

DRAFT, Version 1.1

Draft Management Recommendations for
Goblin's gold
Schistostega pennata (Hedw.) Web & Mohr

Version 1.1
October 21, 1996

TABLE OF CONTENTS

EXECUTIVE SUMMARY	2
I. Natural History	3
A. Taxonomic/Nomenclatural History	3
B. Species Description	3
1. Morphology	3
2. Reproductive Biology	3
3. Ecology	4
C. Range, Known Sites	4
D. Habitat Characteristics and Species Abundance	4
II. Current Species Situation	4
A. Why Species is Listed under Survey and Manage Standards and Guidelines	4
B. Major Habitat and Viability Considerations	5
C. Threats to the Species	5
D. Distribution Relative to Land Allocations	5
III. Management Goals and Objectives	5
A. Management Goals for the Taxon	5
B. Specific Objectives	5
IV. Habitat Management	6
A. Lessons from History	6
B. Identification of Habitat Areas for Management	6
C. Management within Habitat Areas	6
D. Other Management Issues and Considerations	6
V. Research, Inventory and Monitoring Needs	7
A. Data Gaps and Information Needs	7
B. Research Questions	7
C. Monitoring Needs and Recommendations	7
VI. References	7

EXECUTIVE SUMMARY

Species: *Schistostega pennata* (Hedw.) Web & Mohr (Goblin's gold, cat's eyes)

Taxonomic Group: Bryophyte: Moss

ROD Components: Managed Late-successional Area Protection Buffer Species (ROD, C-27)

Other Management Status: None at present. Included on preliminary list of rare mosses submitted to the Washington Natural Heritage Program (Harpel and Gamon, pers. comm.) with suggested category S2 (imperiled in the state because of rarity or because it is vulnerable to extinction or extirpation).

Range: In the Pacific Northwest, *Schistostega pennata* is known from British Columbia to Washington. In Washington, it is reported from eight known sites in Pierce, Grays Harbor, Snohomish, Jefferson, and Whatcom Counties. There are three known sites in Olympic National Park and one on the Mt. Baker Snoqualmie National Forest. Although there are no known sites in Oregon, it could possibly be found there.

Specific Habitat: *Schistostega pennata* occurs on mineral soil in shaded pockets of overturned tree roots, often with standing water much of the year. It is also found in moist crevices and caves, and occasionally under buildings. It requires high humidity and densely shaded microsites.

Threats: Logging, road building, and collecting are the primary threats to this species. Thinning, shelterwood harvest, or clearcutting would result in increased light levels and lower humidity and would probably result in desiccation and replacement by other bryophyte species. Removal of roots of wind thrown trees would eliminate potential habitat for this species. Recreational use of caves could mechanically remove plants and disturb soil, resulting in damage to habitat or populations.

Management Recommendations:

- C Maintain decay class 3, 4, and 5 logs, leaving windfalls in place to provide structurally diverse habitat at known sites. Leave windfalls in place to provide structurally diverse habitat (ROD, p. C-27).
- C Maintain microclimate at known sites, including high humidity and dense shade. Specially, retain overstory with greater than 70 percent closed-canopy forest (ROD, p. C-27).
- C Maintain caves, root wads, and moist, dark microsites to provide suitable substrate.
- C Maintain Riparian Reserves as prescribed in ROD to provide suitable habitat.
- C To the extent possible, limit recreational use of caves near known sites.

Information Needs:

- C Verify status of known populations, and survey for additional sites.

C Collect ecological data to identify limiting factors and habitat requirements.

I. Natural History

A. Taxonomic/Nomenclatural History

Schistostega pennata (Hedw.) Web & Mohr was originally described in 1803. It was initially placed in the genus *Gymnostomum* and has no recent synonyms. It belongs to the family Schistostegaceae.

SYNONYMY:

Gymnostomum pennatum Hedw. Spec. Musc. 31. 1801

Schistostega osmundacea Mohr. Obs. Bot. 26. 1803

Gymnostomum osmundacea Hoffm. ex. Sm., Fl. Brit. 3:1161. 1804

B. Species Description

1. Morphology (Lawton 1971, Grout 1972, 1975, Pojar and Mackinnon 1994)

This highly distinctive moss is very small, (4-7 mm high), flat, and unbranched, with around 10 pinnate leaves. Clusters of green, branched filaments (protonema) are persistent and luminescent, with lens-shaped cells forming golden, gleaming mats of thread-like plants. Leaves are 0.7-1.2 mm long, narrowly elliptic, sharp-pointed, with their bases merging together along the stem. Leaf cells are large and hexagonal. Sporophytes are found occasionally, at the tip of the plant, with slender, straight setae supporting the tiny, hemispheric, upright capsules. Peristome is absent.

This species might be confused with small species of *Fissidens*, which differ in having conspicuous sheathing flaps on their leaves, and capsules with conic opercula and red peristome teeth.

Figure 1. Line drawing of *Schistostega pennata* (to be added). (AWAITING COPYRIGHT PERMISSION)

2. Reproductive Biology

Male and female plants arise from the same protonema. Like all bryophytes, *Schistostega pennata* requires water for sexual reproduction. Sporophytes are reported to be common (Schofield 1976).

3. Ecology

The species is adapted to cool, dark places, where incident light is focused on the chloroplasts of its protonema by special lens-shaped cells. Most of the plant consists of filamentous protonema. The leafy gametophytes are tiny and easily overlooked. Life history information on establishment and dispersal is unknown.

C. Range, Known Sites

In the Pacific Northwest, this species is known only from Washington and Montana, northward through British Columbia to Alaska. In Washington, it is reported the Olympic and Cascade Mountains in Pierce, Grays Harbor, Snohomish, Jefferson, and Whatcom counties. *Schistostega pennata* is known from eight sites, with all but one collected prior to 1978. Three sites occur in Olympic National Park and one on the Mt. Baker Snoqualmie National Forest. Although there are no known sites in Oregon, it could possibly be found there.

It is rare in British Columbia, occurring near the Coast and on islands, infrequently found in the Interior mountains (Schofield 1976). Globally, its range is circumboreal but local in the Northern Hemisphere in both Eurasia and North America.

Figure 2. Known sites of *Schistostega pennata* (to be added).

D. Habitat Characteristics and Species Abundance

Schistostega pennata inhabits moist lowland forest, often with western redcedar. It is also found in moist crevices and caves, and occasionally under buildings. It occurs on mineral soil in shaded pockets of overturned tree roots, often with standing water much of the year. It grows attached to rock or mineral soil in depressions with little light and requires dense shade. In British Columbia, it is most often found near watercourses and in swampy, humid coniferous forest (Schofield 1976).

II. Current Species Situation

A. Why Species is Listed under Survey and Manage Standards and Guidelines

Schistostega pennata was considered a rare species within the range of the northern spotted owl, with occurrences documented only from Washington. It was included in the list of species covered by Mitigation Step 5 of the Scientific Analysis Team Report (Thomas et al. 1993). Mitigation activities prescribed in this document include surveying to determine presence and distribution, and where located, maintaining decay class 3, 4, and 5 logs and greater than 70 percent closed-canopy forest habitats for shade. Shelterwood and thinning prescriptions for timber harvest may impact populations, as logs dry out under the changing microclimate regime.

As part of the mitigation, it was recommended that Regional ecologists or botanists 1) maintain a spatially explicit database of all known sites and 2) develop species or area management plans.

The bryophyte viability panel convened by the Forest Ecosystem Assessment Team included *Schistostega pennata* in the group of rare species rated separately. Panel members indicated that the species was dependent on high humidity and dense shade. Increased light levels or desiccation from thinning would favor other bryophyte species that would replace *Schistostega*. The viability rating under the original Option 9 indicated a high level of confidence this species would remain well distributed throughout its range due to the prescriptions for the riparian zones. However, in the Record of Decision, the species referenced in the Mitigation Measure Step 5 from the Scientific Analysis Team Report were included as “Protection Buffer Species,” with the above mitigation reiterated.

B. Major Habitat and Viability Considerations

The major viability consideration for *Schistostega pennata* is loss of populations due to management activities which directly impacts the habitat or the population.

C. Threats to the Species

Logging, road building, and collecting are the primary threats to this species. Thinning or clearcutting would result in increased light levels and would probably lead to desiccation and replacement by other bryophyte species. Removal of wind thrown trees would eliminate potential habitat for this species. Recreational use of caves could damage habitat or populations.

D. Distribution Relative to Land Allocations

One site occurs within the Mt. Baker National Recreation Area on the Mt. Baker Snoqualmie National Forest and three occur within Olympic National Park. Further analysis will be necessary to determine land allocations of the other sites, which are located near or within the Mt. Baker Snoqualmie and Olympic National Forests.

III. Management Goals and Objectives

A. Management Goals for the Taxon

The goal for the management of *Schistostega pennata* is to assist in maintaining species viability.

B. Specific Objectives

- C Maintain microclimate at known sites, including high humidity and dense shade.
- C Maintain caves, root wads, and moist dark microsites.

IV. Habitat Management

A. Lessons from History

There is a considerable literature on the decline of bryophytes in Europe. Rapid decreases and

fragmentation of primeval forests have caused a serious threat to bryophytes that grow on decaying wood (Laaka 1992). In addition, air pollution (particularly sulphur compounds in combination with low pH) and acid rain are implicated in declines of bryophytes (Hallingbäck 1992, Rao 1982). The extinction rate and rates of decline are high in areas where trends are documented (Greven 1992, Hallingbäck 1992). Factors associated with logging that cause declines in bryophytes include the temperature extremes and the drying effect of increased wind, the lowering of surface water, and drying of logs, reduction in amount of coarse woody debris substrate, increased dispersal distance between fragments of primeval forest (Laaka 1992). Lack of suitable substrate is the main reason for rarity of threatened epixylic (decaying wood inhabiting) species in managed forests.

B. Identification of Habitat Areas for Management

All known sites are identified for management.

Although this species has not been located in Oregon, it may occur in appropriate habitat. The reference to “Washington only” in the Record of Decision reflected the fact that this species was only known from Washington at the time. If populations are discovered in Oregon they should receive the same management described below.

C. Management within Habitat Areas

- C Maintain decay class 3, 4, and 5 logs, leaving windfalls in place to provide structurally diverse habitat at known sites. Leave windfalls in place to provide structurally diverse habitat (ROD, p. C-27).
- C Maintain microclimate at known sites, including high humidity and dense shade. Specially, retain overstory with greater than 70 percent closed-canopy forest (ROD, p. C-27).
- C Maintain caves, root wads, and moist, dark microsites to provide suitable substrate.
- C Maintain Riparian Reserves as prescribed in ROD to provide suitable habitat.
- C To the extent possible, limit recreational use of caves near known sites.

D. Other Management Issues and Considerations

Opportunities exist for combining surveys for *Schistostega pennata* with those for other cave-inhabiting species, including bats. This unique moss can be readily distinguished and does not require specialized training to identify.

V. Research, Inventory and Monitoring Needs

A. Data Gaps and Information Needs

Only one of the seven known sites has been visited since 1978. Historic sites should be visited to determine if populations still exist and ecological data collected to characterize habitat. Suitable habitat should be surveyed to locate new populations. The bryological literature should be further searched to locate any additional references containing ecological information on this species.

B. Research Questions

What role do windfalls play in the colonization of this species?

What are the ecological requirements of this species?

How does *Schistostega pennata* disperse and colonize new sites? What is the growth rate of this species?

C. Monitoring Needs and Recommendations

Known sites should be monitored to assess compliance with management guidelines and evaluate impacts. In particular, monitor the recreational use of caves occupied by *Schistostega pennata*.

VI. References

Crum, H.A. & L.E. Anderson. 1981. *Mosses of Eastern North America*. 2 vols. Columbia Univ. Press, New York.

Forest Ecosystem Management Assessment Team 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. USDA Forest Service, USDI Bureau of Land Management, USDC National Marine Fisheries Service, USDI Fish and Wildlife Service, USDI National Park Service, and Environmental Protection Agency.

Gamon, J. 1996. Washington Natural Heritage Program, Olympia. Personal communication.

Greven, H.C. 1992. Changes in the moss flora of The Netherlands. *Biol. Conserv.* 59:133-137.

Grout, A.J. 1972. Moss Flora of North America, North of Mexico, Hafner Pub. Co., New York, NY.

Grout, A.J. 1965. Mosses With Hand Lens And Microscope, Eric Lundberg Pub., Ashton, MD.

Hallingbäck, T.A. 1992. The effect of air pollution on mosses in southern Sweden. *Biol. Conserv.* 59:163-170.

Harpel, J. 1996. Brush Prairie, Washington. Personal communication.

- Laaka, S. 1992. The threatened epixylic bryophytes in old primeval forests in Finland. *Biol. Conserv.* 59:151-154.
- Lawton, E. 1971. Moss Flora of the Pacific Northwest, Hattori Botanical Laboratory, Miyazaki, Japan.
- Pojar, J. and A. MacKinnon. 1994. Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia, and Alaska. Lone Pine Publishing, Redmond, WA, p. 462.
- Rao, D.N. 1982. Responses of bryophytes to air pollution. pp. 445-471. In: A.J.E. Smith. *Bryophyte Ecology*. Chapman and Hall, London.
- Schofield, W.B. 1976. Bryophytes of British Columbia III: habitat and distributional information for selected mosses. *Syesis* 9:341-354.
- Thomas, J.W., M.G. Raphael, R.G. Anthony, E.D. Forsman, A.G. Gunderson, R.S. Holthausen, B.G. Marcot, G.H. Reeves, J.R. Sedell, and D.M. Solis. 1993. Viability Assessments and Management Considerations for Species Associated with Late-successional and Old-growth Forests of the Pacific Northwest. USDA Forest Service. 523p.
- USDA Forest Service and USDI Bureau of Land Management. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl 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.