

**Management Recommendations for**  
*Hypogymnia duplicata* (Ach.) Rass.

version 2.0

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## SUMMARY

**Species:** *Hypogymnia duplicata* (Ach.) Rass.

**Taxonomic Group:** Lichens (Rare Leafy)

**ROD Components:** 1,2,3

**Other Management Status:** none

**Range:** *Hypogymnia duplicata* is endemic to the Pacific Northwest and ranges from Prince William Sound in Alaska south to northwestern Oregon. On federal land in Washington, it is known to occur on the Mt. Baker-Snoqualmie and Olympic National Forests, and Olympic National Park. In Oregon it is known to occur on the Mt. Hood and Siuslaw National Forests and Salem District BLM.

**Specific Habitat:** *Hypogymnia duplicata* has a fairly narrow ecological amplitude. It grows as an epiphyte on mountain hemlock, western hemlock, Pacific silver fir, Douglas-fir and subalpine fir in old-growth forests of the western Cascades, Olympics and Coast Range, primarily between 330 and 1660 m (1100-5450 ft) elevation. In the western North Cascades, *H. duplicata* is found in high precipitation areas in old-growth mountain hemlock/Pacific silver fir forests in the moist to mesic Alaska huckleberry plant associations. Habitat for Oregon populations is noted as moist hemlock stands, true fir forests, moss-covered basalt outcrops and snags in a bog.

**Threats:** The main threat to *H. duplicata* is loss of populations due to activities that affect the habitat or the population, including removal of colonized substrate and alteration of microclimate. Declining air quality may be a threat to populations if it is determined that *H. duplicata* is sensitive to air pollution. A warming climate may stress populations at the limits of this species' range, and could result in a decline in vigor and a more restricted distribution of *H. duplicata*.

### **Management Recommendations:**

- Manage populations at known sites by maintaining the ecological conditions associated with *H. duplicata* including forest structure, substrate and microclimate.
- Restrict thinning or other stand treatments that will alter stand microclimate.
- Prevent fire in the habitat areas with emphasis on fire suppression.

### **Information Needs:**

- Verify current status of known populations; determine the distribution of populations, species abundance and ecological requirements of *H. duplicata* in the area of the Northwest Forest Plan.
- Determine the air pollution sensitivity of *H. duplicata*.

## Management Recommendations for *Hypogymnia duplicata*

### I. NATURAL HISTORY

#### A. Taxonomy and Nomenclature

*Hypogymnia duplicata* (Ach.) Rass was originally described (as *Parmelia*) by Acharius. This species is in the order Lecanorales, suborder Lecanorineae, family Parmeliaceae (Tehler 1996).

Synonym: *Hypogymnia elongata* (fide Goward).

#### B. Species Description

##### 1. Morphology and Chemistry

*Hypogymnia duplicata* is a medium-sized foliose lichen with hollow, narrow lobes. The thallus is pendulous and its branches form a cascade of curved lobes. The lobes are narrow, typically uniform in width, 1-2 mm wide, and characteristically turn up at the lobe tips (Figure 1). The upper surface is grayish-white, lower surface is black and without rhizines (root-like holdfasts); lobe interior usually white; apothecia uncommon.

Technical description: thallus foliose, medium-sized to large (mostly 4-20 [30] cm), whitish-gray to greenish-gray above; lobes nodulose, hollow, about 1 mm wide, cascading in arcs, somewhat turned up at the lobe tips; lobe interiors usually white, or with a dark floor and white ceiling; lower cortex surface black; apothecia uncommon; soredia and isidia lacking; cortex K+ yellow; medulla K-, KC-, PD+ red, (Goward *et al.* 1994, McCune and Geiser 1997). Contains atranorin, diffractaic, physodalic and protocetraric acids (Goward *et al.* 1994)

There are similar species of *Hypogymnia* that may be confused with *H. duplicata*.

- *Hypogymnia inactiva* typically has erect, broader and shorter thallus lobes, with dichotomous branching, and a pale to dark but never white medulla. Chemistry: cortex K+ yellow, medulla PD-, KC+ red.
- *Hypogymnia imshaugii* also has shorter thallus lobes which are typically stiff and erect, not cascading as in *H. duplicata*; the medulla in *H. imshaugii* is white as in *H. duplicata*. Chemistry: cortex K+ yellow, medulla KC+ red, PD+ red (or PD-).
- *Hypogymnia apinnata* and *H. enteromorpha* may have drooping thallus lobes, although they are typically broad (2-5 mm) and irregular in width, sometimes nodulose, compared with the consistently narrow (1 mm) lobes in *H. duplicata*; the medulla in *Hypogymnia apinnata* and *H. enteromorpha* are pale to dark but never white. Chemistry: *Hypogymnia apinnata*-- all chemical tests for the medulla are negative, cortex is K+ yellow; *H. enteromorpha*-- cortex is K+ yellow, medulla is PD+ orange or red, KC+ red.

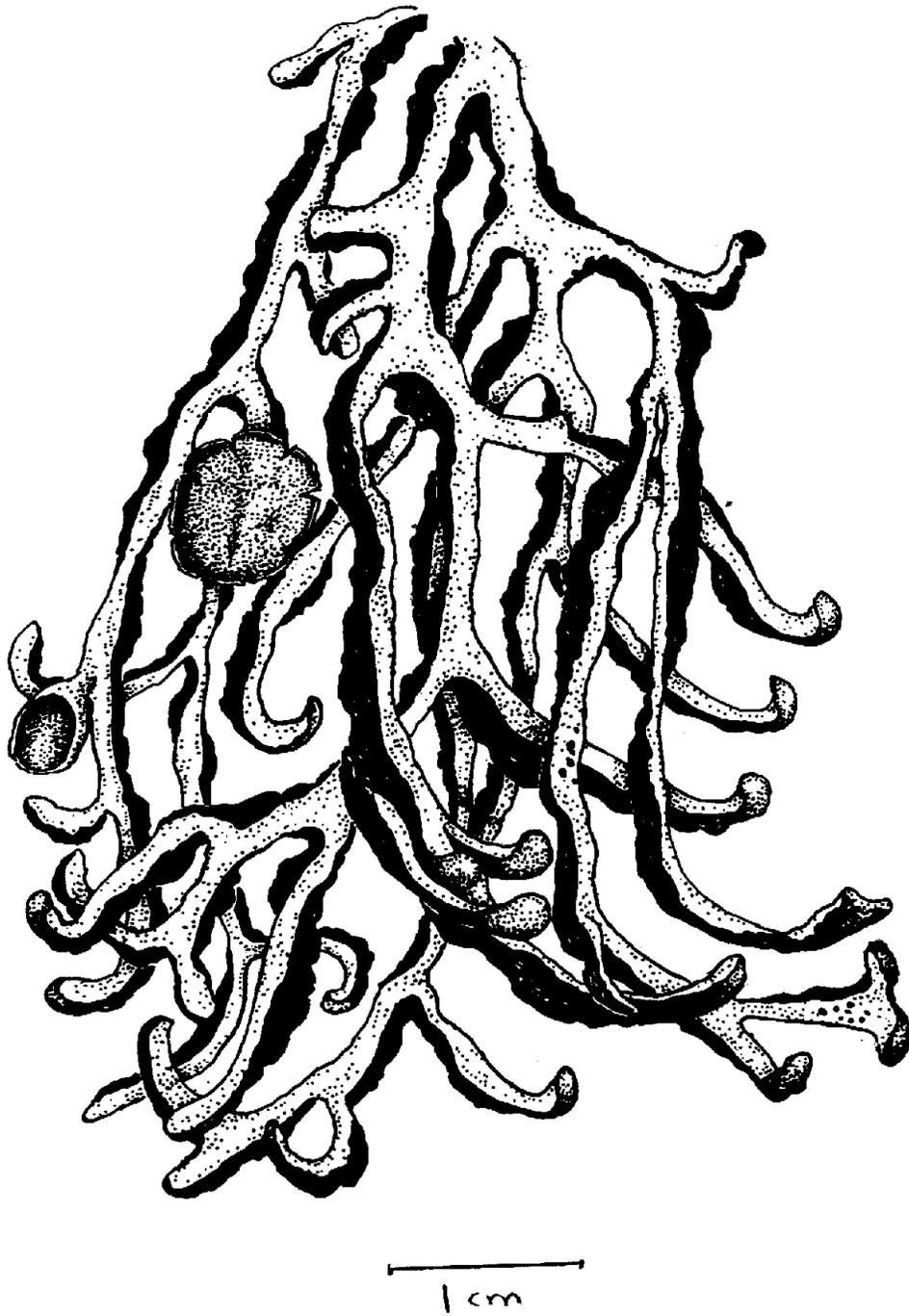


Figure 1. Line drawing of *Hypogymnia duplicata* by Alexander Mikulin.

## 2. Reproductive Biology

Apothecia are uncommon in *H. duplicata*; soredia and isidia are lacking. This species may also reproduce vegetatively by fragmentation.

## 3. Ecological Roles

Little is known specifically about the ecological roles of *H. duplicata*. Various ecological functions of this species may be inferred by noting in general the ecosystem functions of lichens, which include their role as primary producers, their contributions to nutrient cycling by way of accumulating nutrients in their thalli which are then released by decomposition or consumption. Lichen litterfall contributes organic material to the soil. This species may contribute to the food web by providing forage for various organisms, possibly including invertebrates, small mammals, and ungulates. Invertebrates may also use the lichen thalli for shelter and possible nesting sites, as has been observed in some *Hypogymnia* species, e.g., *H. enteromorpha*.

### C. Range and Known Sites

*Hypogymnia duplicata* is endemic to the Pacific Northwest, ranging from Prince William Sound in Alaska south to Oregon. Most of the known sites are on federal land with the majority occurring on the Mt. Baker-Snoqualmie National Forest. In Washington, this species is known from Whatcom, Skagit, Snohomish, King, Lewis, Clallam, Mason, and Grays Harbor counties, and in Oregon from Clackamas, Multnomah, Hood River, Clatsop, Lincoln, Polk, Tillamook, Yamhill, and Lane counties. Known sites on federal lands in Washington include Mt. Baker, Sulphur Creek Lava Flow, Finney Block, Boulder River Wilderness, Suiattle River valley, upper Sauk River, Goodman Creek, Barlow Pass, South Fork Stillaguamish River, Mt. Pilchuck area, Canyon Creek near Verlot, Silverton area, Barclay Lake, Martin Creek in the Tye watershed, Miller River, Mt. Persis, Alpine Lakes Wilderness, Snoqualmie River drainage, Snoqualmie Pass area, and the Cedar River watershed, all on the Mt. Baker-Snoqualmie National Forest. On the Olympic Peninsula, it is known from the Skokomish River drainage on Olympic National Forest; and the Solduc River Valley and Staircase area in Olympic National Park. *Hypogymnia duplicata* is not known in Washington on federal land south of the Cedar River watershed. Known sites on federal land in Oregon include Zigzag, Estacada, and Hood River Ranger Districts on the Mt. Hood National Forest; Columbia River Gorge National Scenic Area; Salem District BLM Lost Prairie Area of Critical Environmental Concern (ACEC), North Fork Siletz River near Valley of the Giants, Saddlebag (Saddleback) Mountain ACEC and Bald Mountain east of Tillamook; Hebo Ranger District (Yamhill and Tillamook counties) and Mt Hebo on the Siuslaw National Forest. Known sites on nonfederal land include Mt. Pilchuck area (Washington State Department of Natural Resources, Snohomish County), Forest Health Monitoring Plot (private land, Lewis County), and Twin Harbors State Park (Grays Harbor County) in Washington; Saddle Mountain State Park (Clatsop County), and Neahkanie Mountain (Tillamook County) in Oregon.

## D. Habitat Characteristics and Species Abundance

*Hypogymnia duplicata* occurs as an epiphyte on mountain hemlock (*Tsuga mertensiana*), western hemlock (*T. heterophylla*), Pacific silver fir (*Abies amabilis*), subalpine fir (*A. lasiocarpa*) and Douglas-fir (*Pseudotsuga menziesii*) in old-growth forests of the western Cascades, Olympics, and Oregon Coast Range between 330 m and 1660 m (1100-5450 ft) elevation. In the western North Cascades, *H. duplicata* is generally found in high precipitation areas in old-growth mountain hemlock/Pacific silver fir forests in the moist Alaska Huckleberry (*Vaccinium alaskaense*) plant associations, and most commonly as an epiphyte on mountain hemlock trees. This species has been recorded as locally abundant at a few sites in northwestern Washington. Two known sites are in lower elevation old-growth western hemlock forests in the high precipitation areas of the South Fork Stillaguamish watershed. High precipitation areas in northwestern Washington are characterized by more than 280 cm (110 in) of precipitation at sea level (Potential Natural Vegetation Model, Henderson 1998). It appears that this species may be more responsive to macroclimate than microclimate. There are areas where it has been found growing in exposed areas, but where the humidity was high.

General habitat information is recorded for Oregon populations. Habitat descriptions include mid-elevation moist western hemlock stands, old-growth Douglas-fir (*Pseudotsuga menziesii*), mature western hemlock/Douglas-fir forest, moist Pacific silver fir or noble fir (*Abies procera*) forests, Sitka spruce (*Picea sitchensis*), riparian forest and late-successional forests along ridgetops in the Oregon Coast Range. Very small populations are reported from known sites in the Oregon Coast Range (Mikulín and DiJiacomo pers. comm.).

Occasionally, atypical habitat conditions are documented for this species. These habitats are described as forests on a lava flow and a lahar in northwestern Washington, on a snag in a bog in the Oregon Coast Range, and on moss-covered basalt outcrops on a windswept ridge of Saddle Mountain in Oregon.

## II. CURRENT SPECIES SITUATION

### A. Why Species is Listed Under the Survey and Manage Standard and Guideline

*Hypogymnia duplicata* was considered at risk under the Northwest Forest Plan because of its presumed rarity and limited distribution in the range of the northern spotted owl (USDA and USDI 1994a, 1994b). At the time of the lichen viability panel, it was known from four sites in the region (USDA and USDI 1994a, 1994b). This species is endemic to the Pacific Northwest and reaches its southern limit in Oregon. The concern for species persistence under the Northwest Forest Plan varies from moderate in northwestern Washington, to high in southern Washington and Oregon where populations are fewer and more isolated, based on current information. Information acquired since the original viability rating (USDA and USDI 1994a) and additional species analysis for the FSEIS (USDA and USDI 1994b) provide more locations for this species than previously known, and suggests it may not be as rare in northwestern Washington as was previously thought. However, *Hypogymnia duplicata* still displays a narrow ecological amplitude and a limited distribution.

*Hypogymnia duplicata* was listed under the Survey and Manage Standard and Guideline to manage known sites, to locate additional populations on federal lands, and to identify high priority sites for management (USDA and USDI 1994c). Concern was expressed for lichens in general because of their sensitivity to air pollution (USDA and USDI 1994a, 1994b), but the pollution sensitivity of *H. duplicata* is unknown.

### **B. Major Habitat and Viability Considerations**

The major viability consideration for *H. duplicata* is loss of populations resulting from management activities that affect the populations or their habitat. The species' distribution along the western edge of the North Cascades may make it vulnerable to air pollution effects, if this species is determined to be sensitive to air pollutants. A warming climate may stress populations at the limits of this species' range, which could result in a decline in vigor and a more restricted distribution for *H. duplicata*.

### **C. Threats to the Species**

Threats to *H. duplicata* are those actions that disrupt stand conditions necessary for its survival, which include treatments that may affect populations such as removing colonized substrate, stand treatments that change the microclimate or forest structure, and possibly a significant deterioration in air quality.

### **D. Distribution Relative to Land Allocations**

The distribution of known sites of *H. duplicata* relative to land allocations needs to be determined. Each administrative unit should evaluate the land allocations for known sites on lands in 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 *Hypogymnia duplicata* is to assist in maintaining species viability.

### **B. Objectives**

Manage known sites on federal lands by maintaining the habitat, forest structure, substrate, and microclimate associated with *Hypogymnia duplicata*.

## IV. HABITAT MANAGEMENT

### A. Lessons From History

Lichen species with specific ecological requirements may experience population declines in response to land management activities that affect habitat or decrease potential or occupied habitats. Loss of lichen species richness has been documented in areas of Europe in response to land management practices (Rose 1988, Olsen and Gauslaa 1991, Esseen *et al.* 1992). The close association of *H. duplicata* with old-growth forests in the Pacific Northwest indicates specific ecological requirements, and may reflect the inability of this species to become established or maintain populations in younger forests.

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). However, the pollution sensitivity of *H. duplicata* is unknown.

### B. Identifying Habitat Areas for Management

All known sites of *Hypogymnia duplicata* on federal lands administered by the Forest Service and BLM in the range of the northern spotted owl 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

- Determine the extent of the local population and habitat area with a field visit.
- Habitat areas should be managed to include an area large enough to maintain the ecological conditions associated with *H. duplicata*, including forest structure and microclimatic conditions.
- Maintain occupied substrate and provide for a distribution of appropriate substrate in habitat areas.
- Restrict thinning and other stand treatments which could alter the stand microclimate.
- Prevent fire in habitat areas, with emphasis on fire suppression.
- Restrict collecting specimens where this species is rare or of limited abundance.

Ecological and habitat conditions where populations of *H. duplicata* occur will vary across the range of the species. In general, known habitat areas are characterized as cool, moist forests with high humidity and old-growth to climax forest structure. Less common or atypical habitat conditions have been documented for this species. At all locations, current habitat conditions should be maintained. The size of the area necessary to maintain populations should be determined by a field visit.

Most known sites in the range of the northern spotted owl are on the Mt. Baker-Snoqualmie National Forest. The current management direction for this Forest under the Northwest Forest Plan allocates a majority of the land base to reserve status, and therefore very little of the landscape is available for management treatments that may affect this species.

Although *H. duplicata* is restricted in its ecological distribution, it may be locally common in certain areas on the Mt. Baker-Snoqualmie National Forest. In these areas, if a population of *H. duplicata* 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 integrity of the local population. Special consideration should be given to maintaining populations near the edge of the geographical range of *H. duplicata*, and in watersheds where it is rare or of limited distribution.

#### **D. Other Management Issues and Considerations**

- In the range of *H. duplicata* where old forests are limited in extent, target the older stands in watersheds to meet the Standard and Guideline for 15% retention of old-growth in watersheds where little remains. Maintaining the older age classes across the landscape is important for *H. duplicata* as this lichen typically does not occur in younger-aged late-successional forests.
- Providing a well-distributed network of older forests in the range of *H. duplicata* will provide stands to replace those lost to fire, blowdown, or other natural disturbance events.

### **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**

- Revisit known sites to verify the status of known populations of *H. duplicata*, determine their extent and abundance, and characterize ecological conditions.
- Determine the distribution of *H. duplicata* in areas identified as potential suitable habitat. Assign priority to Strategy 3 surveys in areas where management treatments or projects are scheduled or proposed.

## **B. Research Questions**

- What habitat characteristics and ecological conditions are necessary for establishment of *H. duplicata* propagules and survival of established thalli?
- Is *H. duplicata* sensitive to air pollution?
- At what point in stand development (stand age, successional stage) does *H. duplicata* enter the stand?
- What are the reproductive and dispersal mechanisms, and dispersal distances for *H. duplicata*?
- What are the rates of growth and reproduction for *H. duplicata*?
- What limits dispersal and establishment of propagules and colonization in suitable habitat?
- What is the genetic diversity of this species within its local populations and across the region?

## **C. Monitoring Needs and Recommendations**

- If management activities are planned near known sites, monitor the population to determine response to treatment and effects on the local population
- Consider establishment of air quality monitoring plots near selected known populations.

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