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I hereby certify that, to the best of my knowledge, all statements made in this sponsorship are true. I understand that the information provided (with the exception of detailed specimen locations) will be made public and attributed to me by the California Lichen Society's Conservation Committee, however I am welcome to publish all or part of this information in other avenues as well.

Signature: _____

Date:

EXECUTIVE SUMMARY

Ramalina thrausta has a global boreal distribution and is uncommon throughout its range. It has a scattered distribution in northern California, existing exclusively in strongly riparian areas. Populations are declining significantly in Europe (10 - 30%), and apparently declining in California with a net loss of 12.5% of sites in three-year period. Population numbers in California and Washington are very small to begin with, and any decrease can validly be viewed with alarm, while Oregon has a large number of sites distributed across two mountain ranges. Protection of current sites in California is good, since Late Successional and Congressionally Withdrawn designations appear stable, but protection is heavily dependent on these land allocations, which are political in nature.

TAXONOMY

accepted scientific name	<i>Ramalina thrausta</i> (Ach.) Nyl.
common name	angel's hair, because of the curled branch tips; angels have naturally curly hair (Brodo 2001).
type specimen and location	unknown.
synonyms	<i>Alectoria thrausta</i> Ach., <i>Alectoria crinalis</i> Ach.

DESCRIPTION

"Thallus fruticose, pendulous, to 30 cm long, pale greenish; branches filamentous, mostly <0.5(1)mm diam., the tips often hooked or curled and ending in minute soralia" (Figure 1) (McCune & Geiser 1997). The thin branches have a translucent cortex with occasional punctate to slightly elongated slightly raised pseudocyphellae. From a distance of 6 - 10 feet the thalli look like lint from a hairbrush. All spot tests are negative.

SIMILAR SPECIES AND DISTINGUISHING CHARACTERISTICS

Alectoria sarmentosa and *A. vancouverensis* are superficially similar in being fruticose, filamentous and pendulous, but have a yellow cast to the thallus due to the presence of usnic acid. They have medullas that test KC+ red (rarely KC-), and C+ red, respectively. Their primary branches when mature are angular in section and up to 2.5mm in diameter, as opposed to round and almost always <1mm in *R. thrausta*. Both *Alectoria* species have an opaque cortex with raised,



Figure 1. *Ramalina thrausta*, showing diagnostic hooked branch tips.

elongate pseudocyphellae, unlike the translucent cortex and round sessile pseudocyphellae found in *R. thrausta*. *Ramalina menziesii* on the immediate coast can have a similar color and predominantly fine branches, with tips that appear similar to the hooked tips of *R. thrausta*, but will invariably have small to large netted areas on at least the tips of the branches, and at some point one can find branches that are clearly flattened and strap-like. The curled branch tips with soredia are diagnostic (adapted from McCune & Geiser 1997, Brodo *et al.* 2001).

BIOLOGICAL CHARACTERISTICS

growth form	Fruticose, pendulous, filamentous.
reproductive method	Primarily asexual; via soredia and thallus fragmentation. Apothecia rare.
dispersal agents	Birds(?), wind, gravity. Limited dispersal ability.
substrate and specificity	Generalist. In northern California it is almost always found on dead twigs, and has been found on Douglas-fir, salmonberry, incense-cedar, red alder and Garry oak. At the location in Sonoma County it grows on and among dangling mats of <i>Ramalina menziesii</i> and <i>Usnea</i> sp.
habitat and specificity	Moist, cool forests within the coastal fog belt, or along the main fork of the Smith River or its major tributaries in Del Norte County. Most sites of <i>Ramalina thrausta</i> in California are in sheltered understories or other sheltered locations, usually within 100 feet of a perennial water source (Carlberg & Jennings, 2002). Five of the nine sites in California occur in late-successional or old-growth stands; a similar finding was made by Rolstad <i>et al.</i> (2001).
pollution sensitivity	Sensitive (McCune & Geiser 1997).
ecological function	Unknown.

GEOGRAPHY, GLOBAL

Ramalina thrausta has a boreal global distribution, appearing on the northern North American continent, and in Europe in Germany, Norway, Sweden and the British Isles (Stone 2003). In western North America it is found in British Columbia, Washington and Oregon, and is found as far south as central California and east into Montana (McCune & Geiser 1997; Sanders 1997). In midwestern Canada and the U.S. it occurs from the Great Lakes north to Hudson Bay. On the East Coast it appears from southern Quebec south to Newfoundland. “The species is uncommon throughout most of its distribution in North America” (Bowler 1977). In Fennoscandia it is widely distributed but nowhere common (Ahlner 1948, Krog & James 1977). The distribution follows the boreal forest in North America.

GEOGRAPHY, LOCAL

There are nine known sites of *Ramalina thrausta* in California, as defined by the rule used by the California Native Plant Society (CNPS; population sites must be $\geq \frac{1}{4}$ mile distant from each other). Eight of these are in northern Del Norte County (Figure 2). Seven are in river bottom to midslope positions along the main stem of the Smith River or its major tributaries. One Del Norte County site is on a flat ridge top which is frequently shrouded with fog, west of Rock Creek. Abundance rating for all seven river bottom sites is “rare” (<4 thalli per site; Carlberg & Jennings 2002), while the Rock Creek site has 10 -20 thalli. Several of the Del Norte County sites were revisited in 2004, and thalli of *Ramalina thrausta* were not found at two sites; see *Population trends*, below.



Figure 2: Distribution of *Ramalina thrausta* in California.

The Sonoma County site (Figure 2) is a roadside detection, and is disjunct from the Pacific Northwest distribution by approximately 230 miles. The habitat is similar, being a sheltered moist forest along the Gualala River, and within the coastal fog zone. Abundance is unknown at this site, and would be very difficult to determine, since the lichen uses mats of pendulous filamentous lichens (notably the very similar *Ramalina menziesii*) as its substrate. These mats are abundant in the lower canopy, but examination has been limited to litterfall.

For all California sites, there is a distinct possibility that numerous thalli exist in the crowns of trees above and adjacent to the understory locations where *Ramalina thrausta* was found, since the surveys during which the detections were made were all ground-based. It is also possible that this lichen is overlooked and undercollected, since it shares certain habitat aspects and can co-occur with *Alectoria sarmentosa* and *Ramalina menziesii*. The large distance between the Del Norte and Sonoma County sites adds credence to this possibility. But given the distinctiveness of the hooked branch tips, the ease with which surveyors can be trained to recognize the “hair lint” appearance of thalli from a distance, and the small number of ground detections made, it seems reasonable to assume that occupied trees are few.

Queries from the Survey & Manage component of the Northwest Forest Plan reveal 186 sites in Oregon (by the CNPS ¼ mile rule), but only three in Washington. Abundances are unknown for these sites (Derr, pers. comm.).

Table 1: Known sites of *Ramalina thrausta* in California. Alloc. = land allocation, LSR = late-successional reserve, CW = Congressionally withdrawn, unk. = unknown land allocation. UTM coordinates are Zone 10, NAD 27.

State	County	UTM E	UTM N	Alloc.	Zone	Elev. (ft)	Observer(s)	Date	Herbarium
CA	Del Norte			LSR	10	1312	S. Jovan	2002	unk
CA	Del Norte	Omitted for online version.		CW	10	280	T. Carlberg, G. Jennings	2002	UCB
CA	Del Norte			CW	10	160	T. Carlberg, G. Jennings	2002	UCB
CA	Del Norte			LSR	10	670	T. Carlberg, G. Jennings	2002	UCB
CA	Del Norte			CW	10	1040	T. Carlberg, G. Jennings	2002	UCB
CA	Del Norte			CW	10	1200	T. Carlberg, G. Jennings	2002	UCB
CA	Sonoma			unk.	10	1050	T. Carlberg	2004	hb. Carlberg
CA	Del Norte			CW	10	1312	T. Carlberg, J. Moore	2005	6R
CA	Del Norte			CW	10	950	T. Carlberg	2003	UCB

POPULATION TRENDS

Unknown. Several of the Del Norte County sites were revisited in 2004. No thalli were found at two sites - one is near a boat launch facility for the main fork of the Smith River; the other is in a scrappy stand of mixed hardwoods and conifers at a riverside flat where mining activities had taken place in historical times, and is now a casual camping pullout. Another resurveyed site had been extirpated by winter blow-down of its substrate tree (red alder), but a survey of adjacent areas turned up another occupied tree with a comparable abundance rating (<4 thalli) (Figure 3). Gain/loss in Del Norte County = eight sites minus three extirpations plus two new sites, within a period of three years. Net gain/loss = loss of 12.5%. This is a very rough estimate and may be misleading since regular monitoring has not been in place for the entire three years.

Bowler (1977) does not give abundances for North America. Other sources are too recent to

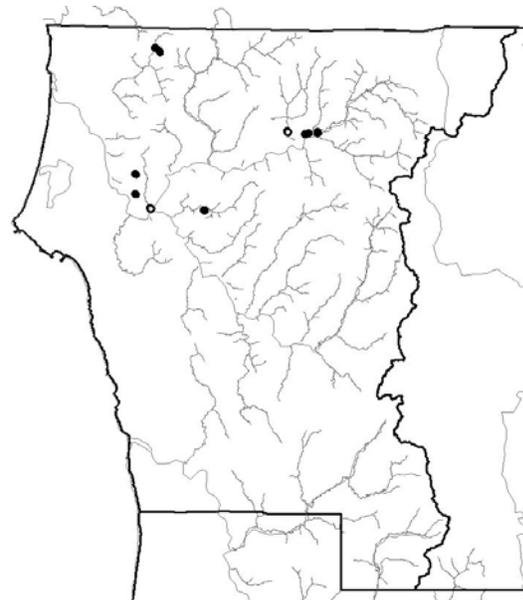


Figure 3. Extant (solid circles) and presumed extirpated (hollow circles) sites in Del Norte County.

use for assessing trends, and/or do not give abundance estimates. *Ramalina thrausta* appears to reach the southernmost limits of its range in California (Carlberg 2003).

It is possible that populations of *Ramalina thrausta* are vagrant, or opportunistic, and will regularly disappear from known locations while re-establishing themselves at new locations, either nearby or at greater distances. However, the limitations imposed by the large asexual propagules (soredia) argue against this. Research that includes monitoring of known locations is needed to ascertain whether this is part of the species' habit. Additional information is also needed to determine whether the species also inhabits the crowns of trees whose lower branches support thalli, since thalli in the crown would serve as propagule sources for recruitment.

THREATS, HISTORY

Global: "Threat in North America considered insignificant compared to that in Europe. The number of populations in Washington is small, so the loss of one would have a major impact. Sensitive to air pollution but threat in North America considered insignificant compared to that in Europe." "Decline of 10-30% in population, range, area occupied, and/or number or condition of occurrences. Decline mainly noted in Europe." (Stone 2003). The situation in California more closely parallels that in Washington, where extirpation of a single site would represent a large percentage of the total population in the state, especially since most California sites have <4 thalli present.

This lichen is sensitive to air pollution (McCune & Geiser 1997). The USDA FS National Lichens & Air Quality Database assigns RATH2 a rank of "Most Sensitive," the highest of its five rankings. It occurs sporadically and not abundantly in moist low-elevation sites, with a tendency to be found in mature forests. While large parts of the Smith River basin fall within a National Recreation Area and thus receive certain Federal protections, there is potential for air quality issues to arise, due to the restrictive geography of the river basin and the increasing visitor population in northern California.

The finding of Rolstad *et al.* (2001) and Carlberg & Jennings (2002) that *Ramalina thrausta* is found more often in late-mature and old-growth stands means that timber harvest may pose some threat, but see section on land allocations under *Protection*.

THREATS, FUTURE

Same as historical threats, since historical practices and tendencies continue today, most often with increased intensity. Impact of future threats on species viability in Del Norte County depends largely on the maintenance of Congressionally-withdrawn lands, the Late Successional Reserve system and the Wild and Scenic River designation.

PROTECTION

Del Norte County: All occurrences are on National Forest lands. Six are on lands that are Congressionally Withdrawn and two are in a Late Successional Reserve. Three sites fall within a Wild & Scenic River corridor. The land allocation of the Sonoma County site is unknown, but it is not on Forest Service, BLM, National Park or State Park lands. It is not known if the Gualala River channel has any protected status, and it seems probable that the occurrence of *Ramalina thrausta* is on and adjacent to private land. These political designations depend on prevailing administrative policies, and as of this writing, current trends are toward deregulation with low regard toward conservation.

Ramalina thrausta is regarded as Endangered in Sweden, Vulnerable in Finland and Norway (Tønsberg *et al.* 1996).

CONSERVATION SUMMARY

Ramalina thrausta has a global boreal distribution and is uncommon throughout its range. It has a scattered distribution in northern California, existing exclusively in strongly riparian areas. Populations are declining significantly in Europe (10 - 30%), and apparently declining in California with a net loss of 12.5% of sites in three-year period. Population numbers in California and Washington are very small to begin with, and any decrease can validly be viewed with alarm, while Oregon has a large number of sites. Protection of current sites in California is good, since Late Successional and Congressionally Withdrawn designations appear stable, but protection is heavily dependent on these land allocations, which are political in nature.

SPECIFIC CONSERVATION RECOMMENDATIONS

Recommended Global Rarity Rank..... G3G4

Species is broadly distributed in the Northern Hemisphere. European populations are highly threatened and are in decline. North American populations do not appear to face immediate threats to the degree that exists in Europe.

Recommended Global Threat Rank 1

Sensitive to air pollution, and habitat (forested lands) is vulnerable to human activities. Decline of 10 - 30% in Europe indicates that threats are impacting populations.

Recommended Local Rarity Rank(s) (per state) CA: S2

Small number of sites (9), small number of individuals per site (<4 individuals at seven of nine sites),

Recommended Local Threat Rank(s) (per state) CA: 1

Apparently in decline (12.5% in three years), although this figure should be viewed with caution.

Recommended List(s) (CNPS equivalent, per state) 2

Small number of sites, small number of individuals per site, limited fecundity and dispersive ability (soredia), but larger numbers of sites in a boreal distribution, and large number of sites in the Cascade and Coast Ranges in Oregon.

RELEVANT EXPERTS AND KNOWLEDGABLE LOCAL BOTANISTS

Bittman, Roxanne – CNDDDB lead botanist
California Dept Fish and Game
Wildlife & Habitat Analysis Branch
1807 13th Street Suite 2002
Sacramento, CA 95814
Phone: 916-323-8970

McCune, Bruce – Professor of ecology lichenology
Dept. Botany and Plant Pathology
Cordley 2082
Corvallis, OR 97331
Phone: 541-737-1741

Renner, Maralyn – Senior Botanist, Pacific Lumber Company,
PO Box 37
Scotia, CA 95565
Phone: 707-764-4199

STAKEHOLDERS FOR NOTIFICATION OF COMMENT PERIOD

California Dept Fish and Game
via Roxanne Bittman (as above)

California Native Plant Society
Attn: Kristi Lazar, Rare Plant Botanist
2707 K Street, Suite 1
Sacramento, CA 95816-5113

Six Rivers National Forest:

Attn: Lisa Hoover, Forest Botanist
1330 Bayshore Way
Eureka, CA 95501

Bureau of Land Management, Arcata Field Office
Attn: Jennifer Wheeler, Botanist
1695 Heindon Road
Arcata CA 95521

Redwood National and State Parks
Attn: Leonel Arguello, Supervisory Botanist
1111 Second Street
Crescent City, CA 95531

Pacific Lumber Company
via Maralyn Renner (as above)

Simpson Timber Company
Attn: Cherie Sanville, Senior Botanist
P.O.Box 1089
Arcata, CA 95518

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