleaf maple, ceanothus (*Ceanothus* sp.), and canyon live oak (*Q. chrysolepis*). *Lobaria hallii* may also occur in riparian areas in northern California, although few surveys have been conducted for this species in riparian habitats.

Lobaria hallii has a broader ecological amplitude west of the Cascade crest in Oregon and Washington, where it grows in a variety of different habitats from low elevation wetland and riparian areas to upland forests and dry sites of open woodlands, savannahs, and rocky balds. It grows on a diversity of hardwood and conifer substrates, both trees and shrubs. Specific habitats documented for this species include low-elevation riparian areas dominated by black cottonwood, bigleaf maple, or both; Oregon ash swales; Oregon white oak and Oregon ash stands; and riparian and low-elevation mesic forests of Douglas-fir, western hemlock and western redcedar. *Lobaria hallii* has been documented in drier sites, including an open rocky bald near a cliff edge in a mixed stand of Douglas-fir and Oregon white oak, xeric meadow fringed with Oregon white oak and ponderosa pine, and in dry hillside forests dominated by Oregon white oak. *Lobaria hallii* also grows in open sites such as meadows, pastures, and old orchards.

II. CURRENT SPECIES SITUATION

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

Lobaria hallii was considered at risk under the Northwest Forest Plan (USDA and USDI 1994a, 1994b). It should be noted that *Lobaria hallii* was included in the group of rare nitrogen-fixing lichens for the purpose of the lichen viability panel (USDA and USDI 1994a). *Lobaria hallii* is not rare like the other members of this group, and the rating for this group of species is probably lower than what would have been given for *L. hallii* if it were to have been rated individually. *Lobaria hallii* has a widespread distribution and at the time was known from many low to mid elevation forests within certain moisture regimes (USDA and USDI 1994b). Viability concerns were also noted for this species because of its presumed sensitivity to air pollution, inferred from the known sensitivity of other nitrogen-fixing species, but the pollution sensitivity of *L. hallii* is unknown.

The concern for this species persistence under the Northwest Forest Plan is probably low. Persistence concerns may increase to moderate for populations in areas more susceptible to pollution effects, or for populations at the edge of the species' range or ecological tolerance. Information acquired since the original viability analysis (USDA and USDI 1994a) and additional species analysis for the FSEIS (USDA and USDI 1994b), provides many more locations for *L. hallii* than were previously known. *Lobaria hallii* is listed as a Survey and Manage strategy 1 and 3 species with objectives to manage known sites and to conduct surveys to identify high priority sites for management (USDA and USDI 1994c).

B. Major Habitat and Viability Considerations

The major viability consideration for *L. hallii* is loss of populations from management activities that affect the populations or their habitat. *Lobaria hallii* has a broad ecological amplitude in the area of the Northwest Forest Plan; it grows in a variety of different habitats and moisture regimes, substrates, and seral stages, as well as in open sites and under disturbed conditions. This ecological amplitude suggests that *L. hallii* may be somewhat tolerant to changes in microclimate that result from stand treatments. This species may also respond differently across its range, so its response may be quite different depending on local habitat conditions and environmental factors, or characteristics of specific populations. Generalizing about responses of *L. hallii* to various treatments or effects is therefore difficult. If *L. hallii* is sensitive to air pollution, then populations in areas exposed to various pollutants may be at risk. Many of the populations in riparian areas will likely be protected by riparian buffer provisions in the Aquatic Conservation Strategy (USDA and USDI 1994c).

C. Threats to the Species

Threats to *L. hallii* are those actions that disrupt stand conditions necessary for its survival, including treatments affecting populations, such as removing colonized substrate, stand treatments that change the microclimate or forest structure that make the site no longer suitable for *L. hallii* to survive, and possibly a deterioration in air quality. In northern California, a potential threat to local populations is the harvest of oak for firewood.

D. Distribution Relative to Land Allocations

The distribution of known sites of *L. hallii* relative to land allocations needs to be determined. Each administrative unit should evaluate the land allocations for known sites on lands within its jurisdiction, and share this information at the regional level.

III. MANAGEMENT GOAL AND OBJECTIVES

A. Management Goal for the Species

The goal for managing *Lobaria hallii* is to assist in maintaining species viability.

B. Objectives

Manage known sites on federal lands by maintaining habitat, stand structure, occupied and potential suitable substrate, and microclimatic conditions associated with *Lobaria hallii*.

IV. HABITAT MANAGEMENT

A. Lessons From History

Many lichen species are known to be sensitive to air pollution, and lichen population declines attributed to air pollution have been documented in Europe and North America (Rao and LeBlanc 1967, Skye and Hallberg 1969, Hawksworth 1971, Ferry *et al.* 1973, Hawksworth and Rose 1976, Case 1980, Sigal and Nash 1983, Gilbert 1992). Many nitrogen-fixing species are especially sensitive to air pollution, particularly sulfur dioxide (Wetmore 1983). The pollution sensitivity of *L. hallii* is not known, however, based on the known sensitivity of other nitrogen-fixing lichens, *L. hallii* may also be affected by air pollution.

The decline of lichens in Europe has resulted in the development of lists of threatened species. Sweden has a “red list” of lichens that are threatened with extinction because of air pollution and habitat degradation (Thor 1990). *Lobaria hallii* is listed as endangered on Sweden’s Red List (Databanken for hotade arter och Naturvardsverket 1991). The International Association of Lichenology has recently initiated a listing of lichens threatened globally.

B. Identifying Habitat Areas for Management

Known sites of *Lobaria hallii* on federal land administered by the Forest Service or BLM in the area of the Northwest Forest Plan are identified as habitat areas where these management recommendations apply. A habitat area for management is defined as suitable habitat occupied by or adjacent to a known population.

C. Managing in Habitat Areas

The objective of managing in habitat areas is to maintain suitable habitat for *Lobaria hallii*. Habitat areas should be managed to include an area large enough to maintain the habitat and associated microclimate of the population, as well as colonized substrates.

- Determine the extent of the local population and habitat area with a field visit.
- Manage populations at known sites by maintaining the existing ecological conditions, including occupied substrate and associated microclimate and stand conditions.
- Restrict collection of specimens where the species is rare or of limited abundance.
- Minimize effects to substrate occupied by *L. hallii*.
- When using fire as a management tool, consider how to provide for maintenance or enhancement of habitat for *L. hallii*.

- Restrict collection of firewood in stands of oak if this activity is affecting the persistence of local populations.
- Populations of *L. hallii* on California black oak and Oregon white oak within conifer stands should be evaluated to determine the need to conduct thinning or selective harvest treatments to provide the stand structure and substrate required by this lichen. Thinning may be necessary to open the canopy and to reduce lateral branch closure of conifers and suppression of oaks. Avoid impacts to oak trees in the habitat area. If treatments are conducted in the habitat area, the California black oak and white oak should be retained in clumps.
- If *Lobaria hallii* occurs in a riparian area where treatments are proposed, maintain a hardwood component in the riparian stand to provide substrate for *L. hallii*.
- Special consideration should be given to maintaining populations near the edge of the geographical range of *L. hallii*, in watersheds where it is rare and with limited distribution.
- In some watersheds, *L. hallii* may be locally abundant. In these areas, if a population of *L. hallii* is in a project area, evaluate several factors to determine the importance of the population in relation to other known sites, and the contribution of that population to the species' persistence. Consider the landscape and ecological context of the population—for example, factors such as the location of the population relative to other known populations, its relative isolation, the ecological conditions of the site and how they compare to other known sites (typical or atypical), the areal extent of the population and the abundance of the lichen in the local population, and the availability of suitable habitat in the area. Each local population should be maintained intact, however, it may be acceptable to impact a small percentage of known individuals at a particular site if it has only minimal impact to the persistence of the local population.

D. Other Management Issues and Considerations

Information from reported sites suggests that *L. hallii* may not be closely associated with late-successional and old-growth forests. For a species to be appropriately listed as a Survey and Manage species, it must first meet the criteria established for designation as a species closely associated with late-successional and old-growth forests (USDA and USDI 1994a [Table IV-6] and 1994b). This issue should be addressed by a regional coordinating body.

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 *L. hallii* is closely associated with late-successional and old-growth forests following the criteria established in the FEMAT report.
- Revisit known sites to verify the status of known populations, determine the extent of populations and abundance, and characterize ecological conditions.

B. Research Questions

- How does *L. hallii* respond to forest clearing activities (thinning, harvesting, road building), particularly to changes in light, temperature, and moisture regimes?
- What are the dispersal mechanisms and dispersal distance of *L. hallii*?
- Which habitat characteristics and ecological conditions are necessary for establishment of *L. hallii* propagules and survival of established thalli?
- What limits dispersal and establishment of propagules and colonization of suitable habitat?
- What are the minimum and optimum patch sizes of colonized habitat necessary to provide for *L. hallii* after timber harvest and thinning?
- How should refugial patches be distributed across the landscape to optimize recolonization into managed stands?
- Is *L. hallii* sensitive to air pollution?
- What is the genetic diversity of this species within its local populations and across the region?

C. Monitoring Needs and Recommendations

- If management treatments are planned near known sites, monitor populations to determine the response to treatment and effects on the local population.

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