

Management Recommendations for
Tholurna dissimilis (Norman) Norman

version 2.0

CONTENTS

SUMMARY	1
I. Natural History	2
A. Taxonomy and Nomenclature	2
B. Species Description	2
1. Morphology	2
2. Reproductive Biology	2
3. Ecological Roles	2
C. Range and Known Sites	2
D. Habitat Characteristics and Species Abundance	4
II. Current Species Situation	5
A. Why Species Is Listed Under Survey and Manage Standard and Guideline	5
B. Major Habitat and Viability Considerations	5
C. Threats to the Species	5
D. Distribution Relative to Land Allocations	5
III. Management Goal and Objectives	6
A. Management Goal for the Species	6
B. Objectives	6
IV. Habitat Management	6
A. Lessons From History	6
B. Identifying Habitat Areas for Management	6
C. Managing in Habitat Areas	7
D. Other Management Issues and Considerations	7
V. Research, Inventory, and Monitoring Needs	8
A. Data Gaps and Information Needs	8
B. Research Questions	8
C. Monitoring Needs and Recommendations	8
REFERENCES	9

SUMMARY

Species: *Tholurna dissimilis* (Norman) Norman

Taxonomic Group: Lichens (Rare Leafy)

ROD Components: 1,3

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

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 three 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 was recently extirpated. In Oregon, it is reported from the Mt. Hood and Willamette National Forests.

Specific Habitat: In the Pacific Northwest, the typical habitat for *T. 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 *T. 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 Recommendations: Manage populations at known sites by maintaining the ecological conditions associated with *T. dissimilis*, including occupied substrate and associated microclimate and stand conditions.

Information Needs:

- Determine the distribution of populations, species abundance and ecological requirements of *T. dissimilis* across the area covered by the Northwest Forest Plan.
- Determine if *T. dissimilis* is sensitive to air pollution.

Management Recommendations for *Tholurna dissimilis*

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-striped 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 *T. dissimilis*.

C. Range and Known 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

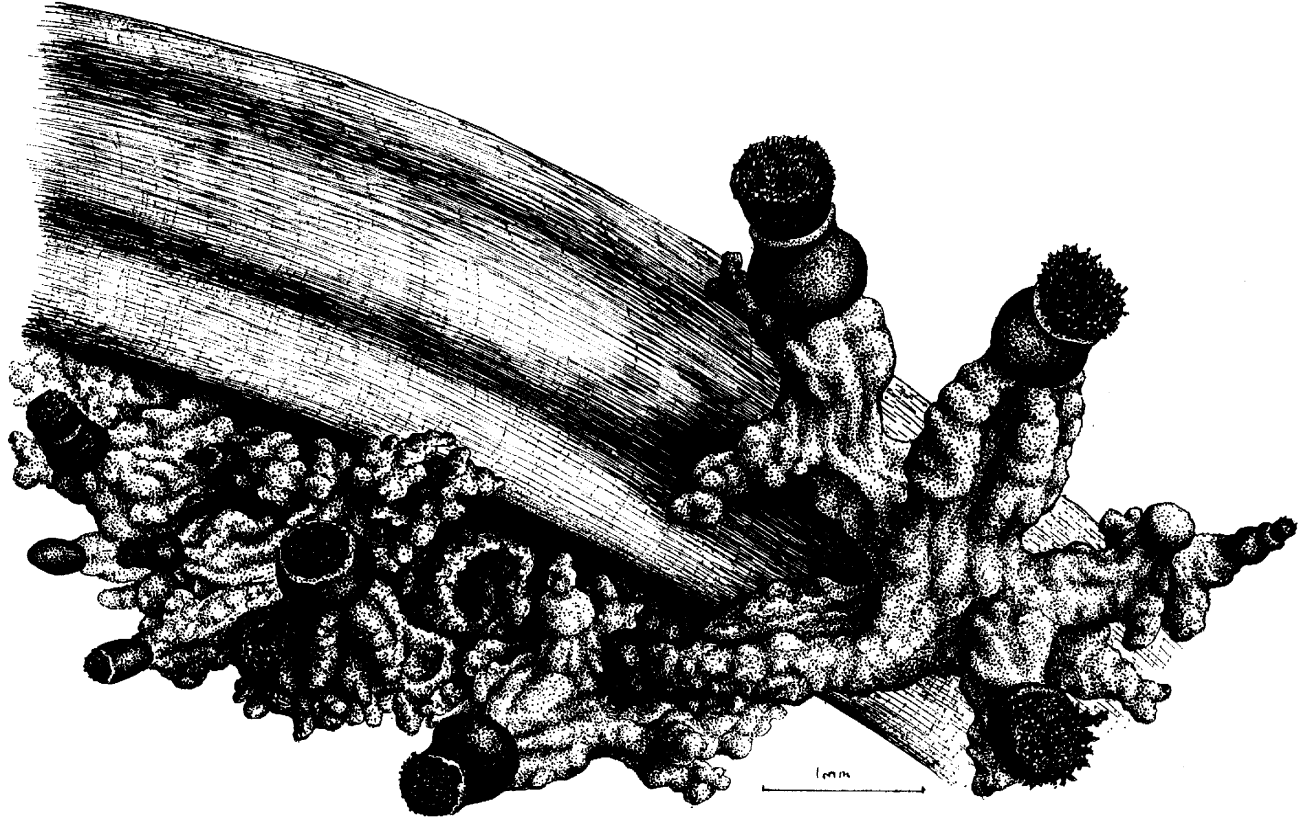


Figure 1. Line drawing of *Tholurna dissimilis* by Alexander Mikulin.

1983). It reaches its southern limit in the central Oregon Cascades, and is known from 18 sites in Washington and three 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. Known 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 *T. dissimilis* in Oregon, its sparseness, and stunted condition suggest that conditions at the southernmost site are near the limit for its growth (Pike 1972).

D. Habitat Characteristics and Species Abundance

In the Pacific Northwest, the typical habitat reported for *T. 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 known 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*) near the Carson Fish Hatchery, on alder (*Alnus*) near Port Angeles, and on rock on a mountain summit in Lewis County. 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 *T. 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). *Tholurna 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. Why Species Is Listed Under Survey and Manage Standard and Guideline

Tholurna dissimilis was considered at risk under the Northwest Forest Plan because of its presumed rarity in the range of the northern spotted owl (USDA and USDI 1994a); at the time of the lichen viability panel, it was known from nine sites in this region (USDA and USDI 1994b). In addition, concern for species viability was noted for lichens in general because of their sensitivity to air pollution (USDA and USDI 1994a, 1994b), but the pollution sensitivity of *T. dissimilis* is unknown. Persistence concerns for *T. dissimilis* are moderate in northern Washington as there are relatively few known populations. The persistence concerns become much higher in Oregon where only three isolated populations are known to exist. Because of persistence concerns, *Tholurna dissimilis* was listed as a Survey and Manage strategy 1 and 3 species (USDA and USDI 1994c), with the objectives to manage known sites and to conduct extensive surveys to identify high priority sites for management.

B. Major Habitat and Viability Considerations

The major viability consideration for *T. 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 *T. 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

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

III. MANAGEMENT GOAL AND OBJECTIVES

A. Management Goal for the Species

The goal for managing *Tholurna dissimilis* is to assist in maintaining species viability.

B. Objectives

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

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 *Tholurna 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 *T. 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 Habitat Areas for Management

Known sites of *T. dissimilis* on lands administered by the Forest Service and BLM in the range of the northern spotted owl are identified as habitat areas where these management recommendations apply. A habitat area is defined as suitable habitat occupied by or adjacent to a known population.

C. Managing in Habitat Areas

The goal of managing in habitat areas is to maintain the habitat conditions of *T. dissimilis*. Sites with known populations should be managed to include an area large enough to maintain the habitat, occupied substrate, and potentially suitable substrate associated with this species. Restrict collecting of specimens where the species is rare or of limited abundance.

At known sites where *T. dissimilis* occurs in flag-form or krummholz trees:

- Maintain occupied substrate, provide additional suitable substrate for colonization as current occupied substrates decline, and avoid damage to colonized substrate.
- The size of the habitat area for management should be determined by a field visit.

Known sites with populations that occur in the tops of old-growth trees will be problematic. It will be difficult to know if the species is present, as well as determining the extent of the population. At these sites:

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

D. Other Management Issues and Considerations

Current information suggests that *T. dissimilis* is sporadic in its distribution, and appears to be rare, particularly in the southern Washington and Oregon Cascades. This distribution may be a function of limited surveys or inventories in suitable habitat.

Until recently, information from known sites suggested that *T. dissimilis* may not be closely associated with late-successional and old-growth forests. However, the recent sighting of *T. dissimilis* in the exposed dead top of an emergent old-growth Douglas-fir confirms its occurrence in old-growth forests, as had been previously reported from British Columbia. This recent discovery illustrates how little we know of the distribution and ecology of *T. dissimilis* in the area of the Northwest Forest Plan.

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

V. RESEARCH, INVENTORY AND MONITORING NEEDS

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

A. Data Gaps and Information Needs

- Determine if additional populations of *T. dissimilis* exist in areas identified as potential suitable habitat. Assign priority for strategy 3 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 *T. 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 known sites to verify the status of known populations, determine the extent of the populations and abundance, and characterize ecological conditions.
- Determine if *T. dissimilis* meets the criteria for close association with late-successional and old-growth forests (Table VI-6, USDA and USDI 1994a).

B. Research Questions

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

C. Monitoring Needs and Recommendations

- If management treatments occur in the vicinity of known sites, monitor population to determine response to treatment and effects on population viability.
- Monitor selected known 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 *T. dissimilis*.

REFERENCES

- Case, J.W. 1980. The influence of three sour gas processing plants on the ecological distribution of epiphytic lichens in the vicinity of Fox Creek and Whitecourt, Alberta, Canada. *Water, Air and Soil Pollution* 14:45-68.
- Databanken for hotade arter och Naturvardsverket 1991: Hotade vaxter i Sverige 1990. Karlvaxter, mossor, lavar och svampar - forteckning och lansvis forekomst. (Sweden's red lists on vascular plants, bryophytes, lichens and macrofungi). Lund.
- Davis, J. 1999. Personal communication. US Fish and Wildlife Service, Portland, OR.
- Ferry, B.W., M.S. Baddeley, and D.L. Hawksworth. 1973. *Air Pollution and Lichens*. University of Toronto Press. Toronto.
- Gilbert, O.L. 1992. Lichen reinvasion with declining pollution. pp. 159-177. In: Bates, J.W. and A.M. Farmer (eds.). *Bryophytes and Lichens in a Changing Environment*. Clarendon Press, Oxford, UK.
- Hawksworth, D. L. 1971. Lichens as a litmus for air pollution: a historical review. *International Journal of Environmental Studies* 1:281-296.
- Hawksworth, D.L. and F. Rose. 1976. Lichens as pollution monitors. *The Institute of Biology's Studies in Biology* no. 66. Edward Arnold, London.
- Oregon Natural Heritage Program. 1998. Rare, threatened and endangered species of Oregon. Oregon Natural Heritage Program, Portland, OR. 92 p.
- Otto, G.F. 1964. *Tholurna dissimilis* new to North America. *Bryologist* 67:73-75.
- Otto, G.F. 1983. *Tholurna dissimilis* well established in western North America. *Bryologist* 86(3):263-265.
- Pike, L. H. 1972. *Tholurna dissimilis* in Oregon. *Bryologist* 75(4):578-580.
- Rao, D.N. and F. LeBlanc. 1967. Influence of an iron-sintering plant on corticolous epiphytes in Wawa, Ontario. *Bryologist* 70(2):141-157.
- Sigal, L.L. and T.H. Nash III. 1983. Lichen communities on conifers in southern California Mountains: an ecological survey relative to oxidant air pollution. *Ecology* 64(6):1343-1354.
- Skye, E. and I. Hallberg. 1969. Changes in the lichen flora following air pollution. *Oikos* 20:547-552.
- Tehler, A. 1996. Systematics, phylogeny and classification. pp. 217-239. In: Nash, T. H. III, (ed.). *Lichen Biology*. Cambridge University Press, Cambridge, UK.
- Thor, G. 1990. International Association of Lichenology committee for conservation of lichens red global list. Swedish threatened species unit. Swedish University of Agricultural Sciences, P.O. Box 7072, S-75007, Uppsala, Sweden.
- 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. 476 p.
- 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.
- USDI, Bureau of Land Management. 1998. Bureau Special Status Species Policy (6840) and Oregon/Washington Special Status Species List, Internal Memorandum OR-98-342, August 28, 1998, including attachments.