

DRAFT, Version 1.1

Draft Management Recommendations for
slender clawleaf
Kurzia makinoana (Steph.) Grolle

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EXECUTIVE SUMMARY

Species: *Kurzia makinoana* (Steph.) Grolle

Taxonomic Group: Bryophyte: Liverwort

ROD Components: 1,2

Other Management Status: none

Range: In our region, *Kurzia makinoana* (sensu Schuster 1980) is known from only three localities within twenty-five miles of the coast, in Clallam and Snohomish Counties in Washington. It is known from coastal California in Mendocino and Del Norte counties. It is known from the Olympic National Park and Mt. Baker Snoqualmie National Forest.

Specific Habitat: *Kurzia makinoana* occurs on well-shaded, rotten wood and humic soil at low elevations, especially on stream terraces, floodplains and other cool, moist forest locations sometimes exceeding the width of Riparian Reserves. It is reported from wetlands in other portions of its range. In Washington, it is closely associated with old-growth forests, particularly near riparian areas.

Threats: Activities that alter the hydrology, coarse woody debris substrate, or microsite conditions would threaten this species. Liverworts are highly susceptible to desiccation and are often specific in their substrate requirements. Logging, road construction, campground construction, and collection of special forest products in the vicinity of known sites may impact this species.

Management Recommendations:

- C Maintain habitat for this species at known sites by retaining shade, moist conditions, and coarse woody debris in the understory. Avoid disturbance at known sites, including modification of canopy and of well-rotted wood and humic soil.
- C Riparian areas should be evaluated to determine extent of populations where they are on broad floodplains or terraces. Protection of an area greater than Riparian Reserves may be needed..
- C Collection of special forest products should not be permitted in the vicinity of known sites.

Information Needs:

- C Conduct inventory, particularly in coastal late-successional reserves, Research Natural Areas and other withdrawn areas to locate additional populations of this inconspicuous species to determine if it is actually more widespread than previously noted.

I. Natural History

A. Taxonomic/Nomenclatural History

Kurzia makinoana (Steph.) Grolle Rev. Bryol. et Lichén 32:171 1964

This tiny liverwort is placed in the division Hepatophyta, class Jungermanniopsida, order Jungermanniales, family Lepidoziaceae (Stotler and Crandall 1977). There has been considerable taxonomic debate on the circumscription of this taxon (e.g. Schuster 1969, Hong 1988, Schuster 1980). Our material is treated as *Kurzia sylvatica* (Evans) Grolle by Hong (1988) and as *Microlepidozia sylvatica* (Evans) Joerg. by Schuster (1969). While some authors treat European and eastern North American material and western North American and Asian material as one species, Schuster (1980) and Inoue (1974) argue for treating *Kurzia makinoana* as distinct from European and eastern North American entities (*K. sylvatica*). Schuster considers *Kurzia makinoana* the most distinct of the four holarctic members of the section Microlepidozia, and *Kurzia makinoana* not to be particularly closely allied with *Kurzia sylvatica*.

Synonymy (from Schuster 1980)

Lepidozia makinoana Steph., Bull. Herb. Boissier 5:94, 1897.

Lepidozia exigua Steph., Spec. Hep. 3:626, 1909.

Lepidozia tosana Steph., ibid. 629, 1909.

Microlepidozia makinoana Hatt., Jour. Hattori Bot. Lab. no. 7:42, 1952.

Kurzia makinoana Grolle, Rev. Bryol. et Lichén. 32(1-4):171, [1963] 1964.

B. Species Description (Hattori and Mizutani 1958, Hong 1988, Inoue 1974, Schuster 1980, Christy and Wagner 1996)

1. Morphology

Kurzia makinoana is a tiny leafy liverwort, **dull or deep green to brownish-green** in color, dense, aromatic, occurring in interwoven, tufts or patches (occasionally creeping as scattered stems among other bryophytes). Stems are 5 (-20?) mm long, threadlike, creeping to ascending, irregularly to more or less regularly pinnately to bipinnately branched, occasionally terminating in slender, runnerlike branches with reduced leaves (flagella); leafy branches usually lateral; flagella usually behind, toward the substrate (postical). Rhizoids are sparsely developed, at the bases of the lower underleaves, more frequent on flagella. Leaves are barely **contiguous to imbricate, transversely inserted**, arising from segments (merophytes) 4 cells broad, the basal portion spreading but lobes usually more or less suberect to erect, or even slightly incurved, thus the **leaves look typically hand-like, somewhat cupped**. Leaves are 3-4 lobed; lobes entire, subulate to narrowly lanceolate, usually somewhat incurved, dorsal lobes of stem leaves reduced and formed of 2 (3) strongly elongated cells, or of **2 (3) cells broad at base** and 1-2 cells high, the lobe thus 2-5 (6) celled. Branch leaves are similar to stem leaves but smaller and more often 2-3 lobed. Cuticle **dull when dry**; oil bodies absent, except in medullary (and less often in cortical) stem cells, occasionally few in leaf cells (small, subspherical, glistening, when present). Underleaves of stem are usually 3-lobed, very rarely 4-lobed. Male inflorescence are on short postical (more rarely lateral) branches; bracts in 4-5 pairs, strongly concave, divided 0.5-0.65 their

length into two ovate to triangular, acuminate lobes, whose margins are sharply spinose-dentate. Female inflorescence are on a very short postical branch, usually with no leaves except for the closely sheathing bracts, ovate to 2 times as long as wide, 0.25-0.4 2(3) lobed, with few and short teeth, one margin usually without teeth. Perianth bears only 1-3-celled teeth at mouth.

Kurzia makinoana is clearly distinct in the asymmetric leaves, which are barely contiguous to imbricate (closely appressed and overlapping), transversely inserted, hand-like and somewhat cupped. The leaves are 3-4 lobed and each lobe is two cells wide at the base. The dull or deep green to brownish-green color is also distinctive.

This species may be confused with *Blepharostoma* (which has more filamentous leaf lobes that are narrow and uniseriate to the base) and *Cephaloziella* (which has bilobed leaves and small or obsolete underleaves).

Figure 1. Line drawing of *Kurzia makinoana* from Schuster (1969) (to be added). (AWAITING COPYRIGHT PERMISSION)

2. Reproductive Biology

Kurzia makinoana is dioicous and requires water for sexual reproduction.

3. Ecology

The ecology of *Kurzia makinoana* is poorly known. Many of the rare and threatened decaying wood-inhabiting bryophytes may be limited by inefficient dispersal and difficulties in establishment (Söderström 1989). However, it is not known if these factors contribute to the rarity of this taxon. *Kurzia makinoana* occurs in cool, well-shaded conditions and may require moist substrates, based on its habitat at known sites. Liverworts are highly susceptible to desiccation and are often specific in their substrate requirements.

C. Range, Known Sites

Kurzia makinoana (sensu Schuster 1980, see above discussion) is known from coastal Washington, north along the northwestern coast of British Columbia to the southern tip of Alaska and from Japan. *Kurzia makinoana* is known from only three localities in Clallam and Snohomish Counties in Washington. It is known from coastal California in Mendocino and Del Norte counties. On federal land in the range of the northern spotted owl, it is known from Mt. Baker Snoqualmie National Forest and from Olympic National Park.

This inconspicuous species has been mapped from at least fourteen localities along the immediate coast of British Columbia and coastal southern Alaska (Hong 1988).

Figure 2. Known sites of *Kurzia makinoana* (to be added).

D. Habitat Characteristics and Species Abundance

Kurzia makinoana occurs on well-shaded, rotten wood and humic soil at low elevations, especially on stream terraces, floodplains and other cool, moist forest locations. It is reported from wetlands in other portions of its range, and from old-growth forests in Washington, particularly near riparian areas. The two known sites in Washington occur at low elevations 100 m (328 ft.) and 335 m (1,100 ft.), elevation, respectively, all within 40 km (25 miles) of the coast.

Most of the collections in British Columbia are from shaded humus banks in forests. However, the Queen Charlotte Islands collections are from damp humus in bogs (Hong 1980). California populations are also reported from mires or small bogs. According to the bryophyte viability panel convened by the Forest Ecosystem Management Assessment Team, *Kurzia makinoana* is reported from Ft. Bragg (Del Norte County), where it is often associated with the pitcher plant *Darlingtonia* and from Redwood National Park (bryophyte panel notes, June 1993). Collections from California have been deposited in the Herbarium in Helsinki, Sweden (Norris, pers. comm.).

According to Hong (1980), this species frequently occurs with the liverworts *Bazzania ambigua*, *B. denudata*, *Calypogeia neesiana*, *Cephalozia bicuspidata*, *C. lunulifolia*, *Diplophyllum albicans*, *D. plicatum*, *Frullania nisquallensis*, *Mylia taylorii*, and *Riccardia palmata*.

II. Current Species Situation

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

Kurzia makinoana was rated separately by the bryophyte panels convened by the Forest Ecosystem Management Analysis Team (1993). This species was considered to have an 80% or greater likelihood of being well distributed throughout its range over the next century for all options, but with some likelihood of being restricted to refugia or extirpated on federal land under Option 9. This reflected uncertainty about the outcomes and concerns with possible extirpation of this rare species, which occurs in old-growth forest habitat at low elevations. Low elevation old-growth forest was considered particularly limited within large portions of the species' range. Of concern were habitat loss or population impacts due to logging, road building, thinning, and harvest activities on stream terraces, particularly on non-federal lands at low elevations.

Due to the number of known sites and concerns about the limited amount of low elevation old-growth habitat, this species was included under Survey and Manage Strategy 1 and 2. The basis for its inclusion was to maintain viable populations at the known sites.

This species is believed to be at high risk due to the uncertainty that viable populations still exist

within the area of consideration. However, it is possible that this inconspicuous species has been under-represented in collections and may be found in additional localities.

B. Major Habitat and Viability Considerations

Very little is known about the abundance, distribution and ecology of this species in the region. Historical locations of this species may have been extirpated from low-elevation forests on non-Federal lands, due to logging and land clearing. Reduction of habitat or extirpation of populations on non-Federal lands at low elevations increases the importance of populations on Federal lands for the continued viability of this species. Riparian Reserves may be adequate to protect some occurrences of this species, but Norris (pers. comm.) indicates that the species occurs on broad floodplains and stream terraces that may fall outside of the immediate riparian area. This should be considered if adjustments are made to interim Riparian Reserve widths during Watershed Analysis.

C. Threats to the Species

Threats to *Kurzia makinoana* include any alteration of hydrology or of habitat that results in desiccation or changes in microclimate. In addition, any activity that would remove or decrease availability of coarse woody debris may reduce potential habitat for this species. Liverworts are highly susceptible to desiccation, and availability of suitable substrate is limiting for bryophytes that inhabit rotten logs. Logging, road construction, campground construction, and collection of special forest products in the vicinity of known sites may threaten this species.

Acid precipitation may be a threat to this species, although plants buffered by forest canopy may be less vulnerable than epiphytic ones. The location of *Kurzia makinoana* on the ground would be removed from areas of highest deposition (e.g. twigs and branches in canopy).

D. Distribution Relative to Land Allocations

Two known populations are located in Olympic National Park. The Snohomish county populations is located at the head of the trail to Lake Twenty-two and appears to be immediately adjacent to the Lake Twenty-two Research Natural Area on the Mt. Baker Snoqualmie National Forest. The trail parallels the Lake Twenty-two Creek (a drainage of the South Fork Stillaguamish River) for approximately a quarter mile before entering the Research Natural Area. The Land Use Allocation for this area is Late-successional Reserve (IB, Merged Plan Allocation; no roads, no thinning, semiprimitive, non-motorized recreation).

III. Management Goals and Objectives

A. Management Goals for the Taxon

The goal for the management of *Kurzia makinoana* is to assist in maintaining species viability.

B. Specific Objectives

Maintain viable populations at known sites by maintaining substrate and microsite conditions

required by *Kurzia makinoana*.

IV. Habitat Management

A. Lessons from History

There is a considerable literature on the declines of bryophytes in Europe. Rapid decreases and fragmentation of primeval forests have caused a serious threat to bryophytes (ecologically similar to *Kurzia makinoana*) 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

Two of the known populations are documented from the immediate coast and the third is located within twenty-five miles of Puget Sound. Unless additional populations are located farther inland, the range of habitat area for management should be considered to extend from the coast to 60 miles inland on the Olympic, Mt. Baker-Snoqualmie, Siuslaw, and Siskiyou National Forests. Because the species appears more closely associated with wetlands in the southern portion of its range, in California no habitat areas for management are specifically identified there.

C. Management within Habitat Areas

Known sites should be managed to maintain viable populations by maintaining microsite conditions (i.e., shade, moist conditions) on stream terraces, floodplains, and riparian areas.

- C Maintain adequate coarse woody debris substrates at the known sites.
- C Avoid disturbance of well-rotted wood and humic soil and modification of canopy.
- C Collection of special forest products should not be permitted in the vicinity of known sites.

- C During Watershed Analysis, designate appropriate widths of Riparian Reserves in order to maintain suitable habitat at known sites. Where the species occurs on broad floodplains or terraces, this may be greater than the ROD-prescribed Riparian Reserves.

D. Other Management Issues and Considerations

The inconspicuous nature of this species may make it difficult to relocate known sites and conduct surveys before ground disturbing activities, as required for this Strategy 2 species.

V. Research, Inventory and Monitoring Needs

A. Data Gaps and Information Needs

The abundance, distribution and ecology of this species in the region is poorly known. Inventories should be conducted by knowledgeable experts, particularly in low elevation old-growth areas along the coast to locate additional populations of this species, characterize its habitat, and provide ecological information. Information such as abundance, non-vascular and vascular plant associates, and specific rotten logs habitats would contribute to understanding ecological requirements.

B. Research Questions

- C Populations on the periphery of the species' range in western North America occur in considerably different habitat (bogs) than populations in the central portion of the range (well-rotten logs in old-growth forest). What is the ecological amplitude of *Kurzia makinoana* in the central portion of its range?
- C What role does vegetative reproduction play in the dispersal of this species?
- C Further taxonomic study of the holarctic species of section *Microlepidozia* is needed. Schuster (pers. comm.) believes that one of the segregate species (*K. sylvatica*) may occur in British Columbia (Christy and Wagner 1996). Is the current species concept for members of this section the most useful representation of *Kurzia makinoana* and its relatives?

C. Monitoring Needs and Recommendations

Once populations are relocated, sites should be monitored to insure compliance with management recommendations.

Because this species is very inconspicuous, it may be difficult to monitor population trends over time. However, visits to known sites should be made periodically to evaluate the status of the habitat.

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