

**Conservation Assessments
for
5 species of Lichens**

Hypogymnia duplicata (Ach.) Rass.

Pilophorus nigricaulis Sato

Pseudocyphellaria rainierensis Imshaug

Sticta arctica Degel.

Tholurna dissimilis (Norman) Norman

January 2005

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Preface

Converting Survey and Manage Management Recommendations into Conservation Assessments

Much of the content in this document was included in previously transmitted Management Recommendations developed for use with Survey and Manage Standards and Guidelines. With the removal of those Standards and Guidelines, the Management Recommendations have been reconfigured into Conservation Assessments to fit Special Status/Sensitive Species Program (SSSSP) objectives and language. Changes include: the removal of terminology specific to Survey and Manage Standards and Guidelines, addition of Oregon Natural Heritage Information Center (ORNHIC), Washington Natural Heritage Program (WNHP) ranks for the species, and the addition of USDA Forest Service (FS) and USDI Bureau of Land Management (BLM) Sensitive Species (SS) status and policy. Where possible, habitat, range, taxonomic and site information have also been updated to be current with data gathered since the Management Recommendations were initially issued. The framework of the original documents has been maintained in order to expedite getting this information to field units. For this reason these documents do not entirely conform to recently adopted standards for the Forest Service and BLM for Conservation Assessment development in Oregon and Washington.

Assumptions about Site Management

In the Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) to Remove or Modify the Survey and Manage Standards and Guidelines, assumptions were made as to how former Survey and Manage species would be managed under Agency Special Status/Sensitive Species policies. Under the assumptions in the FSEIS, the ROD stated “The assumption used in the final SEIS for managing known sites under the Special Status Species Programs was that sites needed to prevent a listing under the Endangered Species Act would be managed. For species currently included in Survey and Manage Categories A, B, and E (which require management of all known sites), it is anticipated that only in rare cases would a site not be needed to prevent a listing.... Authority to disturb special status species sites lies with the agency official who is responsible for authorizing the proposed habitat-disturbing activity” (USDA and USDI 2004). Three of the 5 species covered in these Conservation Assessments were listed as Category A or B at the time of the signing of the ROD, and the above assumptions apply to these species’ management under the agencies’ SSSSP. Those species are *Hypogymnia duplicata*, *Pseudocyphellaria rainierensis*, and *Tholurna dissimilis*.

The other two species included in this document were removed from Survey and Manage prior to the ROD, when it was determined that they were not dependent upon or associated with late-successional/old-growth stands. Known sites continued to be managed for these species while their inclusion within the SSSSP was being evaluated. Now that these two species have been added to one or more agency SSSSP, sites are to be managed consistent with SSSSP policies. The assumptions listed in the ROD regarding site management do not apply to these two species.

Management Considerations

Within each of the following Conservation Assessments, under the “Managing in Species Habitat Areas” section, there is a discussion on “Management Considerations” for each species. “Management Considerations” are actions and mitigations that the deciding official can utilize as a means of providing for the continued persistence of the species’ site. These considerations are not required and are intended as general information that field level personnel could utilize and apply to site-specific situations. Management of all of the species covered in these Conservation Assessments follows Forest Service 2670 Manual policy and BLM 6840 Manual direction. (Additional information, including species specific maps, is available on the Interagency Special Status Species website.)

Conservation Assessment
for
Hypogymnia duplicata (Ach.) Rass.

Originally issued
as Management Recommendations
March, 2000
Robin Lesher, Author

Reconfigured September, 2004
M. Stein

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SUMMARY

Preface: Since the transmittal of the Management Recommendations in 2000, new sites have been reported and additional information has been collected regarding the habitat of *Hypogymnia duplicata* and is presented herein.

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

Taxonomic Group: Lichens

Other Management Status: Forest Service Region 6 Sensitive Species; Bureau of Land Management (BLM) Bureau Tracking for Washington and Oregon. From NatureServe the species is ranked with a Global Heritage Rank of G4, described as apparently secure, uncommon but not rare; some cause for long-term concern due to declines or other factors. The species has a State Heritage Rank of S3 for Washington, considered vulnerable in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation, and a State rank of S2 in Oregon, described as imperiled because of rarity due to a very restricted range, very few populations, steep declines or other factors making it vulnerable to extirpation in the State. The Oregon Natural Heritage Information Center (ORNHIC) ranks the species Heritage List 3, considered taxa for which more information is needed before status can be determined but which may be threatened or endangered in Oregon.

Range: Global distribution is restricted to northwest North America from Prince William Sound, 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 *Hypogymnia 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 Considerations:

- Restrict thinning or other stand treatments that will alter stand microclimate.
- Utilize or prevent fire in the habitat areas with emphasis on fire suppression.

Data and Information Gaps:

- Verify current status of known populations; determine the distribution of populations, species abundance and ecological requirements of *Hypogymnia duplicata* in Oregon and Washington.
- Determine the air pollution sensitivity of *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* (*vide* 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 *H. apinnata* and *H. enteromorpha* are pale to dark but never white. Chemistry: *H. 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 *Hypogymnia 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 *Hypogymnia 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 Sites

Hypogymnia duplicata is endemic to the Pacific Northwest, ranging from Prince William Sound in Alaska south to northwest Oregon. Most of the known sites are on federal land with the majority (71%) occurring on the Mt. Baker-Snoqualmie National Forest. The species is conspicuously absent from the Washington Cascades south of the Interstate-90 corridor, despite repeated attempts to locate it there. 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. *H. duplicata* is not known in Washington on federal land south of the Cedar River watershed. Known sites on federal land in Oregon include Zigzag, Clackamas River, 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, 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. On the Mt. Hood National Forest, sites are in the areas of highest precipitation, generally 250 cm (100 in) and greater. Very small populations are reported from known sites in the Oregon Coast Range (Mikulin 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. Status History

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 and was placed in Survey and Manage strategy 1, 2 and 3 (USDA and USDI 1994a, 1994b). With the completion of the 2000 SEIS, it was assigned to Management Category A (USDA and USDI 2001). In 2004, *H. duplicata* was designated a Sensitive species for Forest Service Region 6 in Oregon and a Bureau Tracking species for the Bureau of Land Management in Washington and Oregon.

Hypogymnia duplicata has a Global Heritage Rank of G4, described as apparently secure, uncommon but not rare; some cause for long-term concern due to declines or other factors. The species has a State Heritage Rank of S2 in Oregon, considered imperiled because of rarity due to a very restricted range, very few populations, steep declines or other factors making it vulnerable to extirpation in the State, and S3 in Washington, described as vulnerable in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation (ORNHIC 2004). The species is on the ORNHIC List 3, described as taxa for which more information is needed before status can be determined but which may be threatened or endangered in Oregon.

B. Major Habitat and Viability Considerations

The major viability consideration for *Hypogymnia 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 *Hypogymnia 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. Random grid surveys for lichens in the Pacific Northwest (Lebo *et al.* 2004) found random detections of *H. duplicata* to have a marginal statistically significant association with old growth forest ($0.05 < p \leq 0.10$) using the Cochran-Mantel-Haenzel (CMH) test of association. Management activities within old growth forest habitats in the range of the species may pose a threat.

D. Distribution Relative to Land Allocations

A total of 183 sites are known for *Hypogymnia duplicata* (ISMS 2004). Seventy-nine percent (131) occur within reserve areas including 18 percent (33) in Congressionally reserved allocations, 54 percent (98) in Late-Successional Reserves, and 7 percent (12) in Administratively withdrawn allocations. Non-reserve land use allocations include 2 percent (3) in Adaptive Management Areas and 7 percent (13) in matrix. Thirteen percent (24) are in unknown or no land use allocation.

III. MANAGEMENT GOALS AND OBJECTIVES

Management for this species follows Forest Service Region 6 Sensitive Species (SS) policy (FS Manual 2670), and/or OR/WA BLM Special Status Species (SSS) policy (6840).

For OR/WA BLM administered lands, SSS policy details the need to manage for species conservation. Conservation is defined as the use of all methods and procedures that are necessary to improve the condition of SSS and their habitats to a point where their Special Status recognitions no longer warranted. Policy objectives also state that actions authorized or approved by the BLM do not contribute to the need to list species under the Endangered Species Act.

For Forest Service Region 6, SS policy requires the agency to maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands. Management “must not result in a loss of species viability or create significant trends toward federal listing” (FSM 2670.32) for any identified SS.

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 association of *Hypogymnia 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 *Hypogymnia duplicata* is unknown.

B. Identifying Species Habitat Areas for Management

All sites of *Hypogymnia duplicata* on federal lands administered by the Forest Service Region 6 and/or OR/WA BLM are identified as areas where the information presented in this Conservation Assessment could be applied. A species habitat area is defined as the suitable habitat occupied by a known population, plus the surrounding habitat needed to support the site

C. Managing In Species Habitat Areas

The objective of a Species Habitat Area is to maintain habitat conditions such that species viability will be maintained at an appropriate scale, in accordance with agency policies. Specific management considerations include:

- Determine the extent of the local population and species habitat area with a field visit.
- Include an area large enough to maintain the ecological conditions associated with *Hypogymnia 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.
- Utilize or prevent fire in species habitat areas, with emphasis on fire suppression.
- Restrict collecting specimens where this species is rare or of limited abundance.

V. RESEARCH, INVENTORY, AND MONITORING OPPORTUNITES

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 and Information Gaps

- Revisit sites to verify the status of known populations of *Hypogymnia duplicata*, determine their extent and abundance, and characterize ecological conditions.

- Determine the distribution of *Hypogymnia duplicata* in areas identified as potential suitable habitat.
- Report documented sites to ORNHIC and Washington Natural Heritage Programs and enter data into agency regional databases.
- Report changes in documented and suspected status as quickly as possible to the interagency (OR/WA BLM and Forest Service Region 6) Special Status/Sensitive Species Specialist in the State and Regional Office.
- Report sitings and survey work in the appropriate agency database.

B. Research Questions

- What habitat characteristics and ecological conditions are necessary for establishment of *Hypogymnia duplicata* propagules and survival of established thalli?
- Is *Hypogymnia duplicata* sensitive to air pollution?
- At what point in stand development (stand age, successional stage) does *Hypogymnia duplicata* enter the stand?
- What are the reproductive and dispersal mechanisms, and dispersal distances for *Hypogymnia duplicata*?
- What are the rates of growth and reproduction for *Hypogymnia 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 Opportunities and Recommendations

- If management activities are planned near 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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Conservation Assessment
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***Pilophorus nigricaulis* Sato**

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SUMMARY

Preface: Since the transmittal of the Management Recommendations in 2000, new sites have been located for *Pilophorus nigricaulis* and that information is presented herein.

Species: *Pilophorus nigricaulis* Sato

Taxonomic Group: Lichen

Other Management Status: Forest Service Region 6 Sensitive Species. From NatureServe the species is ranked with a Global Heritage Rank of G3, described as vulnerable, at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. The State Heritage Rank is S2 for Oregon, considered imperiled, with fewer than 20 known sites, steep declines, or other factors making it very vulnerable to extirpation from the State. The Oregon Natural Heritage Information Center (ORNHIC) ranks the species Heritage List 2, described as threatened, endangered or presumed extinct from Oregon but more common or stable elsewhere.

Range: *Pilophorus nigricaulis* is rare throughout its range, known only from Japan and the west coast of North America, from Alaska south to Washington and Oregon, primarily west of the Cascade crest. It is reported from 19 sites in the Pacific Northwest. Most sites are on federal lands and include the Mt. Baker-Snoqualmie, Gifford Pinchot, Willamette, and Wenatchee National Forests; Columbia River Gorge National Scenic Area; and Salem District BLM.

Specific Habitat: *Pilophorus niaricaulis* grows on rock substrates from 40-1430 m (130-4700 ft) elevation, it is primarily found in non-forest communities on talus slopes, cliffs, rock outcrops, and large boulders; it may also occur on these substrates within a forest setting. Volcanic rock is the predominant substrate reported. Adjacent vegetation has been noted as old-growth forests, vine maple communities, sub-alpine parkland, and moss- and lichen-dominated communities.

Threats: The major threat to *Pilophorus nigricaulis* is loss of populations resulting from activities that affect the population or its habitat, including effects on or removing colonized substrate, altering microclimatic conditions, and collecting specimens where the species is rare. As a nitrogen-fixing species, *P. nigricaulis* may be sensitive to air pollution.

Management Considerations:

- Restrict collection of specimens where the species is rare or of limited abundance.
- Minimize effects to substrate occupied by *Pilophorus nigricaulis*.

Data and Information Gaps:

- Determine distribution of populations, species abundance, and ecological requirements of *Pilophorus nigricaulis* in Washington and Oregon.

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Pilophorus nigricaulis Sato was described in 1940 (Journ. Jap. Bot. 16:173). It is in the order Lecanorales, suborder Cladoniineae, family Stereocaulaceae (Tehler 1996). There are no known synonyms.

B. Species Description

1. Morphology

Pilophorus nigricaulis is a distinctive, but relatively inconspicuous, rock-dwelling lichen (Figure 1). It has very short stalks arising from a white crustose primary thallus; stalks are simple with a blackish core and scattered to continuous white warts or areoles, < 5 mm tall, about 1 mm diameter. Some stalks may have terminal roundish black apothecia (McCune and Geiser 1997). It can be seen from a distance as a bright white, crustose-appearing thallus growing directly over rock, contrasting with the surrounding darker lichens and bryophytes; on closer inspection, the stalks can be seen (McCune and Geiser 1997). The basal cephalodia fix atmospheric nitrogen.

Technical Description: Horizontal thallus persistent, white or light gray, granular. Granules about 2 mm high and 1 mm broad, subglobose, aggregated or scattered on the substrate. Most granules slightly peltate. Pseudopodetia pin-like, 1-6 mm high, 1 mm in diameter. Internally, the stalks are compact, composed of strongly gelatinized hyphae, colored black by the deposition of dark pigment granules. The pseudopodetia are covered by subglobose granules of the same color, morphology, and structure as the granules of the horizontal thallus. In some specimens, a few stalks are branched. Pycnidia apical on short pseudopodetia or sessile on the horizontal thallus. Conidiophores long, slightly branched with terminal sickle-shaped conidia. Apothecia terminal on mature pseudopodetia or sometimes sessile on the horizontal thallus, 1.0-2.5 mm in diameter. Apothecial margin downturned as far as the point of attachment to the stalk. Apothecia subglobose or slightly conical. No columella is present. Apothecium and pseudopodetium separated by a broad boundary texture. No pigment boundary is present. Hymenium about 180 μm high, subhymenium 120 μm . Excipulum absent. Asci eight-spored. Spores rounded when young, becoming spindle-shaped when mature, about 18 x 7 μm . Photobiont green, *Pleurococcus* type. Cephalodia on the horizontal thallus, thick, brown to black, with wrinkled surface, about 0.5 mm in diameter, containing the cyanobacterium *Stigonema* (Jahns 1981).

2. Reproductive Biology

Pilophorus nigricaulis reproduces sexually by producing ascospores in apothecia.

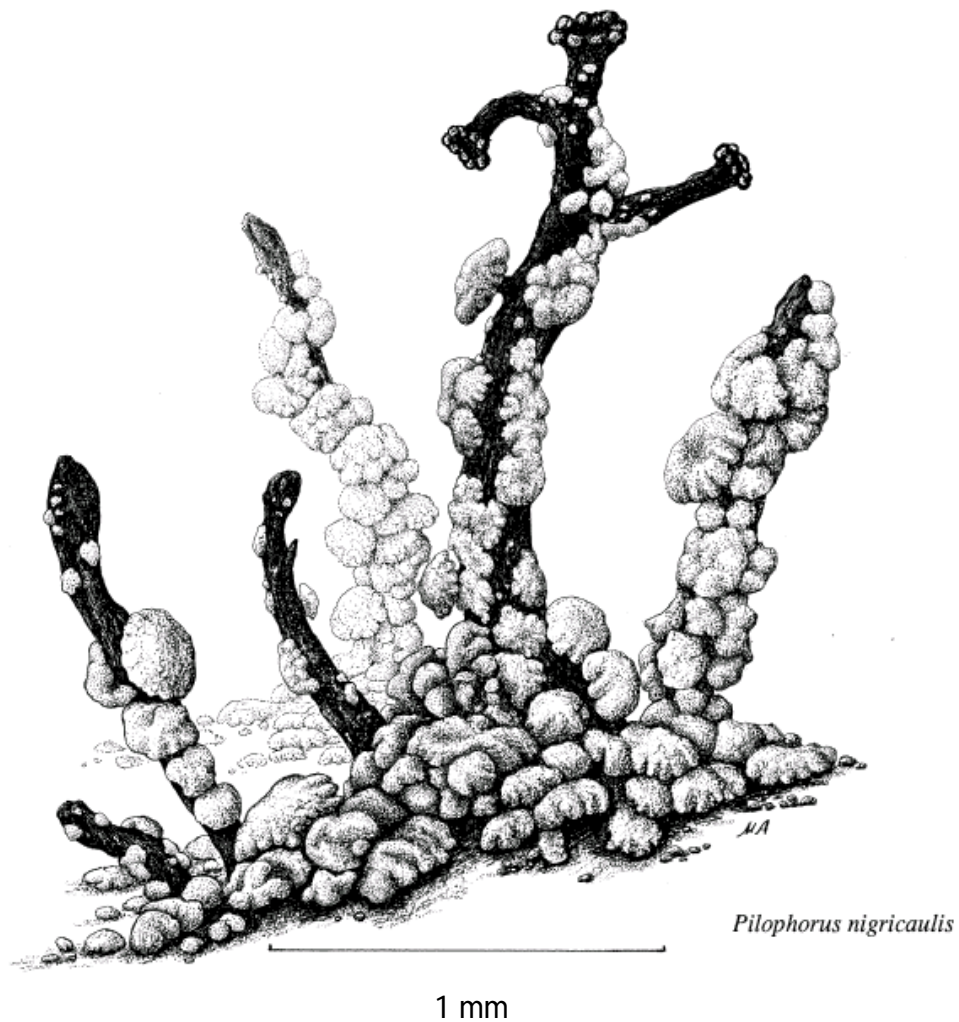


Figure 2. Line drawing of *Pilophorus nigricaulis* by Alexander Mikulin.

3. Ecological Roles

Very little is known about the ecological role of *Pilophorus nigricaulis*. This species contains cyanobacteria, so it is able to fix atmospheric nitrogen.

C. Range and Sites

Pilophorus nigricaulis occurs in Japan and on the west coast of North America, from Alaska south to British Columbia, Washington, and Oregon, west of the Cascade crest (Jahns 1981). In the Pacific Northwest, this species has been reported from 19 sites, 9 in Washington, and 10 in Oregon. All but one of the reported sites is on federal land. In Washington, the species is reported from Whatcom, King, Lewis, and Skamania counties. In Oregon sites are known from

Multnomah, Hood River, Marion, Linn, and Lincoln counties. On the Mt. Baker-Snoqualmie National Forest, it is reported from three sites: Austin Pass in the Mt. Baker area, Sulphur Creek Lava Flow, and Franklin Falls near Snoqualmie Pass. The taxonomic identity needs to be verified at the Sulphur Creek Lava Flow site. Five sites are reported on the Gifford Pinchot National Forest: Cowlitz Valley Ranger District on Forest Road 74 near milepost 22, the Mineral Block, Lava Cast Wayside on the south side of Mt. St. Helens, and a Current Vegetation Survey (CVS) plot (Geiser, pers. comm.). In Oregon, locations in the Columbia River Gorge National Scenic Area include: east of Multnomah Falls, near Trail 400 east of McCord Creek, Trail 400 west of Wyeth, Eagle Creek Trail 440, and Herman Creek Trail 406 to the Pacific Crest Trail, and the Pacific Crest Trail south of the Bridge of the Gods. It is also found near Opal Creek on the Willamette National Forest, and from two sites on Salem District BLM: Carolyn's Crown Proposed Research Natural Area near Crabtree Lake, and Shaffer Creek Research Natural Area/Area of Critical Environmental Concern.

D. Habitat Characteristics and Species Abundance

Pilophorus nigricaulis grows primarily on volcanic rock substrates (basalt and andesite). Habitats have been described as lava flows, cliffs, rock outcrops, talus slopes, and large boulders. Observations of known site habitats in the Columbia River Gorge report fairly stable substrate conditions. The elevation ranges from 40 m to 1430 m (130-4700 ft). This lichen grows on rock substrates in a variety of plant communities, including low- to mid-elevation old-growth conifer forests dominated by Douglas-fir (*Pseudotsuga menziesii*), true fir (*Abies* spp.) and western hemlock (*Tsuga heterophylla*); shrub communities dominated by vine maple (*Acer circinatum*), subalpine parkland, or in open sites on rock associated with other cryptogams in the genera *Cladonia*, *Stereocaulon*, and *Racomitrium*.

Pilophorus nigricaulis is reported as rare throughout its range. However, several populations in the Columbia River Gorge are reported to have large colonies consisting of several hundred individuals (Davis, pers. comm.).

II. CURRENT SPECIES SITUATION

A. Status History

Pilophorus nigricaulis was considered at risk under the Northwest Forest Plan because of its rarity and limited distribution within the range of the northern spotted owl (USDA and USDI 1994a, 1994b). Initially, it was a Survey and Manage strategy 1 and 3 species (USDA and USDI 1994c). With the completion of the 2000 SEIS, it was removed from Survey and Manage because information indicated it was not closely associated with late-successional and old growth forest (USDA and USDI 2001). In 2004, *Pilophorus nigricaulis* was designated a Sensitive Species for Forest Service Region 6 in Oregon and Washington.

From NatureServe, *Pilophorus nigricaulis* has a Global Heritage Rank of G3, described as vulnerable, at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors. The species has a State Heritage Rank of S2 in Oregon, considered imperiled, with fewer than 20 known sites, steep

declines, or other factors making it very vulnerable to extirpation from the State (ORNHIC 2004). The species is on the ORNHIC List 2, described as threatened, endangered or presumed extinct from Oregon but more common or stable elsewhere.

B. Major Habitat and Viability Considerations

The major viability consideration for *Pilophorus nigricaulis* is loss of populations resulting from management activities that affect the populations or the habitat. A major consideration would be quarrying or road building that directly affects the colonized rock substrates. Some known sites indicate habitat as rock substrates in an old-growth forest matrix. Removing forest canopy and subsequent changes in microclimate may affect *P. nigricaulis* at these sites. A warming climate may stress populations at the limits of a species range and could result in a decline in vigor and a more restricted distribution of *P. nigricaulis*. Many of the sites are in the Columbia River Gorge and may be more susceptible to air pollution effects, given the vicinity to the Portland metropolitan area and other pollution sources.

Pilophorus nigricaulis appears restricted in its ecological amplitude, and thus is limited in distribution partly because of the specificity of its habitat requirements.

C. Threats to the Species

Threats to *Pilophorus nigricaulis* are those actions that disrupt habitat conditions necessary for its survival, including treatments that destroy populations by quarrying and road building, or stand treatments that alter the microclimate. As a nitrogen-fixing species, *P. nigricaulis* may be affected by a significant deterioration of air quality. Collecting specimens may be a threat where the species is rare or of limited abundance.

D. Distribution Relative to Land Allocations

The distribution of known sites of *Pilophorus nigricaulis* relative to land allocations needs to be determined.

III. MANAGEMENT GOALS AND OBJECTIVES

Management for this species follows Forest Service Region 6 Sensitive Species (SS) policy (FS Manual 2670), and/or OR/WA BLM Special Status Species (SSS) policy (6840).

For OR/WA BLM administered lands, SSS policy details the need to manage for species conservation. Conservation is defined as the use of all methods and procedures that are necessary to improve the condition of SSS and their habitats to a point where their Special Status recognitions no longer warranted. Policy objectives also state that actions authorized or approved by the BLM do not contribute to the need to list species under the Endangered Species Act.

For Forest Service Region 6, SS policy requires the agency to maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands. Management “must not result in a loss of species viability or create significant trends toward federal listing” (FSM 2670.32) for any identified SS.

IV. HABITAT MANAGEMENT

A. Lessons From History

Very little is known about the ecology of this species, or how past actions have affected its distribution or viability. 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). The air pollution sensitivity of *Pilophorus nigricaulis* is unknown; but it may be sensitive to pollution, as other nitrogen-fixing lichen species have been shown to be.

B. Identifying Species Habitat Areas

All sites of *Pilophorus nigricaulis* on federal lands administered by the Forest Service Region 6 and/or OR/WA BLM are identified as areas where the information presented in this Conservation Assessment could be applied. A species habitat area is defined as the suitable habitat occupied by a known population, plus the surrounding habitat needed to support the site.

C. Managing in Species Habitat Areas

The objective of species habitat areas is to maintain habitat conditions such that species viability will be maintained at an appropriate scale, in accordance with agency policies. Specific management considerations include:

- Determine the extent of the local population and species habitat area with a site visit.
- Include an area that is large enough to maintain the habitat and associated microclimate of the population.
- Maintain occupied or potentially suitable substrate within the habitat area.
- Minimize effects to substrates occupied by *Pilophorus nigricaulis*, and restrict activities such as quarrying and road building in habitat areas.
- Restrict collection of specimens where the species is rare or of limited abundance.

V. RESEARCH, INVENTORY, AND MONITORING OPPORTUNITIES

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 and Information Gaps

- Revisit sites to verify the status of known populations, determine the extent of the populations and abundance, and characterize ecological conditions.
- Verify the taxonomic identity of the population reported from the Sulphur Creek Lava flow on the Mt. Baker-Snoqualmie National Forest.
- Determine the distribution of *Pilophorus nigricaulis* in areas identified as potentially suitable habitat.
- Report documented sites to ORNHIC and Washington Natural Heritage Programs and enter data into agency regional databases.
- Report changes in documented and suspected status as quickly as possible to the interagency (OR/WA BLM and Forest Service Region 6) Special Status/Sensitive Species Specialist in the State and Regional Office.
- Report sitings and survey work in the appropriate agency database: GeoBOB or NRIS.

B. Research Questions

- What habitat characteristics and ecological conditions are necessary for the establishment of *Pilophorus nigricaulis* propagules and the survival of established thalli?
- What are the dispersal mechanisms and dispersal distances of *Pilophorus nigricaulis*?
- What is the genetic diversity of this species within its local populations and across the region?
- Is *Pilophorus nigricaulis* sensitive to air pollution?

C. Monitoring Opportunities and Recommendations

- If management activities occur near known sites, monitor populations to determine their response to treatment and effects on the local population.

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Conservation Assessment

for

Pseudocyphellaria rainierensis Imshaug

Originally issued
as Management Recommendations
March, 2000
Robin Lesher, Author

Reconfigured September, 2004
M. Stein

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SUMMARY

Preface: Since the transmittal of the Management Recommendations in 2000, additional sites have been reported for *Pseudocyphellaria rainierensis* and information about them is included herein.

Species: *Pseudocyphellaria rainierensis* Imshaug

Taxonomic Group: Lichen

Other Management Status: Forest Service Region 6 Sensitive Species. Bureau of Land Management (BLM) Tracking Species for Washington and Oregon. From NatureServe the species is ranked with a Global Heritage Rank of G3/G4, described as vulnerable (G3), at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), steep declines or other factors, to apparently secure (G4), uncommon but not rare, some cause for long-term concerns due to declines or other factors. The species has a State Heritage Rank of S3, considered vulnerable, for Oregon and Washington. The Oregon Natural Heritage Information Center (ORNHIC) ranks the species Heritage List 4, described as taxa that are not currently threatened or endangered.

Range: Global distribution is northwest North America from southeast Alaska south through British Columbia and Washington to Douglas County, Oregon. Federal lands with sites include the Mt. Baker-Snoqualmie, Olympic, and Gifford Pinchot National Forests; Mt. Rainier and Olympic National Parks in Washington; and the Siuslaw, Mt. Hood, Willamette, Umpqua National Forests; Salem and Roseburg Districts BLM in Oregon.

Specific Habitat: *Pseudocyphellaria rainierensis* is an epiphyte primarily on conifer trees in cool, humid, old-growth to climax forests in the Western Hemlock or lower Pacific Silver Fir zones. The elevational range of known sites is between 100 m and 1220 m (330-4000 ft). When present, *P. rainierensis* is generally not abundant, and occupies only a portion of what appears to be suitable habitat, suggesting strong dispersal limitations, and possibly specific habitat preferences.

Threats: The main threat to *Pseudocyphellaria rainierensis* is loss of populations resulting from activities that affect the habitat or the population, including changes in microclimate and removal of colonized substrate. As a nitrogen-fixing species, *P. rainierensis* may be sensitive to air pollution, as has been documented for other nitrogen-fixing lichens. *P. rainierensis* appears to be restricted to old forests. The limited distribution and abundance of these older age-classes in the landscape limit potentially suitable habitat, as well as contribute to the isolation of populations.

Management Considerations:

- Restrict collection of specimens where the species is rare or of limited abundance.

Data and Information Gaps:

- Determine the distribution of populations, species abundance, and ecological requirements of *Pseudocyphellaria rainierensis*. Verify the current status of known populations.

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Pseudocyphellaria rainierensis Imshaug was first found in Mount Rainier National Park in 1948, and was described by Henry Imshaug in 1950 (Imshaug 1950). It is in the order Lecanorales, suborder Peltigerineae, family Lobariaceae (Tehler 1996).

B. Species Description

1. Morphology and Chemistry

Pseudocyphellaria rainierensis is a large, blue-gray foliose lichen, with thallus lobes typically longer than wide. It bears a superficial resemblance to *Lobaria oregana*, but the bluish-gray color of *P. rainierensis* and presence of pseudocyphellae (white spots) on the lower surface are distinctive features. *P. rainierensis* produces abundant lobules and/or isidia along the thallus margin, similar to those found in *Lobaria oregana* (Figure 1).

Technical Description: Thallus foliose, large, loosely appressed to pendulous, 1-2 dm across, brittle when dry; lobes 0.5-3 cm broad; upper surface gray or pale bluish-gray, smooth or irregularly wrinkled; lower surface whitish to light brown, tomentose, with scattered conspicuous pseudocyphellae, 0.2-0.6 mm in size; primary photobiont a green alga, with internal cephalodia containing the cyanobacterium photobiont; lobules and coralloid isidia present; apothecia rare, reddish-brown, with thalline margin; medulla white to gray; cortex K+ yellow; medulla K- or brownish, all other spot tests negative (Imshaug 1950, McCune and Geiser 1997).

2. Reproductive Biology

Pseudocyphellaria rainierensis apparently reproduces primarily by producing asexual lobules and isidia, which break off the thallus and become established nearby. Because of the size of the lobules (0.5-3 mm), dispersal distances are probably typically short, limiting this species' dispersal capabilities. Only one fertile population is known (Sillett 1997, Sillett and Goward 1998), suggesting that apothecia are very rare and sexual reproduction is uncommon. The patchy distribution of *P. rainierensis*, even in suitable habitat, suggests there are factors limiting its dispersal and establishment (Sillett 1997, Sillett and Goward 1998, Goward 1994).

3. Ecological Roles

Pseudocyphellaria rainierensis is a nitrogen-fixing lichen. Nitrogen-fixing lichen species play an important ecological role by contributing nitrogen to ecosystems. Although *P. rainierensis* is generally restricted in its ecological distribution and generally not abundant when present, it provides a source of nitrogen in ecosystems where this nutrient is often limiting.

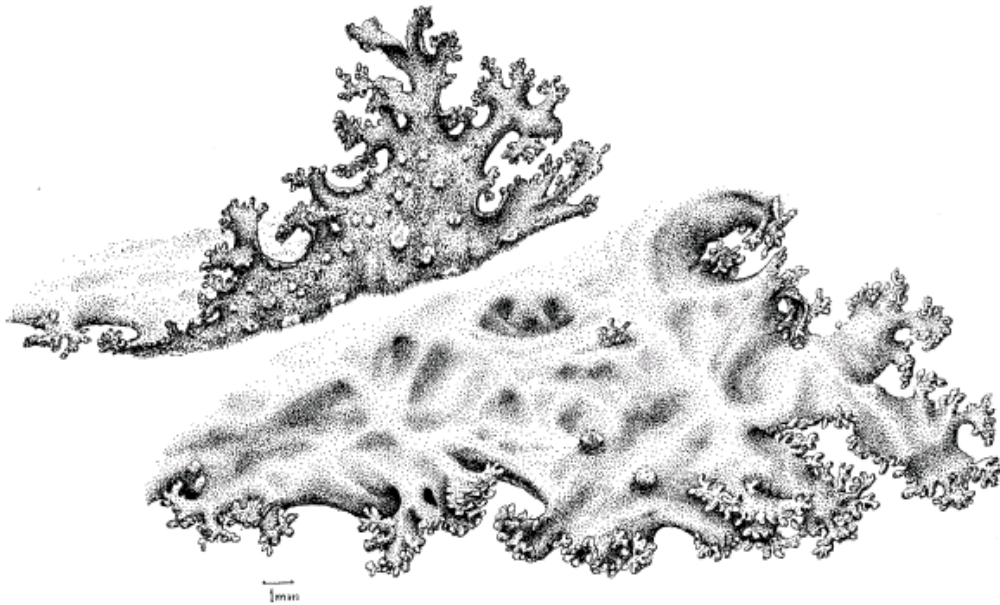


Figure 3. Line drawing of *Pseudocyphellaria rainierensis* by Alexander Mikulin.

C. Range and Sites

Pseudocyphellaria rainierensis is endemic to the Pacific Northwest. It is found from southeastern Alaska south to British Columbia, Washington, and Oregon. It is only known west of the Cascade crest. In Washington and Oregon, it is reported from 237 sites, mostly on federal lands. It is reported from Washington in Whatcom, Snohomish, King, Pierce, Lewis, Skamania, Clallam, and Jefferson counties. In Oregon, it is reported from Clackamas, Marion, Linn, Lane, Lincoln, Polk, and Douglas counties. It appears to reach the southern limit of its range in Douglas County, Oregon.

Pseudocyphellaria rainierensis is documented from thirty-four sites on the Mt. Baker-Snoqualmie National Forest in Whatcom, Snohomish, Skagit, and King counties. Populations are reported from Mount Rainier National Park (Pierce County), including the type locality (Imshaug 1950). It is reported from nine sites on the Olympic Peninsula in Clallam, Jefferson, and Grays Harbor counties; these sites need to be verified. It is known from multiple sites on the Gifford Pinchot National Forest (Lewis and Skamania Counties), from the Cowlitz Valley Ranger District, and Mount St. Helens National Volcanic Monument south to the Mount Adams Ranger District.

In Oregon, it is known from the Clackamas River and Zigzag Ranger Districts, on the Mt. Hood National Forest in Clackamas County; Salem District BLM in the Coast Range in Polk County, and the Cascades in Linn County; the Willamette National Forest from the North Fork Santiam

River area in Marion and Linn counties, south to the H.J. Andrews Experimental Forest in Lane County North Umpqua Ranger District on the Umpqua National Forest in Lane County and Roseburg District BLM in the vicinity of Rock Creek and Canton Creek. It is also known from the Oregon Coast at Cape Perpetua in Lincoln County (Sillett 1995).

D. Habitat Characteristics and Species Abundance

Pseudocyphellaria rainierensis appears to have factors that limit its dispersal and establishment as it is often absent from sites that appear to be suitable habitat. When present, *P. rainierensis* is not abundant; within stands it typically has a patchy distribution and is absent on apparently suitable substrate. *P. rainierensis* appears to be restricted to old-growth and climax forests.

Pseudocyphellaria rainierensis is an epiphyte primarily on conifer trees in old-growth forests in the Western Hemlock or lower Pacific Silver Fir zones. It has been reported as an epiphyte on Pacific silver fir (*Abies amabilis*), Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), subalpine fir (*Abies lasiocarpa*), Pacific yew (*Taxus brevifolia*), Sitka spruce (*Picea sitchensis*), and western redcedar (*Thuja plicata*), as well as bigleaf maple (*Acer macrophyllum*), vine maple (*Acer circinatum*), red alder (*Alnus rubra*), cascara (*Rhamnus purshiana*), chinquapin (*Chrysolepis chrysophylla*), black cottonwood (*Populus trichocarpa*), and Pacific rhododendron (*Rhododendron macrophyllum*). The elevational range of known sites is from 100 m to 1220 m (330-4000 ft). The common feature of the habitats at known sites appears to be old-growth forest structure with cool, humid microclimate.

In the North Cascades of Washington on the Mt. Baker-Snoqualmie National Forest, the typical habitat of *Pseudocyphellaria rainierensis* is mesic to moist, old-growth Pacific Silver Fir/Alaska Huckleberry (*Vaccinium alaskaense*) forests more than 500 years old. Generally, these sites are in wet climatic areas with high precipitation, and the forests are characterized by high humidity and cool temperatures. In these areas, *P. rainierensis* is an epiphyte on the lower boles of Pacific silver fir. Other habitats where this species has been documented in northern Washington include an old-growth Douglas-fir/western hemlock forest, and an unusual low elevation stand of dead or dying subalpine fir on the Sulphur Creek lava flow (Rhoades 1981).

In the southern Washington Cascades on the Gifford Pinchot National Forest, *Pseudocyphellaria rainierensis* grows in old-growth Douglas-fir/western hemlock forests, with western redcedar and Pacific yew sometimes present. In this area, it has been recorded as an epiphyte on Douglas-fir, western hemlock, Pacific silver fir, bigleaf maple, and vine maple.

In Oregon, the majority of sites are in old-growth conifer forests. Typical habitat for *Pseudocyphellaria rainierensis* is old-growth Douglas-fir/western hemlock forests from 490 m to 900 m (1600-2950 ft) elevation. It has been recorded as an epiphyte on Douglas-fir, western hemlock, Pacific silver fir, Pacific yew, western redcedar, Sitka spruce, red alder, chinquapin, and in canopy litterfall. In Oregon, it may not be restricted entirely to interior forest; it has persisted on an old-growth Douglas-fir at the edge of a 20-year-old clear-cut (Sillett 1995), and was found on an open grown western hemlock on a talus slope in an old-growth Douglas-fir/western hemlock forest. This lichen species has also been found on the moss-covered branches of Pacific yew in partially open conditions under the shelter of an old-growth forest canopy.

Pseudocyphellaria rainierensis appears to be one of the last lichens to reach the upper canopy during forest development (McCune 1993, Sillett 1995, Sillett and Neitlich 1996). In the 700-year-old Douglas-fir trees it was limited to the middle and lower crown (Sillett 1995), with a distribution pattern similar to the moss, *Antitrichia curtipendula*. These moss mats may provide an important function in regulating moisture regimes in the forest canopy (Norris, pers. comm., Sillett 1995), and may contribute to providing suitable habitat and microclimatic conditions for *P. rainierensis*.

Several reports of *Pseudocyphellaria rainierensis* are from stands younger than 200 years (Sillett 1995, Messinger pers. comm.). These sites are in the western Oregon Cascades and described as mature forests, late-successional forests, and a 140-year-old riparian forest of Douglas-fir and western hemlock.

II. CURRENT SPECIES SITUATION

A. Status History

Pseudocyphellaria rainierensis 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 of the lichen viability panel, it was known from 16 sites in the range of the northern spotted owl (USDA and USDI 1994a, 1994b). Because of its rarity, its close association with old-growth forests, and its presumed dispersal limitation, *P. rainierensis* is potentially vulnerable to land management activities, and there was a high level of concern for species persistence. Because of these concerns, *P. rainierensis* was listed under the Survey and Manage strategies 1, 2, and 3 to manage known sites, to locate additional populations on federal lands, and to identify high priority sites for management (USDA and USDI 1994c).

With completion of the 2000 SEIS, the species was assigned to Management Category A (USDA USDI 2001). In 2004, *Pseudocyphellaria rainierensis* was designated a Sensitive species for the Forest Service Region 6.

From NatureServe the species is ranked with a Global Heritage Rank of G3/G4, described as vulnerable (G3), at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors, to apparently secure (G4), uncommon but not rare; some cause for long-term concern due to declines or other factors (ORNHIC 2004). The species has a State Heritage Rank of S3 for Washington and Oregon, considered vulnerable in the State due to a restricted range, relatively few populations, recent and widespread declines, or other factors making it vulnerable to extirpation. The ORNHIC ranks the species Heritage List 4, described as taxa that are not currently threatened or endangered.

B. Major Habitat and Viability Considerations

The close association of *Pseudocyphellaria rainierensis* with old forests in certain climatic regimes in the Pacific Northwest is an important factor determining this species' distribution. This association indicates specific ecological requirements, and may reflect the inability of this species to become established or maintain viable populations in younger forests. The limited extent of older age-classes across the landscape, particularly in certain geographical areas, suggests that potential suitable habitat may be limited for this species. This contributes to the isolation of populations and the vulnerability of populations to disturbance. The major viability consideration for *P. rainierensis* is loss of populations resulting from management activities that affect populations or their habitat.

It appears there are factors that limit the dispersal and establishment of this lichen. *Pseudocyphellaria rainierensis* is often absent from sites that appear to be suitable habitat. Even when this species occurs, it is patchy in its distribution and is absent on apparently suitable substrate.

A warming climate may stress populations at the limits of a species' range, and could result in a decline in vigor and a more restricted distribution of *Pseudocyphellaria rainierensis*.

C. Threats to the Species

Threats to *Pseudocyphellaria rainierensis* are those actions that disrupt stand conditions necessary for its survival, including treatments that may directly or indirectly affect populations, such as removing colonized or potential substrate, or stand treatments that result in changes in forest structure or changes in microclimate (such as temperature, humidity, radiation). Significant deterioration in air quality is also a potential threat to this species.

D. Distribution Relative to Land Allocations

The distribution of known sites of *P. rainierensis* on federal lands include 28 (12%) in Congressionally reserved allocations, 98 (41%) in Late-Successional Reserves, 31 (13%) in Adaptive Management Areas, 11 (5%) in Administratively withdrawn allocations, 48 (20%) in matrix and 21 (9%) of unknown land use allocation.

III. MANAGEMENT GOALS AND OBJECTIVES

Management for this species follows Forest Service Region 6 Sensitive Species (SS) policy (FS Manual 2670), and/or OR/WA BLM Special Status Species (SSS) policy (6840).

For OR/WA BLM administered lands, SSS policy details the need to manage for species conservation. Conservation is defined as the use of all methods and procedures that are necessary to improve the condition of SSS and their habitats to a point where their Special Status recognitions no longer warranted. Policy objectives also state that actions authorized or

approved by the BLM do not contribute to the need to list species under the Endangered Species Act.

For Forest Service Region 6, SS policy requires the agency to maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands. Management “must not result in a loss of species viability or create significant trends toward federal listing” (FSM 2670.32) for any identified SS.

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 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). There has been little documentation of *Pseudocyphellaria rainierensis* in response to management treatments or other disturbance in the Pacific Northwest. It was probably more abundant in the past, since some of its probable habitat and substrate has been removed through timber harvest activities.

The thalli of *Pseudocyphellaria rainierensis* may need time to become acclimatized to edge conditions when populations are isolated by harvesting (Sillett 1994). Sillett conducted transplant studies of *P. rainierensis* thalli that originated from edge and old-growth interior forest sites. His results showed that edge lichens transplanted back to a 20-year-old regeneration clear-cut edge environment grew well, but interior lichens from a 700-year-old stand transplanted to the clear-cut edge lost weight (Sillett 1994). This study suggests that to retain sites, maintaining interior forest habitat conditions around *P. rainierensis* populations adjacent to timber harvest or road building activities may be important.

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 lichen species are especially sensitive to air pollution, particularly sulfur dioxide (Wetmore 1983). The air pollution sensitivity of *Pseudocyphellaria rainierensis* is unknown, but it is likely to be sensitive to pollution, based on the known sensitivity of other nitrogen-fixing lichen species.

B. Identifying Species Habitat Areas

All sites of *Pseudocyphellaria rainierensis* on federal lands administered by the Forest Service Region 6 and/or OR/WA BLM are identified as areas where the information presented in this Conservation Assessment could be applied. A species habitat area is defined as the suitable habitat occupied by a known population, plus the surrounding habitat needed to support the site.

C. Managing in Species Habitat Areas

The objective of Species Habitat Areas is to maintain habitat conditions such that species viability will be maintained at an appropriate scale, in accordance with agency policies. Specific management considerations include:

- Determine the extent of the local population and species habitat area with a field visit.
- Include an area large enough to maintain the ecological conditions associated with *Pseudocyphellaria rainierensis*, including undisturbed forest structure and interior forest microclimatic conditions.
- Maintain occupied substrate and manage a species habitat area large enough to provide for a distribution of appropriate substrate within the habitat area.
- Restrict thinning or other stand treatments that will alter stand microclimate.
- Utilize or prevent fire in species habitat areas with emphasis on fire suppression.
- Restrict collection of specimens in areas where this species is rare or of limited abundance.

V. RESEARCH, INVENTORY AND MONITORING OPPORTUNITIES

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 and Information Gaps

- Revisit sites to verify the status of known populations, determine the extent of populations and abundance, and characterize ecological conditions.
- Request additional information from S. Sillett, K. Glew, and G. McHenry-Teller to incorporate their reported sites of *Pseudocyphellaria rainierensis* into agency databases.
- Locate and determine the status of reported populations on the Olympic Peninsula.
- Determine the distribution of *Pseudocyphellaria rainierensis* in areas identified as potential suitable habitat. Potential suitable habitat is characterized as old-growth to climax forests in high precipitation areas of the Western Hemlock and Pacific Silver Fir zones, with cool humid microclimate.
- Determine the air pollution sensitivity of *Pseudocyphellaria rainierensis*.
- Revisit the 140-year-old riparian site in the Blue River basin, and other sites in stands less than 200 years old on the Willamette National Forest, and characterize habitat conditions and forest structure to compare with the ecological conditions at other sites.
- Report documented sites to ORNHIC and Washington Natural Heritage Programs and enter data into agency regional databases.
- Report changes in documented and suspected status as quickly as possible to the interagency Sensitive/Special Status Species Specialist in the State and Regional Office.
- Report sitings and survey work in the appropriate agency database.

B. Research Questions

- What habitat characteristics and ecological conditions are necessary for establishment of *Pseudocyphellaria rainierensis* propagules and survival of established thalli?
- What are the dispersal mechanisms and dispersal distances of *Pseudocyphellaria rainierensis* propagules?
- What limits dispersal and establishment of propagules and colonization of suitable habitat?
- What are the rates of growth and reproduction for this species?
- What is the genetic diversity of this species within its local populations and across the region?
- Can other locations be found where populations of *Pseudocyphellaria rainierensis* have persisted after harvest treatments, as reported by Sillett (1994, 1995)?
- Is *Pseudocyphellaria rainierensis* sensitive to air pollution?

C. Monitoring Opportunities and Recommendations

- If management activities occur near known sites, monitor the population to determine its response to treatment and the effects on the population.
- Establish monitoring plots in the population of *Pseudocyphellaria rainierensis* in the recent blowdown area of the Sauk River on the Mt. Baker-Snoqualmie National Forest to document population trends of *P. rainierensis* in response to this disturbance.
- Consider establishing air quality monitoring plots near selected known populations.

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Conservation Assessment

for

Sticta arctica Degel.

Originally issued
As Management Recommendations
March, 2000
Chiska Derr, Author

Reconfigured July, 2004
M. Stein

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SUMMARY

Preface: Since the transmittal of the Management Recommendations in 2000, no additional site or habitat information for *Sticta arctica* has been recorded.

Species: *Sticta arctica* Degel.

Taxonomic Group: Lichen

Other Management Status: Forest Service Region 6 Sensitive Species. From NatureServe the species is ranked with a Global Heritage Rank of G4, described as apparently secure, uncommon but not rare; some cause for long-term concern due to declines or other factors. The State Heritage Rank for Oregon is S1, considered critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation in the State. The Oregon Natural Heritage Information Center (ORNHIC) ranks the species Heritage List 2, described as taxa threatened, endangered or possibly extirpated in Oregon but more stable or common elsewhere.

Range: *Sticta arctica* is known from Siberia, Kamchatka, and North America from arctic Alaska east to Baffin Island, Canada, and as far south as Juneau, Alaska with single disjunct sites near the summit of Saddle Mountain State Park in Clatsop County, Oregon, and Deception Pass State Park, Washington. *S. arctica* is not known to occur on federal land in Oregon or Washington.

Specific Habitat: *Sticta arctica* is an arctic-alpine lichen that grows among mosses and on hummocks in dry and moist tundra in the northern part of its range. In its southern range, it is found on rocky ledges and mossy soil near the edges of marine beaches, and on a moss-covered basalt outcrop on a rocky mountain summit at 900 m (2950 ft) near the coast. It can be easily overlooked because it is small and grows intermingled with other species.

Threats: The major threat to *Sticta arctica* is loss of local populations resulting from activities that affect the population or its habitat, including collecting specimens, removing colonized substrate, and alter its microclimate. Recreation-related activities such as hiking, mountain biking, trail or shelter building would be most likely activities to threaten the species.

Management Considerations:

- Maintain existing habitat conditions, including occupied substrate and associated microclimatic conditions, and restrict collecting of specimens.

Data and Information Gaps:

- Determine the distribution of local populations, species abundance and ecological requirements of *Sticta arctica* on federal lands in Washington and Oregon.

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Sticta arctica Degel. was described by Degelius in 1937 (in Medd. Goteborgs Bot. Tradg. 12:108).

B. Species Description

1. Morphology

Sticta arctica is a small, dark brown foliose lichen with scattered cyphellae on the lower surface (Figure 1). These cyphellae are large, white, circular, recessed pores that resemble lunar craters. The upper side is smooth with somewhat crisped edges; the underside is pale at the edges, dark toward the center, and covered with a fine tomentum (woolly or felt-like hairs).

Technical Description: Thallus foliose, dorsiventral, the lobes small, to 30 mm long and 12 mm broad, the edges somewhat crisped and turned up, upper surface paraplectenchymous, smooth, brown; underside pale at the edges, dark centrally, covered with a fine tomentum and with scattered cyphellae, attached to substrate by simple or branched rhizines. Apothecia and pycnidia are not known. Cyanobacterium is *Nostoc* (Thomson 1984). Chemistry: K-, C-, KC-, P-, I-.

2. Reproductive Biology

Sexual reproductive structures are unknown for *Sticta arctica*. It reproduces asexually by producing lobules; migrating arctic birds may be a vector for distributing lobules (McCune *et al.* 1997). This species also reproduces by fragmentation when thalli are broken apart by animals or disrupted by rolling rocks or wind, and pieces become reestablished nearby.

3. Ecological Roles

Very little is known about the ecological roles of this species in the Pacific Northwest. It appears to have a geographic affinity with northeastern Asia and the maritime Arctic (McCune *et al.* 1997), and may have ecological ties with associated northeastern Asia and maritime Arctic plant and animal communities and habitats. The widely disjunct sites in Washington and Oregon may be relicts from a previous, colder climatic period.

C. Range and Sites

Sticta arctica is known from Siberia, Kamchatka, and North America (Krog 1968). Until 1993, its North America distribution was known to extend from arctic Alaska east to Baffin Island, Canada, and as far south as Juneau, Alaska (Krog 1968). In 1993, a single disjunct site was found near the summit of Saddle Mountain State Park in Clatsop County, Oregon (*Derr #881*), extending its range over 1000 km (600 miles) to the south (McCune *et al.* 1997). Recent

herbaria searches provided information on two additional southern populations of *S. arctica*, one from the Queen Charlotte Islands, British Columbia, and one from Deception Pass State Park, Washington; they had been misidentified as *S. weigellii* (McCune *et al.* 1997). *S. arctica* is not known to occur on federal land in Oregon and Washington.

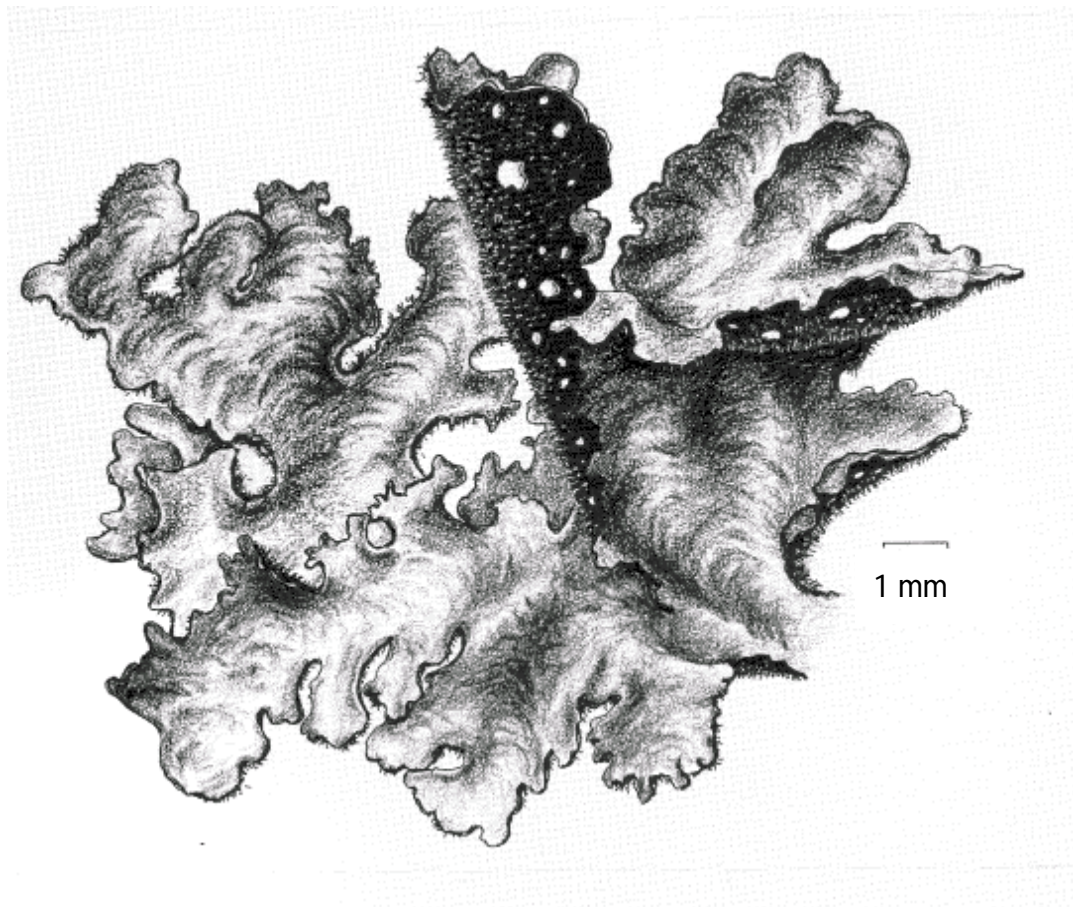


Figure 4. Line drawing of *Sticta arctica* by Alexander Mikulin.

D. Habitat Characteristics and Species Abundance

Sticta arctica is an arctic-alpine species that grows among mosses and on hummocks in both dry and moist tundras in the northern part of its range (Thomson 1984). In British Columbia and Washington, it is known from rocky ledges, soil, and rock at the edge of marine beaches (McCune *et al.* 1997). In Oregon, it is only known from a massive moss-covered basalt outcrop on the windswept ridge of an exposed rocky mountain summit of Saddle Mountain (elevation about 900 m (2950 ft)) near the coast, where only a few thalli were present (McCune *et al.* 1997). It can easily be overlooked because it is small and grows intermingled with bryophytes.

II. CURRENT SPECIES SITUATION

A. Status History

Sticta arctica 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). With the completion of the 2000 SEIS, it was removed from Survey and Manage because information indicated it was not closely associated with late-successional and old growth forest (USDA and USDI 2001). In 2004, *S. arctica* was designated a Sensitive Species for Forest Service Region 6.

Sticta arctica has a Global Heritage Rank of G4, described as apparently secure, uncommon but not rare; some cause for long-term concern due to declines or other factors. The species has a State Heritage of S1 in Oregon, considered critically imperiled because of rarity due to a very restricted range, very few populations (often 5 or fewer), steep declines, or other factors (ORNHIC 2004). A State Rank has not been assigned by the Washington Natural Heritage Program. The species is on the ORNHIC List 2, described as taxa that are threatened, endangered or possibly extirpated from Oregon but more stable or common elsewhere.

B. Major Habitat and Viability Considerations

The major viability considerations for *Sticta arctica* are loss of local populations resulting from collecting specimens that could extirpate local populations, and management activities that adversely affect the individuals or their habitat. A warming climate may stress populations at the limits of a species range and could result in a decline in vigor and a more restricted distribution of *S. arctica*. If *S. arctica* relies to some extent on dispersal by migratory northern breeding birds that winter on the coast, ecological conditions in arctic nesting habitats could be important to this species.

C. Threats to the Species

Threats to *Sticta arctica* are actions that disrupt habitat conditions necessary for its survival, or collecting specimens for scientific purposes from limited populations. Because this species is found on coastal rocks and soil or on coastal mountain summits, recreational activities (ex. hiking, mountain biking), off-road vehicle use, and trail or shelter building could threaten this species.

D. Distribution Relative to Land Allocations

The two known sites of *Sticta arctica* in Washington and Oregon are within State Park Systems.

III. MANAGEMENT GOALS AND OBJECTIVES

Management for this species follows Forest Service Region 6 Sensitive Species (SS) policy (FS Manual 2670), and/or OR/WA BLM Special Status Species (SSS) policy (6840).

For Oregon and Washington BLM administered lands, SSS policy details the need to manage for species conservation. Conservation is defined as the use of all methods and procedures that are necessary to improve the condition of SSS and their habitats to a point where their Special Status recognitions no longer warranted. Policy objectives also state that actions authorized or approved by the BLM do not contribute to the need to list species under the Endangered Species Act.

For Forest Service Region 6, SS policy requires the agency to maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands. Management “must not result in a loss of species viability or create significant trends toward federal listing” (FSM 2670.32) for any identified SS.

IV. HABITAT MANAGEMENT

A. Lessons From History

No information on the history of *Sticta arctica* and management activities is available.

B. Identifying Species Habitat Areas

All sites of *Sticta arctica* on federal lands administered by the Forest Service Region 6 and/or OR/WA BLM are identified as areas where the information presented in this Conservation Assessment could be applied. A species habitat area is defined as the suitable habitat occupied by a known population, plus the surrounding habitat needed to support the site.

C. Managing in Species Habitat Areas

The objective of species habitat areas is to maintain habitat conditions such that species viability will be maintained at an appropriate scale, in accordance with agency policies. Specific management considerations include:

- Determine the extent of the local population and species 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 species 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, and 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 species habitat area unless these actions would do no harm to, or would improve, the species habitat area for *Sticta arctica* (for example, by preventing deeply shaded conditions or by removing invasive exotics).

V. RESEARCH, INVENTORY, AND MONITORING OPPORTUNITIES

The objective of this section is to identify opportunities to acquire additional information that 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 and Information Gaps

- Determine if *Sticta arctica* occurs on BLM or Forest Service lands in Washington or Oregon by conducting surveys in areas identified as potential suitable habitat.
- Determine mechanisms and rates of reproduction, dispersal, and growth.
- Report documented sites to ORNHIC and Washington Natural Heritage Programs and enter data into agency regional databases.
- Report changes in documented and suspected status as quickly as possible to the interagency Sensitive and Special Status Species Specialist in the Regional/State Office.
- Report sitings and survey work in the appropriate agency database.

B. Research Questions

- Are the southern sites of *Sticta arctica* glacial relicts?
- How do the genotypes of the southern populations of *Sticta arctica* compare to populations in the center or more northern parts of its range?
- What are the dispersal distances of *Sticta arctica*?
- Are the habitat characteristics for *Sticta arctica* in Washington and Oregon similar to those of its arctic counterparts?

C. Monitoring Opportunities and Recommendations

- Monitor population trends at any sites discovered on National Forest System Lands.

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- USDA Forest Service and USDI Bureau of Land Management. 2001. Record of Decision for Amendments to the Survey and Manage Protection Buffer, and other Mitigation Measures Standards and Guidelines. Portland, OR.

Conservation Assessment

for

Tholurna dissimilis (Norman) Norman

Originally issued
as Management Recommendations
March, 2000
Robin Lesher, Author

Reconfigured July, 2004
M. Stein

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SUMMARY

Preface: Since the transmittal of the Management Recommendations in 2000, no new information for *Tholurna dissimilis* has been collected.

Species: *Tholurna dissimilis* (Norman) Norman

Taxonomic Group: Lichen

Other Management Status: Forest Service Region 6 Sensitive Species; Bureau of Land Management (BLM) Bureau Assessment for Washington and Oregon. From NatureServe the species is ranked with a Global Heritage Rank of G3/G5, from vulnerable (G3), described as at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors to secure (G5), considered common, widespread and abundant. The State Heritage Rank is S2 for Washington and Oregon, described as imperiled because of rarity due to very restricted range, very few populations (often fewer than 20), steep declines, or other factors making it vulnerable to extinction from the State. The Oregon Natural Heritage Information Center (ORNHIC) ranks the species Heritage List 2, defined as threatened, endangered, or possibly extirpated in Oregon but more stable or common elsewhere.

Range: *Tholurna dissimilis* was previously thought to be endemic to Scandinavia until it was discovered in North America. It ranges from the Northwest Territories, Yukon, and British Columbia, south into Washington and Oregon, where it reaches its southern limit in the central Oregon Cascades. It is known from 18 sites in Washington and 3 sites in Oregon; all but one known site is on federal land. In Washington, it occurs on the Mt. Baker-Snoqualmie, Wenatchee, Okanogan, and Gifford Pinchot National Forests; Mt. Rainier and Olympic National Parks; and Carson National Fish Hatchery where it has been extirpated. In Oregon, it is reported from the Mt. Hood and Willamette National Forests.

Specific Habitat: In the Pacific Northwest, the typical habitat for *Tholurna dissimilis* is on krummholz or flag-form subalpine fir and Engelmann spruce on windswept ridges in the upper montane and subalpine zones up to timberline. It was recently reported from the top of an old-growth Douglas-fir at the canopy crane site in southern Washington. The elevational range of known sites is from near sea level at Port Angeles, Washington to 2042 m (6700 ft). In Oregon, reported populations occur at treeline on subalpine fir, and in an alpine area on wild currant twigs.

Threats: The main threat to *Tholurna dissimilis* is loss of populations resulting from activities that affect the populations or their habitat, particularly removing colonized substrate. Current known populations in Washington are considered at low risk from management activities because most sites are not managed for timber production. This species is at higher risk in Oregon because it is known from only three sites. A warming climate may stress populations at the southern limit of this species' range, and could result in a decline in vigor and a more restricted distribution.

Management Considerations

- Develop practices to route human use away from species habitat areas.

Data and Information Gaps:

- Determine the distribution of populations, species abundance and ecological requirements of *Tholurna dissimilis* across Washington and Oregon.
- Determine if *Tholurna dissimilis* is sensitive to air pollution.

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Tholurna dissimilis (Norman) Norman is monotypic. The species is in the family Caliciaceae, order Caliciales (Tehler 1996). No specific information is currently available regarding its taxonomic history.

B. Species Description

1. Morphology

Tholurna dissimilis is a very distinctive, dwarf, fruticose lichen composed of short, erect, hollow gray stalks (Figure 1). The tiny stalks are 1-3 (5) mm tall and 1 mm broad, arising from a squamulose to nearly crustose primary thallus. The brownish-gray stalks form a coarse stubble, and terminate with black apothecia, which dissolve into a powdery mass of spores. *Tholurna dissimilis* is obscure because of its diminutive size.

Technical description: Squamulose thallus of once-pinnate sterile lobes bearing erect, nearly cylindrical sulcate fertile podetia 1-3 mm high. Thallus dark brown to black and with upper and lower cortex and a spongy medulla. Green algal photobiont is *Protococcus*. Cup-shaped black apothecia are solitary on the apices of the gray podetia, which are expanded to a disciform receptacle. Asci slender and narrowed at the base to a thin stalk, 8-spored, the spores uniseriate. Spores composed of two globose cells and constricted in the middle; each cell with spiral diagonal-stripped apispore. Conceptacle of the pycnoconidia at the edge of the thallus, small, wart-like and brownish, and with a soft wall. Sporophores septate and with nearly globose cells; pycnoconidia straight, constricted in the middle, possessing secondary branches (Otto 1964).

2. Reproductive Biology

Tholurna dissimilis reproduces sexually by producing ascospores. It is not known to produce isidia or soredia.

3. Ecological Roles

Little is known about the ecological role of *Tholurna dissimilis*.

C. Range and Sites

Tholurna dissimilis, once thought to be endemic to Scandinavia (Otto 1964), is known from the Northwest Territories, Yukon, and British Columbia south into Washington and Oregon (Otto 1983). It reaches its southern limit in the central Oregon Cascades, and is known from 18 sites in Washington and 3 sites in Oregon. All known sites are on federal land with the exception of a Port Angeles location. In Washington it is found in Clallam, Whatcom, Snohomish, King, Chelan, Pierce, Lewis, and Skamania counties. Sites on federal lands in Washington include

Hurricane Ridge (Olympic National Park); the Mt. Baker-Snoqualmie National Forest on Skyline Divide, Table Mountain, Tomyhoi Peak area, White Mountain in the Glacier Peak Wilderness, Mt. Defiance in Alpine Lakes Wilderness, and Crystal Mountain Ski Area; Lake Wenatchee Ranger District on the Wenatchee National Forest, and above Harts Pass near the Cascade Crest on the Okanogan National Forest. It has been reported on the Gifford Pinchot National Forest from Castle Butte on the Cowlitz Valley Ranger District, and the canopy crane site on the Wind River District. There was a known site at the Carson Fish Hatchery in southern Washington, although that population no longer exists (J. Davis, pers. comm.). The only known site on nonfederal land is at low elevation near Port Angeles, Washington.

In Oregon, there are three known sites. It has been reported from the Mt. Hood Wilderness. The two sites on the Willamette National Forest at Iron Mountain and Carpenter Mountain represent the known southern limit of this species. The rarity of *Tholurna dissimilis* in Oregon, its sparseness, and stunted condition suggest that conditions at the southernmost site are near the limit for its growth (Pike 1972).

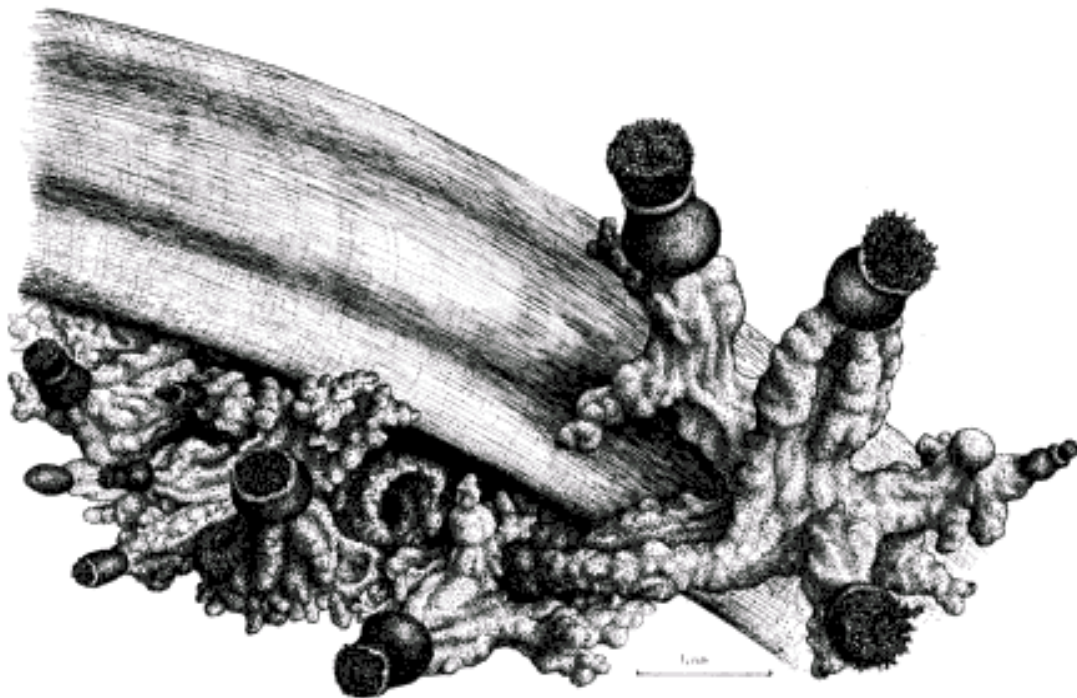


Figure 5. Line drawing of *Tholurna dissimilis* by Alexander Mikulin.

D. Habitat Characteristics and Species Abundance

In the Pacific Northwest, the typical habitat reported for *Tholurna dissimilis* is on krummholz or flag-form subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*) on windswept ridges in the upper montane and subalpine zones up to timberline. The elevation of sites in this region ranges from near sea level to 2042 m (6700 ft). Atypical habitat characteristics include the historic location on ornamental birch (*Betula* sp.) near the Carson Fish Hatchery, on alder (*Alnus* sp.) near Port Angeles, and on rock on a mountain summit in Lewis County, Washington. In Oregon, populations were reported at treeline on subalpine fir and in an alpine area on wild currant (*Ribes triste*).

Tholurna dissimilis appears to be rare in Oregon, becoming more common to the north in British Columbia. Abundance data for this species are not currently available.

There has been only one report of *Tholurna dissimilis* from low-elevation tree canopies in the range of the northern spotted owl, but few if any surveys have been conducted in this habitat. In the Kitimat Valley of west-central British Columbia, it was found in the emergent crowns (40 m height, 131 ft) of dominant spruce (presumably *Picea sitchensis*) in low elevation forests (150 m, 492 ft) (Otto 1983). *T. dissimilis* was recently observed at the very top of an emergent spike-top old-growth Douglas-fir (*Pseudotsuga menziesii*) at the canopy crane site at Wind River on the Gifford Pinchot National Forest (J. Davis, pers. comm.). This recent discovery is evidence that *T. dissimilis* occurs in tree canopies other than krummholz, and at lower elevations.

II. CURRENT SPECIES SITUATION

A. Status History

Tholurna dissimiliss was considered at risk under the Northwest Forest Plan because of its rarity and limited distribution within the range of the northern spotted owl (USDA and USDI 1994a, 1994b). Initially, it was a Survey and Manage strategy 1 and 3 species (USDA and USDI 1994c). With the completion of the 2000 SEIS, sites north of the Columbia River were dropped as Survey and Manage because it was presumed that the high elevation habitat is within protected land allocations. South of the Columbia River, where there are fewer sites, concern for persistence remained and the species was assigned to Management Category B (USDA and USDI 2001). In 2004, *T. dissimilis* was designated a Sensitive Species for Forest Service Region 6 and a Bureau of Land Management (BLM) Assessment species in Washington and Oregon.

Tholurna dissimilis has a Global Natural Heritage Rank of G3/G5, from vulnerable (G3), described as at moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors to secure (G5), considered common, widespread and abundant. The species has a State Heritage Rank of S2 in Oregon and Washington, described as imperiled because of rarity due to very restricted range, very few populations (often fewer than 20), steep declines, or other factors making it vulnerable to extinction from the State (ORNHIC 2004). The species is on the ORNHIC List 2, described as

species that are threatened, endangered, or possibly extirpated in Oregon but more stable or common elsewhere.

B. Major Habitat and Viability Considerations

The major viability consideration for *Tholurna dissimilis* is loss of populations resulting from management activities that affect the populations or their habitat, particularly removing colonized substrate. Current known populations in northern Washington are considered at low risk from management activities because many known sites are krummholz trees at timberline, and most sites are in Wilderness areas, or in areas not managed for timber production. The occurrence of *T. dissimilis* in exposed ridgetop habitats may make it more vulnerable to air pollution, if it is determined that *T. dissimilis* is sensitive to pollutants. A warming climate may contribute to a decline in vigor of this species at the southern limit of its range, and could result in an even more restricted distribution for *T. dissimilis*.

C. Threats to the Species

Threats to *Tholurna dissimilis* are those actions that affect populations, particularly removing colonized substrate. A significant deterioration in air quality could threaten the viability of this species, considering the exposed nature of the habitat it occupies--that is ridgetops, mountain summits, and tree canopies.

D. Distribution Relative to Land Allocations

Sites of *Tholurna dissimilis* on federal land include 9 in Congressionally reserved land use allocations, 2 are administratively withdrawn, 2 are in an Adaptive Management allocation, and 3 are within matrix. The four remaining federal sites are undetermined.

III. MANAGEMENT GOALS AND OBJECTIVES

Management for this species follows Forest Service Region 6 Sensitive Species (SS) policy (FS Manual 2670), and/or OR/WA BLM Special Status Species (SSS) policy (6840).

For OR/WA BLM administered lands, SSS policy details the need to manage for species conservation. Conservation is defined as the use of all methods and procedures that are necessary to improve the condition of SSS and their habitats to a point where their Special Status recognitions no longer warranted. Policy objectives also state that actions authorized or approved by the BLM do not contribute to the need to list species under the Endangered Species Act.

For Forest Service Region 6, SS policy requires the agency to maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands. Management “must not result in a loss of species viability or create significant trends toward federal listing” (FSM 2670.32) for any identified SS.

IV. HABITAT MANAGEMENT

A. Lessons From History

Tholurna dissimilis was recently discovered in North America (Otto 1964). Previously it was known only from Scandinavia. Since the discovery of *T. dissimilis* in western North America in the 1960s, many more sites have been documented. The number of known sites went from eight in 1972 to 47 by 1981 (Otto 1983); 42 of these known sites are from western Canada in British Columbia, the Yukon and Northwest Territories (Otto 1983). Pike (1972) was the first to report *T. dissimilis* from Oregon; he also looked for this species in suitable habitat on Mt. Hood and Mt. Jefferson in Oregon, but did not find it. It was recently reported from the Mt. Hood Wilderness. It is possible that with additional surveys, this species may not be as rare as currently thought. In addition, the recent discovery of *T. dissimilis* in the upper crown of old-growth Douglas-fir at the canopy crane site expands our concept of suitable habitat for this species in the area of the Northwest Forest Plan.

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). The sensitivity of *Tholurna dissimilis* to air pollution is unknown.

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). *Tholurna dissimilis* is listed as rare on this list (Databanken for hotade arter och Naturvardsverket 1991). The International Association of Lichenology has recently initiated a listing of lichens threatened globally.

B. Identifying Species Habitat Areas

All sites of *Tholurna dissimilis* on federal lands administered by the Forest Service Region 6 and/or OR/WA BLM are identified as areas where the information presented in this Conservation Assessment could be applied. A species habitat area is defined as the suitable habitat occupied by a known population, plus the surrounding habitat needed to support the site.

C. Managing in Species Habitat Areas

The objective of a species habitat area is to maintain habitat conditions such that species viability will be maintained at an appropriate scale, in accordance with agency policies. Specific management considerations include:

- Determine the extent of the local population and species habitat area with a site visit.
- Maintain occupied substrate, provide additional suitable substrate for colonization as current occupied substrates decline, and avoid damage to colonized substrate.

- Develop practices to route human use away from the populations in species 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, and introducing non-native species by seed dispersal or planting, can all adversely affect habitat integrity

Sites with populations that occur in the tops of old-growth trees may be problematic. It is often difficult to determine the extent of the population. Further considerations for these sites include:

- Maintain the tallest trees with exposed upper crowns in the stand, as well as trees with dead spike-tops if present. Select trees with these attributes for green tree retention.

V. RESEARCH, INVENTORY AND MONITORING OPPORTUNITIES

The objective of this section is to identify opportunities to acquire additional information that 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 and Information Gaps

- Determine if additional populations of *Tholurna dissimilis* exist in areas identified as potential suitable habitat. Assign priority surveys to timberline habitats especially near the southern edge of its range in Oregon and southern Washington, and to exposed upper crowns of conifers at lower elevation, particularly in areas of cold-air drainage.
- Determine the extent of the population of *Tholurna dissimilis* at the canopy crane site. This is a unique opportunity to survey traditionally inaccessible habitat and to develop additional information on the distribution and abundance of *T. dissimilis* in this type of stand, as well as characterizing its habitat in tree crowns. This information could be used to improve our management of this species elsewhere.
- Revisit sites to verify the status of known populations, determine the extent of the populations and abundance, and characterize ecological conditions.
- Report documented sites to ORNHIC and Washington Natural Heritage Programs and enter data into agency regional databases.
- Report changes in documented and suspected status as quickly as possible to the interagency (BLM OR/WA and FS R6) Special Status/Sensitive Species Specialist in the State and Regional Office.
- Report sitings and survey work in the appropriate agency database: GeoBOB or NRIS.

B. Research Questions

- What habitat characteristics and ecological conditions are necessary for establishment of *Tholurna dissimilis* propagules and survival of established thalli?
- What are the dispersal mechanisms and dispersal distances of this species?
- Is *Tholurna dissimilis* sensitive to air pollution?

- What is the genetic diversity of this species within its local populations and across the region?

C. Monitoring Opportunities and Recommendations

- If management treatments occur in the vicinity of known sites, monitor population to determine response to treatment and effects on population viability.
- Monitor selected sites to document population trends, particularly those populations at the edge of a species range, or those sites of atypical habitats.
- Consider establishing air quality monitoring sites near selected known populations of *Tholurna dissimilis*.

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