

Management Recommendations for

***Sticta* sp. #1** (Goward & Tønsberg in prep.)

[formerly *Dendriscoaulon intricatulum* (Nyl.) Henssen]

version 2.0

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version 2.0
SUMMARY

Species: *Sticta* sp. #1 (Goward & Tønsberg in prep.). The name that was used in the Record of Decision (*Dendriscoaulon intricatulum*) was apparently misapplied to this taxon. The material from the Pacific Northwest is currently undergoing taxonomic revision, and in this document this taxon will be referred to *Sticta* sp. #1.

Taxonomic Group: Lichen (Rare Nitrogen-fixing)

ROD Components: 1,3

Other Management Status: None

Range: *Sticta* sp. #1 is a Pacific Northwest endemic ranging from southeast Alaska through British Columbia; it reaches the apparent southern limit of its range in California. It is rare throughout its range, known only from 16 sites in the range of the Northwest Forest Plan. Eleven are in Washington, one on the Mt. Baker-Snoqualmie National Forest, eight on the Gifford Pinchot National Forest, and two in the Columbia River National Scenic Area. One Oregon site is on the Mt. Hood National Forest, and the other is on the Roseburg BLM District. The three California sites are on Horse Mountain, and near Arcata, and in Mendocino County on land of unknown ownership.

Specific Habitat: In the range of the Northwest Forest Plan, *Sticta* sp. #1 appears to occupy two types of stand conditions: open-grown conifer and deciduous stands, and moist forests in the upper Western Hemlock and lower Pacific Silver Fir Zones in the western Cascades, between 10 and 660 m elevation (30-2170 ft). The open-grown sites are: in a stand of subalpine fir on a old lava flow; in California in lodgepole pine and bishop pine, a bigleaf maple woodland, and oak balds. Most of the Washington sites are in Douglas-fir, western hemlock, and Pacific silver fir forests.

Threats: The major threat to *Sticta* sp. #1 impact to local populations from activities that affect the lichen or its habitat, including removing colonized substrates and altering microclimate by removing associated vegetation.

Management Recommendations:

- Maintain trees with colonies of *Sticta* sp. #1.
- Maintain existing environmental conditions for local populations and adjacent suitable habitat.

Information Needs:

- Resolve the taxonomic status of this entity.
- Characterize the ecological requirements of the taxon.

Management Recommendations for *Sticta* sp. #1

[formerly *Dendriscoaulon intricatulum*]

I. NATURAL HISTORY

A. Taxonomy and Nomenclature

Sticta sp. #1 (Goward & Tønsberg in prep.) (Tønsberg, pers. comm.).

Dendriscoaulon intricatulum (Nyl.) Henss. James and Henssen (1976) (as listed in USDA and USDI 1994a, 1994b, and 1994c)

Synonyms: *Leptogidium intricatulum* Nyl., Syn. Lich. 1:135, 1858.

Polychidium intricatulum (Nyl.) Henss., Symb. Bot. Upsal. 18:106, 1963.

This taxon is currently undergoing taxonomic revision (Goward, pers. comm., Tønsberg, pers. comm.). The name *Dendriscoaulon intricatulum* is based on material from the East Coast, and was erroneously applied. Evidence suggests that each of the species referred to in the genus *Dendriscoaulon* actually represent the blue-green phototype of either a *Lobaria* or a *Sticta* (James and Henssen 1976). This species has two photomorphs, one with a green primary photobiont and foliose stictoid morphology, and one with a blue-green primary photobiont. Because the green foliose photomorph is currently only known from British Columbia, and the species description has not been published, our species description is for the blue-green photomorph which does occur in the range of the Northwest Forest Plan. According to Goward and Tønsberg (pers. comm.), the taxon in the Pacific Northwest is a *Sticta* and they are preparing a species description for publication.

The taxonomy of this entity is further complicated by the recent suggestion it may actually be two distinct taxa in the Pacific Northwest, as evidenced by the two very different habitats it occupies. For the time being, all material in the Pacific Northwest is referred to as *Sticta* sp. #1.

B. Species Description

1. Morphology

Because of the taxonomic uncertainty, a full technical description of *Sticta* sp. #1 is not available. The blue-green photobionts of *Sticta* sp. #1 are small, fragile, fruticose-coralloid, more or less hairy structures rarely ridged in texture (Figure 1). The production of apothecia and pycnidia are unknown (James and Henssen 1976). *Leptogium teretiusculum*, a small gelatinous lichen, closely resembles *Sticta* sp. #1, but *Sticta* sp. #1 is stratified and has fine tomentum visible with a high power hand lens, and *L. teretiusculum* is non-stratified and lacks tomentum (McCune, pers. comm.). *Polychidium contortum* is also similar to *Sticta* sp. #1, but *P. contortum* is smaller, and its jigsaw-shaped cells are obvious under the light microscope (McCune and Geiser 1997).



Figure 1. Line drawing of *Sticta* sp. #1 by Alexander Mikulin.

2. Reproductive Biology

Sticta sp. #1 is not known to produce sexual or asexual propagules (spores or isidia). This taxon may reproduce asexually through fragmentation, given the brittle nature of the thallus. The rarity and patchy distribution of *Sticta* sp. #1 suggests that it could be dispersal limited. The concept of dispersal includes the actual physical migration of propagules into new habitat, and the successful establishment and development of those propagules.

3. Ecological Roles

Little is known about the ecological roles of *Sticta* sp. #1. Evidence suggests that this taxon may be an independent cyanobacterial outgrowth of a foliose green algal lichen in the genus *Sticta* (Goward, pers. comm.; Tønsberg, pers. comm.). *Sticta* sp. #1 is a nitrogen-fixing lichen, and contributes an unknown amount of usable nitrogen to the ecosystem. Although little is known about the pollution sensitivity of *Sticta* sp. #1, nitrogen-fixing lichens in general are highly sensitive to air pollutants, particularly sulfur dioxide (Wetmore 1983).

C. Range and Known Sites

Sticta sp. #1 (Goward and Tønsberg, in prep.) is a North American endemic that ranges from southeastern Alaska (Geiser *et al.* 1998) through British Columbia and reaches the apparent southern limit of its range in California. It is rare throughout its range, and known only from 16 sites in the range of the Northwest Forest Plan. Eleven of the sites are in Washington, one on the Mt. Baker-Snoqualmie National Forest (Whatcom County), eight on the Gifford Pinchot National Forest (Skamania County), and two in the Columbia River National Scenic Area (Skamania County). One Oregon site is on the Mt. Hood National Forest (Clackamas County), and the other is on the Roseburg BLM District (Douglas County). The three California sites are on Horse Mountain near the Six Rivers National Forest boundary and near Arcata (Humboldt County), and in Mendocino County on land of unknown ownership.

D. Habitat Characteristics and Species Abundance

At known sites in the range of the Northwest Forest Plan, *Sticta* sp. #1 occurs between 10 and 660 m (30-2170 ft) elevation in moist habitats. In the Western Cascades it is known from riparian forests (two sites), upland old-growth in the Western Hemlock and Pacific Silver Fir Zones, mature Douglas-fir (*Pseudotsuga menziesii*)/western hemlock (*Tsuga heterophylla*) forests, and a stand of subalpine fir (*Abies lasiocarpa*) on an old lava flow. In northern California it is known from three sites in the coastal fog zone. It also occurs on the boles of oaks (*Quercus*) in oak balds at sites that appear to receive high levels of humidity from coastal influences. *Sticta* sp. #1 is rare throughout its range, and only one or a few individuals are known from each site.

At the Gifford Pinchot National Forest closed-canopy sites, the lichen is found in the transition between the Western Hemlock and Pacific Silver Fir Zones. The Big Creek Falls site is an old-growth riparian stand of western hemlock and Pacific silver fir (*Abies amabilis*) with Pacific yew (*Taxus brevifolia*) in the understory. *Sticta* sp. #1 was growing on small dead twigs on the lower

portion of a western hemlock overhanging a 30-m (100-ft) cliff above the splash pool of a large waterfall. The Curly Creek Road site is a mature stand of Douglas-fir and western hemlock with old-growth components. A thorough survey over the course of several field visits revealed only about 10 individuals on about four different trees, again on small dead twigs at about eye level on western hemlock and Pacific silver fir. Other closed canopy sites are similar to the two described above, and vegetation types suggest that precipitation and humidity are high at all these sites.

On the Mt. Baker-Snoqualmie National Forest, *Sticta* sp. #1 is found on subalpine fir on the Sulphur Creek Lava Flow, on a south-facing slope in a cold pocket. The mid-elevation (550-660 m; 1640-2170 ft) lava flow supports scattered live, dead, and dying subalpine fir infested with balsam woolly aphid. The stand has a dense shrub component of vine maple (*Acer circinatum*) and huckleberry (*Vaccinium* spp). The lava flow is unusual in that it supports relatively low-elevation subalpine fir (*Abies lasiocarpa*) stands with an epiphytic lichen flora that appears to be more similar to that of Douglas-fir stands than subalpine fir in its typical, higher elevation sites (Rhoades 1981). Although precipitation is high on the lava flow, soil development is poor and the site is very well-drained.

At the Horse Mountain (Humboldt County), California site *Sticta* sp. #1 grows on open-grown bigleaf maple (*Acer macrophyllum*) in an oak woodland. This site is in the coastal fog zone with high humidity from the frequent fog (Sharnoff, pers. comm.). Many other cyanolichens were also present at this site. The other California site either in or next to the Van Damme State Park (Mendocino County) is part of the pygmy forest ecosystem. This unusual habitat occurs on old sea terraces that are poorly drained and have poor soil, so the cypress, lodgepole pine (*Pinus contorta*) and bishop pine (*Pinus muricata*) that grow there have a very stunted growth form (Sharnoff, pers. comm.). This ecosystem experiences high humidity because of the influence of coastal fog and the frequently saturated soil.

There are several recently discovered sites in the Columbia River Gorge, in Douglas County on Roseburg BLM District and in northern California near Arcata, where *Sticta* sp. #1 was found growing on the mossy boles of open-grown oaks. The Columbia River Gorge and Arcata sites are areas that apparently receive high levels of humidity from coastal influences.

In British Columbia, *Sticta* sp. #1 is known from a few moist, old, coniferous forests from sea level to 1000 m (0-3280 ft) elevation, where it is found on lower canopy conifer branches, and rarely on rocks (Goward, pers. comm.). In southeast Alaska, it occurs at low elevation coastal mainland sites, on willows (*Salix*), alder (*Alnus*) and Sitka spruce (*Picea sitchensis*) (Geiser *et al.* 1998).

II. CURRENT SPECIES SITUATION

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

Sticta sp. #1 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,b). This taxon is endemic to the Pacific Northwest and reaches its apparent southern limit in northern

California. Based on current information, this taxon is closely associated with old-growth forests. At the time of the FEMAT viability analysis, this taxon was known from only one site in the range of the northern spotted owl (USDA and USDI 1994a,b).

B. Major Habitat and Viability Considerations

A major habitat consideration for *Sticta* sp. #1 is loss of local populations resulting from management activities which affect their habitat. These management activities include removing colonized trees and altering microclimate by tree removal. Apparent dispersal limitations could be a factor influencing persistence, particularly if suitable habitat is not available for the taxon to colonize, as current habitat conditions change through natural processes or management treatments.

C. Threats to the Species

Threats to *Sticta* sp. #1 are from actions that disrupt stand conditions necessary for its survival. These include:

- Treatments that eliminate local populations by removing colonized trees.
- Altering the light, moisture, or temperature regime that would change the microclimatic conditions of an occupied site.
- Deteriorating air quality, particularly through an increase in sulfur dioxide.
- Collecting colonized twigs for firewood, particularly on Horse Mountain.

D. Distribution Relative to Land Allocations

The Sulphur Creek Lava Flow site on the Mt. Baker-Snoqualmie National Forest, is in a Botanical Special Interest Area in a Late-Successional Reserve (Hansen-Murray, pers. comm.). On the Mt. St. Helens National Volcanic Monument, Gifford Pinchot National Forest, the Big Falls Creek population is in a Riparian Reserve, while other sites nearby are in Matrix. The Curly Creek Road site is in Matrix and in an approved road project area; several colonized trees were removed for the road, and one colonized tree is now immediately adjacent to the new road. The Horse Mountain site is on land of unknown ownership, and the Mendocino County site is either in Van Damme State Park or on private land immediately adjacent to the park. The distribution of other known sites of *Sticta* sp. #1 will be determined. It is suggested that each administrative unit evaluate the land allocations for known sites on lands in its jurisdiction and share this information at the regional level.

III. MANAGEMENT GOAL AND OBJECTIVE

A. Management Goal for the Taxon

The goal for managing *Sticta* sp. #1 is to assist in maintaining species viability.

B. Objectives

Manage known sites on federal lands by maintaining habitat, forest structure, occupied and potential suitable substrate, and microclimate conditions associated with *Sticta* sp. #1.

IV. HABITAT MANAGEMENT

A. Lessons from History

Sticta sp. #1 is a rare Pacific Northwest endemic that is poorly understood. Because of taxonomic uncertainty, little is known about the taxon historically. *Sticta* sp. #1 fixes nitrogen and many nitrogen-fixing species are particularly sensitive to sulfur dioxide (Wetmore 1983). In the Pacific Northwest, lichens are currently being used as indicators of air quality on public lands (Rhoades 1988; Ryan and Rhoades 1992; Stolte *et al.* 1993). In some parts of the Pacific Northwest, some nitrogen-fixing lichen species are beginning to decline and show morphological changes from air quality degradation (Denison and Carpenter 1973; Geiser, pers. comm.).

B. Identifying Habitat Areas for Management

All known sites of *Sticta* sp. #1 on federal lands in the range of the Northwest Forest Plan are identified as habitat areas where these management recommendations should be implemented. A habitat area for management is defined as suitable habitat occupied by or adjacent to a known local population.

C. Managing in Habitat Areas

The objective of managing in habitat areas is to maintain suitable habitat for *Sticta* sp. #1. Because of its rarity, scattered distribution, and presumed dispersal limitations, all local populations should be maintained to provide for the taxon across its range.

- Determine the extent of the local population and habitat area with a site visit.
- Leave trees with *Sticta* sp. #1 standing.
- Leave adequate standing trees and understory vegetation adjacent to colonized trees to maintain the microclimatic conditions, and to provide substrate for colonization. With the limited information available at this time, it is difficult to adequately identify *Sticta* sp. #1 habitat requirements.

D. Other Management Issues and Considerations

The Curly Creek Road site on the Gifford Pinchot National Forest is at very high risk due to habitat removal. A major arterial road was built through the stand, removing one known colonized tree and leaving another colonized tree immediately adjacent to the road. Future pollution impacts from the new road are unknown. The Sulphur Creek Lava Flow site on the Mt. Baker-Snoqualmie National Forest is at moderate risk from habitat changes because the subalpine fir are declining from the balsam woolly aphid infestation (Rhoades 1981).

V. RESEARCH, INVENTORY, AND MONITORING NEEDS

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

A. Data Gaps and Information Needs

- The taxonomic status of this group needs to be resolved.
- The characteristics at the two different types of habitats needs to be better understood.
- Determine the ecological requirements of the taxon.
- Determine the mechanisms and rates of reproduction, dispersal, and growth.

B. Research Questions

- What is the taxonomy of *Sticta* sp. #1? Is it a valid taxon?
- Which environmental factors favor the development of the two different morphologies of *Sticta* sp. #1?
- How does this taxon disperse, and at what rate and distance?
- Which habitat characteristics are necessary for survival of propagules?

C. Monitoring Needs and Recommendations

- Monitor the Curly Creek road site to evaluate the response of the taxon to changes in microclimatic conditions, vegetation changes, and air quality.
- Monitor the Sulphur Creek Lava Flow site to determine the population trends of *Sticta* sp. #1 after colonized trees die.
- Establish air quality biomonitoring sites near selected local populations, using protocols established by the Forest Service in Region 6.

REFERENCES

- Denison, W.C. and S.M. Carpenter. 1973. A guide to air quality monitoring with lichens. Lichen Technology Inc. , Corvallis, OR. 39 p.
- Geiser, L.H., K.L. Dillman, C.C. Derr and M.C. Stensvold. 1998. Lichens and allied fungi of southeast Alaska. pp. 201-243. *In: M.G. Glenn, R.C. Harris, T. Dirig and M.S. Cole (eds.). Lichenographia Thomsoniana: North American Lichenology in Honor of John W. Thomson.* Mycotaxon Ltd., Ithaca, NY 445 p.
- Geiser, L.H. 1998. Personal communication. Siuslaw National Forest, Corvallis, OR.
- Goward and Tønsberg in prep.**
- Goward, T. 1996. Personal communication. Clearwater, British Columbia, Canada.
- Hansen-Murray, J. Personal communication. Mt. Baker-Snoqualmie National Forest, Mountlake Terrace, WA.
- James, P.W. and A. Henssen. 1976. The morphological and taxonomic significance of cephalodia. *In: Lichenology: Progress and problems.* Academic Press, New York, NY. 551 p.
- McCune, B. 1996. Personal communication. Dept. Botany and Plant Pathology, Oregon State University, Corvallis, OR.
- McCune, B. and L. Geiser. 1997. Macrolichens of the Pacific Northwest. Oregon State University Press, Corvallis, OR. 386 p.
- Rhoades, F. 1996. Personal communication. Bellingham, WA.
- Rhoades, F. 1988. Re-examination of baseline plots to determine effects of air quality on lichens and bryophytes in Olympic National Park. Northrop Environmental Sciences NPS Contract CX-0001-4-0057. National Park Service Air Quality Division.
- Rhoades, F. 1981. Biomass of epiphytic lichens and bryophytes on *Abies lasiocarpa* on a Mt. Baker lava flow, Washington. *The Bryologist* 84:39-47.
- Ryan, B. and F. Rhoades. 1992. Lichens, bryophytes and air quality in Pacific Northwest wilderness areas. *In: J. Peterson, D. Schmoltdt, D. Peterson, J. Eilers, R. Fisher, and R. Bachman. Guidelines for Evaluating Air Pollution Impacts on Class 1 Wilderness Areas in the Pacific Northwest.* Gen. Tech. Rep. PNW-GTR-299. USDA Forest Service, Pacific Northwest Research Station. Portland, OR. 83 p.
- Sharnoff, S.D. and S. 1997. Personal communication. Berkeley, CA.
- Stolte, K., D. Mangis, R. Doty and K. Tonnessen. 1993. Lichens as bioindicators of air quality. GTR RM-224. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Fort Collins, CO. 131 p.
- Tønsberg, T. 1996-present. Personal communication. Botanical Institute, University of Bergen, Allegaten 41, N-5007 Bergen, Norway.
- USDA Forest Service, and USDI Bureau of Land Management. 1994a. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Related Species within the Range of the Northern Spotted Owl, Appendix A, Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Portland, OR.
- USDA Forest Service, and USDI Bureau of Land Management. 1994b. Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl, Appendix J2, Results of Additional Species Analysis. Portland, OR.
- USDA Forest Service and USDI Bureau of Land Management. 1994c. Record of decision for amendments to Forest Service and Bureau of Land Management planning documents and standards and guidelines for management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl. Portland, OR.
- Wetmore, C.M. 1983. Lichens of the air quality Class 1 National Parks. Final Report, National Park Service Contract CX 0001-2-0034. Denver, CO.