

**Conservation Assessment
for
Rhizomnium nudum (Britt. & Williams) Kop.**



Photo by Martin Hutten

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USDI Bureau of Land Management, Oregon and Washington**
Updated in January 2010 by Camille Duncan (Update added Attachment 1, Photos).

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, the addition of Oregon Natural Heritage Information Center ranks for the species, and the addition of USDA Forest Service and USDI Bureau of Land Management (BLM) Special Status/Sensitive Species status and policy. Habitat, range, and taxonomic information have also been updated to be current with data gathered since the Management Recommendations were initially issued. This document does 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) (USDA and USDI 2004a) and Record of Decision (ROD) to Remove or Modify the Survey and Manage Standards and Guidelines (USDA and USDI 2004b), 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.” This species was not on the Survey and Manage list at the time of the signing of the ROD; it had been in Category B but in 2002 was removed due to a lack of concern for persistence.

Management Considerations

“Management Considerations” are discussed within the “Conservation” section of this document. “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 the species covered in this Conservation Assessment follows Forest Service 2670 Manual policy and BLM 6840 Manual direction. (Additional information, including species specific maps, is available on the Interagency Special Status and Sensitive Species website.)

Executive Summary

Species and Taxonomic Group

Rhizomnium nudum (Britt. & Williams) Kop. Bryophyte

Management Status

Rhizomnium nudum is listed as Sensitive on the Region 6 U.S. Forest Service (R6) Sensitive Species List for Oregon, and is considered an Assessment species by the Oregon/Washington Bureau of Land Management (<http://www.or.blm.gov/issp/>). In Oregon this species is ranked as S2 and List 2 by Oregon Natural Heritage Program (<http://oregonstate.edu/ornhic/data/nonvascu.html>). This species is not ranked in Washington.

Range & Habitat

Rhizomnium nudum is part of a North Pacific Distribution and occurs in Japan and East Asia. In the Pacific Northwest it is known from Alaska, British Columbia, Idaho and Montana, Oregon and Washington.

Threats

There are potentially direct and indirect impacts that may occur to this species. Direct impacts result in the degradation or destruction of individuals or populations of *R. nudum* by ski lift, ski runs, or trail construction, trampling and wildfire. Indirect threats include: hydrological changes resulting from road construction, timber harvest and the removal of trees that may potentially tip over and create future habitat for the species. Construction of ski lifts, runs and trails pose the greatest threat to this subalpine, alpine species.

Management Considerations

- Avoid fire line construction, trampling or application of fire retardant at sites.
- Directionally fell timber away from sites and avoid skidding of timber through sites.
- Encourage large old trees to tip over to maintain shallow forest depressions for future colonization.
- Locate trails so that they do not encourage trampling of the site or alter the hydrology of the site.
- Limit road construction or maintenance that would alter the hydrology of a site.

Research, Inventory, and Monitoring Opportunities

- Conduct purposive surveys for this species in Oregon to establish its range and distribution.
- Monitor existing known populations to establish patterns of change over time.
- If a site is disturbed (ie timber sale, thinning, or ski lifts and run construction) monitor how *R. nudum* responds to the disturbance.
- Determine how readily *R. nudum* colonizes new habitat.

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Introduction

Goal

The goal of this Conservation Assessment is to summarize existing knowledge regarding the biology and ecology of *Rhizomnium nudum*, threats to the species, and management considerations to provide information to line managers to assist in the formation of options for management activities. This species is of concern due to limited distribution within Oregon. Federal management for this species follows Forest Service Region 6 Sensitive Species (SS) policy, and/or Oregon/ Washington Bureau of Land Management Special Status Species (SSS) policy.

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 are 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 Region 6 of the Forest Service, 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.

Scope

The geographic scope of this assessment includes consideration of the known and suspected range of the species, within the Pacific Northwest. An emphasis of species considerations is provided for federal lands in Oregon; however, species-knowledge compiled from non-federal lands is included as it is relevant to the overall conservation of the species. This assessment summarizes existing knowledge of a bryophyte species that is rare in one portion of its range and more common in another. A summary of known or suspected threats is listed but may change with time. Management considerations apply to localities, within Oregon. The uncertainty caused by management actions for *R. nudum* is not clearly known at this time.

Management Status

Rhizomnium nudum was originally considered a Protection Buffer species under the original Record of Decision (USDA, USDI 1994). In 2001 it was moved into Category B in the Record of Decision (USDA, USDI 2001). In 2002 it was taken off the Survey and Manage list in Washington because there was no concern for its persistence. According to NatureServe (2004) the global rank for *R. nudum* is G4. In Oregon it is ranked S2, List 2 by the Oregon Natural Heritage Information Center (2004). Currently, it is on the USFS Region 6 Sensitive Species list in Oregon and is considered a Bureau Assessment species by the Bureau of Land Management in Oregon. There is no management ranking for this species in Washington.

Classification and Description

Systematics and synonymy

Rhizomnium nudum (Britt. & Williams) Kop. was previously known as *Mnium nudum* Britt. & Williams and *Mnium punctatum* Hedw. var. *nudum* (Britt. & Williams) Warnst.

Species Description

Rhizomnium nudum is a fairly large, robust moss that is dark grayish-green that darkens in dried specimens. Plants are 1-5 cm tall with naked reddish-brown stems, the rhizoids are confined to the base. Leaves are 3-6 by 4-9 mm, obovate to nearly circular in outline, obtuse, and lack an apiculus. The costa is broad at the base, and usually ends before the apex. Median leaf cells are large, hexagonal, 50-60 x 85-150 μm ; cross-sections reveal triangular thickenings at each end of the cell wall. Leaf margins are bordered by 2-4 rows of long, narrow cells. Plants are glossy and not contorted when dry.

Biology and Ecology

Life History and Reproductive Biology

Rhizomnium nudum is dioicous with numerous antheridia, mixed in with orange paraphyses in a terminal disk-like head. Reynolds (1980) using *Mnium ciliare* (a related species) demonstrated that this “splash cup” dispersal method transported sperm up to 5.3 cm from the male plant. Capsules are pendent, single and elevated on a seta 1 – 2.5 cm long. Peristome teeth are greenish-yellow.

Range, Distribution and Abundance

Rhizomnium nudum is part of a North Pacific Distribution and occurs in Japan and East Asia. In the Pacific Northwest it is known from Alaska, British Columbia, Washington, Oregon, Idaho and Montana. In Oregon *R. nudum* is known from the Mt. Hood, Willamette, and Deschutes National Forests, and reaches its southernmost occurrence on the Umpqua National Forest. According to Koponen (1973) in Western North America this is a subalpine to alpine species and “the southernmost localities in the state of Washington are at high altitudes and, therefore, not quite close to the coast.” He further comments, “The distribution of *R. nudum* does not extend along the coast far south to California”. At present all of the sites in western Oregon occur above 975m (3200 ft.) and are consistent with the patterns described above. In eastern Oregon there are two historical sites on the Wallowa-Whitman National Forest in the Wallowa Mountains at Big Sheep Creek, and Cornucopia although these records have not been verified.

Population Trends

Although there are no specific population details for *R. nudum*, the population trends appear to vary within its' range. Within Washington *R. nudum* appears to be widespread and frequent in subalpine, and alpine areas. In Oregon it has a scattered distribution within the Cascades above 975m (3200 ft.). This scattered distribution in Oregon may be the result of less survey effort in the higher elevations and that the species appears to be reaching the southern edge of its range. *Rhizomnium nudum* may form small pure patches or may be mixed in with other species of moss. At this time there is not

sufficient information on the range and distribution, ecological factors or threats to clearly determine what the population trends are for this species in Oregon.

Habitat

Rhizomnium nudum occurs in coniferous forests in Oregon mostly at mid to high elevations. In the northern portions of its range (outside of Oregon), it extends into alpine sites with late-persisting snow beds (Schofield 1976). On the Mt. Hood National Forest it has been associated with Pacific silver fir (*Abies amabilis*), western hemlock (*Tsuga heterophylla*) mountain hemlock (*Tsuga mertensiana*), western red cedar (*Thuja plicata*), Engelmann spruce (*Picea engelmannii*) and various species of huckleberry (*Vaccinium spp*). Some sites have little tree cover but are on forest edges or under shrubs. Most sites are on the west side of the Cascades with a few sites in high humidity areas on the east side.

On the Willamette National Forest the majority of the locations occur in late-seral stands in the true-fir series, with Engelmann spruce and occasionally Alaska yellow cedar (*Chamaecyparis nootkatensis*) present in the stand. Generally the locations are in seepy areas or along the edge of a pond, wet meadow or small stream bank (Bacheller per. comm. 2003).

On the Umpqua National Forest it is known from low-gradient riparian zones within old-growth stands of silver fir with scattered Shasta red fir (*Abies magnifica* var. *shastensis*). The understory is very sparse.

This species occurs on moist forest, humus soils and mineral soils. *Rhizomnium nudum* has been found in seepages, on soil over rock in the splash zone of a stream and in vernal wet areas associated with forest depressions or ephemeral low gradient channels. By late summer some sites appear quite dry while other sites are constantly wet. Light intensity varies from full sun when the species is in very open area such as along a trail bank to full shade in dense forest stands.

Ecological Considerations

Several studies have been done to try and determine which microclimatic variables correlate with plant distribution in order to determine what factors drive habitat preferences for bryophytes. The most significant factors appear to be water availability and evaporation (Busby et al. 1978, Foote 1966, Potzyer 1939, Zehr 1977, and Clausen 1952). Temperature and light intensity may also play an important role (Busby et al. 1978, Seltzer and Wistendale 1971). A combination of environmental variables including pH, relative humidity, temperature, potential evapo-transpiration rate, and water availability all play important roles in defining where a species, may occur. This information, when available for a specific species may be helpful in determining the appropriate management for a species. However, because each species has unique substratum preferences, caution should be used when applying data for a specific species to all species. Unfortunately only a limited number of species have been studied. In general the growing seasons for mosses is considered to be opportunistic and occurs whenever conditions are suitable (Longton 1980). Because bryophytes lack roots and

have leaves that are usually only one cell layer thick they are extremely sensitive to desiccation. According to Proctor (1982) some species found in moist habitats are always killed from even slight drying, while other species that have adapted to arid environments can tolerate high temperatures for short periods. It has been demonstrated that the lethal temperatures for moister habitat species are generally around 40° C – 50° C (Proctor 1982). Therefore direct contact with fire or the heat generated by a fire may lead to the loss of individuals.

Rhizomnium nudum fits into the During's (1979) "perennial stayers" life strategy category which is characterized by being a perennial species that forms mats on the forest floor, sometimes in very localized small areas. Species in this category also occur in more or less stable environments. Most known sites currently occur in relatively stable stands without signs of obvious recent disturbance.

Some of the sites are adjacent to small perennial streams. In such cases, *R. nudum* may be found on bare soil on the banks of the stream or on soil over rock. Scouring of stream banks may serve to create new suitable substrate. However known sites are also common along low-order, and sometimes low-gradient streams, which are less likely to be subject to significant flood damage.

Silver fir and mountain hemlock forests, where *R. nudum* has most commonly been found, are typically subject to infrequent, high-intensity fires. Stands are cool and moist with minimal summer drought. These conditions have been observed to dampen and even extinguish historic fires (Agee 1993). Winter snowpack is persistent and stands subjected to significant opening are prone to frost and generally far more extreme environmental conditions than undisturbed stands.

Windthrow may be the most significant perturbation that would occur in these stands between major fires. Because *R. nudum* is occasionally found in moist depressions, it is possible the hummocky topography created by uprooted trees may contribute to suitable habitat conditions for this species (Oliver & Larson 1996).

Although pure patches can be found this species is often mixed in with other moss species including: *Rhizomnium magnifolium*, *R. glabrescens*, and *Plagiomnium insigne*, three related species. *Brachythecium frigidum* a robust pleurocarpus species that forms large, often dense mats in riparian areas may actually out compete or prevent *R. nudum* from becoming established.

Conservation

Threats

There are potentially direct and indirect impacts that may occur to this species. Direct impacts result in the degradation or destruction of individuals or populations of *R. nudum* by ski lift, ski runs, or trail construction, trampling and wildfire. Indirect threats include: hydrological changes resulting from road construction, timber harvest and the lack of shallow forest depressions created by tree tip over. Construction of ski lifts, runs and trails pose the greatest threat to this subalpine, alpine species.

Conservation Status

Rhizomnium nudum occupies relatively long-term stable sites in generally mature stands. Many of the known sites in Oregon are in wilderness areas. Most of the remaining sites appear to be within riparian areas or at least within riparian reserves. Considering the apparent ecological stability of the habitats and the high percentage of the sites in reserved land allocations, most sites should have a reasonable likelihood of persisting in the absence of human disturbance. However, numbers of individuals at sites are generally not large and the distribution is often spotty. It is also not clear how the species interacts with natural perturbations including seasonal flooding and infrequent natural fire and wind damage to stands. Several sites are within ski management areas and have recently encountered management conflicts with expansion proposals. Finally, projects allowed or encouraged under the Aquatic Conservation Strategy may adversely impact sites if no mitigation for *R. nudum* is considered.

Known Management Approaches

There were no prior management approaches applied to this species.

Management Considerations

Below are options to consider if managing a site for continued persistence:

- Consider locating ski area expansion projects to areas without occupied sites.
- Avoid fire line construction and trampling at sites.
- Avoid applying fire retardant on occupied sites.
- Directionally fell timber away from sites and avoid skidding of timber through sites.
- Because this species grows directly on soil, care should be taken that routine activities associated with projects don't inadvertently damage sites.
- In forests with an undulating floor created by tree tip over, long term site management should encourage large old trees to tip over.
- Locate trails so that they do not encourage trampling of the site or alter the hydrology of the site.
- Limit road construction or maintenance that would alter the hydrology of a site.

Research, Inventory and Monitoring Opportunities

- Conduct purposive surveys for this species in Oregon to establish its range and distribution.
- Monitor existing known populations to establish patterns of change over time.

- If a site is disturbed (ie timber sale, thinning, or ski lifts and run construction) monitor how *R. nudum* responds to the disturbance.
- Determine how readily *R. nudum* colonizes new habitat.

Definitions of Terms Used

NatureServe G4 Rank: Apparently secure globally.

Oregon Natural Heritage Information List 2: Contains taxa that are threatened with extirpation or presumed to be extirpated from the state of Oregon. These are often peripheral or disjunct species which are of concern when considering species diversity within Oregon's borders. They can be very significant when protecting the genetic diversity of a taxon. ORNHI regards extreme rarity as a significant threat and has included species which are very rare in Oregon on this list.

Oregon Natural Heritage Information Center S2 Rank: Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences.

Site (Occupied): The location where an individual or population of the target species (taxonomic entity) was located, observed, or presumed to exist and represents individual detections, reproductive sites, or local populations. Specific definitions and dimensions may differ depending on the species in question and may be the area (polygon) described by connecting nearby or functionally contiguous detections in the same geographic location. This term also refers to those located in the future. (USDA, USDI 1994). Other terms such as known site, species location, and element occurrence are included in this definition.

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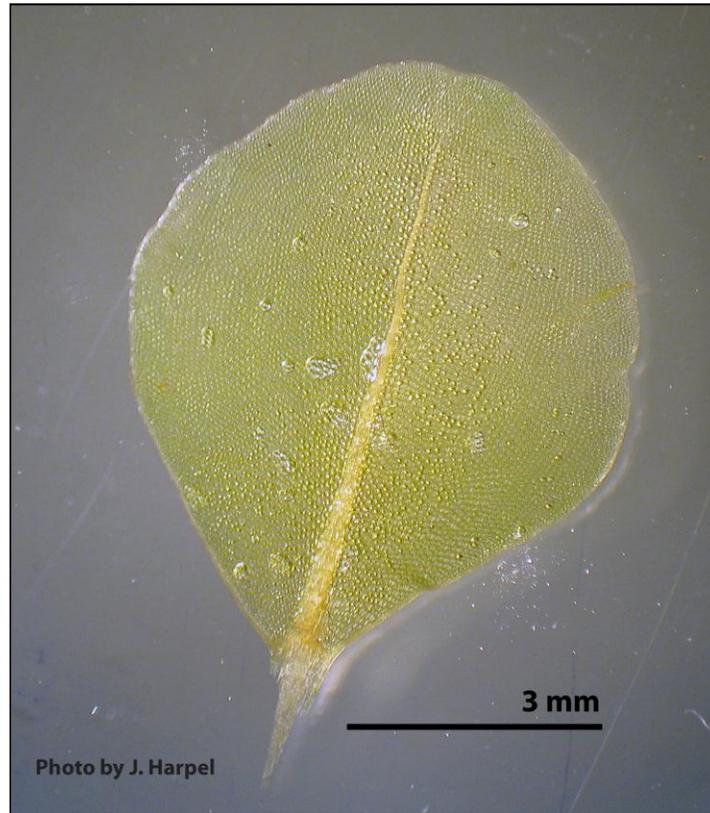
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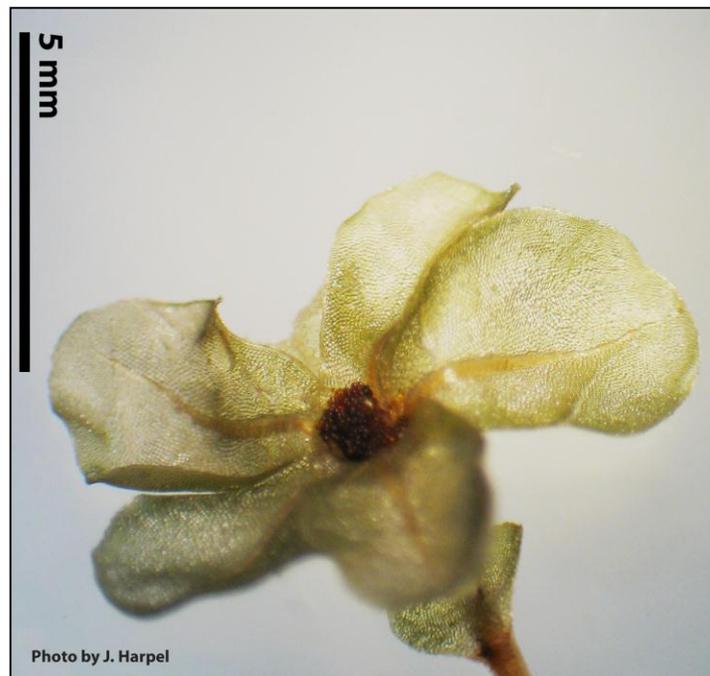
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Attachment 1 – Photos

All photos by Dr. Judy Harpel, under contract with the Oregon/Washington Bureau of Land Management.



Leaf



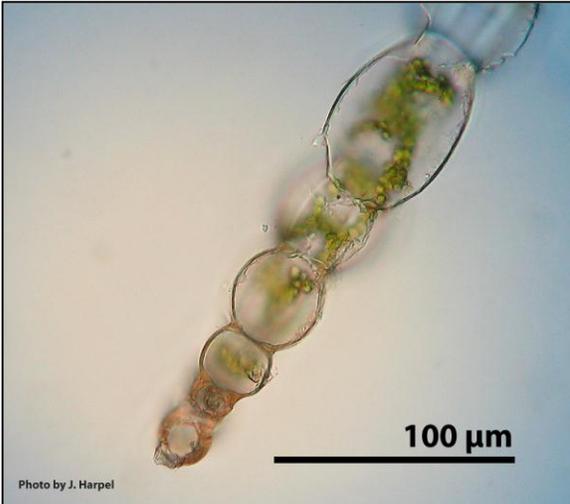
Perigonum



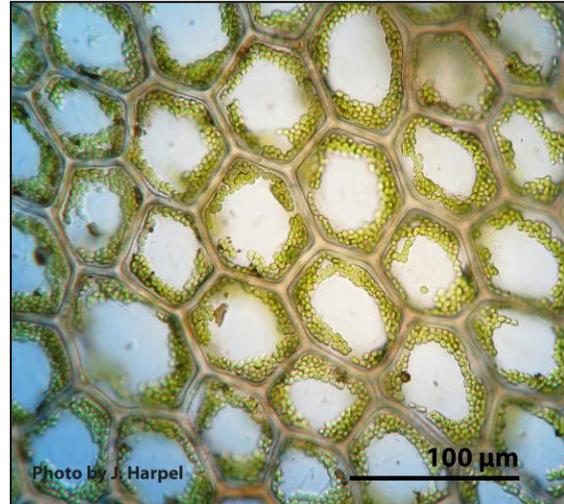
Sporophyte



Leaf apex



Leaf cross-section



Upper medial cells