

***Collema curtisporum* Degel. in Riparian Forests of Northern Idaho**

Jenifer L. Hutchinson and Bruce P. McCune

Oregon State University
Department of Botany and Plant Pathology
Corvallis, OR 97331

Abstract

Collema curtisporum Degel. is an epiphytic lichen with disjunct populations in the Pacific Northwest and Scandinavia. Prior to this study, *C. curtisporum* was considered rare in northern Idaho. Riparian forests of the Idaho Panhandle were searched for *Collema curtisporum* during the summer of 1999. *Collema curtisporum* occurred on twenty-one of the eighty-one 0.4 ha plots surveyed in the study area. Additional information on locations of *C. curtisporum* was gathered through herbarium and literature searches. The core distribution of *C. curtisporum* in North America is riparian forests in northern Idaho. *Collema curtisporum* is found most frequently on large *Populus balsamifera* ssp. *trichocarpa* (black cottonwood) in frequently inundated floodplains. The primary threat to *C. curtisporum* is loss of habitat through loss of natural flood cycles, which facilitate the regeneration of riparian cottonwood forests.

Introduction

The lichen, *Collema curtisporum* Degel., has a disjunct distribution consisting of European populations and populations in the Pacific Northwest (PNW) of the United States. The European populations occur in Sweden, Finland, and Norway with one report from Austria and another from Italy (Toosberg et al. 1996). In the PNW, most of the populations occur between the Cascade Range and the continental divide in Washington, Oregon, Idaho, and Montana, with one report from the Alaskan peninsula.

When this study was initiated, the state of Idaho considered *C. curtisporum* a priority 1 species, meaning that there are 5 or fewer documented occurrences in the state. *Collema curtisporum* was globally ranked by the Idaho Conservation Data Center (ICDC) as G1, meaning that there are 5 or fewer known occurrences worldwide.

Collema curtisporum is ranked by the Idaho Bureau of Land Management (BLM) as a sensitive species, which are either under status review by the United States Fish and Wildlife Service (USFWS), or with numbers declining so rapidly that federal listing may become necessary, or with typically small and widely dispersed populations, or inhabiting refugia, or other specialized unique habitats (BLM 1988). The United States Forest Service (USFS) considers *C. curtisporum* a sensitive species in Region 1. United States Forest Service sensitive species are those that have been determined by the Regional Forester for which viability is a concern, as evidenced by significant current or predicted downward trends (USFS 1995). The Natural Heritage Program in Oregon and Montana consider *Collema curtisporum* rare. It is not listed in Washington, though the type specimen for North America is from Washington, near Goldendale. *Collema curtisporum* is endangered in Sweden, Finland and Norway.

The objectives of this project were to understand the extent and number of the populations found in northern Idaho, gather information on site characteristics and vegetation where it was found, visit areas where *C. curtisporum* is known to occur, and locate additional populations through fieldwork and contacting herbaria. Based on this information, we summarize the distribution and abundance of the species, and describe management problems associated with it.

Methods

Collections were searched online using the Lichen Information System for European specimens and for specimens outside the PNW (<http://lis.freeweb.supereva.it/environ.htm?p>). Local herbaria were searched on site, these included Oregon State University and B. McCune's research herbaria. We also checked collections at the University of Washington, University of

British Columbia, Smithsonian, University of Colorado at Boulder, the British Museum of Natural History, University of Helsinki, and the University of Idaho herbaria. Regional experts (Doyle Anderegg, Bruce McCune, Roger Rosentreter, Trevor Goward, John Davis, Ann DeBolt, and Peter Neitlich) sent information from personal collections via E-mail. We compiled two databases: an historic database, which includes all known records of *C. curtisporum* in North America as well as European records, and a database including all of the information collected during our 1999 surveys. The databases are in Microsoft Access Version 2.00 (Microsoft Corporation 1989-1994).

Collema curtisporum was studied in conjunction with a larger project that included a suite of 17 rare lichens known or suspected to occur in riparian forests of northern Idaho that had a hardwood component of alder, birch, or cottonwood. The study area encompassed all of Idaho north of the latitude 45 degrees 45 minutes. This included the area north of Whitebird (from the Salmon River) to the Canadian Border, bordered by Washington on the west and Montana on the east.

The area was stratified into nine geographic regions with three stream order classes and three replicates in each stream order class in each region. This yielded eighty-one plots. Plot selection criteria were developed to allow for sampling of most riparian forests that had a hardwood component and to allow for a selection of sites that would be scattered throughout the region rather than clumped in one area. Field sampling followed the Forest Health Monitoring Protocol (McCune, et al. 1997) with the exception that the plot was a flexibly-shaped polygon of approximately 4000 square meters. Tree ages were not taken, due to the indistinct rings in black cottonwood. Tree life stages were recorded by growth form instead. If the tree had a flexible main stem, it was determined to be a sapling, if the top was still growing and had few dead branches, it was determined to be mid-seral, and if it had dead limbs in the upper quarter, it was determined to be late-seral. For a more detailed description of field and data analysis methods, see Hutchinson and McCune (2000).

Species Description. *Collema curtisporum* (jelly lichen or short-spored jelly lichen) is a nitrogen-fixing cyanolichen found in riparian forests. The thallus is foliose to 2(4) cm broad, color olive green to blackish when wet or dry, gelatinous and somewhat transparent when wet, small with broadly rounded lobes, isidia and soredia lacking, but pustulate (bumpy) and ridged; apothecia 0.5 to 1.5 mm diameter when moist; spores 4-celled (sometimes 5 or 6-celled), 20-40 μm long x (2.5) 3-4. μm wide, with bluntly tapered ends, slightly thicker in the center than at the ends, often slightly curved to somewhat flexuose and colorless (Degelius 1954).

In the PNW, *Collema nigrescens* is virtually identical to *C. curtisporum* in outward appearance. The definitive difference is that *C. curtisporum* has very short narrow spores as compared to *C. nigrescens* (Goward et al 1994, McCune and Geiser 1997, Degelius 1954). In addition, the thallus of *C. curtisporum* is slightly darker and thinner (65-106 μm when moist) than that of *C. nigrescens*, which is 90-150 μm thick when moist (Degelius 1954, 1974).

Results and Discussion

Distribution and Habitat. Outside the Pacific Northwest (PNW), *Collema curtisporum* is known only from Sweden, Finland, Norway, Italy, and possibly Austria (see Degelius 1974). All of the European locations cited by Degelius (1954) were in the high mountains. Three of the locations were near waterfalls or rapids, and were very moist places. Degelius (1954) determined *C. curtisporum* to be a rare species and noted that it was sparse in its localities. A more recent review (Tønsberg, et al. 1996) noted that the highest regional abundance in Europe is probably Jokkmokk, in northern Sweden, which has 50 known localities., Tønsberg et al. (1996) also noted

that *C. curtisporum* was found in very moist places. In Jokkmokk, *C. curtisporum* grows exclusively on *Populus tremula*. Associated epiphytic species for the European collections were *Collema furfuraceum*, *Leptogium saturninum*, *Lobaria pulmonaria*, *Pannaria conoplea*, *Parmelia sulcata*, and *Physcia aipolia*. Crustose associates included *Caloplaca cerina* and *Ochrolechia pallescens*.

In the PNW, *C. curtisporum* is found between the Cascade Mountains and the Continental Divide, south of the U.S.- Canadian border and north of the Snake River Plain, with an additional population at the Alaskan Peninsula National Wildlife Refuge. Most of the material found during the 1999 field season came from the northern part of the Idaho panhandle, along the St. Maries River starting near Clarkia, and north throughout the Coeur d'Alene drainage. We, and others, have found *Collema curtisporum* as far north as Priest Lake in Idaho and others have found it in Glacier National Park in Montana, in the continental United States. No populations of *C. curtisporum* have been verified from British Columbia, as none of the potential specimens have had apothecia bearing spores (Trevor Goward, pers. comm.). Almost certainly, however, it will be found in southern British Columbia.

Collema curtisporum has been collected in Oregon east of the Cascades; twice in the Wallowa Mountains, once in Jefferson County near Sisters, and once in Linn County. The type specimen for North America was taken on the east side of the Cascades near Goldendale, Washington. Additional collections were taken from extreme eastern Washington, southwest of Priest Lake, Idaho in Pend Oreille County. Ten collections have been made in western Montana, one collection from the Alaskan peninsula, and 24 collections from northern Idaho. "Collections" are specimens collected by individuals regardless of whether the location has been collected from repeatedly. For example, two different collection numbers from the same area by the same person are considered two collections. Many of the collections from Norway come from the same locale. The same is true of the North American collections. See Table 3.1 for descriptions of all known sites.

In the PNW, *C. curtisporum* is most frequent on *Populus balsamifera* ssp. *trichocarpa* in riparian forests known to experience occasional flooding. *Collema curtisporum* has been found in a *Pinus ponderosa*-*Quercus garryana* stand, on a *Populus* sp., and once on *Pseudotsuga menziesii*, by others. However, *Collema curtisporum* is almost always found on black cottonwood, or on trees and shrubs growing with black cottonwood.

Its core distribution, in North America, appears to be riparian forests at mid to high elevations in northern Idaho (McCune and Goward 1995, McCune and Rosentreter 1998). Elevations for the Idaho sites at which we, and others, have found the species range from 629 meters to 1114 meters. The range of *C. curtisporum* extends into eastern Washington, central and northeastern Oregon, and western Montana (McCune and Geiser 1997) where it possibly has an affinity for higher elevations (greater than 900 meters, but less than 1500 meters). The location for *C. curtisporum* in Alaska is anomalous at 30 meters. However, all of these sites have *Populus balsamifera* ssp. *trichocarpa* (black cottonwood) present.

Several other riparian lichen species frequently found with *C. curtisporum* are *Collema furfuraceum*, *Leptogium saturninum*, and *Lobaria hallii* (McCune and Geiser, 1997). During the 1999 summer field season, we found *Collema furfuraceum* and *L. saturninum* on a variety of hardwood trees and shrubs. We found that *Lobaria hallii* was more common in riparian forests that had black cottonwoods, but was found on conifers and shrubs associated with black cottonwood.

Table 3.1. *Collema curtisporum* locations.

Entry	St	Cnty,Reg	Location	Lat (N)	Long	Comments/ UTM	Substrate	Habitat	Elev (m)	Collector	CollNo	Date	Herb.
USA	AK		Alaska Peninsula NWR: Mother Goose Lake	57.18	157.27 W		POPTRI bark	POPTRI/AL S/Salix ~0.5 k from lakeshore	30	Neitlich & Hasselbach	1271		MCC
USA	ID	Idaho	Wendover CG	46.51	114.78 W		POPTRI	Bog	998	J. Hutchinson	ID611	7/4/99	
USA	ID	Clearwater	Cold Ck CG	46.72	115.30 W		POPTRI	Wetland	810	J. Hutchinson	ID-612-03	7/9/99	OSC
USA	ID	Clearwater	Near Cedars CG	46.87	115.08 W		POPTRI	Seasonally Wet	1114	J. Hutchinson	ID-623-06	7/12/99	OSC
USA	ID	Shoshone	Rd 301/east of 47 Bridge at jet w/1905	47	116.17 W		POPTRI	Creek	937	J. Hutchinson	ID533	7/15/99	
USA	ID	Latah	Rd 447, N of Clarkia	47.06	116.33 W		POPTRI	Creek	835	J. Hutchinson	ID-433-01, ID-433-02	7/21/99	SRP, OSC
USA	ID	Benewah	N of 6/3 jet, 1 km S of Mashburn Sta.	47.18	116.5 W		POPTRI	River	786	J. Hutchinson	ID-413-11	7/21/99	SRP, OSC
USA	ID	Shoshone	Huckleberry CG/Hwy50	47.27	116.09 W		POPTRI	River	692	J. Hutchinson	ID811	7/23/99	

Table 3.1. *Collema curtisporum* locations, continued.

Entry	St	Cnty, Reg	Location	Lat (N)	Long	Comments/ UTM	Substrate	Habitat	Elev (m)	Collector	CollNo	Date	Herb.
USA	ID	Shoshone	Big Fish Bridge, E of St. Joe	47.31	116.35 W		POPTRI	River	673	J. Hutchinson	ID711	7/23/99	
USA	ID	Benewah	Lake Chacolet, Hwy 5	47.35	116.7		POPTRI	Lakeshore	650	J. Hutchinson	FP171	8/9/99	
USA	ID	Kootenai	Off FS208, approx. 5 mi N of Pritchard	47.71	115.97 W		POPTRI	Creek	760	J. Hutchinson	ID-822-03	7/24/99	SRP, OSC
USA	ID	Kootenai	Just E of Honeysuckle CG	47.73	116.47 W		POPTRI	Creek	834	J. Hutchinson	ID-722-04	7/30/99	OSC
USA	ID	Kootenai	E of Trestle Ck	47.75	116.43 W		POPTRI	River	858	J. Hutchinson	ID723	7/30/99	
USA	ID	Kootenai	FS206, approx. 3 miles E of Hayden Lk	47.8	116.64 W		POPTRI	Creek	784	J. Hutchinson	ID-731-02	7/29/99	SRP, OSC
USA	ID	Kootenai	FS412 N of Berlin Flats	47.82	115.96 W		POPTRI	Creek	884	J. Hutchinson	ID833	7/25/99	
USA	ID	Kootenai	Near Big Hank CG	47.82	116.09 W		POPTRI	River	822	J. Hutchinson	ID813	7/25/99	
USA	ID	Kootenai	FS208 N of Big Hank CG	47.88	116.11 W		POPTRI	Creek	852	J. Hutchinson	ID832	7/25/99	

Table 3.1. *Collema curtisporum* locations, continued.

Cntry	St	Cnty,Reg	Location	Lat (N)	Long	Comments/ UTM	Substrate	Habitat	Elev (m)	Collector	CollNo	Date	Herb.
USA	ID	Bonner	Johnson Creek CG, W of Clark Fork	48.14	116.23 W		POPTRI	River	629	J. Hutchinson	ID913	8/3/99	
USA	ID	Bonner	NW of Clark Fork	48.15	116.19 W		POPTRI	Creek	633	J. Hutchinson	ID922	8/2/99	
USA	ID	Bonner	Priest Lake	48.74	116.85 W		POPTRI	Lake Margin	746	J. Hutchinson	ID931	7/31/99	
USA	ID	Bonner	Trail to Upper Priest Lake	48.8	116.91		POPTRI	Lake Margin	748	E.Martin	FP192	8/15/99	
USA	ID	Shoshone	14 k N of Wallace, mouth of Beaver Ck at Trail Ck	47.6	115.93 W		POPTRI	Floodplain	1065	B.McCune	16519	8/1/87	MCC
USA	ID	Kootenai	N Coeur d Alene R mouth of Leiberg Ck	47.72	116.38 W		POPTRI	Floodplain	700	B.McCune	21082	9/1/93	MCC
USA	ID	Bonner	Tripod Point, Priest Lake	48.72	116.85 W		POPTRI	On shoreline of Priest lake	747	D.Penny		6/20/97	OSC
USA	ID	Bonner	North End of Priest Lake N	48.73	116.85 W		Populus Bark	Mixed TSHE/THP L	747	R. Rosentreter	9667	8/1/95	RR

Table 3.1. *Collema curtisporum* locations, continued.

Country	State	County/Reg	Location	Lat (N)	Long	Comments/UTM	Substrate	Habitat	Elev (m)	Collector	CollNo	Date	Herb.
USA	MT	Lake	Swan River, Pt. Pleasant Camp	47.82	113.83 E		POPTRI	Floodplain	944	B. McCune	9128	8/24/77	MCC
USA	MT	Lake	Near Pt. Pleasant CG	47.82	113.83 W		Crataegus bark	Floodplain	944	B. McCune	9132	9/2/77	MCC
USA	MT	Lake	Swan Lake	48.06	114.03 W		POPTRI	Lakeshore	935	B. McCune	9558	7/23/78	MCC
USA	MT	Flathead	Mouth of Logan Creek, Glacier NP	48.63	113.87 W		POPTRI	Floodplain	1075	B. McCune	12369	7/23/82	MCC
USA	MT	Flathead	East end of McDonald Lake, Glacier NP	48.65	113.87 W		POPTRI	Lakeshore	960	B. McCune	12374	7/23/82	MCC
USA	MT	Flathead	Glacier NP, nr Lake McDonald Lodge			N. 5388 E.291	POPTRI	Lakeshore	1050	A. DeBolt	436	10/20/84	RR
USA	MT	Glacier	Glacier NP, Lost Lake				POPTRI	Lakeshore	1440	A. DeBolt	592	7/26/86	RR
USA	MT	Flathead	Glacier NP, Logan Ck				POPTRI	Creek	1080	A. DeBolt	587	7/26/86	RR
USA	MT	Lake	Swan River				POPTRI	River	990	R. Rosentreter	3212	7/7/83	RR
USA	MT	Flathead	Noisy Ck, Swan Mtns				PSME	PSME forest	1400	R. Rosentreter	2058	6/26/81	RR

Table 3.1. *Collema curtisporum* locations, continued.

Cntry	St	Cnty, Reg	Location	Lat (N)	Long	Comments/ UTM	Substrate	Habitat	Elev (m)	Collector	CollNo	Date	Herb.
USA	OR	Linn	Hwy 20	44.43	121.91		POPTRI	Lakeshore	1216	J. Hutchinson	FP211	11/23/99	
USA	OR	Wallowa	Wallowa River, upstream from Wallowa Creek	45.28 N	117.21 W		POPTRI	River margin	1345	McCune, B.	23963	12/1/97	MCC
USA	OR	Wallowa	Lostine R., near Pole Br. Picnic Area	45.40 N	117.43 W		POPTRI	Floodplain	1250	McCune, B.	21733	8/1/94	MCC
USA	OR	Jefferson	First Creek, Deschutes NF, Sisters District				POPTRI	PIEN/ABG R/POPTRI	1280	Geiser & Hutchinson		6/1/95	
USA	WA	Pend Oreille	Boswell Ranch	48.35	117.05		POPTRI	Wet Meadow	739	J. Hutchinson	FP391	8/11/99	
USA	WA	Klickitat	Klickitat				Populus sp.	Ponderosa		H.K. Goree		1969	S
NOR		Buskerud,	Holet, NE of	60.6	8.32 E		Trunk of an		780	R. Haugan	L26183	10/6/96	O
NOR		Buskerud, Hol	FHI N of Hol Churchd, N of Rue	60.6	8.35 E		Trunk of an old Populus tremula		830	R. Haugan	L26164	10/5/96	O
											L26222		O

Table 3.1. *Collema curtisporum* locations, continued.

Country	State	County, Reg.	Location	Lat (N)	Long	Comments/UTM	Substrate	Habitat	Elev (m)	Collector	CollNo	Date	Herb.
NOR		Buskerud, Hol	Holet, SW-facing slopes above the farms Ovremyro and Nedremyro	60.62	8.30 E		Trunk of an old Populus tremula		740	R. Haugan	L26191 L26195 L26918	10/6/96	O
NOR		Buskerud, Hol	N of Hol, NE of Rude	60.62	8.35 E		Populus tremula		800	T. Tonsberg	L36987 L36988 L36989 Inv3620	7/4/92	BG
NOR		Buskerud, Hol	langs en saetervei nord for Neral	60.63	8.30 E		Populus		850	B. Lyng	L11266 L12638 L12886	7/1/15	O
NOR		Buskerud, Hol	N of Holsfjorden, N of Hagen	60.63	8.30 E		Populus tremula		850	T. Tonsberg	L36986 Inv16	7/3/92	BG
FIN			Kutsa				Trunk of dry piece	north side of waterfall		Lehtonen & Pankakoski		1937	?
FIN			Ostrobottnia borealis				Populus tremuloides			Rasanen		1915	H
FIN			Syvalahti				Populus tremuloides			Rasanen		1915	H

Table 3.1. *Collema curtisporum* locations, continued.

Entry	St	Cnty, Reg	Location	Lat (N)	Long	Comments/ UTM	Substrate	Habitat	Elev (m)	Collector	CollNo	Date	Herb.
ITA			1 location			The Lichens of Italy. Monografie di Museo Regionale di Scienze Naturali, Torino 12. Torino MRSN Italy				P.L. Nimis			
NOR		Oppland, Ringebu	Soraa ved Halvfaret			NP 649 260 (map 181 III)			480	G. Gaarder	L11267	6/27/92	O
NOR		Oppland, Vang	Oye, in the slope SW of Eihun			MN 670-671 818-819 (map: tremula 1517 II)	Old Populus tremula	NE-facing old Spruce forest	580	E. Timdal	L25167	8/6/97	O
SWE		Jamtland Asele	Vilhemena,				Picea twig	Waterfall		Ahliner		1937	S
SWE		Lappmark.	Dimforsen				Picea twig	by rapid		Ahliner		1937	S
SWE		Jamtland					Betula	Betula Picea Forest		Degelius		1953	S
SWE		Jamtland					Sorbus aucaup.	dense mixed forest between waterfalls		Degelius		1953	S

Table 3.1. *Collema curtisporum* locations, continued.

Cntry	St	Cnty,Reg	Location	Lat (N)	Long	Comments/ UTM	Substrate	Habitat	Elev (m)	Collector	CollNo	Date	Herb.
SWE		Jamtland					Betula, Picea, Sorbus	Waterfall	580	Du Riez		1913	S
SWE		Jamtland. Are: Tannforsen								Hakelær		1964	
SWE		Jamtland											
SWE		Jokkmokk	50 locations				Picea twig	Waterfall		Hasselrot Karstrom		1937 6/14/05	S
						Stegat føre i det glomda landet. Svensk bot. Tidskr. 86: 115-146							
SWE		Pite Lappmark Arjepluog	Arjepluog									1919	GB
							Betula			Stenholm			

Legend: Cntry = country, Cnty = county, Reg = region, Lat = latitude, Long = longitude, Elev = elevation, CollNo = collection number, Herb. = herbarium, POPTRI = *Populus trichocarpa*, PIEN = *Picea englemannii*, ABGR = *Abies grandis*, PSME = *Pseudotsuga menziesii*

Stand Characteristics. Prior to our summer 1999 fieldwork, we contacted botanists familiar with the Idaho panhandle regarding possible vascular plants that might indicate appropriate habitat for *C. curtisporum*. One list consisted of species that might be associated with a particular wetland type. For example, *Lysichitum americanum* tends to be found in wooded wetlands, while *Typha latifolia* tends to be found in standing water in disturbed areas (Guard, 1995). Tree and tree-like shrubs were included on the list, as well as the following vascular plants: *Gymnocarpium dryopteris*, *Lysichitum americanum*, *Sphagnum* (almost 100% or with vascular plants), *Nuphar polysephalum*, *Polygonum amphibium*, *Typha latifolia*, *Scirpus* sp., misc. aquatic plants, and *Menziesia ferruginea*. *Gymnocarpium dryopteris* and *Menziesia ferruginea* were present at many of the survey sites, and not always found on the sites with *C. curtisporum*. There was no association between any of the indicator species and *C. curtisporum* that would allow us to predict the presence of *C. curtisporum* on the basis of the presence or absence of the wetland indicator species.

Flood disturbance is important in the establishment of cottonwood seedlings, and there are many disturbances, human and otherwise in riparian zones. Another list consisted of vascular plants that should indicate disturbance: *Senecio jacobea*, *Centaurea solstitialis*, *Tanacetum vulgare*, *Poa pratensis*, *Phleum pratensis*, *Centaurea maculosa*, and *Bromus inermis*. *Centaurea maculosa* was found on almost every site we surveyed.

Most of the stands that we sampled in northern Idaho with *C. curtisporum* (84%) had both conifers and hardwoods. All of the stands with *C. curtisporum* had black cottonwood, and all had trees that were primarily in the mid-seral growth form, which meant that the top was still growing, but had a few dead branches. The average of the most typical dbh for black cottonwoods on plot with *C. curtisporum* was 51 cm (20"). The largest average dbh was 106 cm (42") for black cottonwoods on plots with *C. curtisporum*. The average of the most typical dbh for conifers on plots with *C. curtisporum* was 29 cm (11.6"). The average largest dbh was 54 cm (21.6") for conifers on plots with *C. curtisporum*. The average canopy cover was 24% for plots with *C. curtisporum*. The average relative basal area for hardwoods on plots with *C. curtisporum* was 53%. The average relative basal area for conifers was 22% on plots with *C. curtisporum*.

Associated trees in the PNW include: *Populus balsamifera* ssp. *trichocarpa*, *Abies grandis*, and *Picea engelmannii*. Epiphytic macrolichens that commonly grow with *C. curtisporum* include: *Collema furfuraceum*, *Leptogium saturninum*, *Lobaria pulmonaria*, *Lobaria hallii*, *Nephroma resupinatum*, *Nephroma helveticum*, and *Physconia americana*.

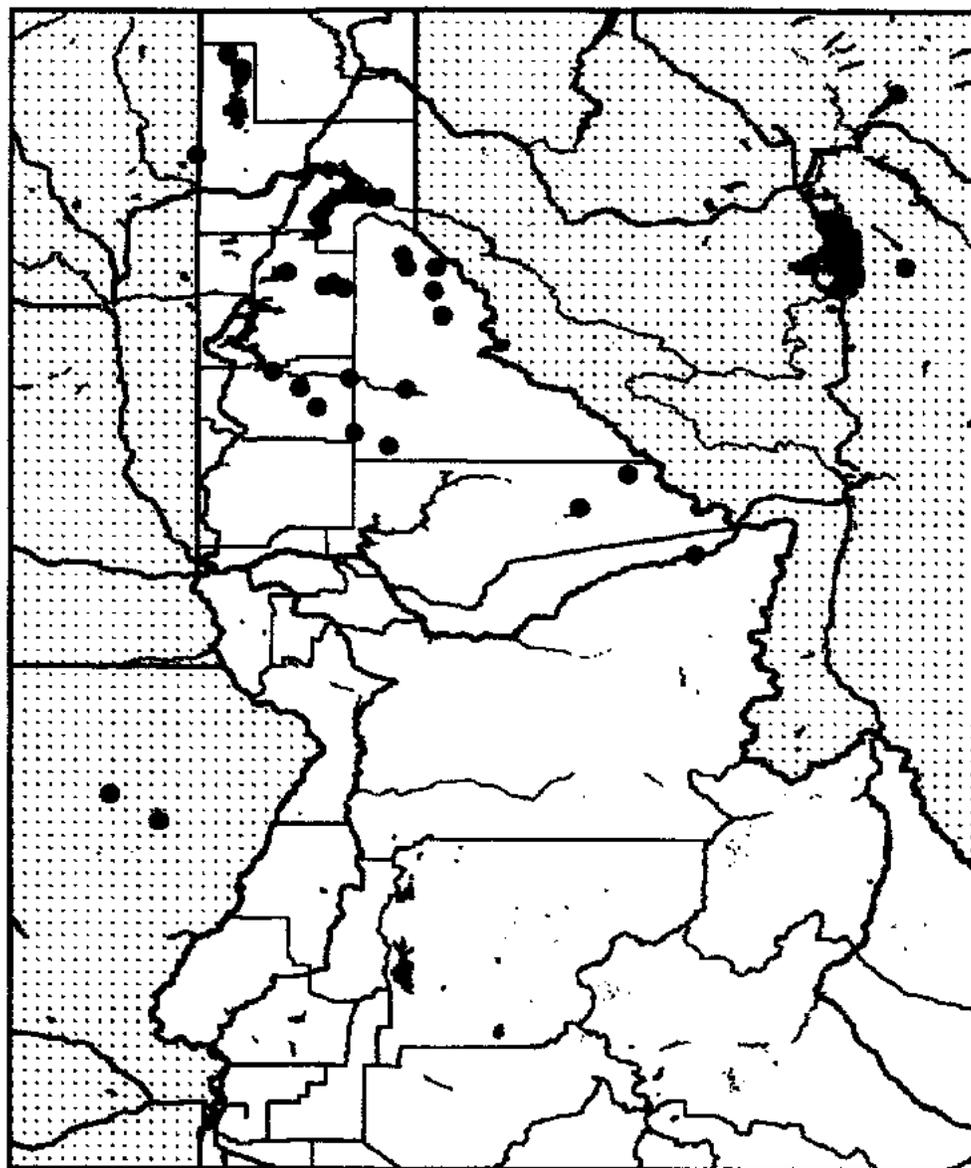
Disturbance history. Disturbance may play a role in the establishment of *C. curtisporum*. *Collema curtisporum* grows exclusively on *Populus tremula* in Sweden (Tønsberg et al. 1996). The abundance of *P. tremula* is probably the result of stand-replacing fires and the richer populations of *C. curtisporum* in Sweden were found in areas that had fires (Tønsberg, et al. 1996).

Cottonwood (*Populus balsamifera* ssp. *trichocarpa*) galleries are composed of crescent-shaped bands of different aged trees, the youngest usually being closest to the river and the oldest being the farthest from the river, but still on the floodplain. Black cottonwoods establish on riverbanks where silt has been recently deposited (Rood and Mahoney 1993, Rood, et al. 1994). It is possible that there is a correlation between the presence of *C. curtisporum* and occasional flooding within the black cottonwood gallery forests of Idaho, though no direct measurement of seasonal flooding was made during our 1999 survey (Hutchinson and McCune 2000). *Collema curtisporum* is associated with rivers that have floodplains on both sides (Indicator Species Analysis, $p = 0.085$ from a Monte Carlo Test). It is likely that forests on broad floodplains have

longer periods of inundation during spring flooding than forests found on other floodplain cross-section types, and maintain higher water tables than forests with other cross-section types. Rivers with floodplains on one side also had approximately twice the average basal area in cottonwoods of rivers with floodplains on both sides and about three times the average basal area of rivers with no floodplain. It may be *C. curtisporum* is associated with rivers on both sides simply because cottonwoods have a greater presence there, or because the microclimate found in riparian forests on broad floodplains is moister and *C. curtisporum* is possibly most successful in moist microclimates.

Is the species rare? Whether a species is considered rare depends on how one defines “rare.” According to the Idaho Conservation Data Center (ICDC), five or less documented occurrences are considered critically imperiled. From our fieldwork and other documented occurrences, we now know that there are 25 reports of *C. curtisporum* in Idaho. This would be considered rare, but not immediately threatened by the ICDC. If one considers the species in terms of Rabinowitz's seven forms of rarity (1981), *C. curtisporum* can be considered widespread with narrow habitat specificity and small population size in northern Idaho. For northern Idaho, within the area from the St. Maries River, western half of the St. Joe, along the Coeur d'Alene River, north to Hayden Lake, east to Pritchard and in the Clark Fork delta, *C. curtisporum* is fairly frequent within black cottonwood gallery forests (Figure 3.1). However, the species in northern Idaho is apparently restricted to floodplains with black cottonwood, and occurred in only 23% of the plots, though 79% of the plots supported black cottonwood. These Idaho populations form the core of the species range in North America. The risk of extinction in Idaho and the PNW is fairly low, given the recognition of the ecological value of riparian areas (Kauffman, et al. 2001, Gregory, et al. 1991), wetland laws (Lewis, et al. 1995, Gregory 1997), and forest practice rules (FEMAT, 1993). However, the species should remain ranked with the ICDC because of its narrow habitat specificity and relatively low number of known occurrences.

Figure 3.1. *Collema curtisporum* locations in northern Idaho and the surrounding area.



Is the species important? *Collema curtisporum* could be an important indicator of the health of riparian gallery forests. In the PNW, *Collema curtisporum* has been found only on mid- to late-seral black cottonwood in seasonally inundated floodplains east of the Cascades, which suggests that *C. curtisporum* may indicate the presence of natural fluvial processes that lead to the formation of the black cottonwood floodplain forests. The Idaho populations are taxonomically important because they form the core of the global distribution in North America. Disjunct populations are likely to be genetically distinct, possibly diverging toward separate species (Kruckeberg and Rabinowitz 1985). *Collema curtisporum* undoubtedly contributes some nitrogen to the system, although it is small and contributes little biomass to the riparian forest system. The importance of unstratified lichens as nitrogen-fixers in riparian forest ecosystems (or any ecosystem) is largely unstudied. Cyanolichens are known to be sensitive to air pollution, primarily sulfur dioxide (Hutchinson et al. 1996, Denison et al. 1977). *Collema furfuraceum* (which, like *C. curtisporum*, is in the nigrescens taxonomic group) is considered sensitive to air pollution in the PNW (Hutchinson et al. 1996, Geiser and McCune 1997). Heavy metals especially lead and zinc are also extremely toxic to lichens in general (Nieboer et al. 1978).

Nonvascular epiphytes “see” the environment differently than vascular plants (McCune & Antos 1982, Rhoades 1995), because they are less protected by complex tissues and organs. They lack the protective waxy cuticle of vascular plant species, for example. Recent and ongoing research is revealing a strong connection between riparian forests and the nitrogen-fixing species or cyanolichens (Rosso 2000, Sillett & Neitlich 1996), some of which are of primary importance in the President's Forest Plan. Nonvascular species are also the proverbial canary in the coalmine, in that they are sensitive detectors of environmental quality, particularly of air quality .

Status summary and management recommendations. *Collema curtisporum* in northern Idaho is primarily associated with black cottonwood on rivers with floodplains on both sides. While humidity from stream run-off may create good conditions for *C. curtisporum*, conservation of *C. curtisporum* depends on primarily on healthy riparian forests with black cottonwood. It is reasonable to manage for maintenance of mature black cottonwood stands and clean air, rather than to manage *C. curtisporum* as a single species.

A large and growing body of evidence shows that black cottonwood forests can be maintained only through natural flood regimes (Rood & Mahoney 1993, Rood et al. 1994). Special attention should be given to water release timing from dams based on natural cycles rather than human needs or convenience. While dams may temporarily favor old growth black cottonwoods, regeneration is extremely reduced without natural flood regimes. Removal of any dams that are not profoundly essential to the comfort and well being of a large number of PNW residents would be beneficial for regeneration of black cottonwood galleries, consequently providing future habitat for *C. curtisporum*.

Riparian forests are important in other ways besides habitat for plants and lichens. Riparian forests act as the link between terrestrial and aquatic habitats. Nutrients are taken up by riparian vegetation and stored for slow release, versus the pulses of organic matter and nutrients that would occur without it. Riparian forests not only store nutrients and stop erosion, they also slow river speed where the water contacts the forest. Slower water speeds at peak flow can greatly decrease the negative effects of flooding, such as bank erosion. Riparian forests provide shading, which acts to cool water, and large woody debris creates both aquatic and terrestrial habitats for wildlife (Gregory, et al. 1991, Kauffman et al. 2001). Cooler water with less nutrients in solution, adds up to water with a higher oxygen holding capacity than warm nutrient rich water (Gilliam 1994). As any trout fisherman can tell you, fish like well oxygenated water with cover, where they don't have to work hard to feed. Salmon fishermen will tell you that salmon like much the same, though salmon use well-oxygenated pools more for holding (rest) than they do

for feeding. More than 90% of documented extinction or declines of salmon stocks in the PNW have been associated with habitat degradation (Gregory and Bisson 1997). Habitat alteration occurs on both short-term, localized scales and on long-term large scales. Habitat can be destroyed through diking, filling, land draining, channelization and stream rerouting, all of which also destroy cottonwood floodplain forests. Salmon habitat alteration is based on the destruction of riparian and floodplain forests, which include loss of pools, large woody debris, side channels and other lateral habitats or floodplains. Alteration of ecosystem processes, such as hydrologic regimes, delivery of sediment and thermal loading, and structure, may influence habitat conditions over large areas for long periods of time.

We recommend the following actions to help minimize the need for future listing of *Collema curtisporum* under the Endangered Species Act:

1. Ban or restrict urban and residential growth within the 100-year floodplain.
2. Restrict firewood cutting within the riparian corridor to encourage large diameter black cottonwood and conifers.
3. Impose heavy fines on industrial pollution. Examples are air pollution from smelters and coal-fed power plants, and water pollution from paper mills and mining activities.
4. Encourage the growth of cottonwood galleries as a method of reducing flood impacts. This can be done using agricultural incentives, such as compensation for maintaining riverbanks using natural vegetation such as black cottonwood.
5. Allow flooding and other natural disturbances within the northern Idaho river systems to occur and thus encourage black cottonwood communities at all stand ages.
6. Discourage diking, channelization, and draining of wetlands in favor of alternative less destructive uses for the land.
7. Avoid mitigation (which is basically a manmade wetland that "replaces" the natural wetland) in favor of maintaining natural wetlands whenever possible.
8. Educate the public on using natural flood control and promote the idea that healthy riparian zones are important in maintaining quality of life for humans as well as native plants and wildlife.
9. Establish long term monitoring sites:
 - a. To determine whether or not *C. curtisporum* can persist as old overstory cottonwoods die and are replaced by other species.
 - b. To determine whether there is predation on *C. curtisporum*.
 - c. To determine whether populations of *C. curtisporum* change with variations in climate.

Possible monitoring sites.

1. St. Maries River south of the town of St. Maries along Saint Maries River Road. This area is near the confluence of the St. Maries River and the St. Joe River. There are stands of very large old cottonwoods that are subject to flooding which are on state land. A small parcel of land closer to St. Maries is accessible by boat and is BLM land (T46N, R2W, section 2) that might also be appropriate.

2. The St. Joe River, from east of Calder to Avery, has small parcels of BLM land that might be suitable monitoring areas. The St. Joe seems like it would be a good candidate for becoming a wild and scenic river.
3. The Coeur d'Alene National Forest along the North Fork of the Coeur d'Alene River from Honeysuckle Campground to the confluence of Leiberg Creek with the North Fork of the Coeur d'Alene is another possible monitoring site. With its long history of mining and logging, this area could use some administrative designation that would encourage projects to restore natural stream channels and reduce runoff.

Summary

The objectives of this project were to understand the extent of the populations of the 17 target species of rare riparian lichens in northern Idaho, and to gather information on site characteristics and vegetation where the target species were found. We described lichen communities on trees in riparian forests, particularly *Populus balsamifera* ssp. *trichocarpa* (black cottonwood) forests.

The climatic affinities of lichen communities vary geographically and with respect to elevation in northern Idaho. Lichen communities differ strongly among regions in northern Idaho. Lichen communities also differ among stream cross-section types, and in relation to overstory compositions as reflected by percentage of basal area in hardwoods.

The Idaho panhandle is floristically diverse not only for vascular plants, but also for epiphytic lichens. We found 126 epiphytic lichen species in the riparian forests of northern Idaho. Some species, such as *Collema occultatum* and *Nephroma laevigatum*, were new reports for the region. Many species found on the west side of the Cascades also live in the riparian forests in northern Idaho. Herbarium searches and fieldwork showed that *Pseudocyphellaria anomala* is quite rare in northern Idaho. *Pseudocyphellaria anthraspis* is locally abundant in the Lochsa-Selway drainage, but is at the east edge of its range in northern Idaho.

Some target species were not found in northern Idaho, such as *Menegazzia terebrata*, which is not known east of the Cascades and *Hypogymnia oceanica*, which has not been found east of the Cascades in the U.S.A. *Physcia semipinnata*, and *Leptogium subtile* were not found, either because they are not associated with riparian areas, or perhaps because they are extremely rare or absent in Idaho. *Ramalina obtusata*, which has been found in eastern Oregon and western Montana, remains unreported from northern Idaho and the reasons are unclear. Further sampling of *Lysichitum*-conifer swamps and old *Picea* dominated floodplains is needed to establish the presence or absence of this species in Idaho.

Collema curtisporum is locally abundant in floodplain forests and is typically found on black cottonwood, but can also be found on other substrates such as hardwood shrubs and occasionally conifers. It was found on about 1/4 of the plots in our study. *Collema curtisporum* should still be considered rare, though not under immediate threat in northern Idaho. More work is needed to determine the extent of the *C. curtisporum* population within the Pacific Northwest, especially its range limits to the south, north, and west of Idaho. Genetic differences, if any, have yet to be determined between the populations from Scandinavia and those from the Pacific Northwest.

Land use practices have impacted epiphytic lichen communities by eliminating habitat through mining, logging, transportation corridors, agricultural practices, and urban/suburban development, yet northern Idaho has many relatively pristine areas, such as Spion Kop, the St. Joe River, the Lochsa-Selway drainage and the area surrounding Priest Lake. Vigilance in protecting natural riparian ecosystems is necessary, as is attention to restoring, or protecting from further damage, areas that have been already altered by human influences.

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APPENDICES

Appendix A
Definitions of Categories used in Table 2.1. Status of Target Species,
Worldwide and in the PNW.

Definitions from IUCN Red List Categories 1994

Criteria for included species:

- Taxonomy, biology and distribution of the species must be understood.
- The species must be threatened or extinct on a world-wide scale.
- There must be considerable documentation showing that the species is threatened.
- The species should be narrowly distributed, or known from a few localities.
- The species should not be under-collected.

Red List Categories:

Extinct: there is no reasonable doubt that the last individual has died.

Critically Endangered: a. an observed or suspected reduction of at least 80% over the last 10 years, or a projected reduction of at least 80% in the next ten years.

b. Occupied area estimated to be less than 10 km².

c. Population estimated to be less than 250 individuals with a further expected decline.

d. Population estimated to be less than 50 individuals.

e. Qualitative analysis shows that the probability of extinction is at least 50% within 10 years.

Endangered: a. an observed or suspected reduction of at least 50% over the last 10 years, or a projected reduction of at least 50% in the next ten years.

b. Occupied area estimated to be less than 500 km² and either severely fragmented or known to exist in 5 locations or less and/or continuing decline is observed or projected.

c. Population estimated to be less than 2500 individuals with a further expected decline where either the populations are severely fragmented with no subpopulation containing more than 250 individuals or all individuals are in a single subpopulation.

d. Population estimated to be less than 50 individuals.

e. Qualitative analysis shows that the probability of extinction is at least 20% within 20 years.

Vulnerable: a. an observed or suspected reduction of at least 20% over the last 10 years, or a projected reduction of at least 20% in the next ten years.

b. Occupied area estimated to be less than 2000 km² and either severely fragmented or known to exist in 10 locations or less and/or continuing decline is observed or projected.

c. Population estimated to be less than 10000 individuals with a further expected decline where either the populations are severely fragmented with no subpopulation containing more than 250 individuals or all individuals are in a single subpopulation.

d. Population estimated to be less than 10000 individuals or the population is restricted to less than 100 km² or in the number of locations (typically less than 5), where the taxon would be prone to the effects of human activities or chance events whose impacts are increased by human activities within the foreseeable future, thus capable of becoming Extinct or Critically Endangered.

e. Qualitative analysis shows that the probability of extinction is at least 10% within 100 years.

Natural Heritage Program Definitions (from ONHP webpage): DEFINITIONS

Endangered taxa are those which are in danger of becoming extinct within the foreseeable future throughout all or a significant portion of their range.

Threatened taxa are those likely to become endangered within the foreseeable future.

LE = Listed Endangered. Taxa listed by the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) as Endangered under the Endangered Species Act (ESA), or by the Departments of Agriculture (ODA) and Fish and Wildlife (ODFW) of the state of Oregon under the Oregon Endangered Species Act of 1987 (OESA).

LT = Listed Threatened. Taxa listed by the USFWS, NMFS, ODA, or ODFW as Threatened.

PE = Proposed Endangered. Taxa proposed by the USFWS or NMFS to be listed as Endangered under the ESA or by ODFW or ODA under the OESA.

PT = Proposed Threatened. Taxa proposed by the USFWS or NMFS to be listed as Threatened under the ESA or by ODFW or ODA under the OESA.

C = Candidate taxa for which NMFS or USFWS have sufficient information to support a proposal to list under the ESA, or which is a candidate for listing by the ODA under the OESA.

SoC = Species of Concern. Former USFWS C2 candidates which need additional information in order to propose as Threatened or Endangered under the ESA. These are species which USFWS is reviewing for consideration as Candidates for listing under the ESA.

Definitions for the Oregon Natural Heritage Program Lists 1-4

The Oregon Natural Heritage Program Lists (ORNHP) were originally developed by the California Native Plant Society, and are used in their publications. The criteria for the Heritage Program lists are as follows:

List 1 contains taxa that are threatened with extinction or presumed to be extinct throughout their entire range.

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. ORNHP regards extreme rarity as a significant threat and has included species which are very rare in Oregon on this list.

List 3 contains species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.

List 4 contains taxa which are of conservation concern but are not currently threatened or endangered. This includes taxa which are very rare but are currently secure, as well as taxa which are declining in numbers or habitat but are still too common to be proposed as threatened or endangered. While these taxa currently may not need the same active management attention as threatened or endangered taxa, they do require continued monitoring.

Taxa Considered but Rejected contains all taxa deleted from any of the above lists in previous editions of this booklet. Taxa dropped from the list since the last book (1995) are also included in the main list.

The Nature Conservancy - Natural Heritage Network Ranks

ORNHP participates in a national system for ranking rare, threatened and endangered species throughout the world. The system was developed by TNC and is used in Heritage Programs or Conservation Data Centers (CDCs) in all 50 states, in 4 Canadian provinces, and in 13 Latin American countries. The ranking is a 1-5 scale, primarily based on the number of known occurrences, but also including threats, sensitivity, area occupied, and other biological factors. In this book, the ranks occupy two lines. The top line is the Global Rank and begins with a "G". If the taxon has a trinomial (a subspecies, variety or recognized race), this is followed by a "T" rank indicator. A "Q" at the end of this line indicates the taxon has taxonomic questions. The second line is the State Rank and begins with the letter "S". The ranks are summarized below:

1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences.

2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences.

3 = Rare, uncommon or threatened, but not immediately imperiled, typically with 21-100 occurrences.

4 = Not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences.

5 = Demonstrably widespread, abundant, and secure.

H = Historical Occurrence, formerly part of the native biota with the implied expectation that it may be rediscovered.

X = Presumed extirpated or extinct.

U = Unknown rank.

? = Not yet ranked, or assigned rank is uncertain.

Definitions from: Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (USFS Region 6):

C1= manage known sites
C2= survey prior to activities and manage known sites
C3= conduct extensive surveys and manage sites
C4= conduct general regional surveys

USFS definitions:

S = Sensitive Species: Taxa that are identified by the Regional Forester for which viability is a concern, as evidenced by significant current or predicted downward trends in habitat capability that would reduce a species existing distribution (FS Manual 2670).

BLM definitions:

S=Sensitive Species: Taxa: 1. under status review by US Fish and Wildlife Service/Marine Fisheries Service, 2. whose numbers are declining so rapidly that federal listing might become necessary, 3. with typically small and widely dispersed populations, or 4. inhabiting ecological refugia or other specialized unique habitats (BLM Manual 6840, 9/16/88).

Appendix B

Plot Locations for Target Species.

Figure A1. Plot locations in northern Idaho, sampled in 1999.

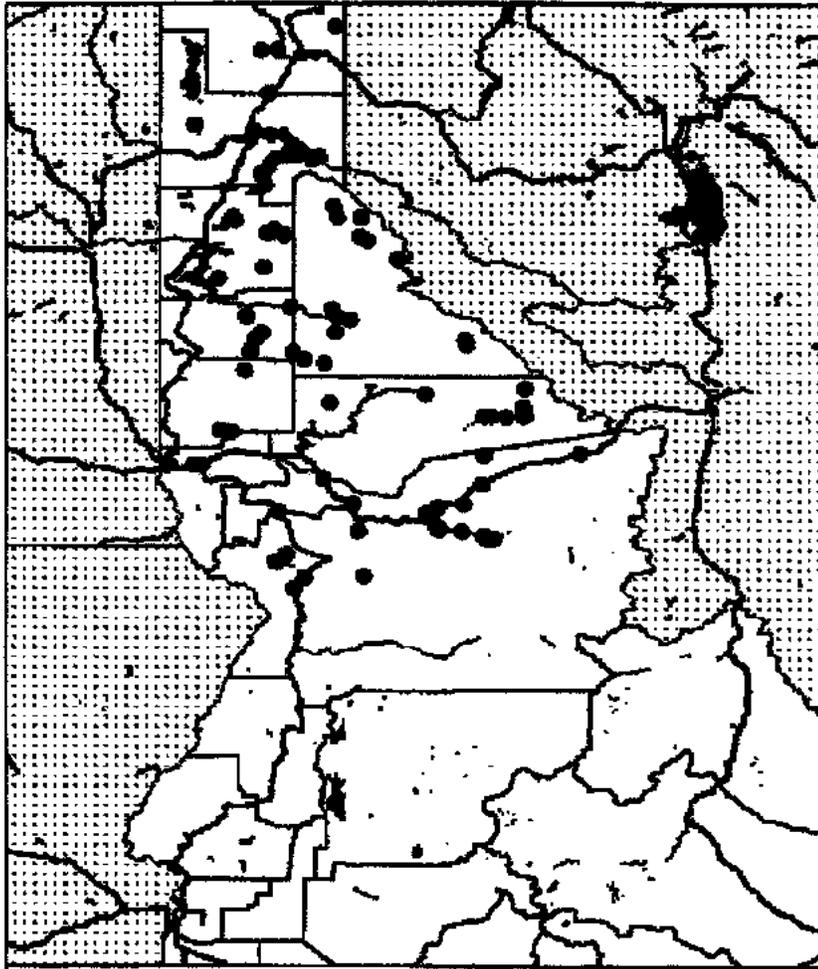


Figure A2. *Cetraria sepincola* locations in northern Idaho and the surrounding area.

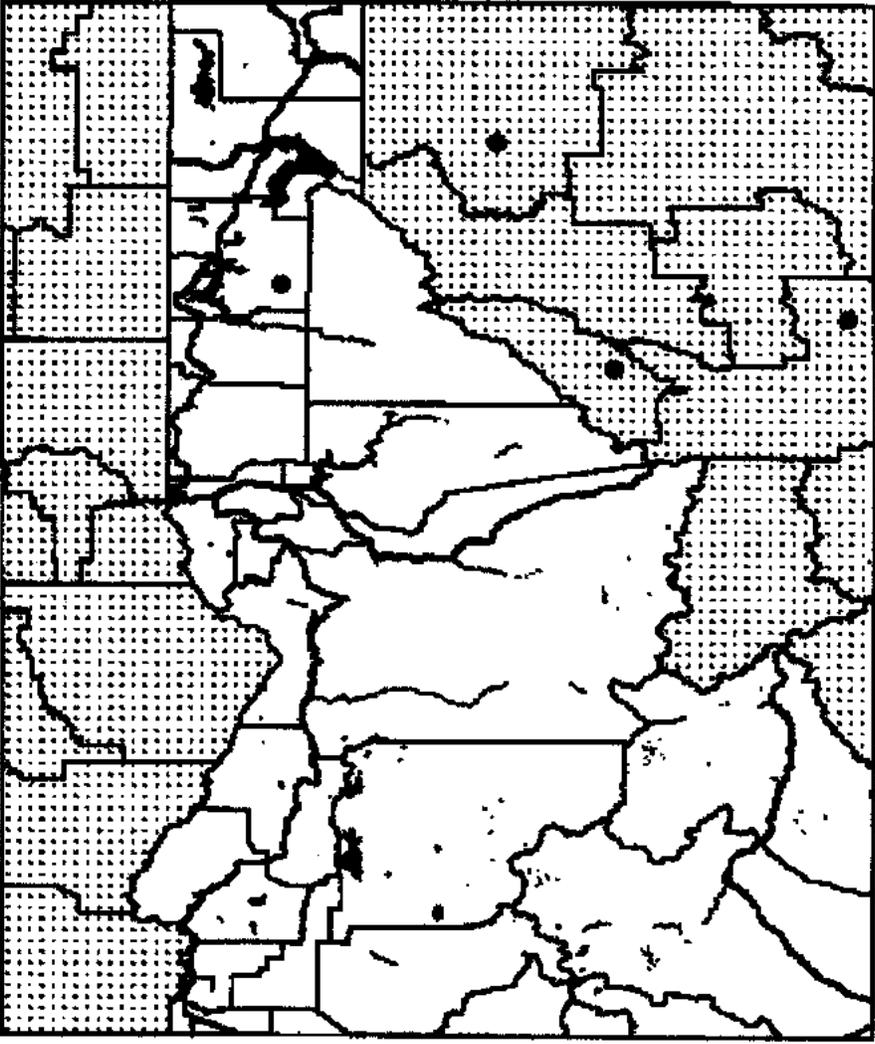


Figure A3. *Collema curtisporum* locations in northern Idaho and the surrounding area.

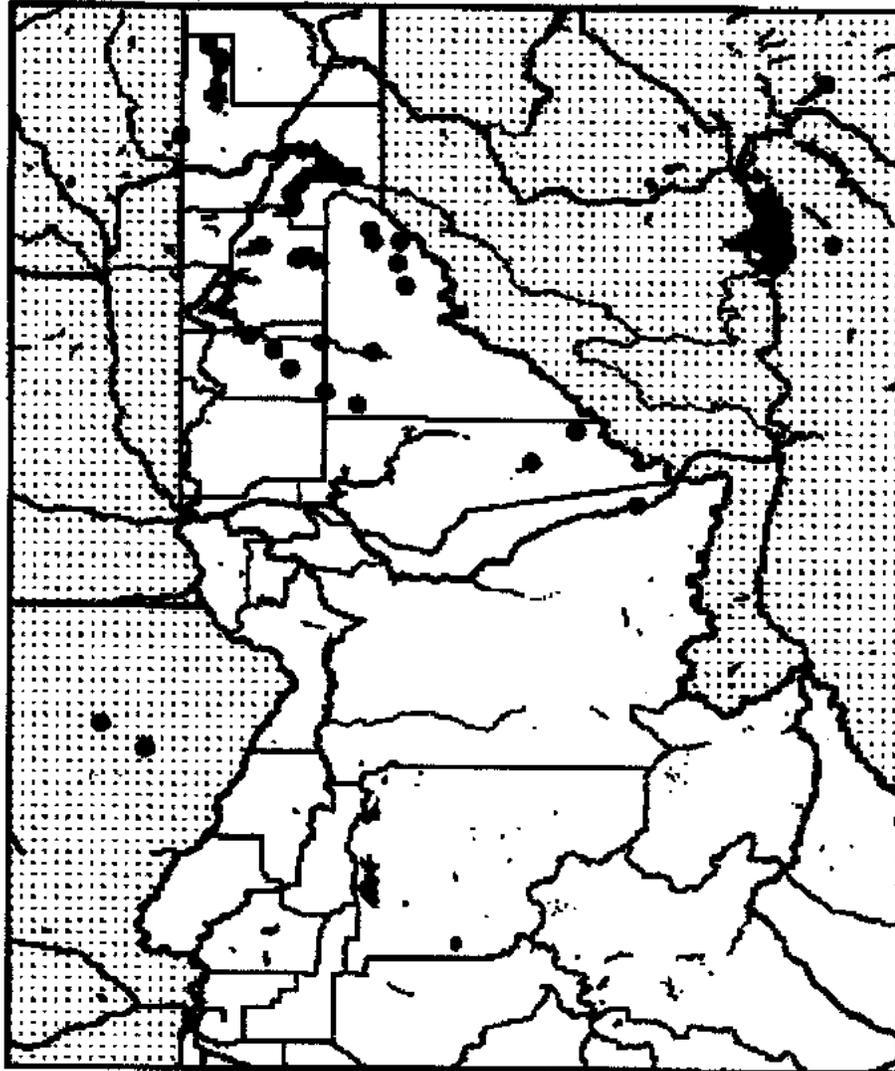


Figure A4. *Collema furfuraceum* locations in northern Idaho only.

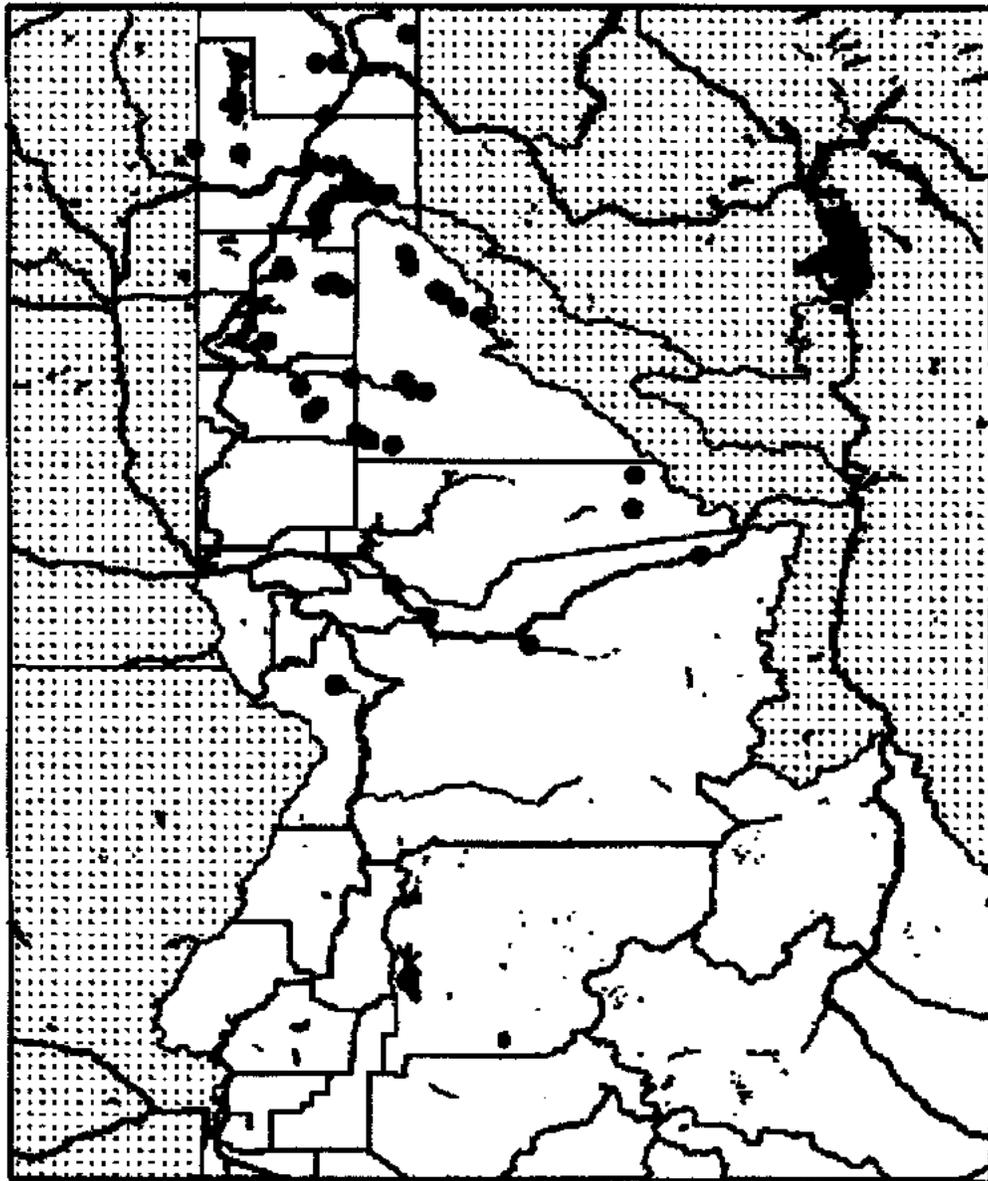


Figure A5. *Lobaria hallii* locations in northern Idaho only.

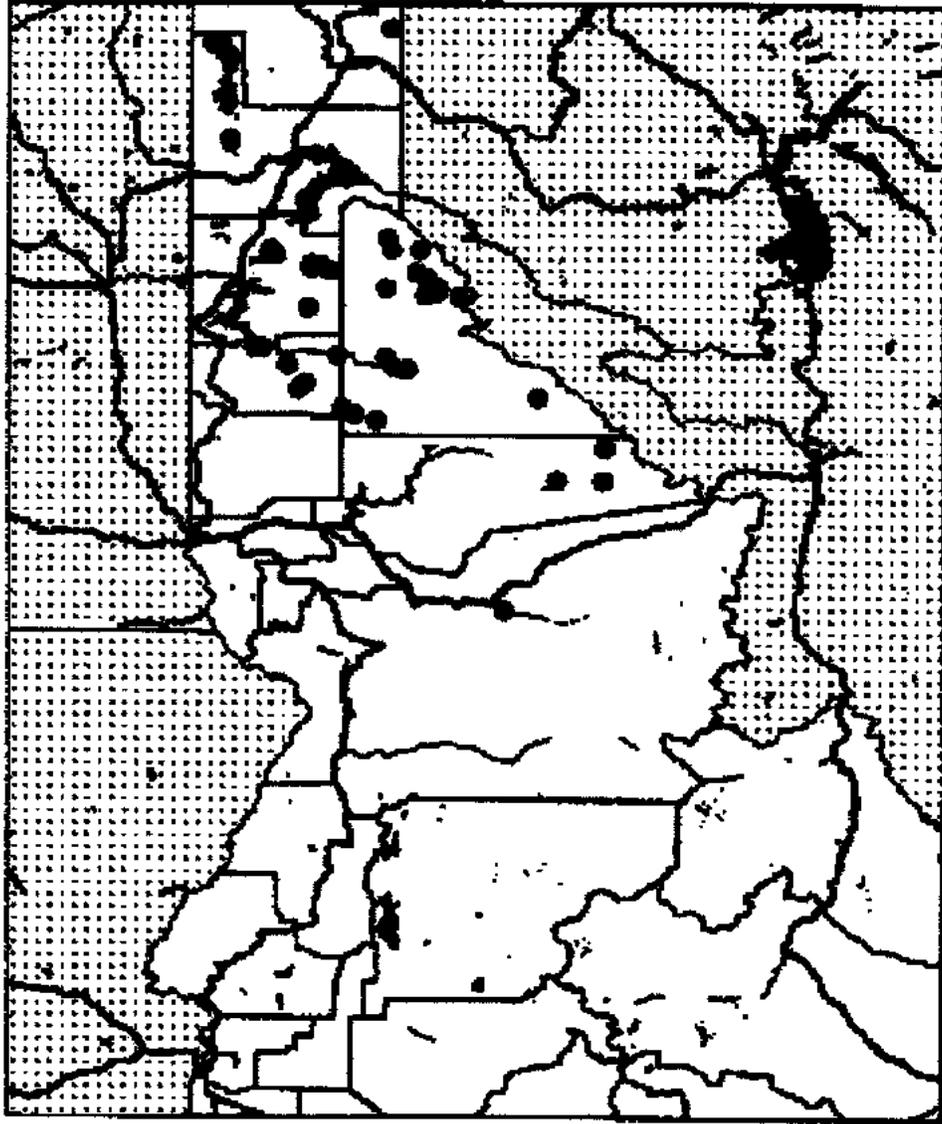


Figure A6. *Lobaria pulmonaria* in northern Idaho only.

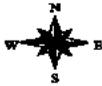
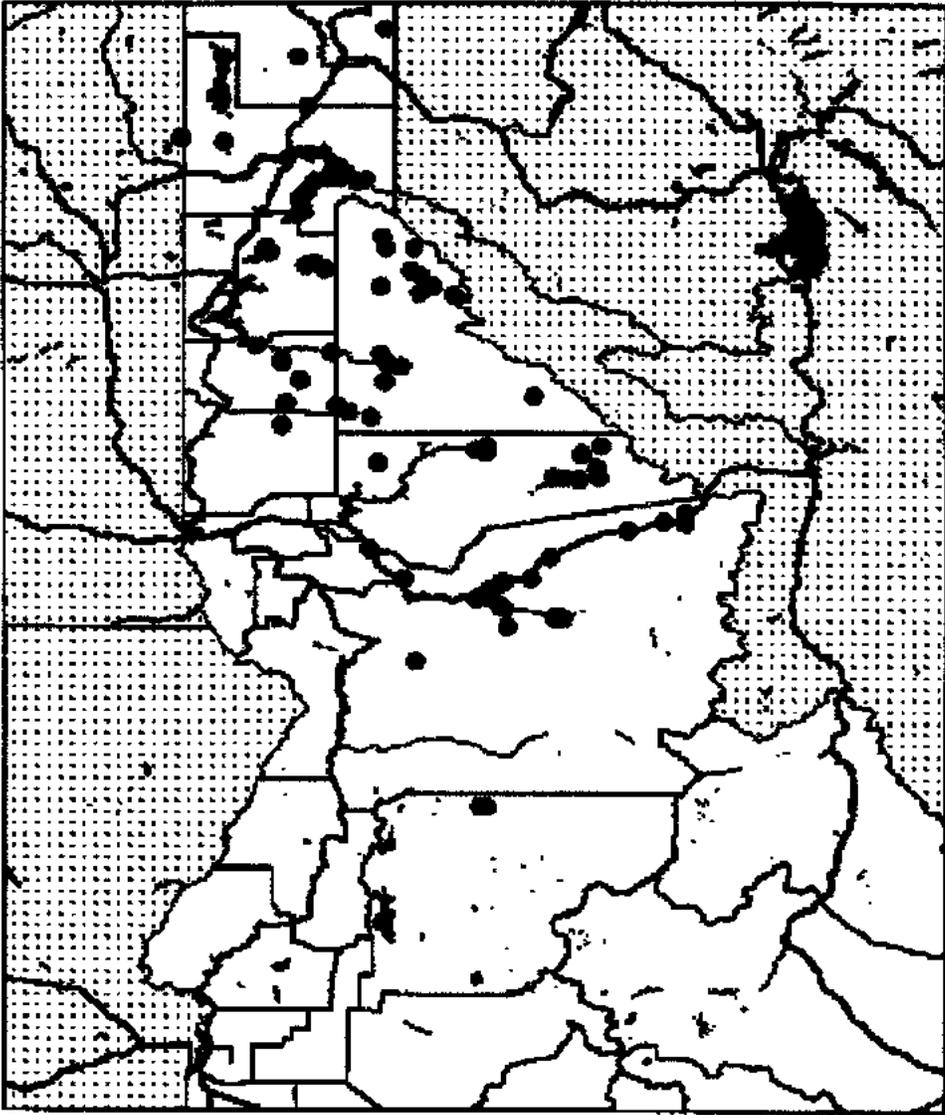


Figure A7. *Physcia semipinnata*. One location near Swan Lake in northwestern Montana.

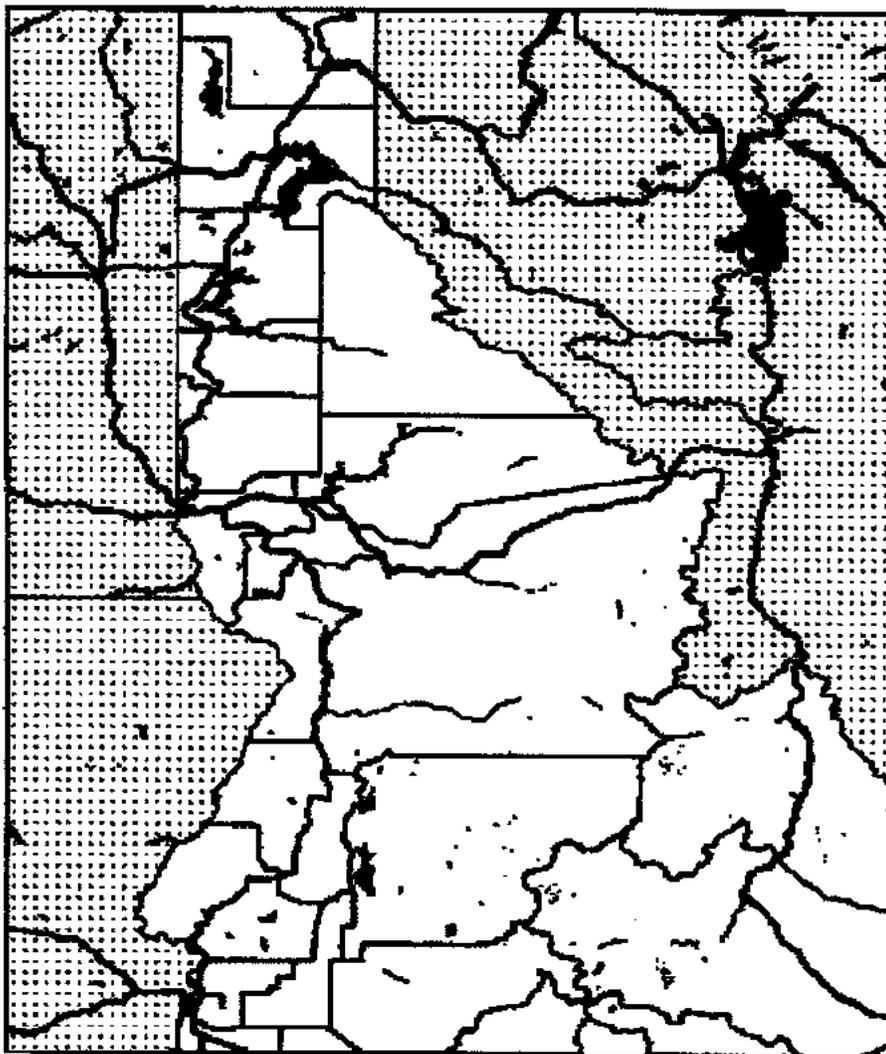


Figure A8. *Physconia americana* locations in northern Idaho and the surrounding area.

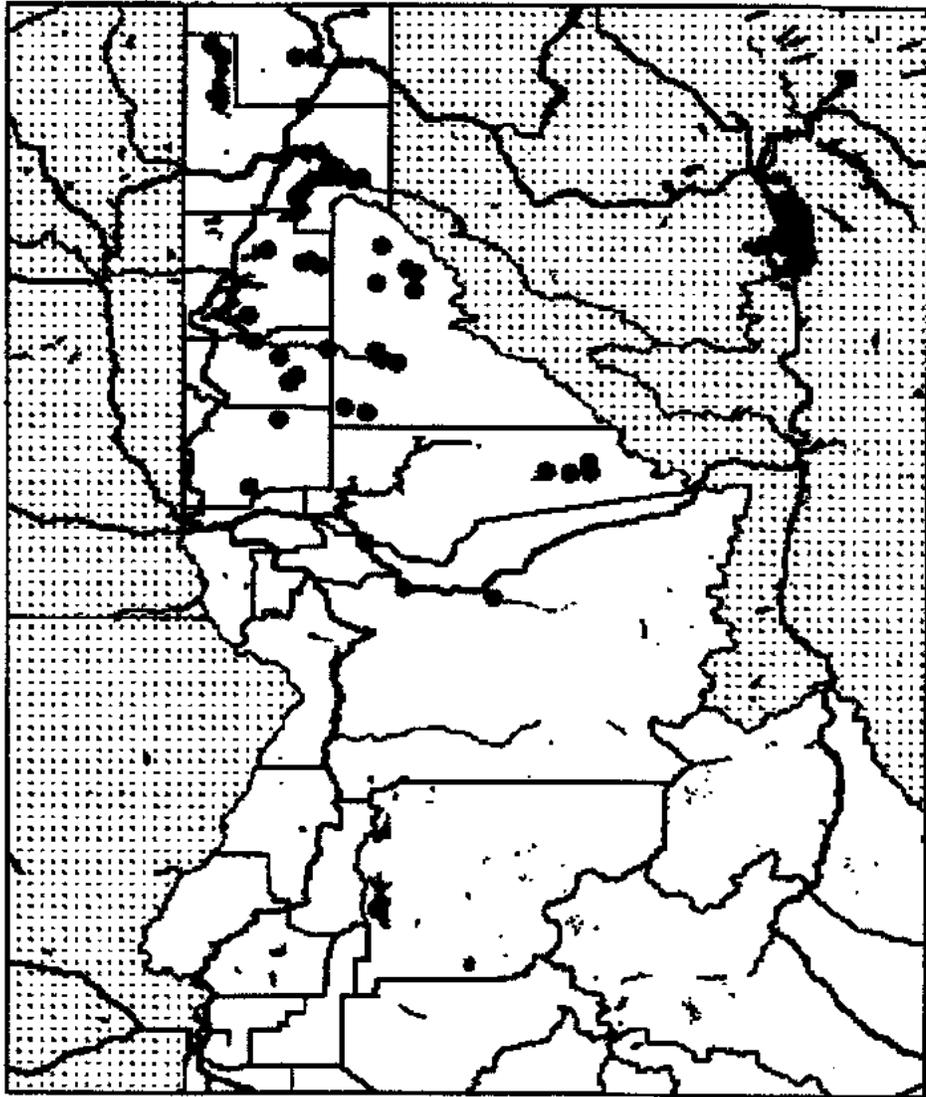


Figure A9. *Pseudocyphellaria anomala* locations in northern Idaho and the surrounding area.

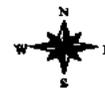
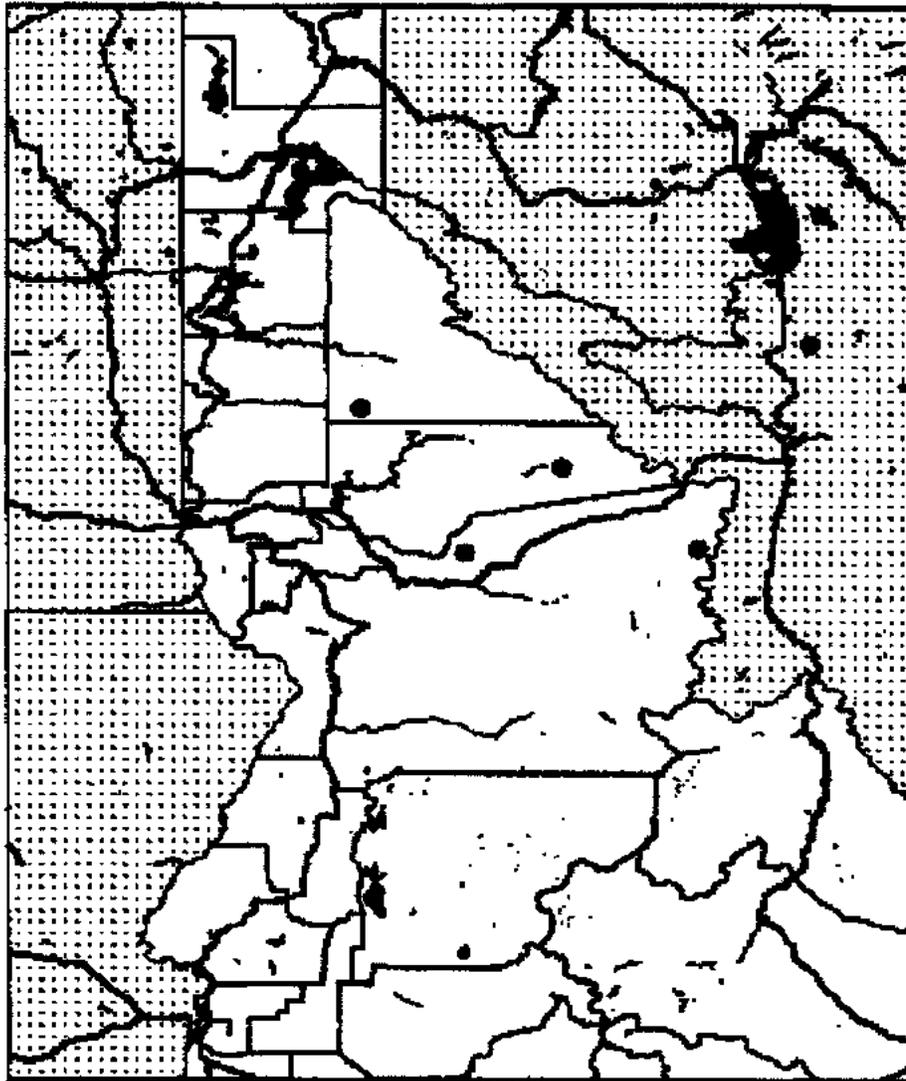


Figure A10. *Pseudocyphellaria anthraspis* locations in northern Idaho and the surrounding area.

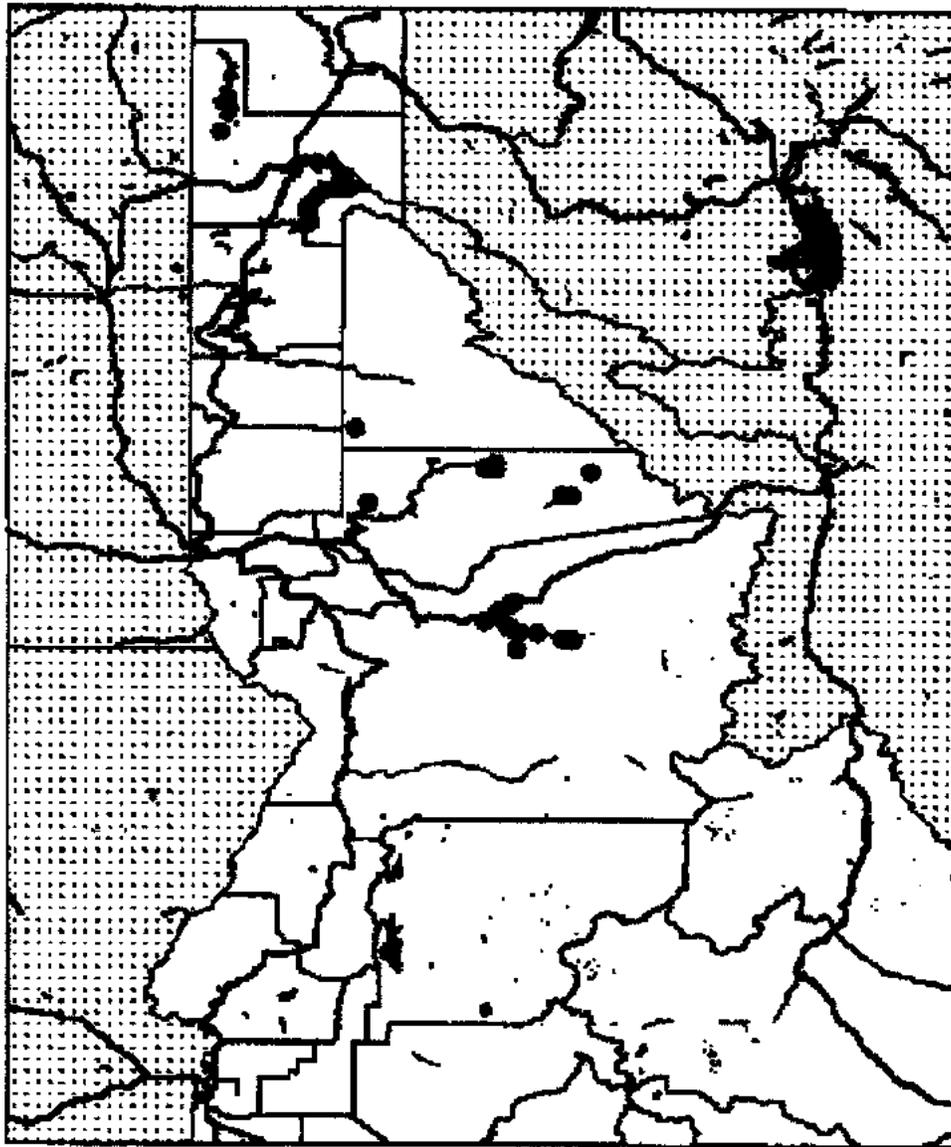


Figure A11. *Ramalina dilacerata* locations in northern Idaho only.

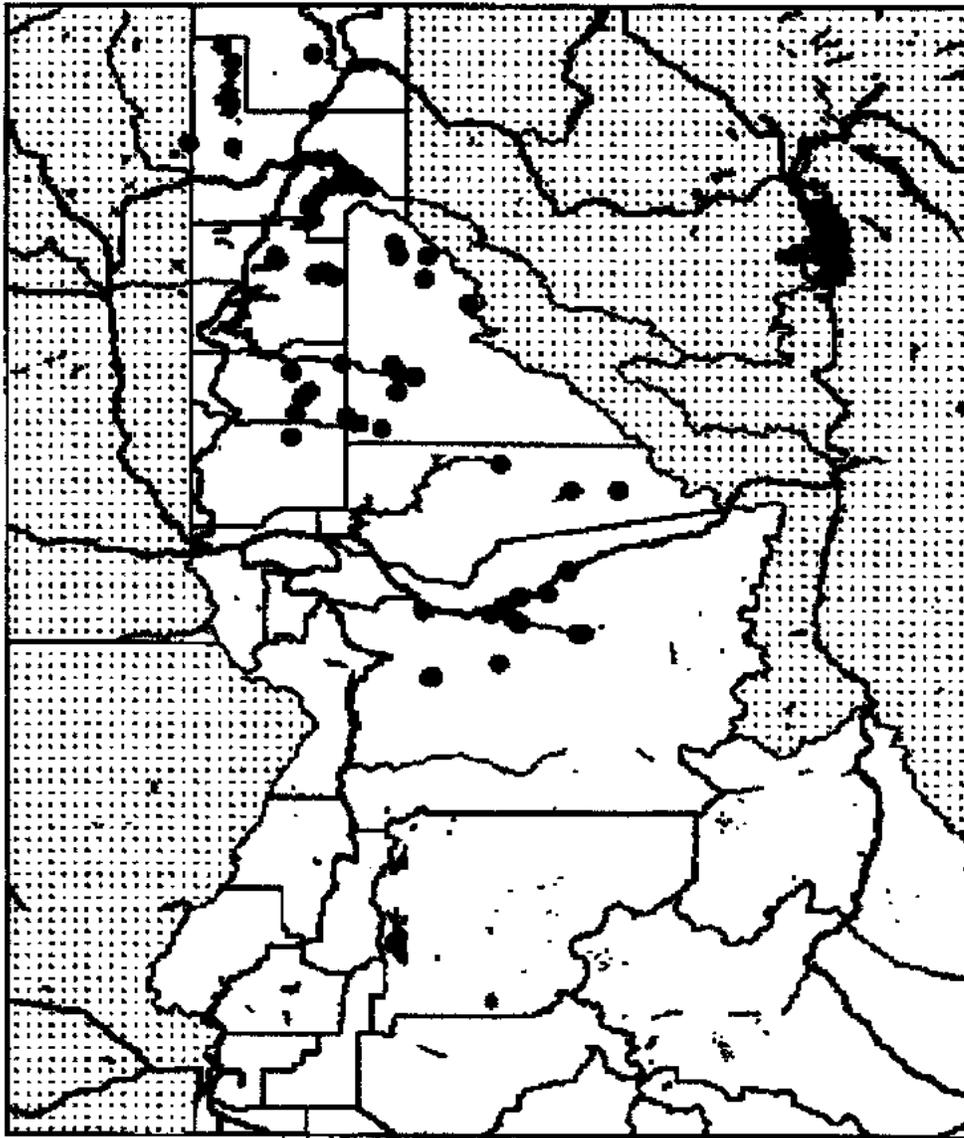


Figure A12. *Ramalina obtusata* locations in northern Idaho and the surrounding area.

