AN ABSTRACT OF THE THESIS OF

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Bruce McCune

Riparian forests in the Idaho Panhandle, north of Whitebird, were surveyed for rare riparian lichen species. The region was stratified into nine geographic units and by stream size. Eighty-one plots were surveyed for lichen community, stand and river characteristics. Variables important to lichen community composition included regional differences, elevation, climatic affinity, floodplain cross-section type, and the amount of basal area in hardwoods. Seventeen species were reported to be rare or uncommon in northern Idaho by lichenologists familiar with eastern Washington, northern Idaho and northwestern Montana. Of the seventeen target species, *Cetraria sepincola, Pseudocyphellaria anomala, Ramalina pollinaria* and *Ramalina subleptocarpha* were determined to be rare, with less than 25 occurrences each in northern Idaho. *Lobaria hallii, Physconia americana,* and *Ramalina thrausta* were determined to be locally abundant when found, but should continue to be species of concern in northern Idaho because of their limited distribution and narrow habitat requirements. *Collema curtisporum* is more common in the riparian forests of northern Idaho than previously thought, but appears to be restricted to old *Populus balsamifera* ssp. *trichocarpa* (black cottonwood) stands that receive seasonal

inundation. *Collema occultatum, Nephroma laevigatum, Leptogium cellulosum, Phaeophyscia hirtella*, and *P. ciliata* are all new records for northern Idaho. Management recommendations include maintaining or restoring natural flood cycles in riparian forests and protecting mature black cottonwood stands on floodplains.

Riparian Lichens of Northern Idaho

by

Jenifer L. Hutchinson

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Jenifer L. Hutchinson, Author

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CONTRIBUTION OF AUTHORS

Dr. Bruce McCune contributed substantially to this dissertation by providing advice and guidance on study design, implementation, analysis, and presentation of results.

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DEDICATION

This thesis is dedicated to my parents, Jeremy Ann and William M. Hutchinson.

Riparian Lichens of Northern Idaho

Introduction

The flora of northern Idaho is a lush mixture of adjacent regions, combining species found in the Rocky Mountains, southern interior British Columbia, and the coastal Pacific Northwest (PNW). The forests of northern Idaho contain many species commonly found on the west side of the Cascades, such as *Thuja plicata* (western red cedar), *Tsuga heterophylla* (western hemlock), and *Alnus rubra* (red alder). Some lichens common to the west side of the Cascades are also commonly found in northern Idaho, such as *Lobaria pulmonaria* and *Pseudocyphellaria anthrapsis*. Some species such as *Pseudocyphyellaria anomala* are common west of the Cascades, but are rare east of the Cascades. *Collema curtisporum,* on the other hand, grows with these oceanic species east of the Cascades to northwestern Montana, but is not found west of the Cascades. *Collema curtisporum* has disjunct populations in Scandinavia and the Pacific Northwest, generally east of the Cascades; into western Montana (McCune and Geiser 1997, McCune and Goward 1995).

Habitat loss is one of the most important factors that threatens or endangers species (Moseley and Groves 1990). It has been estimated that over 56% of the wetlands in Idaho have been lost since 1780 (Idaho Conservation Data Center 1998). *Populus balsamifera var. trichocarpa* (black cottonwood) communities are recognized as under-represented in northern Idaho as well in the

western United States in general (Janovsky-Jones 1997), as compared to the historical distribution of riparian cottonwood forests (e.g. Dykaar and Wigington 2000). People in the western U.S. depend on water from its rivers for energy, agriculture and urban use. Consequently very few rivers in the region remain free flowing (Patten 1998). Dams and channelization reduce or eliminate cottonwood recruitment through flood control and the subsequent loss of seasonal sediment deposits (Rood et al. 1994).

There is a lack of information regarding lichens in riparian forests in general and particularly regarding lichens in cottonwood stands in northern Idaho. Previous studies of lichens in northern Idaho have not concentrated on riparian habitats. W.B. Cooke (1955) studied fungi, lichens, and mosses in eastern Washington and western Idaho, within a 150-mile radius of Pullman, Washington. A number of lists of the lichens of Idaho have been compiled (Schroeder et al. 1973, Anderegg et al. 1973, Schroeder et al. 1975, Neitlich and Rosentreter 2000). Other lichen floristic works exist for the Priest River Experimental Forest (McCune and Rosentreter 1998), Glacier National Park (DeBolt and McCune 1993), the Swan Valley in northwest Montana (McCune 1982), and for the Bitterroot Range of Montana and Idaho (McCune 1984). Notes on genera and new species include *Cladonia* in Idaho (Anderegg 1977), the description of *Cetraria idahoensis* (Esslinger 1971), and a discussion of *Lobaria hallii*, *Pseudocyphellaria anomala* and *P. anthraspis* (Schroeder and Schroeder 1972).

None of the existing literature examines which lichens are rare in the riparian forests of northern Idaho, nor does the existing literature contain a comprehensive species list for cottonwood floodplain forests.

Riparian zones are interfaces between terrestrial and aquatic systems. They encompass sharp gradients of environmental factors, ecological processes, and plant communities. Riparian zones are mosaics of landforms, communities, and environments within the larger landscape, which can make them hard to delineate (Gregory et al. 1991).

Riparian zones have many different looks, but they all can be described in terms of landform and process gradients that result in their changing continua of characteristics. Processes can be considered on three major gradients that are nested in both space and time. The continental gradient includes the effects of latitudinal climatic gradients acting at the hydrologic basin level. An intra-riparian continuum reflects changes in elevation, stream gradient (steep or flat), fluvial processes (the way the river flows: peaks, base and timing), and sediments along the length of the stream system. A lateral trans-riparian gradient across the riparian zone is a local topographic gradient that reflects stream valley cross-sectional form and influences the local moisture and soil development (Mitsch & Gosslink 1993). Many questions arise regarding the continua of riparian zones and potential effects on lichen community composition. Effects of elevation

changes, spatial placement within the various continua, climatic differences among regions, and the variety of potential substrates are all potential sources of study.

Riparian zones are important for many reasons, which include providing natural flood control and wildlife habitat, and enhancing water quality (Mitsch and Gosslink 1993). Riparian zones, and the included waterways, also have many human-centered uses. Some drainages, such as the Coeur d'Alene, have been extensively used to transport timber downstream to mills, as sources of ore and as coolant and waste disposal for the Bunker Hill lead and zinc smelter in Kellogg (Root 1997). Other rivers, such as the Clearwater River, have been extensively channelized for agricultural purposes and dammed for power and recreation (Root 1997). Activities that affect the hydrology and water quality of the river also affect the adjacent riparian corridors, including riparian forests.

Extensive stands of black cottonwood occupy the riparian zones of the large valley bottom rivers of northern Idaho. Black cottonwood is considered a keystone species, meaning that it plays a pivotal role in the ecosystem processes upon which a large part of the community depends (Kauffman et al. 2001). Cottonwoods are typically found associated with alluvial fans, low elevations, braided channels, and gravel substrates (Harris 1988). Cottonwoods are important as wildlife habitat (Kauffman et al. 2001), providing shelter, cover, and food. Cottonwoods have a strong influence on terrestrial and aquatic systems.

They can change channel morphology through trapping and filtering sediment (Kauffman et al. 2001). Cottonwoods play a key role in moderating temperature and moisture during the summer, while allowing increased throughfall during the cooler parts of the year. The bark is slightly basic, which is important for nitrogen-fixing cyanolichens (Goward and Arsenault 2000). Drip zone effects from the upper canopy of *Populus* trees have been inferred to have a buffering effect on adjacent and more acidic conifers, which may increase the number of lichen species found on the conifers (Goward and Arsenault 2000).

Spatial heterogeneity in cottonwood galleries can be seen in the age bands that form along rivers, with saplings in areas with recent disturbance and the oldest trees farthest from recent flood disturbance (Kauffman et al 2001). Potential productivity, disturbance, and spatial heterogeneity are the key factors controlling local patterns of diversity. Highest diversity in vascular plants occurs when conditions are suitable for growth and competition is not severe, resulting in many co-dominant species. Productive, frequently disturbed sites, such as some cottonwood galleries, tend to be high in diversity of vascular plants because growth rates are high, but disturbances are frequent enough that competitive exclusion does not occur (Pollack 1998). Lichen species diversity tends to be highest in cottonwood galleries that include shrubs and conifers, and receive some seasonal inundation (personal observation).

Cottonwood galleries degrade through water diversions such as dams, diversions, channelization, and draining. Other agents of degradation include:

removal of streamside vegetation by cattle; alteration of structural integrity of the river through road construction, dredge mining, and splash dams for log transport; and physiological stress from pollution in the form of pesticides, feces, salts, and environmental estrogens (Kauffman et al. 2001).

Floods, which disturb vegetation through bank erosion or sediment burial via sediment deposition, are extremely important for the development and maintenance of cottonwood galleries. Floods and large woody debris interact to form new islands, which can eventually coalesce to form fully vegetated floodplains. In turn the islands, sandbars, and large woody debris reroute channels (Naiman et al. 1998), creating new possibilities for further sediment deposition on both the banks and newly formed islands. Ice formation in rivers during the winter can cause flooding that scours the bank at levels equal to or above spring flood levels. Ice scouring can remove much of the riparian vegetation and contribute large amounts of large woody debris. A moving ice gorge may have enough energy to alter stream morphology (Patten 1998). Ice scouring, woody debris and the formation of new islands lead to varied sediment deposition. Floods, as the dispersal mechanism for black cottonwood seeds as well as fresh sediment, are essential to the recruitment and survival of black cottonwood stands (Rood et al. 1994).

Floods maintain a spatially heterogeneous environment, and slow rates of competitive exclusion, making flooding probably the most important factor accounting for the unusually high levels of biodiversity in riparian corridors

throughout the world (Pollack 1998). Removing low frequency/high intensity flood disturbance, or changing the hydro-period, is detrimental to cottonwood galleries. While cottonwoods can be found in any wet area, from a ditch in a clear-cut to a floodplain, true galleries require floods to scour away existing vegetation and deposit sediment for dispersal and establishment (Kauffman et al. 2001, Rood et al. 1995, Dykaar 2000, Naiman et al. 1998, Patten 1998). A long-term study of the effects of the St. Mary Dam in Alberta, Canada showed a steady decline in cottonwoods that was clearly associated with the controlled release of water for irrigation purposes. High cottonwood mortality in the St. Mary Dam study was induced as a result of insufficient flows during the summer months and abrupt flow reductions following the high flow period in the late spring. In addition, the riparian water table was found to be closely associated with the river stage, as changes in river elevation were followed by quantitatively similar changes in the water table (Mahoney et al.1995). Lowered water tables via diversions decrease moisture availability, which could adversely affect growth and survival of existing vegetation, including cottonwood.

When natural flood cycles and hydroperiods are altered, river hydrology and geomorphology are changed. In the case of black cottonwood galleries, stands are no longer sustained through new recruitment. Lowered water tables can adversely affect the survival of established trees. Other human activities, such as road construction, and urban and rural development, also contribute to the loss of riparian forests. Loss of riparian forests may increase input of nitrogen

and other pollutants into the aquatic system. Riparian forests are valuable natural filter systems (Gilliam 1994) and act as nutrient sinks for nitrogen and phosphorus (Mitsch & Gosslink 1993). Other effects are loss of shading and a gradual loss of woody debris, as well as a loss of organic matter important to aquatic invertebrates.

Loss of riparian forests through human activities impacts epiphytes, such as lichens, which grow on black cottonwood and other riparian trees and shrubs. The core of this study is a group of 17 rare riparian lichens believed by lichenologists familiar with the area to exist, or have the possibility of existing, in northern Idaho. Doyle Anderegg, W.B. Cooke, Robin Jones, Bruce McCune, Roger Rosentreter, and others have made previous documented collections for the panhandle region. These "target species" are associated with cottonwood galleries and other riparian hardwoods. Many of the target species are listed with the state of Idaho as being rare or species of concern. Many questions are inherent in determining whether a species should be listed, the most basic being whether the species is truly rare. Lichens can be overlooked due to small size, or possibly misidentified as another closely related species. Questions that arise regarding epiphytic lichens on cottonwoods include possible microhabitat specificity of species such as *Collema curtisporum* and *Physconia americana.*

The objectives of this study were to understand the extent of the populations of the target species in northern Idaho, and to gather information on site characteristics and vegetation where the target species were found. In

addition, we wanted to visit areas where target species were known to occur, and locate additional populations through fieldwork and contacting herbaria.

Data were collected from eighty-one sites in the Idaho panhandle between June and August, 1999. This study differs from previous studies of the lichen flora in northern Idaho not only in its focus on riparian species, but also in its discussion of the special problems of determining rarity of lichens. Furthermore, patterns of species' distribution and abundance are described within the context of climatic affinities. Determining distribution and abundance are the first steps in forming realistic management plans for lichen species. Previously documented reports of the target species occurrence in the study area have been included (OSU herbarium, McCune Herbarium, Boise State Herbarium, and University of Idaho Herbarium).

Rare Lichens in the Riparian Hardwood Forests of Northern Idaho

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Abstract

Riparian forests along rivers and streams in the Idaho Panhandle, north of Whitebird, were surveyed for rare riparian lichen species. The region was stratified into nine geographic units and by stream size. Eighty-one plots were surveyed for lichen community, stand, and river characteristics. The strongest differences in lichen community composition were regional, followed by community differences with respect to basal area in hardwoods and differences in floodplain cross-section type. Climatic affinities appear to vary with location in the study area. Plots with the highest suboceanic affinities clustered along the eastern border (Bitterroot Mountains), while those with the highest continental affinities were clustered in the southwest corner of the study area, near Lewiston. Plots with the highest oceanic affinities were more scattered but were loosely clustered in the south central half of the study area. One hundred and twenty-six lichen species were found, including eleven of the seventeen target species. About seventy percent of the plots had at least one of the target species. Management recommendations and information on distribution and rarity are given for each of the target species.

Introduction

No previous studies address specifically the ecology and distribution of lichens in riparian forests in northern Idaho. Some studies in the area have,

however, included lichens; which are enumerated here. For the region that includes northwest Montana, northeastern Oregon, eastern Washington, and northern Idaho, only two ecological studies incorporating lichens exist (Cooke 1955, Neitlich and Rosentreter 2000). A number of lists of the lichens of Idaho have been compiled (Schroeder et al. 1973, Anderegg et al.1973, Schroeder et al.1975, Neitlich and Rosentreter 2000). There are a couple of studies regarding the effects of pollution on epiphytic lichens along rivers in Idaho (Geiser, et al 2001, Hoffman 1974). Others have concentrated on the ecology of specific areas in northwest Montana, and northern Idaho (McCune and Rosentreter 1998, DeBolt & McCune 1993, McCune 1982, McCune 1984) while others have published notes on genera and new species for the region (Anderegg 1977, Esslinger 1971, Schroeder and Schroeder 1972). Some of this work includes lichens found in riparian forests, but none of the work specifically addresses the ecology and distribution of lichens in riparian forests in northern Idaho.

This study is a survey of riparian lichens including seventeen target species that lichenologists familiar with the area thought were rare in northern Idaho. Information presented here is based on data collected at 81 sites in the Idaho panhandle between June and August,1999. To make the inventory more useful, previously documented reports of target species have been included (OSU herbarium, Nimis, Degelius, Tønsberg, McCune Herbarium, Boise State Herbarium, and University of Idaho Herbarium).

This study differs from previous studies of the lichen flora in northern Idaho, not only in its focus on riparian species, but in that forms of rarity are discussed for lichens, and climatic affinities are given for relevant species. The objectives of this project were to understand the extent of the populations of the target species found in northern Idaho, and gather information on site characteristics and vegetation where the target species were found. We wanted to know what lichens are found on trees in riparian forests, particularly *Populus balsamifera ssp. trichocarpa* (black cottonwood) forests. In addition, we wanted to visit areas where target species were known to occur, and, potentially, locate additional populations through fieldwork and contacting herbaria. Such sampling would allow us to answer questions about whether lichens such as *Collema curtisporum* and *Physcia semipinnata*, which are considered rare in northern Idaho (ICDC 1998), really are rare, or simply under reported.

Study Area

The study area included all of Idaho, north of the latitude 45 degrees 45 minutes N (about the latitude of the town of Whitebird, ID). The Idaho panhandle is included in the North Idaho Ecoregion in the Interior Columbia River Basin Ecosystem Management Project Environmental Impact Statement (USDA/USFS 1997). The survey area is bounded on three sides by the Idaho state line. The following counties were included in the survey: Boundary, Bonner, Shoshone, Latah, Clearwater, Nez Perce, and Idaho County north of the Salmon River. This

large, ecologically diverse area contains many large drainages in the following sub-basins: Priest, Kootenai, Pend Oreille, Coeur d'Alene, St. Joe, St. Maries, Clearwater, and Salmon.

Climate, canyons, and geographic position have contributed to form refugia for coastal disjuncts, such as the Clearwater drainage, a major refugium, and the lower St Joe and lower Coeur d'Alene drainages, as minor refugia (Crawford 1979). The climate is cool in most of northern Idaho, with a maritime influence, caused by large air masses moving inland from the Pacific Ocean from the west (Janovsky-Jones 1997). Orographic precipitation along the Bitterroot Range, in the eastern part of the study area, is another reason for the relatively abundant moisture. Low elevation canyons contribute to the heat load unique for forests of the northern Rockies (Crawford 1979). The canyons tend to hold warm air, which rises and warms the surrounding higher areas. Sandpoint, at 640 m (2100'), averages 12.6 cm (32 inches) of precipitation per year with most of the precipitation occurring in the winter as snow. Mean temperatures range from 10° C (18° F) in December to 36° C (65° F) in July (Ross and Savage 1967).

Major components of upland forests in northern Idaho are *Abies grandis, A. lasiocarpa, Pinus contorta, P. ponderosa, Pseudotsuga menziesii, Thuja plicata, Tsuga heterophylla,* and *T. mertensiana* (Cooper et al.1991). Black cottonwood occurs on alluvial terraces of major streams and rivers and around lakes and ponds. These sites are often flooded in the spring, but water tables lower to 91 cm (3 feet) or more below the soil surface by the end of the summer

(Rood et al. 1994). In the absence of fluvial, or other, disturbance, succession continues to communities dominated by conifers. Stands in moister regions are successional to *Populus tremuloides/Thuja plicata* and the *Picea/Cornus sericea* habitat types (Janovksy-Jones 1997). Broad-leaved forests that occur on islands of major rivers are dominated by black cottonwood (Janovksy-Jones 1997).

Methods

Target Species List. Botanists and lichenologists familiar with northern Idaho were consulted regarding rare riparian lichens that were known or suspected to occur in riparian forests with a hardwood component of alder, birch or cottonwood in the study area. A suite of seventeen target species was the result. These species were sought in plot sampling, herbaria, and the literature:

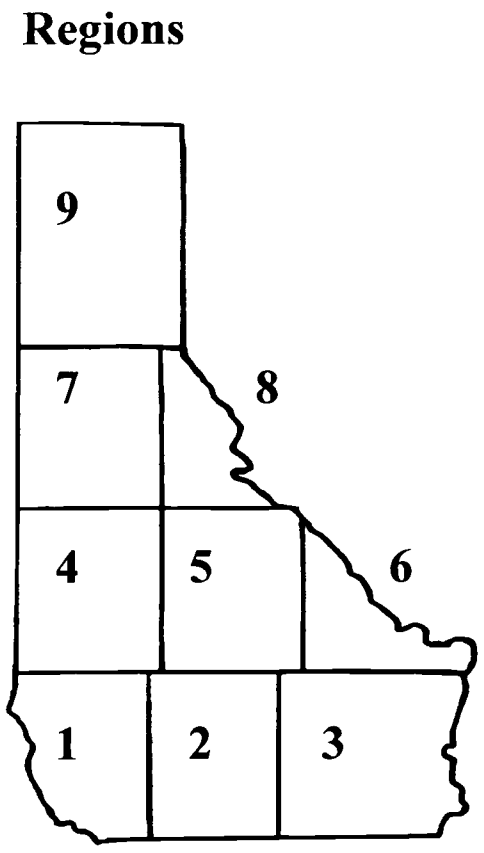
Cetraria sepincola
Collema curtisporum
Collema furfuraceum
Hypogymnia oceanica
Leptogium subtile
Lobaria hallii
Lobaria pulmonaria
Menegazzia terebrata
Physconia americana
Physcia semipinnata
Pseudocyphellaria anomala
Pseudocyphellaria anthraspis
Ramalina dilacerata
Ramalina obtusata
Ramalina pollinaria
Ramalina subleptocarpha
Ramalina thrausta

Sampling. The area was stratified into nine geographic areas, or regions, based on pages of the DeLorme Atlas of Idaho (Figure 2.1). Nine plots were sampled within each region. The plots were stratified by stream order classes, which were defined in relation to other streams and rivers. Stream order classes

were: "large valley bottom rivers," which were the largest rivers running through the region; "major tributaries," which were rivers or streams that fed directly into rivers defined as large valley bottom rivers and/or greater than 2 meters wide (wetted width of base flow in the channel); and "minor tributaries," which were streams that fed into major tributaries, or another minor tributary, or were less than 2 meters wide (wetted width of base flow in the channel). Stream order classes were not the same as valley classes. For example, minor tributaries were often sampled on the floodplains of larger rivers because black cottonwood tends to grow where the valleys are wider. Three plots were sampled for each stream order class within each geographic region. Stream class designations were relative and were influenced by the region being sampled. For example, the Lochsa River was considered a large valley bottom river in Region 3, where it was the largest river in that region, but was considered a major tributary in Region 2, where it flows into the Clearwater River.

Figure 2.1. Key to regions in the study area. Regions correspond to DeLorme (1992):

Region: 9 = Pend Oreille / Priest Lake
8 = Wallace / North Fork of the Coeur d'Alene River
7 = Coeur d'Alene / Coeur d'Alene River
6 = Kelly Creek / St. Joe east
5 = North Fork of the Clearwater
4 = Moscow / St. Maries River
3 = Lochsa / Selway
2 = Clearwater River / South Fork of the Clearwater
1 = Lewiston / Salmon River



Plot Selection Criteria. Plots were selected using the following criteria:

1. A twenty kilometer minimum distance between plots on large valley bottom rivers within the same geographic region.

2. A minimum of five cottonwoods with a diameter at breast height (dbh) greater than 51 cm within the plot boundaries, or a minimum of 20% total canopy in hardwood trees and shrubs large enough to be taken as part of the estimate of the total canopy.

3. Lake shores were included if they were part of the riparian corridor in a broad sense.

4. Within each sampling stratum, the first site encountered that met these criteria was sampled.

Plot Dimensions. The plots were a flexible polygon of approximately 4000 m^2 in area. Most of the plots were 100 m x 40 m rectangles, except for plots on broad floodplains, where we used approximately 4000 m^2 circular plots with a 35 m radius, following Forest Health Monitoring protocol (McCune et al.1997).

Information Collected. Plot information included location, river characteristics, and terrestrial characteristics, as described below. Information about plot location included assigning a plot number based on region, where "1" was the southernmost and westernmost region in the panhandle. The numbering was from west to east and south to north, making the northernmost region of the panhandle region "9" (Figure 2.1). The second digit in the plot number represented stream order class, where "1" was a large valley bottom river and "3" was a minor tributary. The last digit represented the replicate within each region. County, stream name, elevation in meters, date, state, sub-basin, latitude,

County, stream name, elevation in meters, date, state, sub-basin, latitude, longitude, and a brief description of where the plot was located were recorded for each plot, as was the date of sampling. Elevation, latitude, and longitude were obtained using Topo USA, version 2.0.

River characteristics included floodplain gradient as a percent ratio of rise over run, and width of the floodplain, using Topo USA version 2.0. The width of the active channel was estimated by sight. An ocular estimate of the percent of the channel substrate that was within the plot was made for the following categories: boulder, cobble/gravel, sand/silt, and organic-rich. If the channel was not part of the plot, percent cover of these substrates was estimated for the part of the channel closest to the plot. Floodplain cross-section type, based on Harris (1988), was recorded as one of the following categories: incised with no apparent floodplain, floodplain on one side only with talus or colluvium on the other side, floodplain on both sides of the channel, and multiple channels on a broad floodplain.

Terrestrial characteristics included site type, canopy cover, and percentage of the plot area covered by various ground surface types, shrubs by height classes, grasses, rushes, sedges, forbs, and trees by size class. Shrub height classes were tall shrubs (>2 m), medium shrubs (5 cm –2 m), and ground covering shrubs (<5 cm). Site type was a one-word description of the site recorded from the following choices: seep, creek, river, wetland, seasonally wet, lake margin, bog/fen.

Canopy cover as a percent cover of the plot was estimated visually. Ground surface types could include boulder, cobble/gravel, sand/silt, organic-rich, water, and litter. See data dictionary in Appendix F.

Tree cover percentages were evaluated by tree life stages in three categories: cottonwoods, other hardwoods, and conifers. Tree life stages were recorded by growth form. Trees with flexible main stems were called saplings. If the top was still growing and had few dead branches, it was determined to be mid-seral, if it had dead limbs in the upper quarter, it was determined to be late seral.

Tree composition was based on basal area, as determined with a 10 or 20 basal area factor (BAF) wedge prism. The number of trees (hardwoods or conifers) recorded with the wedge prism was divided by the five sample points used and multiplied by the BAF of the prism to give the basal area values. Shrubs the size of sapling trees were included in basal area estimates if captured by the prism. The analysis used percent basal area in hardwoods categorized into four groups; 97 to 100% basal area in hardwoods, 72% to 96% basal area in hardwoods, 51% to 72% basal area in hardwoods, and less than or equal to 50% basal area in hardwoods.

Sketches of each plot were drawn, recording features such as water, sandbars, vegetation changes, roads, and the points where basal area was taken. Presence/absence was also collected for indicator species, which were a group of plants that area botanists thought of as riparian indicators. The presence of weeds of concern to the USFS was also included. Dominant species of trees, shrubs,

grasses, and forbs were also recorded. An ocular estimate of bryophyte cover on soil/rock and on trees/shrubs was recorded as a percent cover of the plot, and dominant epiphytic lichen species were recorded. See Appendix D for the actual site forms.

The lichen community survey was terminated after ten minutes passed without finding a new epiphytic lichen species, with a minimum time for the survey being thirty minutes and the maximum time being two hours. Information on abundance and substrate was collected for all epiphytic macrolichens observed in that time. Abundance was determined to be one of four categories: 1 meant that there were less than 4 individuals, 2 was 4 to 10 individuals, 3 was more than 10 individuals, and 4 was individuals occurring on more than half of the available branches and trunks. Additional information was collected for the target species on shading on a scale of 1-3 (1 was exposed and 3 was full shade). Location data specified whether the target species was located on the upper, middle, or lower part of the tree and whether it was on branches, twigs, or bole.

Database. A database was compiled using Microsoft Access Version 2.00 (Microsoft Corporation 1989-1994). The 1999 database (Idaho.mdb) includes all of the information collected, as well as all previously known records for the target species that were found in regional herbaria and that were relevant to this report. Only records from the PNW are included. In the case of species that had many populations on the west side of the Cascades, such as *Pseudocyphellaria anomala, Pseudocyphellaria anthraspis, Physconia americana, Ramalina*

subleptocarpha, and Ramalina thrausta, only records from the east side of the Cascade crest are included. In the case of species such as *Collema furfuraceum, Lobaria hallii, Lobaria pulmonaria, Ramalina dilacerata,* which have been collected frequently in northern Idaho, only collections from Idaho are included. In the case of species that were rare everywhere in the PNW, such as *Collema curtisporum, Physcia semipinnata, Ramalina obtusata,* and *Ramalina pollinaria,* all reports from the PNW are included. Records from both databases were combined into an Excel spreadsheet (Idaho.xls). See Appendix C for locations of each record. Each record in the table represents one collection by an individual. In some cases more than one collection was made for approximately the same location and these were included in the database if they had a unique collection number. Additional information on the plots is included in an Excel spreadsheet (Plot Data.xls). The Location Maps (Appendix B) were generated from latitude and longitude, using ArcView GIS version 3 (Environmental Systems Research Institute Inc.). Records in Appendix C that did not include latitude and longitude, or enough location information to determine latitude and longitude, and records that fell outside the map boundaries were not plotted on the maps.

Analysis. Analyses focused on answers to the following questions: How do riparian macrolichen communities differ across geographic regions, stream order classes, floodplain cross-section types, and basal area in hardwoods? Community data were analyzed using Multi-response Permutation Procedures, (MRPP; Mielke 1984; McCune & Mefford 1999), which provides a

nonparametric multivariate test of the hypothesis of no difference between two or more groups, based on a matrix of Sørensen distances. Groups were defined by categorical site variables for data collected as categorical variables (region, stream order class, and floodplain cross-section type), with the addition of basal area in hardwoods, which appeared to have natural breaks upon examining its frequency distribution. The test statistic (A) describes the separation between groups in an n-dimensional space, and ranges from 0 to 1, with 0 indicating no separation. A large value for A means that there is a large difference in lichen communities between groups. The probability value expresses the likelihood of finding a difference as extreme or more extreme than the observed difference between groups, based on all possible partitions of the data set.

When MRPP indicated that communities differed significantly for groups, Indicator Species Analysis in PC-ORD (McCune & Mefford 1999) was used to detect and describe the value of different species for indicating the environmental conditions that defined the groups. Indicator Species Analysis is based on Dufrene and Legendre's (1997) method of calculating species indicator values. The method combines information on the concentration of a species' abundance in a particular group and the faithfulness of occurrence of a species in a particular group. An indicator value for each species in each group is the result. The indicator values range from 0 (no indicator value) to 100 (perfect indicator). A perfect indicator means that the presence of a species is always associated with that particular group, and only with that group. With two or more groups per

categorical variable, the indicator value for a particular species in a particular group depends on the other groups. If one drops a group, the indicator values for the remaining groups will change. The test for statistical significance for the indicator species analysis came from a Monte Carlo technique where the null hypothesis is that the largest indicator value for a particular species is no larger than expected by chance.

Measures of diversity were defined according to Whittaker (1977). Alpha is the total number of species per plot, gamma is the total number of species found in a region, and beta diversity is gamma diversity divided by alpha diversity. First order jackknife estimator of species richness was determined using:

$$Jack1 = S + r1(n-1)/n$$

where Jack1 is the first order jackknife estimator, S is the observed number of species, r1 is the number of species occurring in only one sample unit, and n is the number of sample units (Palmer 1990).

Climatic Affinities. Species were assigned to the categories "oceanic," "suboceanic," "continental," or "widespread" on the basis of known distributions:

- Oceanic climates are moist and mild, with smaller seasonal temperature fluctuations than continental climates (Trewartha 1961). We categorized as oceanic those lichen species that peak in abundances west of the crest of the Cascade Range.

- Continental climates are relatively dry with more extreme temperatures. We defined continental lichen species as those with peak abundances east of the Continental Divide and south of Idaho in the Rocky Mountains.

- Suboceanic climates are moist interior climates. Suboceanic lichen species were defined as those peaking in abundance in moist forests between the Cascade crest and the Continental Divide.

- Widespread lichen species, lichens that are common throughout the Pacific Northwest, such as *Platismatia glauca* and *Hypogymnia physodes,* or with no strong affinities were not assigned to any climatic group. These do not appear in the tabulation of climatic affinities.

The number of occurrences of species with affinities to particular climatic classes was tallied by region. For example, assume 9 plots in a region, with a total of 30 occurrences of oceanic lichen species. This means that an average of 30/9 or approximately 3.3 oceanic species per plot occurred in that region.

Weighted average ordination of presence-absence data was used to assign values for climatic affinities for each plot, calculating a score for each plot on each of the three axes of climatic affinity: oceanic, suboceanic, and continental. Weighted averaging calculates a score x_i for each plot i for each climatic affinity as:

$$x_i = (\sum_{j=1}^{p} w_j a_{ij})/p$$

where the weight w_j for each species is zero or one, indicating whether that species has that particular climatic affinity, p is the number of species, and a_{ij} is zero or one indicating absence or presence of species j in plot i. Because the weights and species data are both binary, the score for a given plot is simply the fraction of species in that plot belonging to a particular climatic affinity. So a score of 0.25 on the oceanic axis means that a quarter of the species in that plot had an oceanic affinity. Each plane of the ordination shows the relation of one climatic affinity to another. Pearson and Kendall correlations were used to indicate environmental variables strongly associated with the climatic affinities.

Results

Target species in an international perspective. Table 2.1 shows the status of the target species both worldwide and within the Pacific Northwest states. Appendix A gives the definitions for the status listings (Moseley and Groves 1990, ONHP 1998, Tønsberg et al. 1996, WNHP 1995). Of the taxa documented in our study area, seven: *Cetraria sepincola, Pseudocyphellaria anomala, Ramalina pollinaria, Ramalina subleptocarpha Cladonia norvegica, Collema occultatum*, and *Nephroma laevigatum,* are considered rare within northern Idaho (ICDC 1998). *Collema curtisporum* is considered rare for North America and worldwide (ICDC 1998, Tonsberg, et al. 1996).

Table 2.1. Status of Target Species and Selected Species of Interest, Worldwide and in the Pacific Northwest.

Target Species	**Norway**	**Sweden**	**Finland**	**Europe**	**ID**	**MT**	**OR**	**WA**	**USFS/BLM**
Cetraria sepincola					G?		NA		No
Collema curtisporum	E	E	E	EX*	G1,S1	G1,S1	G3,S1		S (R1)
Collema furfuraceum	present	V	present	present	G5, S1				No
Hypogymnia oceanica					absent			P2,G?,S1	SM1,3(R6)
Leptogium subtile					G?		present		
Lobaria hallii	V	E			G4,S1			P2,G?,S?	SM1,3(R6)
Lobaria pulmonaria									SM4(R6)
Menegazzia terebrata	V present	R	V	present	absent				
Physcia semipinnata	R	V	E	present	G5, S1				
Physconia americana									
Pseudocyphellaria anomala					G?				SM4(R6)
Pseudocyphellaria anthraspis					G4,S1				SM4(R6)
Ramalina dilacerata	V	present	present	present					
Ramalina obtusata	E	V	V present	E	G?				
Ramalina pollinaria					G?			P2,G?,S?	
Ramalina subleptocarpha									
Ramalina thrausta	V	E	V present	E /V **				P1,G?,S1	SM4(R6)

Other Listed/Rare Sp in N Id	**Norway**	**Sweden**	**Finland**	**Europe**	**ID**	**MT**	**OR**	**WA**	**USFS**
Bryoria tortuosa								P2,G2,S3	SM1,3(R6)
Hypogymnia apinnata					G4,S1				
Sphaerophorus globosus					G5,S1				

Unusual Finds	**Norway**	**Sweden**	**Finland**	**Europe**	**ID**	**MT**	**OR**	**WA**	**USFS/BLM**
Cladonia norvegica	present	present	present	V				P2,G3,S2	SM3(R6)
Collema occultatum	present	V present	E	present					
Flavopunctelia soredica									

Table 2.1. Status of Target Species and Selected Species of Interest, Worldwide and in the Pacific Northwest, continued.

Unusual Finds (cont.)	**Norway**	**Sweden**	**Finland**	**Europe**	**ID**	**MT**	**OR**	**WA**	**USFS/BLM**
Leptogium cellulosum									
Leptogium teretiusculum								P2,G?,S?	SM4(R6)
Melanelia glabra									
Nephroma laevigatum	present	V present	V	present					SM4(R6)
Pannaria leucostictoides									SM4(R6)
Pannaria saubinettii									SM4(R6)
Phaeophyscia ciliata									
Phaeophyscia hirtella									
Usnea chaetophora	present	V	present						
Usnea subfloridana									

Legend
NA = not listed or not present in area
present = listed as present on the World Conservation Union (IUCN) red list
EX = extinct
E= endangered
V=vulnerable
V present = vulnerable and present on the redlist of the country specified
SM = survey and manage category from USFS Spotted Owl Record of Decision, Region 6
G,S= global and state rankings by the Natural Heritage Program: 1</= 5 occurrences, 2=6-20, 3=21-100, 4>100, 5=widespread
P1,2=(WA Natural Heritage Prgrm) based on occurrence pattern, vulnerability, threats, degree of protection, and taxonomy
ID=Idaho, MT=Montana
OR=Oregon, WA=Washington
* Nimis reported *C. curtisporum* from Italy -- 1993 in The Lichens of Italy, Museo Regionale di Scienze Naturali Torino
** E in the mediterranean, V elsewhere. R6 is USFS region 6.

Species in northern Idaho. One hundred twenty-six macrolichen species were found during the 1999 survey. The estimate of the true species richness, based on the first order jackknife estimator was 148. Caution must be used regarding jackknife estimates because they are highly sensitive to the number of rare species observed (there were 22 species found only once in this study) and they may not be appropriate when sampling large heterogenous regions (Palmer 1990). Five range extensions are reported, including first records in northern Idaho for *Phaeophyscia hirtella, P. ciliata, Collema occultatum, Nephroma laevigatum* and *Leptogium cellulosum.* Table 2.2. shows species counts by region.

Table 2.2. Lichen species listed by region. Counts (number of plots in which it occurred) and p-values for the significance of the lichen as an indicator of regional difference from Indicator Species Analysis are included. Regions are shown in Figure 2.1. Total = total number of plots with the species. %F = Percent frequency, or number of plots with the species/ total number of plots. p* = probability value from a Monte Carlo Test.

	Region											
Species	1	2	3	4	5	6	7	8	9	Total	%F	p *
Alectoria imshaugii	0	0	2	1	3	3	1	6	1	17	21	0.047
Alectoria sarmentosa	1	5	9	4	9	8	5	8	3	52	64	0.054
Bryoria	0	0	0	1	2	1	1	3	1	9	11	0.44
Bryoria capillaris	1	6	6	6	5	5	5	3	4	41	51	0.723
Bryoria fremontii	0	5	8	6	2	3	1	4	3	32	40	0.007
Bryoria friabilis	0	0	2	1	0	3	2	2	1	11	14	0.7
Bryoria fuscescens	1	7	5	8	7	9	6	6	6	55	68	0.092
Bryoria glabra	0	0	1	0	0	0	0	0	0	1	1	1
Bryoria lanestris	0	0	1	3	3	1	0	2	2	12	15	0.805
Bryoria pseudofuscescens	0	0	3	5	3	0	4	4	2	21	26	0.357
Bryoria simplicior	0	0	0	2	0	0	0	0	0	2	2	0.112
Bryoria tortuosa	0	2	1	0	0	0	0	0	0	3	4	0.294

Table 2.2. Continued.

	Region											
Species	1	2	3	4	5	6	7	8	9	Total	%F	p *
Candelaria concolor	3	1	1	1	0	1	0	1	2	10	12	0.913
Cetraria canadensis	1	3	4	3	3	3	3	0	3	23	28	0.303
Cetraria chlorophylla	1	5	7	8	7	7	8	9	7	59	73	0.167
Cetraria merrillii	0	0	0	2	3	1	1	0	0	7	9	0.096
Cetraria orbata	0	1	6	1	4	3	5	6	2	28	35	0.269
Cetraria pallidula	0	0	0	0	2	0	0	0	2	4	5	0.003
Cetraria platyphylla	0	4	8	0	3	4	3	2	4	28	35	1
Cetraria sepincola	0	0	0	0	0	0	0	0	1	1	1	0.027
Cladonia	0	0	3	0	1	0	0	0	0	4	5	1
Cladonia albonigra	0	0	1	0	0	0	0	0	0	1	1	1
Cladonia carneola	0	1	1	0	0	0	0	0	0	2	2	0.741
Cladonia cenotea	0	1	2	0	0	1	2	0	1	7	9	1
Cladonia chlorophaea	0	0	0	0	1	0	0	0	0	1	1	1
Cladonia coniocraea	1	0	0	0	0	0	0	0	0	1	1	0.962
Cladonia fimbriata	3	3	3	0	4	2	2	4	2	23	28	0.006
Cladonia ochrochlora	1	3	6	0	2	1	1	0	0	14	17	0.003
Cladonia squamosa	0	2	5	0	1	0	0	0	0	8	10	0.871
Cladonia sulphurina	0	1	2	0	2	0	1	0	0	6	7	0.516
Cladonia umbricola	0	2	2	0	0	0	0	0	0	4	5	0.447
Collema curtisporum	0	0	0	2	1	3	5	5	3	19	23	0.153
Collema furfuraceum	2	2	0	4	2	3	8	8	9	38	47	0.002
Collema occultatum	0	0	0	0	0	1	0	0	0	1	1	1
Esslingeriana idahoensis	0	1	6	1	3	2	2	1	1	17	21	0.011
Evernia prunastri	6	8	9	9	5	5	7	4	9	62	77	0.035
Flavopunctelia soredica	1	0	0	0	0	0	0	0	0	1	1	1
Fuscopannaria leucostictoides	0	0	0	0	1	0	0	0	0	1	1	1
Fuscopannaria pacifica	0	1	0	0	2	0	0	0	0	3	4	0.28
Hypocenomyce castaneocinerea	0	0	2	0	0	0	0	0	0	2	2	0.104
Hypocenomyce scalaris	0	0	2	0	0	3	0	0	0	5	6	0.079
Hypogymnia apinnata	0	4	9	4	7	4	6	6	0	40	49	0.005
Hypogymnia enteromorpha	0	0	1	0	0	0	0	0	1	2	2	1
Hypogymnia imshaugii	1	6	9	4	7	5	7	6	5	50	62	0.055
Hypogymnia inactiva	0	0	0	0	0	0	1	0	0	1	1	1
Hypogymnia metaphysodes	0	3	4	1	3	4	2	0	2	19	23	0.607
Hypogymnia occidentalis	0	4	6	4	8	7	6	8	4	47	58	0.097
Hypogymnia physodes	3	7	8	8	9	9	8	9	9	70	86	0.567
Hypogymnia tubulosa	1	6	9	8	9	9	9	7	9	67	83	0.121
Leptogium cellulosum	4	1	0	5	5	8	2	8	5	38	47	0.041
Leptogium saturninum	4	3	0	5	3	7	6	9	8	45	56	0.017
Leptogium teretiusculum	2	1	0	2	1	2	2	4	1	15	19	0.438
Letharia vulpina	2	3	4	4	5	5	3	1	3	30	37	0.826

Table 2.2. Continued.

	Region											
Species	1	2	3	4	5	6	7	8	9	Total	%F	p *
Lobaria hallii	0	1	0	4	4	3	8	9	3	32	40	0.001
Lobaria pulmonaria	0	8	8	5	8	9	7	9	7	61	75	0.006
Melanelia	1	0	0	0	0	1	0	0	0	2	2	1
Melanelia elegantula	3	1	2	5	2	3	4	1	2	23	28	0.477
Melanelia exasperatula	2	3	0	6	4	7	8	3	7	40	49	0.1
Melanelia fuliginosa	0	2	2	1	3	2	6	6	8	30	37	0.005
Melanelia glabra	1	0	0	0	0	0	0	0	0	1	1	1
Melanelia multispora	4	6	6	8	8	8	8	9	8	65	80	0.202
Melanelia panniformis	0	1	0	0	0	0	0	0	0	1	1	1
Melanelia subargentifera	5	0	0	0	0	0	0	0	0	5	6	0.001
Melanelia subaurifera	3	7	7	6	7	2	2	3	0	32	40	0.011
Melanelia subelegantula	4	2	1	4	5	7	7	2	8	10	12	1
Melanelia subolivacea	1	1	0	0	0	0	0	0	1	37	46	0.265
Nephroma bellum	0	0	1	0	0	0	0	0	0	1	1	1
Nephroma helveticum	0	5	9	2	6	2	4	6	1	35	43	0.002
Nephroma laevigatum	0	0	0	0	1	0	0	0	0	1	1	1
Nephroma parile	0	3	3	1	2	3	0	2	2	16	20	0.579
Nephroma resupinatum	2	8	8	5	7	8	5	9	4	56	69	0.042
Nodobryoria abbreviata	1	1	1	3	2	2	1	0	1	12	15	0.641
Nodobryoria oregana	0	0	1	1	3	0	1	0	2	8	10	0.163
Parmelia hygrophila	6	6	8	8	9	9	9	8	9	72	89	0.621
Parmelia sulcata	7	8	9	9	9	9	9	9	9	78	96	0.637
Parmeliopsis ambigua	1	1	6	0	1	6	2	3	3	23	28	1
Parmeliopsis hyperopta	2	1	8	0	3	7	3	4	1	29	36	0.009
Peltigera	1	0	0	0	0	1	0	0	0	2	2	0.007
Peltigera aphthosa	0	0	0	0	0	0	0	0	1	1	1	1
Peltigera canina	1	0	0	0	1	0	0	0	0	2	2	0.009
Peltigera collina	1	7	4	7	8	9	7	9	5	57	70	1
Peltigera membranacea	0	1	3	1	1	0	0	0	0	6	7	1
Peltigera pacifica	0	0	0	0	2	0	0	0	1	3	4	1
Phaeophyscia	0	0	0	0	0	0	1	0	0	1	1	0.076
Phaeophyscia ciliata	0	0	0	0	0	1	0	0	0	1	1	0.128
Phaeophyscia hirtella	0	0	0	0	0	1	0	0	0	1	1	1
Phaeophyscia nigricans	1	0	0	0	0	0	0	0	0	1	1	1
Phaeophyscia orbicularis	9	2	0	4	1	0	2	0	6	24	30	0.001
Physcia adscendens	8	4	1	9	4	3	7	0	7	43	53	1
Physcia aipolia	1	3	3	2	0	0	0	0	0	9	11	1
Physcia biziana	4	2	0	1	0	2	0	0	0	9	11	0.001
Physcia stellaris	5	8	6	7	6	6	7	9	8	62	77	0.059
Physcia tenella	9	3	2	5	1	3	3	0	6	32	40	0.001
Physciella	1	0	0	0	0	0	1	0	0	2	2	0.053

Table 2.2. Continued

	Region											
Species	1	2	3	4	5	6	7	8	9	Total	%F	p *
Physciella chloantha	3	0	0	0	0	0	0	0	0	3	4	0.017
Physciella melanchra	5	2	0	1	0	0	2	0	0	10	12	0.237
Physconia americana	0	1	0	6	3	4	7	5	6	32	40	0.019
Physconia enteroxantha	8	0	0	1	0	1	1	0	4	15	19	0.122
Physconia perisidiosa	7	3	0	7	2	7	8	4	7	45	56	0.001
Platismatia glauca	0	8	8	8	9	9	7	9	6	64	79	0.486
Pseudocyphellaria anomala	0	0	0	0	1	1	0	0	0	2	2	0.028
Pseudocyphellaria anthraspis	0	5	6	1	2	2	0	0	0	16	20	0.002
Ramalina dilacerata	0	6	6	6	5	3	7	8	3	44	54	0.201
Ramalina farinacea	2	6	2	8	5	4	7	3	7	44	54	0.063
Ramalina pollinaria	0	0	0	0	0	0	0	0	3	3	4	0.011
Ramalina subleptocarpha	0	2	0	1	0	0	0	0	1	4	7	0.529
Ramalina thrausta	0	1	4	4	2	1	2	3	2	19	23	0.322
Sphaerophorus globosus	0	2	0	0	2	0	0	0	0	4	5	0.11
Usnea	0	1	0	2	1	2	1	0	0	7	9	0.714
Usnea chaetophora	0	0	1	0	0	0	0	0	0	1	1	1
Usnea diplotypus	0	0	1	0	0	0	1	0	1	3	4	1
Usnea esperantiana	0	0	0	0	0	0	1	0	0	1	1	1
Usnea filipendula	0	0	1	1	0	0	2	1	0	5	6	0.283
Usnea glabrata	0	3	4	1	0	2	1	2	3	16	20	0.272
Usnea hirta	1	1	0	1	0	1	1	0	1	6	7	1
Usnea lapponica	3	8	8	8	6	6	7	3	9	58	72	0.208
Usnea scabrata	0	4	7	0	2	2	0	1	0	16	20	0.001
Usnea subfloridana	0	0	1	1	0	0	0	0	0	2	2	1
Xanthoria candelaria	6	6	3	7	5	5	4	5	7	48	59	0.62
Xanthoria fallax	7	0	0	0	0	0	0	0	1	8	10	0.001
Xanthoria fulva	7	2	0	6	3	2	5	1	8	35	43	0.029
Xanthoria hasseana	0	0	0	1	2	0	0	0	0	3	4	0.266
Xanthoria montana	8	3	2	7	6	6	9	9	7	57	70	0.276
Xanthoria oregana	1	0	0	0	0	0	0	0	0	1	1	1
Xanthoria polycarpa	1	2	0	5	0	1	5	1	5	20	25	0.258
Xanthoparmelia cumberlandia	1	0	0	0	0	0	0	0	0	1	1	1

Regional differences in lichen communities. Lichen communities differed among regions (A= 0.370, p <0.001, from MRPP analysis; Table 2.2). Some of the best indicators of regional differences in lichen communities were *Usnea scabrata*, *Xanthoria fallax,* and *Lobaria hallii*, all with p-values of 0.001 from Indicator Species Analysis.

Table 2.3. Total number of species occurrences by region. Alpha, beta and gamma diversity by region are included.

	Regions								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Species occurrences by region	191	263	311	301	302	306	315	292	308
α diversity	21.2	29.3	34.6	33.7	33.6	34	35.1	32.4	34.1
β diversity	2.8	2.6	2.1	2.2	2.3	2.3	2.1	1.8	2.2
γ diversity	60	76	72	74	78	77	74	58	75

Region 1 had the lowest number of species occurrences, which is the sum of the number of species for each plot for the region, and the lowest alpha diversity (Table 2.3). Region 1 included Lewiston and the Salmon River drainage and was the driest region. Lewiston has an average annual precipitation of 31 cm (Abranovich et al. 1998), compared to an average of approximately 90 cm for the entire study area. Species unique to Region 1 included: *Flavopunctelia soredica, Melanelia glabra, Melanelia subargentifera, Phaeophyscia nigricans,* and *Physciella chloantha.* This region also had the most species missing that were present in all other regions. Missing species included: *Bryoria fremontii, Cetraria*

orbata, Esslingeriana idahoensis, Hypogymnia occidentalis, Melanelia fuliginosa, Nephroma helveticum, Platismatia glauca, Ramalina dilacerata, Ramalina thrausta, and *Lobaria pulmonaria.*

Region 8 had the lowest beta and gamma diversity and intermediate alpha diversity. This region includes the Silver Valley, which is in the drainage of the North Fork of the Coeur d'Alene River. Species that had the highest number of occurrences in Region 8 include: *Alectoria imshaugii, Cetraria chlorophylla, Leptogium saturninum, Leptogium teretiusculum, Lobaria hallii, Melanelia multispora, Nephroma resupinatum, Physcia stellaris,* and *Ramalina dilacerata.*

Stream class and valley class differences in lichen communities. Lichen communities did not differ significantly among stream class groups (A= 0.002, p = 0.526, from MRPP analysis), or among valley classes (A= 0.001, p = 0.486, from MRPP analysis).

Floodplain cross-section type differences in lichen communities. Riparian macrolichen communities differed among floodplain cross-section types (A= 0.046, p = 0.002 from MRPP analysis). Indicators of floodplain cross-section types are included in Tables 2.4a through 2.4c. In this analysis, the "multiple channels on a broad floodplain" was combined with the category "floodplain on both sides." "Floodplain on one side" and "incised with no floodplain" were the other two categories.

Table 2.4a. Indicator species for streams with a floodplain on one side. The numbers under the column headings, one side, both sides and incised, are indicator values (see methods). Only species with significant ($p \leq 0.1$) indicator values (IV) are included.

	Cross section Type			
Species	Floodplain one side	Floodplain both sides	Floodplain incised	p-value
Fuscopannaria pacifica	13	0	0	0.070
Sphaerophorus globosus	17	0	0	0.066
Xanthoria fallax	17	1	0	0.061

Table 2.4b. Indicator species for streams with floodplains on both sides.

	Cross section Type			
Species	Floodplain one side	Floodplain both sides	Floodplain incised	p-value
Collema furfuraceum	10	41	0	0.016
Leptogium saturninum	16	41	2	0.023
Xanthoria polycarpa	2	24	0	0.082
Collema curtisporum	4	24	0	0.085

Table 2.4c. Indicator species for incised streams (no floodplain).

	Cross section Type			
Species	Floodplain one side	Floodplain both sides	Floodplain incised	p-value
Pseudocyphellaria anthraspis	7	0	46	0.002
Cladonia sp.	1	0	29	0.007
Platismatia glauca	17	27	41	0.010
Parmeliopsis ambigua	6	4	38	0.016
Cetraria canadensis	5	5	32	0.017
Usnea scabrata	10	0	34	0.017
Cetraria platyphylla	4	7	37	0.019
Peltigera membranacea	2	0	25	0.022
Bryoria tortuosa	1	0	19	0.039

Table 2.4c. Continued.

	Cross section Type			
Species	Floodplain one side	Floodplain both sides	Floodplain incised	p-value
Nodobryoria abbreviata	1	3	21	0.045
Bryoria fremontii	4	15	34	0.046
Usnea glabrata	3	3	26	0.057
Cladonia ochrochlora	9	1	25	0.062
Cladonia squamosa	6	0	21	0.066
Cladonia umbricola	1	0	17	0.068
Hypogymnia enteromorpha	0	0	10	0.089
Letharia vulpina	8	8	28	0.093

Collema curtisporum has a relatively high indicator value for "floodplains on both sides" with low indicator values for the other floodplain cross-section types, meaning that it is associated with streams and rivers with floodplains on both sides. With the exception of *Xanthoria polycarpa*, indicator species for floodplains on both sides are lichens with blue-green photobionts.

Fuscopannaria pacifica and *Sphaerophorus globosus* were both found primarily along the North Fork of the Clearwater River and on the Lochsa River where there was a floodplain on one side. *Sphaerophorus globosus* was abundant on large old western red cedar, especially in the drainage of the North Fork of the Clearwater River where there was a floodplain on one side. *Fuscopannaria pacifica* was found on red alder in the same areas as *S. globusus*. *Xanthoria fallax* was found on large black cottonwood in dry areas, especially in regions 1 and 2 where there was a floodplain on one side of the river or stream.

Pseudocyphellaria anthraspis has the highest indicator value for cross sections that were incised with no floodplain, meaning that it is strongly associated with incised stream cross-sections. Many of the species listed in Table 2.4c are also associated with conifers (compare with Table 2.5b).

Basal area in hardwoods. Lichen communities differed among classes of basal area percentages for hardwoods ($A = 0.072$, $p < 0.001$ from MRPP analysis). Indicators of different basal area percentages of hardwoods are in Tables 2.5a-c. Although the tables show how different lichen species were associated with different levels of hardwood composition, they do not give any information about what substrate the lichen species was growing on.

Table 2.5a. Indicator species most strongly associated with hardwood-dominated stands. The numbers under percent basal area in hardwoods are indicator values. Only species with significant IV's are included.

	Percent basal area in hardwoods				
Species	≤50%	51-70%	72-96%	100%	p-value
Ramalina farinacea	4	13	35	11	0.003
Physciella melanchra	0	1	1	24	0.004
Phaeophyscia hirsuta	0	1	2	23	0.005
Xanthoria fallax	0	1	0	23	0.007
Melanelia subargentifera	1	0	0	16	0.017
Physconia americana	2	9	26	11	0.020
Physciella chloantha	0	0	0	15	0.036
Xanthoria montana	7	15	28	26	0.052
Physconia perisidiosa	4	11	20	27	0.054
Xanthoria fulva	3	8	14	25	0.116
Physconia enteroxantha	2	4	2	15	0.128

Table 2.5b. Indicator species most strongly associated with conifer-dominated stands.

	Percent basal area in hardwoods				
Species	≤50%	51-70%	72-96%	100%	p-value
Cladonia squamosa	26	0	1	0	0.001
Usnea scabrata	30	4	1	0	0.001
Cladonia ochrochlora	29	2	0	0	0.003
Pseudocyphellaria anthraspis	25	7	1	0	0.005
Cetraria platyphylla	27	12	5	1	0.009
Alectoria sarmentosa	30	17	12	8	0.018
Bryoria tortuosa	13	0	0	0	0.049
Esslingeriana idahoensis	19	1	1	6	0.049

Table 2.5c. Indicator species most strongly associated with mixed stands (intermediate basal area in hardwoods).

	Percent basal area in hardwoods				
Species	≤50%	51-70%	72-96%	100%	p-value
Leptogium teretiusculum	0	25	0	8	0.004
Melanelia multispora	15	22	30	15	0.026
Bryoria pseudofuscescens	7	3	20	2	0.045
Hypogymnia tubulosa	27	20	29	9	0.058
Cetraria canadensis	8	20	8	0	0.073
Evernia prunastri	29	18	24	9	0.082

Climatic Affinities. The Lochsa and Selway rivers (in region 3) are known for large numbers of vascular plant species that are coastal disjuncts (Crawford 1979, Steele 1975). The lichen communities in region 3 also show a high number of oceanic species (Figure 2.2). Region 5 includes the North Fork of the Clearwater that, prior to the completion of the Dworshak reservoir, had a rich coastal disjunct component that included a large *Alnus rubra* (red alder) forest

(Crawford 1979). There are still red alder upstream from the dam, as well as along the edges of the reservoir, and the lichen community shows a large component of oceanic species.

When the data were examined by plots, it appeared that elevation played a role in the distribution of the climatic affinities (2.3-2.4). Elevations in the study area ranged from 235 m to 1134 m. and, in general, elevation increases from the Palouse on the west side of the study area to the Bitterroot Mountains on the east side of the study area. Oceanic affinity was not correlated with elevation ($r = 0.047$) though the most oceanic plots appeared to cluster in the middle of the study area, which is at mid-elevations (see Figure 2.3). Plots with relatively high suboceanic values were concentrated in the Bitterroot Range, which were at the high elevations (see Figure 2.3), and the suboceanic axis was positively correlated with elevation ($r = 0.618$). Most of the plots with relatively continental lichen flora were at the edge of the Palouse (see Figure 2.3) and tended to have the lowest elevations. The continental axis was negatively correlated with elevation ($r = -0.346$)

Figure 2.2. Numbers of oceanic, suboceanic, and continental lichen species per plot. Each of nine regions in northern Idaho are shown, and regions correspond to DeLorme (1992).

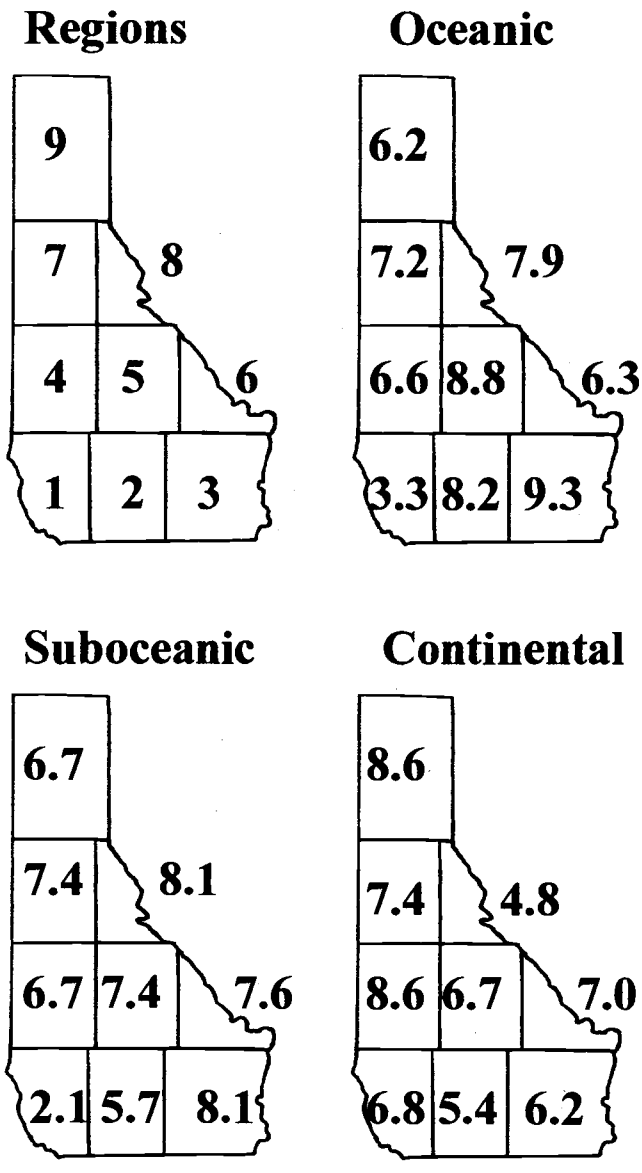


Figure 2.3a. Continental affinities by plot, using weighted average ordination. The size of the circle indicates the value for continental affinity for the plot.

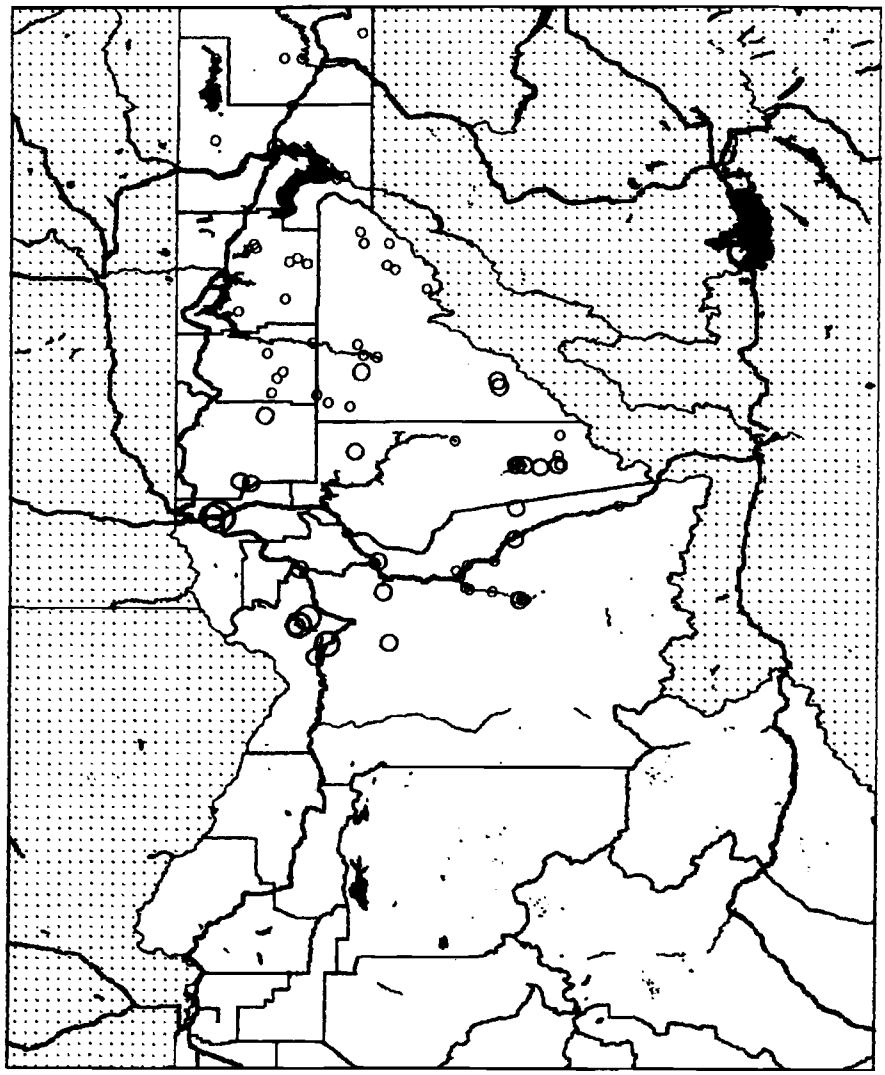


Figure 2.3b. Oceanic affinities by plot, using weighted average ordination. The size of the circle indicates the value for oceanic affinity for the plot.

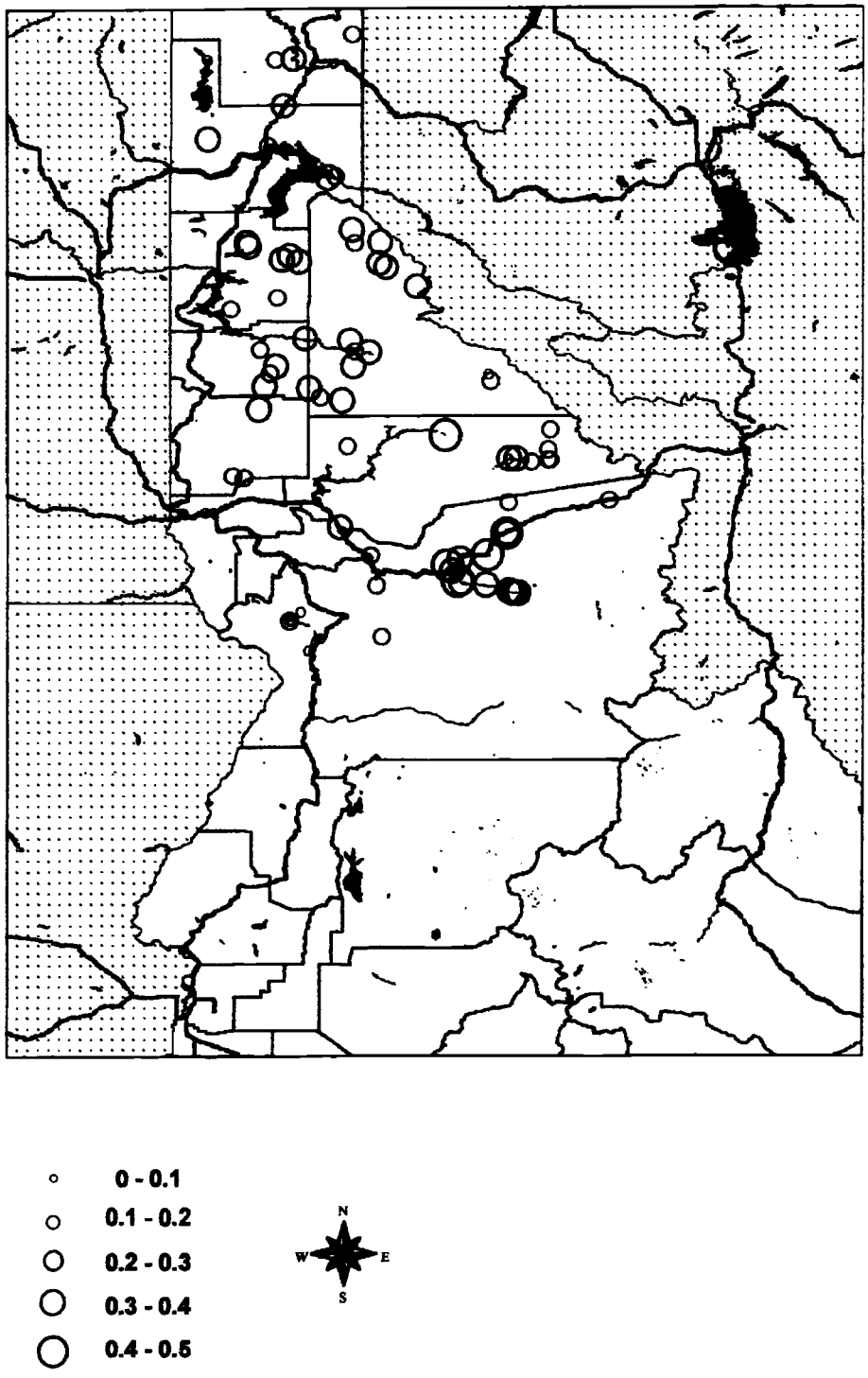


Figure 2.3c. Suboceanic affinities by plot, using weighted average ordination. The size of the circle indicates the value for suboceanic affinity for the plot.

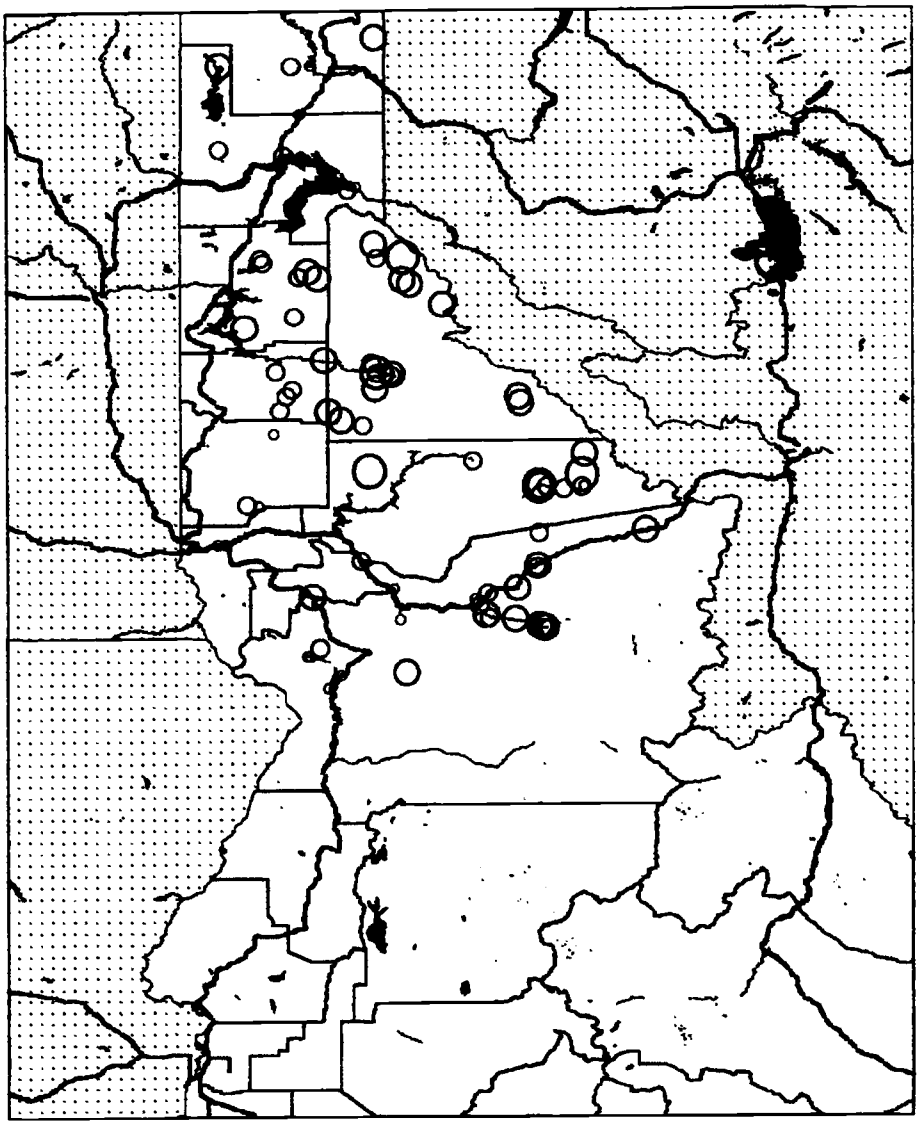


Figure 2.4a. Weighted average ordination, showing relative placement of plots on axes of continental and oceanic affinities. Plot coding system is described in methods. Axes are scaled as the proportion of the macrolichens belonging to a particular climatic affinity.

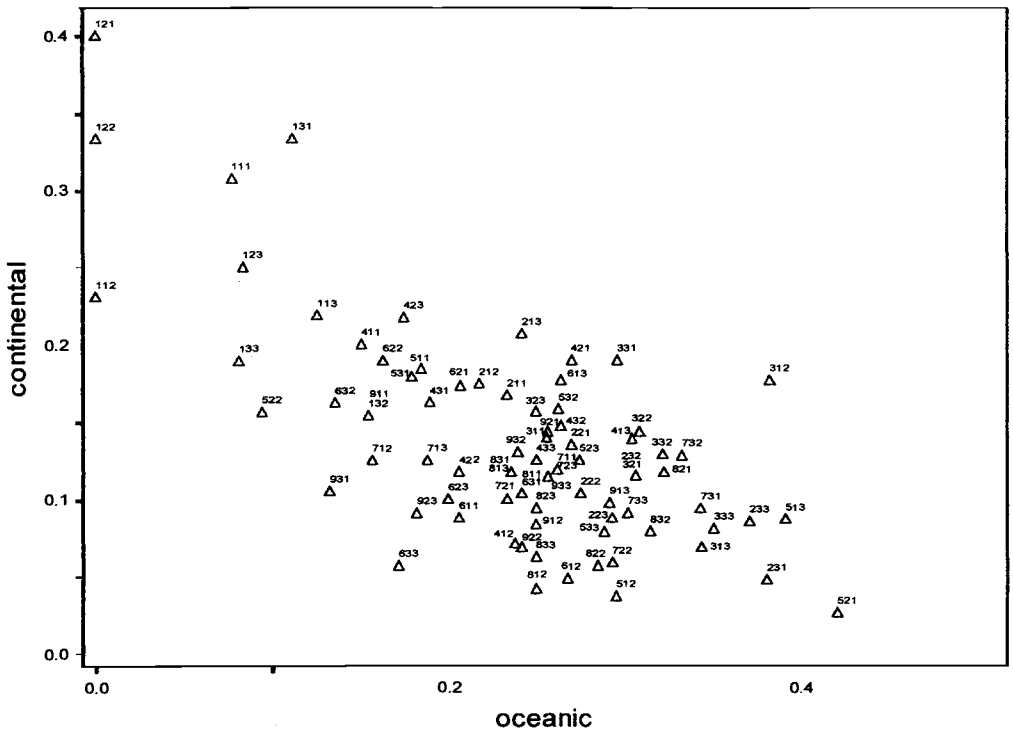


Figure 2.4b. Weighted average ordination, showing relative placement of plots on axes of suboceanic and oceanic affinities. Plot coding system is described in methods. Axes are scaled as the proportion of the macrolichens belonging to a particular climatic affinity.

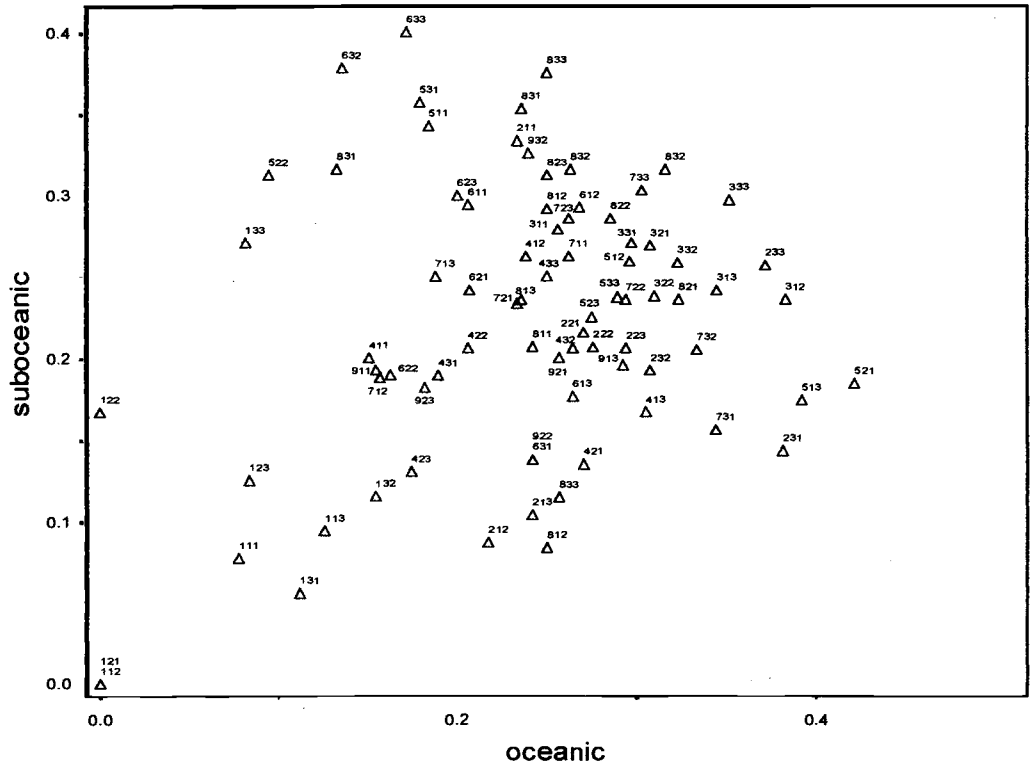
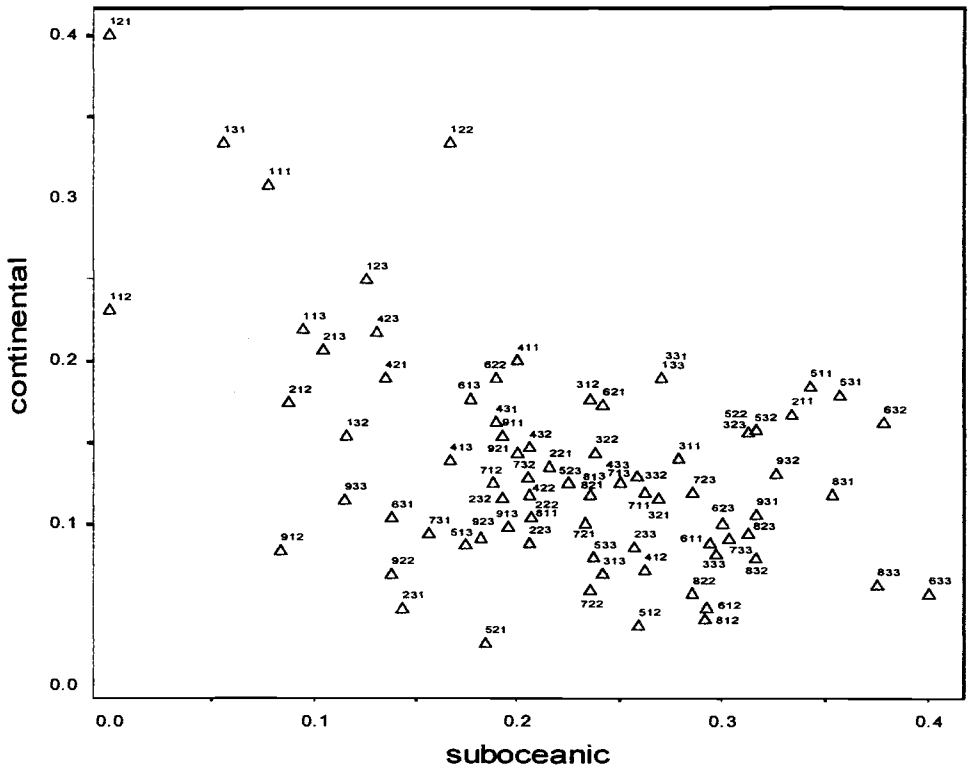


Figure 2.4c. Weighted average ordination, showing relative placement of plots on axes of continental and suboceanic affinities. Plot coding system is described in methods. Axes are scaled as the proportion of the macrolichens belonging to a particular climatic affinity.



Correlations of climatic affinities with variables describing conifer attributes in the plot (e.g. the dbh of the largest conifer, modal conifer dbh, and percent cover by sapling conifers) indicate that the size and presence of conifers on the plots was also related to climatic affinity. Plots with relatively high suboceanic values tended to support larger conifers ($r = 0.352$) and more cover of saplings ($r = 0.560$). More continental plots had less cover in conifer saplings ($r = -0.307$) and smaller conifer dbh ($r = -0.451$). Relatively oceanic plots supported larger conifers ($r = 0.510$ for the largest conifer, a larger correlation than was found for suboceanic plots, and $r = 0.442$ for typical conifer dbh).

Rarity and Ecology of the Target Species. The most practical definition of rarity comes from Rabinowitz (1981), who categorized rarity into seven forms based on large/small geographic range, narrow/wide habitat specificity, and large/small population size. We added "moderate" in addition to her small/large, narrow/wide categories. The listings below give the best information we have on both worldwide geographic distribution and more local distribution in Idaho, habitat and typical population sizes for populations.

The following information was compiled using McCune and Geiser (1997), McCune and Goward (1995), Goward et al. (1994), Tønsberg et al. (1996), and various monographs for species: Moberg (1977), Esslinger (1994), Bowler (1977), Rundel and Bowler (1976), Sierk (1964), Jørgensen and Tønsberg (1999), and Degelius (1954, 1974), as well as field data from this study. See Appendix B for distribution maps for target species. "Status in Idaho" was

determined by using the information compiled in this study. Suggested rankings for the species, under "Management Recommentations" were also determined using the information compiled in this study. Global (G) is the global ranking for the species and S is the state ranking in Idaho. The numbers following G and S correspond to the number of documented occurrences: 1 = 5 or fewer occurrences, 2 = 6-20 occurrences, 3 = 21-100 occurrences, 4 = greater than 100 occurrences, 5 = widespread, abundant and secure. For more in-depth definitions see Appendix A.

Cetraria sepincola (Ehrh.) Ach. (as *Tuckermanopsis s.* (Ehrh.) Hale)
Rarity Type in Idaho: Narrow geographic range, narrow habitat specificity, small populations. There are two documented occurrences in Idaho.
Distribution: Circumpolar boreal and subarctic, Alaska to northern California and northwestern Montana, east to northeast United States. In Idaho, it is found in Kootenai County on *Betula glandulosa* twigs at Rose Lake, and in Bonner County near the Clark Fork River.
Growth Form: Small foliose lichen with apothecia. Closely appressed to the substrate and typically growing on twigs.
Ecology: Usually on shrub twigs in bogs. Often on *Betula* species. Elevation range for Idaho is 570 – 630 m. *Cetraria sepincola* is found almost exclusively in areas where the soil is always saturated.
Primary Threat: Dams and water diversions.
Secondary Threats: Agricultural activities, urbanization, livestock grazing, mining.
Status in Idaho: Rare.
Management Recommendations: Activities in wetlands and waterways are regulated by local, state and federal agencies; however, wetlands are often destroyed for right of way. Mitigation does not guarantee the wetland used to replace the disturbed wetland will be of the same quality or type. We suggest protection from disturbances and consideration of special botanical designation for *Betula* bogs. We suggest listing *C. sepincola* as G5, S1.

Collema curtisporum Degl.
Rarity Type in Idaho: Moderate geographic range, narrow habitat specificity, small populations. There are 25 documented occurrences in Idaho.

Distribution: Between the Cascades and the Rockies in Oregon, Washington and Idaho, into western Montana and possibly British Columbia. One population in Alaska. Populations in Scandinavia and in the Italian Alps. In Idaho, from the Lochsa River, north to Priest Lake.
Growth Form: Small foliose lichen with apothecia. Closely appressed to substrate.
Ecology: Usually on older *Populus balsamifera ssp. trichocarpa* in the PNW, or on *Populus tremula* in Scandinavia. In the PNW *Collema curtisporum* will also grow on conifers beside *Populus balsamifera ssp. trichocarpa* (black cottonwood) in floodplain forests. *C. curtisporum* is typically on heavily furrowed bark of mature black cottonwood boles. Seems to grow most abundantly in frequently inundated floodplains. Elevations for the Idaho sites range from 630 m to 1114 m. For more information on the ecology of *C. curtisporum*, see Hutchinson and McCune (2000).
Primary Threat: Dams and water diversions.
Secondary Threats: Agricultural activities, grazing, mining, logging and associated activities, recreation, fire suppression.
Status in Idaho: Recognized as threatened in Idaho and worldwide.
Management Recommendations: Damming rivers and draining floodplains for farming are deleterious to riparian forests containing black cottonwood. While riparian forests are protected through local, state and federal laws, there is a large and growing body of evidence showing that black cottonwood forests can only be maintained through natural flood regimes and special attention should be given to water release timing from dams based on natural cycles rather than human needs or convenience. Since *Collema curtisporum* is found almost exclusively on black cottonwood, managing for black cottonwoods in riparian forests should protect *C. curtisporum.* We recommend changing the listing of *C. curtisporum* to G2,S3. See Hutchinson and McCune (2000) for more details regarding management recommendations.

Collema furfuraceum (Arn.) DR
Rarity Type in Idaho: Wide geographic range, wide habitat specificity, small populations.
Distribution: Widespread in North America, found throughout forested parts of the PNW, including Idaho.
Growth Form: Small foliose isidiate lichen, closely appressed to substrate. Found on boles, branches, twigs and occasionally rock.
Ecology: Most common in moist low elevation riparian forests on broad-leaved trees and shrubs. In northern Idaho *C. furfuraceum* is found on *Populus balsamifera ssp. trichocarpa*, *Acer glabrum*, *Celtis* sp., *Alnus* sp., and *Rhamnus purshiana*. Elevations in northern Idaho ranged from 33 to 1115 m.
Primary Threat: Urbanization, development.

Secondary Threats: Damming and water diversion, agricultural activities, mining, air pollution, logging and associated activities.
Status in Idaho: Widespread and common in floodplain forests of northern Idaho and the PNW.
Management Recommendations: No special protection is recommended. *Collema furfuraceum* can be removed from the state list.

Hypogymnia oceanica (Goward) Goward 1988
Rarity Type in Idaho: No reports for Idaho.
Distribution: Fairly common west Cascades, from coastal Alaska to Oregon, increasingly rare southward. Not known on the east side of the Cascades in the United States, but oceanic in the interior cedar-hemlock zone in British Columbia.
Growth Form: Small to medium sized lichen. Foliose with soredia. Loosely appressed. Hollow interior.
Ecology: Most often found in moist coastal forests and *Pseudotsuga-Tsuga* forests in the Coast Range and Cascades.
Primary Threat: Logging and associated activities.
Secondary Threats: Urbanization and development and fire suppression.
Status in Idaho: Not known in Idaho.
Management recommendations: No special protection is necessary in Idaho at this time. Survey potential habitable sites, such as Douglas fir/western hemlock stands, cedar-hemlock stands and cool *Abies* stream bottoms.

Leptogium subtile (Schrad.) Torss.
Rarity Type in Idaho: There are no known sites in Idaho. *Leptogium subtile* is possibly overlooked and under collected due to its extremely small size.
Distribution: Not regarded as an American species until Goward et al. (1994) accepted *L. subtile*. It has been included in north American material by Sierk as *L. tenuissimum* and *L. perminutum*. Widespread, but distribution poorly known.
Growth Form: Tiny foliose lichen with apothecia. Closely appressed to substrate.
Ecology: On rotten or burnt wood, plant debris, rarely on standing trees.
Primary Threat: Logging and associated activities.
Secondary Threats: Livestock grazing, recreation, fire suppression.
Status in Idaho: Not known from Idaho, possibly rare or under-collected; previously collected specimens that were thought to be *L. subtile* are actually *L. cellulosum*.
Management Recommendations: Survey potential habitable sites.

Lobaria hallii (Tuck.) Zahlbr.
Rarity Type in Idaho: Moderate geographic distribution, narrow habitat specificity, small populations. There are 53 documented sites for *Lobaria hallii* in Idaho.
Distribution: Alaska to northern California, east to near the Continental Divide in western Montana. In Europe, *Lobaria hallii* is only known from Scandinavia and Greenland. In Idaho, *L. hallii* is found from Clearwater Co., north to Boundary Co.
Growth Form: Large, loosely appressed foliose lichen with soredia. On boles and branches. Tends to be smaller and more closely appressed on smaller branches and twigs.
Ecology: *Lobaria hallii* is frequently found in sheltered, moist riparian forests mainly on mature *Populus balsamifera ssp. trichocarpa.* It is associated with *Physconia americana, Leptogium saturninum, Collema curtisporum* and *Nephroma resupinatum.* While *L. hallii* is almost always associated with *Populus balsamifera ssp. trichocarpa* in northern Idaho, it will grow on other trees and shrubs associated with *P. trichocarpa*, such as *Alnus* sp., *Acer glabrum, Rhamnus purshiana, Picea englemannii*, and *Abies grandis*. It has been found on rock once in northern Idaho. Elevation range in northern Idaho was 480 to1120 m.
Primary Threat: Dams and water diversions.
Secondary Threats: Agricultural activities, grazing, mining, logging and associated activities, recreation, fire suppression, and air pollution.
Status in Idaho: Recognized as a species of concern in Idaho and rare worldwide.
Management Recommendations: Damming rivers and draining floodplains for farming are deleterious to riparian forests containing black cottonwood. While riparian forests are protected through local, state and federal laws, there is a large and growing body of evidence showing that black cottonwood forests can only be maintained through natural flood regimes and special attention should be given to water release timing from dams based on natural cycles rather than human needs or convenience. Because cottonwood forests in wetlands are vulnerable to a variety of human induced impacts, *Lobaria hallii* should still be considered at risk in Idaho. We recommend changing the state listing of *L. hallii* to G4, S3.

Lobaria pulmonaria (L.) Hoffm.
Rarity Type in Idaho: Wide geographic range, moderate habitat specificity (moist forests, upland and riparian), and large population sizes.
Distribution: Alaska to central California and inland to western Montana. *Lobaria pulmonaria* is found throughout northern Idaho.
Growth Form: Large loosely appressed foliose lichen with soredia. On boles and branches of trees and large shrubs.
Ecology: *Lobaria pulmonaria* is found in moist low to mid-elevation forests in areas with strong coastal influence. It is frequent west of the Cascades, but uncommon to rare in most areas east of the Cascades, except for northern Idaho

where it can be frequent in riparian areas. In northern Idaho *L. pulmonaria* was most abundant along the Lochsa and Selway Rivers on *Thuja plicata*. It is also common in *Populus balsamifera ssp. trichocarpa* floodplain forests and in *Thuja plicata/ Alnus rubra* stands along the North Fork of the Clearwater River. Elevations at the sites of occurrence in northern Idaho range from 360 to 1370 m.
Primary Threat: Urbanization and development.
Secondary Threats: Logging and associated activities, air pollution, dams and water diversion, agricultural activities, mining.
Status in Idaho: Can be locally abundant along riparian corridors.
Management recommendations: Although no state listing or special protection is recommended, this species should be watched, as it has suffered huge declines in Europe.

Menegazzia terebrata (Hoffm.) Massal.
Rarity Type in Idaho: No known records from Idaho.
Distribution: Alaska to California, west Cascades in the PNW. *Menegazzia terebrata* is a northern hemisphere species found in Europe, North America, China, Russia and Japan.
Growth Form: Small to medium sized foliose, sorediate lichen. Lobes are hollow. Appressed and typically on boles of trees and shrubs.
Ecology: Moist oceanic forests, often in riparian areas, especially frequent on *Alnus rubra*. Tønsberg et al. (1996) noted that, *M. terebrata* is saxicolous in inland areas in Scandinavia. Saxicolous *M. terebrata* has not been observed in the continental United States.
Primary Threat: Logging and associated activities.
Secondary Threats: Urbanization and development, agricultural activities, dams and water diversion.
Status in Idaho: Not known in Idaho.
Management Recommendations: No special protection is necessary in Idaho at this time. Survey in potential habitable sites, i.e. swampy *Alnus rubra* forests.

Physcia semipinnata (Gmel.) Moberg
Rarity Type in Idaho: No reports for Idaho. Small and possibly overlooked.
Distribution: North America west and east, north to BC and south to New Mexico. Western Eurasia and India. The quality of information is compromised by the confusion of *P. semipinnata* with other species with similar appearance, such as *P. tenella.*
Growth Form: Small lichen with apothecia and marginal cilia. Lobes appressed or ascending. On bark.
Ecology: Most commonly found in low moist forests, on conifers, especially near streams, or lakes in the PNW. In Fennoscandia, *Physcia semipinnata* occurs on eutrophic bark of deciduous trees in well-lit habitats influenced by humans.

Primary threat: Too little information to assess threats.
Secondary threats: Logging and associated activities, urbanization and development.
Status in Idaho: Not yet recorded from Idaho.
Management Recommendations: No special protection is necessary in Idaho at this time. Possibly more surveys are needed.

Physconia americana Essl.
Rarity Type in Idaho: Moderate geographic range, narrow habitat specificity, moderate population size. There are 39 documented sites in Idaho.
Distribution: Common west of the Cascades in broad agricultural valleys and valley fringe. Widespread and occasional in northern Idaho and Rockies on *Populus balsamifera ssp. trichocarpa.*
Growth Form: Medium sized lichen with apothecia and pruinose upper surface. Closely appressed on boles and branches.
Ecology: Frequently found in northern Idaho on *Populus balsamifera ssp. trichocarpa* with *Lobaria hallii, Collema furfuraceum, C. curtisporum, Lobaria pulmonaria, Nephroma resupinatum.* Elevation range in northern Idaho is 334 to 1250 m.
Primary Threat: Dams and water diversions.
Secondary Threats: Agricultural activities, grazing, mining, logging and associated activities, recreation, fire suppression.
Status in Idaho: Widespread and occasional.
Management Recommendations: Damming rivers and draining floodplains for farming are deleterious to riparian forests containing black cottonwood. While riparian forests are protected through local, state and federal laws, there is a large and growing body of evidence showing that black cottonwood forests can only be maintained through natural flood regimes. Special attention should be given to water release timing from dams based on natural cycles rather than human needs or convenience. *Physconia americana* should be considered for listing similar to the G4, S3 listing for *Lobaria hallii,* since *P. americana* is also found mainly on black cottonwood.

Pseudocyphellaria anomala Brodo & Ahti
Rarity Type in Idaho: Narrow geographic distribution, narrow habitat specificity, small populations. There are six documented sites in Idaho.
Distribution: Alaska to California, west Cascades with rare disjuncts to western Montana. Rare and widely scattered in northern Idaho.
Growth Form: Large foliose lichen with soredia. Loosely appressed, on boles and branches.

Ecology: Low to mid-elevation moist forests including riparian areas. Rare in northern Idaho. On *Abies bifolia* and *Abies grandis* in northern Idaho and Montana. Elevations in northern Idaho and Montana range from 760 to1090 m.
Primary Threat: Logging and associated activities.
Secondary Threats: Urbanization, development, and air pollution.
Status in Idaho: Rare in Idaho
Management Recommendations: *Pseudocyphellaria anomala* is rare east of the Cascades, although it is common west of the Cascade Range. The nature of its distribution, small widely scattered populations that aren't necessarily associated with riparian areas, makes it difficult to protect. Protect known sites. Survey potential habitat prior to disturbance. We recommend listing *P. anomala* as G5, S1.

Pseudocyphellaria anthraspis (Ach.) Magnussen
Rarity Type in Idaho: Narrow geographic distribution confined to the Clearwater River Drainage, narrow habitat specificity, small to moderate population size. There are 52 documented sites in Idaho.
Distribution: Alaska to California with disjuncts into northern Idaho. Generally restricted to riparian areas in northern Idaho.
Growth Form: Large, loosely appressed foliose lichen with apothecia. On boles and branches.
Ecology: Low to mid-elevation moist forests including riparian areas. Rare in northern Idaho. Abundant along the Lochsa and Selway Rivers with *Lobaria pulmonaria* on *Thuja plicata* and other conifers. Also on *Taxus brevifolia*, *Alnus rubra*, and *Rhamnus purshiana.* Elevations in northern Idaho range from 360 to 1035 m.
Primary Threat: Logging and associated activities.
Secondary Threats: Urbanization, development, and air pollution.
Status in Idaho: Locally abundant.
Management recommendations: While *P. anthraspis* seems to be more locally abundant that *P. anomala*, it may be more narrowly distributed. *P. anthraspis* is not found in Montana, while *P. anomala* is. We suggest changing the state listing of *P. anthraspis* to G5, S3, and protecting old riparian forests in the Lochsa-Selway valleys and tributaries.

Ramalina dilacerata (Hoffm.) Hoff. sens. lat.
Rarity Type in Idaho: Wide geographic range, narrow habitat specificity, large population size.
Distribution: Alaska to California, west of the Cascades, inland to Montana. Circumboreal, occurring also in Asia and Europe. Widespread in riparian areas of northern Idaho.

Growth Form: Small, shrubby, fruticose lichen with apothecia. Typically on fine branches of large shrubs and trees.
Ecology: Low elevation riparian forests and shrubs. Mainly in areas with strong oceanic influence east of the Cascades. Locally common to abundant in moist riparian areas with trees and shrubs in northern Idaho. *Ramalina dilacerata* requires well-lit sites near water (Tønsberg et al. 1996). Most sites in Scandinavia seem to be fire free refugia (Tønsberg et al. 1996). Most common substrates in northern Idaho are *Alnus* and *Rhamnus purshiana*. Elevation range in northern Idaho is 360 to 1020 meters.
Primary Threat: Dams and water diversions, possibly fire.
Secondary Threats: Urbanization and development, livestock grazing, mining, agricultural activities.
Status in Idaho: Frequent in riparian areas in northern Idaho.
Management recommendations: State listing is not needed.

Ramalina obtusata (Arn.) Bitt.
Rarity Type in Idaho: No records for *R. obtusata* in northern Idaho, but records from Swan Valley, Montana and the Wallowas in Oregon, suggest *R. obtusata* should be present in northern Idaho.
Distribution: Widespread but uncommon, in the PNW mainly between the Cascades and the Rockies. Occurs in boreal regions of Europe and N. America. In Sweden it has a similar range to *Ramalina dilacerata.*
Growth Form: Small, shrubby fruticose lichen with soredia. Fenestrate (branches have hollow spots and are perforated). On twigs.
Ecology: Mostly restricted to *Picea* twigs in low elevation (approx. 900-1200 m) swamps and floodplains. Frequently found with *Ramalina pollinaria. Ramalina obtusata* often grows close to running water and lakes in areas with ample light and may be associated with fire free refugia (Tønsberg, et al. 1996). Mostly restricted to *Picea* twigs between the Rocky Mountains and the Cascades.
Primary threat: Dams and water diversions.
Secondary threats: Logging and associated activities, agricultural activities, livestock grazing.
Status in Idaho: Not recorded from Idaho.
Management recommendations: No special protection required in Idaho at this time. Survey potential habitable sites, i.e. bottomland forests with *Picea englemannii* and standing water in stream channels, or *Lysichitum* swamps.

Ramalina pollinaria (Westr.) Ach.
Rarity Type in Idaho: Narrow geographic distribution, narrow habitat specificity, small populations. Three documented sites in Idaho. Possibly under collected in Idaho.

Distribution: Widespread but uncommon, in the PNW mainly between the Cascades and the Rockies.
Growth Form: Small shrubby, fruticose lichen with soredia. Not hollow or perforated. On twigs.
Ecology: On conifers, hardwoods and shrubs in swamps and floodplains. Generally in the same habitats as *R. obtusata*. *Ramalina pollinaria* appears to be restricted to the Pend Orielle subbasin in northern Idaho. Sometimes difficult to separate from *R. farinacea* without testing for chemistry.
Primary Threat: Dams and water diversions.
Secondary Threats: Logging and associated activities, agricultural activities, livestock grazing.
Status in Idaho: Rare.
Management Recommendations: More surveys of potential habitable sites, i.e. bottomland forests. Protect known sites. Consider state listing as G5, S2.
Taxonomic Notes: *Ramalina pollinaria* generally has flared tips and soralia scattered over the entire thallus and margins. It can be difficult to separate from *R. farinacea* in the field. When in doubt use TLC; *R. pollinaria* has evernic acid.

Purvis et al. (1992) describes *R. pollinaria* as having a rather large thallus, up to 5 cm long, and having nodulose proliferations on the thallus. The habitat for the British version of *R. pollinaria* is dry sheltered underhangs of siliceous rock, exposed tree roots and on north or east facing church walls. While the northern Idaho and the British versions both contain evernic acid, other evidence suggests that they may not be the same species.

Ramalina subleptocarpha Rundel & Bower
Rarity Type in Idaho: Narrow geographic range, narrow habitat specificity, small population size. Five documented sites in Idaho.
Distribution: British Columbia to California, on the coast and in the Puget trough. Widely scattered throughout northern Idaho.
Growth Form: Small to medium sized, shrubby to subpendant, fruticose, sorediate lichen. On boles branches and twigs of trees and shrubs.
Ecology: West of the Cascades in valley bottoms, ash swamps, and riparian hardwood forests, occasionally into the foothills, fairly frequent in agricultural and urban areas. Uncommon east of the Cascades. On *Crataegus sp.* and *Abies grandis* in northern Idaho. Elevations ranged from 365 to 810 m for specimens east of the Cascades.
Primary Threat: Urbanization and development.
Secondary Threats: Agricultural activities, mining, dams and water diversions, livestock grazing.
Status in Idaho: Rare.
Management Recommendations: *Ramalina subleptocarpha* is common west of the Cascade Range, in the Willamette-Puget trough, but it appears to be

increasingly uncommon to the east of the Cascades. Protect known sites. Survey potential habitable sites prior to disturbance. Consider state listing as G5, S2.
Taxonomic Notes: *Ramalina subleptocarpha* has delaminating, or slit like marginal soralia, and tends to have wider lobes and palmate branching. However, small specimens from dry areas can be similar in appearance to PD- *R. farinacea*. TLC results for ambiguous specimens were not always enlightening. It appears that some PD- *R. farinacea* can have slit like marginal soralia or that some specimens of *R. subleptocarpha* either lack zeorin, or have such small amounts of zeorin that TLC doesn't pick them up. The latter idea is supported by the fact that most of the *Ramalina* I tested using TLC were difficult to extract substances from with acetone when spotting the plate.

Regarding PD- *R. farinacea*: 11 plots had PD– specimens. Two plots had collections that belonged to the hyprotocetraric race. The hypoprotocetraric race is generally limited to coastal regions with maritime influence (Bowler & Rundel 1978). Hypoprotocetraric specimens were found on *Betula papyrifera*, with an additional collection from *Crataegus douglasii* on one of the plots. Both plots that had the hypoprotocetraric race of *R. farinacea* have high relative values for oceanic affinity and low values for suboceanic and continental affinities (from weighted average ordination).

Ramalina thrausta (Ach.) Nyl.
Rarity Type in Idaho: Moderate geographic range, narrow habitat specificity, small populations. Thirty-six documented sites in Idaho.
Distribution: Boreal North America, south to Oregon and west to Montana. Worldwide *R. thrausta* has an incomplete boreal distribution, ranging through parts of Europe, Asia and North America. In Idaho *R. thrausta is* found from Idaho County to Bonner County.
Growth Form: Fruticose, fine, pendant, sorediate. On twigs.
Ecology: Sporadic in low elevation moist forests, especially riparian *Picea*, *Abies* and *Thuja plicata* east of the Cascades. In Idaho it grows in riparian corridors, frequently with *Lobaria pulmonaria*, *Nephroma resupinatum*, and *Pseudocyphellaria anthraspis* in mixed hardwood and conifer forests – on *Thuja plicata* and *Picea englemannii* branches in narrow canyons, such as the Lochsa River canyon. *Ramalina thrausta* has been found in moist sheltered habitats at timberline and on coastal cliffs in Scandinavia (Tønsberg et al 1996). Elevation ranges from 446 to 1240 m in northern Idaho.
Primary Threats: Logging and associated activities, fire.
Secondary Threats: Dams and water diversions, urbanization and development, and air pollution.
Status in Idaho: Most common in floodplain forests where there are both hardwoods and conifers.

Management Recommendations: Protect old bottomland conifer forests from fire and logging. Since *R. thrausta* is very patchy and probably dispersal limited, maintenance of old conifer stands in stream-bottoms is important to its survival in Idaho. Consider state listing as G5, S3.

Discussion

Prior to this study, virtually nothing was known about rare riparian lichens in northern Idaho. As a result of this study, much more is known regarding which species are rare, how they are distributed, and what habitats they are found in. Many of the target species listed with the Idaho Conservation Data Center (ICDC) have been considered for changes in both global and state rankings. We suggest that *Collema curtisporum, Lobaria hallii,* and *Pseudocyphellaria anthraspis* should be down listed, though *C. curtisporum* and *L. hallii* should still be regarded as species of concern.

Collema curtisporum is found only in cottonwood gallery forests with seasonal inundation. While *Lobaria hallii* is found fairly frequently in hardwood gaps as well as in riparian areas of Oregon and Washington, 92% of the specimens collected in Idaho are from riparian forests. *Pseudocyphellaria anthraspis* is locally abundant in areas with oceanic influence, such as the Lochsa-Selway drainage and the North Fork of the Coeur d'Alene, but is at the easternmost limits of its range.

Physconia americana, Pseudocyphellaria anomala, Ramalina pollinaria, Ramalina subleptocarpha, and *Ramalina thrausta* should be considered for

listing. *Physconia americana* is found only on large cottonwood in riparian areas. *Pseudocyphellaria anomala* is rare in northern Idaho (ten records). *Ramalina pollinaria* is rare in northern Idaho (three records for northern Idaho and seven records for northwestern Montana). *Ramalina subleptocarpha* is rare in northern Idaho (six records). *Ramalina thrausta* is locally abundant in riparian areas with oceanic influence, but isn't common otherwise and is thought to be dispersal limited

The target species *Leptogium subtile, Menegazzia terebrata, Hypogymnia oceanica,* and *Ramalina obtusata* were not found during the study. It is probable that *M. terebrata* and *H. oceanica* do not exist east of the Cascade crest in the United States. Taxonomic work done on tiny *Leptogium* (Jørgenson and Tønsberg 1999) refined the species descriptions so that specimens previously identified as *L. subtile* no longer fit the species concept. At this point, true *L. subtile* has not been found in northern Idaho. *Ramalina obtusata* has been found in the surrounding area, but hasn't been found in Idaho, which is troubling since *R. obtusata* is found in riparian forests. It isn't clear why it wasn't found in the course of this study. It is possible that sampling of *Lysichitum*-conifer swamps and old *Picea* dominated floodplains is needed to establish the presence or absence of this species in Idaho.

Collema occultatum, Nephroma laevigatum, Phaeophyscia hirtella, Phaeophyscia ciliata, and *Leptogium cellulosum* are all new records for Idaho. With the exception of *N. laevigatum*, all of the new records are for extremely

small (a few millimeters in diameter) species that were found on cottonwood. *Collema occultatum* is the smallest of the group (~3mm diameter), and its distribution is uncertain. *Phaeophyscia ciliata* is rare in Idaho, but common in Utah and Colorado. *Phaeophyscia hirtella* is rare in Idaho, but common in the northeastern United States. *Leptogium cellulosum* is recently described for the PNW and more finds throughout the PNW undoubtedly will be forthcoming.

Lichen communities varied strongly among different regions of northern Idaho. Communities differed in lichen species richness, total number of species and climatic affinities. The strongest differences in lichen community composition were regional (A= 0.37 from MRPP), followed by community differences related to basal area in hardwoods (A=0.07), and differences in floodplain cross-section type (A=0.05).

Average species richness per plot is higher in riparian forests than it is for the region as a whole. Neitlich and Rosentreter (2000) show the southwestern corner of the panhandle (Region 1) as being part of the Great Plains Palouse Dry Steppe Physiographic Region, while most of the panhandle is in the Northern Rocky Mountain Forest-Steppe-Coniferous Forest-Alpine Meadow physiographic region. For the portion of the region that is in the Northern Rocky Mountain Forest-Steppe-Coniferous Forest-Alpine Meadow physiographic region as a whole, average species richness per plot was about 12 species per plot, while in this study (riparian forest only) the average richness was about 33 species per plot. Lichen species richness for the entire Great Plains Palouse Dry Steppe was

also about 12 species per plot, while average species richness per plot in this study was 21 species per plot.

Species richness and total number of species were lowest in the southwest part of the study area, which was much drier than the rest of the panhandle (Region 1). This area included the edge of the Palouse, from Lewiston south to Whitebird, which included the Salmon River and main fork of the Clearwater River. The low species richness may reflect environmental conditions that are less hospitable to lichens than the conditions found in the other regions, such as low humidity, more temperature extremes, and less precipitation. This was the driest, most continental region with the lowest average elevation, and had the most species with continental affinity. The prominence of continental species in the Lewiston- Salmon area, combined with fewer oceanic species within this area, may reflect physiographic differences from the rest of northern Idaho (Neitlich and Rosentreter 2000). Hardwoods in this region include a relatively larger number of *Celtis* and *Robinia* than the other regions. It is difficult to tease out the potential effects of nitrogen pollution and climatic stress tolerance in this region. It is characterized by harsh conditions, relatively open dry areas, and relatively high continental values, and is also agricultural. It is possible that lichen communities in this area have been altered by N-enrichment from wheat farms and livestock, as well as by pollutants from a paper pulp mill at Lewiston (Geiser 2001, Hoffman 1974).

The area northeast of Wallace, along the North Fork of the Coeur d'Alene (Region 8) had relatively low regional (gamma) diversity and little differentiation among plots (beta diversity). Plots in this region may have had more homogenous elevations and vegetation than the other regions. While heavy metal pollution resulting from the operations of a zinc and lead smelter near Kellogg has had profound effects on both the river and human inhabitants, studies haven't shown much impact outside of a ten-mile radius of the smelter (Reece et al. 1978, Rabe & Bauer 1977, Ragaini et al. 1977). There have been no formal studies using lichens as bioindicators for heavy metal pollution in the Coeur d'Alene area, and since the smelter shut down in 1982, lead and zinc as air pollutants are not a large concern, although contaminated sediments entering Lake Coeur d'Alene are of great concern (La Force et al. 1998).

Plots with the most oceanic species were concentrated at mid-elevations along the Lochsa and Selway Rivers, as well as the North Fork of the Clearwater (Regions 3,5). The Clearwater Drainage has relatively high numbers of oceanic species, which most likely reflect milder, wetter conditions and possibly its history as a glacial refugium. The Clearwater and Lochsa River are known for vascular plants that are coastal disjuncts. *Fuscopannaria pacifica* and *Sphaeophorus globosus,* are oceanic species found on the Clearwater and the Lochsa.

Plots with the most suboceanic species tended to occur at higher elevations, along the east side of the panhandle, which is the Bitterroot Range.

This regional pattern probably results from orographic precipitation along the west slope of the mountains.

Although the streams within regions were divided into three different stream order classes according to size and position, neither the size of the stream nor the valley was as important as the substrate available to the lichens. The reasons why there were no pronounced differences in lichen communities among stream or valley classes aren't clear. Climatic differences such as the amount, timing, and duration of annual rainfall, and temperature extremes may have more influence on lichen communities than either the size of the stream or the size of the valley. For example, light duration can vary greatly depending on the topographic orientation of the valley or canyon. Another possibility is that large valley bottom rivers have an influence on lichen communities within their entire drainage area, so that all stream classes within a large drainage are more similar to each other than to like stream classes in other regions.

There were differences in lichen communities for different stream floodplain cross-section types. Streams with no floodplain had lichen communities that one would expect to find on conifers, including species such as *Bryoria fremontii* and *Letharia vulpina*, as well as some that seem to prefer mixed canopy sites, such as *Cetraria canadensis*. Two of the lichens associated with plots having floodplains on one side, *Fuscopannaria pacifica* and *Sphaerophorus globosus,* are considered uncommon in northern Idaho. The presence of *Collema curtisporum* as an indicator species for areas having floodplains on both sides

suggests that there is something about floodplain forests or cottonwoods that it requires. Many cottonwoods that were not in floodplain forests were examined during our travels, and these trees did not have *C. curtisporum*.

While *C. curtisporum* is an indicator of areas having floodplains on both sides, it is not an indicator of high basal area in hardwoods. Species that were indicators of forests with high basal area values for hardwoods tended to be nitrogen-loving species such as *Xanthoria fallax* and *X. fulva*. Bark chemistry, specifically enhanced nitrogen, of hardwoods may have an effect on lichen community composition (Goward and Arsenault 2000, Rhodes 1995, McCune 1982) as can other bark characteristics, such as sloughing and texture (Kenkel and Bradfield 1981). Indicators for forests with relatively high percentages in basal area in conifers included *Pseudocyphellaria anthraspis* and another lichen of concern in the PNW, *Bryoria tortuosa*. The remainder of species listed in Table 2.5c, are common on conifers in upland sites (personal observation).

Much work regarding rare lichens in the riparian forests of northern Idaho remains to be done. For example, more taxonomic work could be done regarding the *Ramalina farinacea* complex and *Ramalina pollinaria*. Molecular studies to determine whether the European *R. pollinaria* is genetically the same as its North American counterpart would be useful in conservation. In the case of *C. curtisporum* with the widely disjunct populations and relatively small North American population, molecular work assessing its similarity to populations in Europe could be extremely important to its conservation.

Studying the effects of natural flood cycles compared to the flood events on dammed rivers is important not only in the conservation of lichens, but to the forests themselves and river health. Idaho is bound to increase in population, making environmental monitoring extremely important in providing information essential for maintaining natural systems. Natural systems should be maintained, not only for conservation, but for quality of all life. Lichens should be included as an economical and ecologically important component of ecosystem monitoring.

Collema curtisporum Degel. in Riparian Forests of Northern Idaho

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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 (Tønsberg 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, 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 Email. 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) 3-4.5 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.

Cntry	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/ALSI/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 Bridge at jct 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 jct, 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.

Cntry	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	48.73 N	116.85 W		Populus Bark	Mixed TSHE/THPL	747	R. Rosentreter	9667	8/1/95	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	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	Hill N of Hol Churdh, N of Rue	60.6	8.35 E		Trunk of an old Populus tremula		830	R. Haugan	L26164 L26222	10/5/96	O

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.
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. Lynge	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 picea	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.

Cntry	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 Eltun			MN 670-671 818-819 (map: 1517 II)	Old Populus tremula	NE-facing old Spruce forest	580	E. Timdal	L25167	8/6/97	O
SWE		Jamtland					Picea twig	Waterfall		Ahlner		1937	S
SWE		Asele Lappmark.	Vilhemena, Dimforsen				Picea twig	by rapid		Ahlner		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 Rietz		1913	S
SWE		Jamtland. Are: Tannforsen								Hakelier		1964	
SWE		Jamtland					Picea twig	Waterfall		Hasselrot		1937	S
SWE		Jokkmokk	50 locations			Steget fore i det glomda landet. Svensk bot.Tidskr.86: 115-146				Karstrom		6/14/05	
SWE		Pite Lappmark Arjepluog	Arjepluog				Betula			Stenholm		1919	GB

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*.

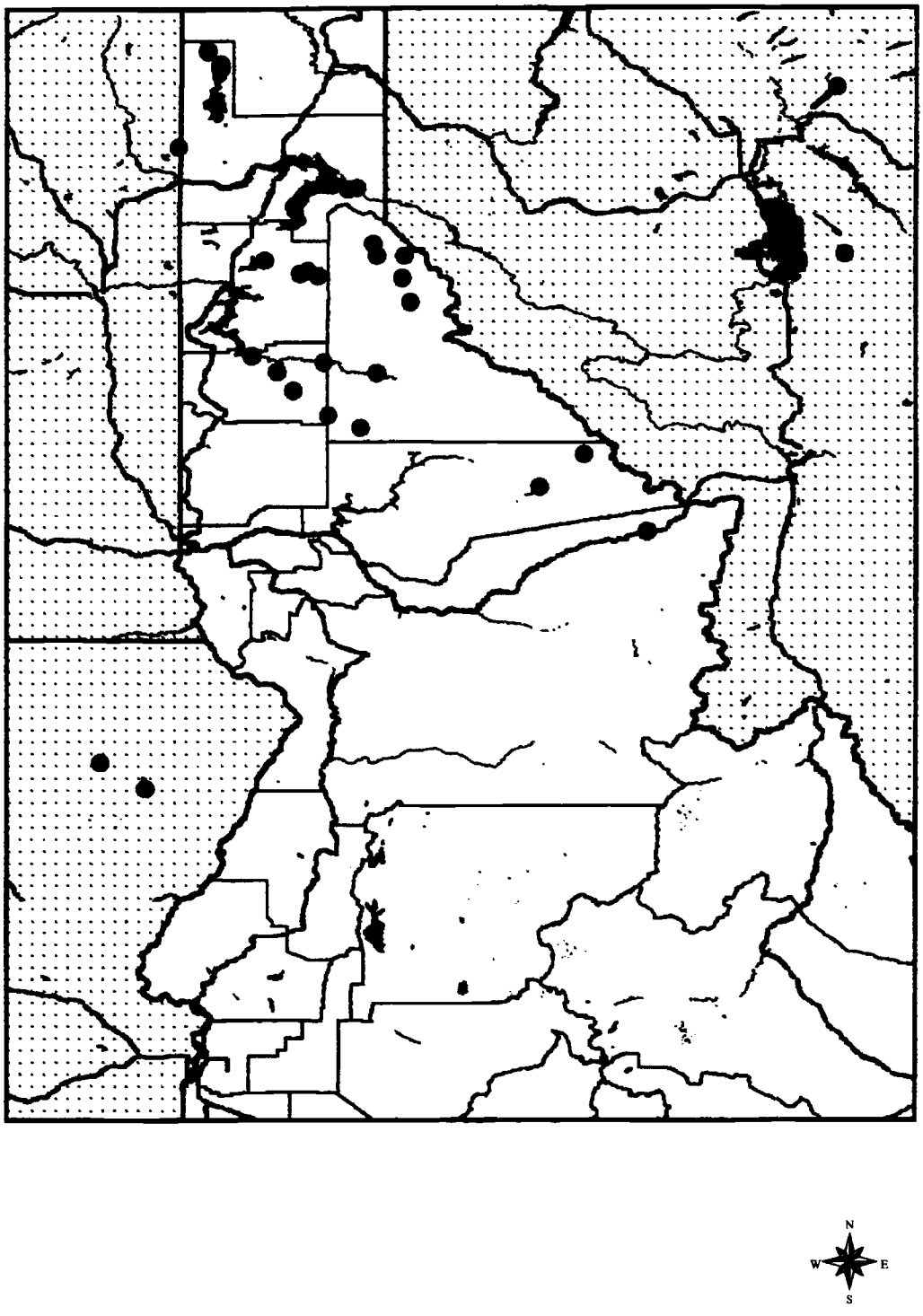
Disturbance history. Disturbance may play a role in the establishment of *C. curtisporum*. *Collema curtisporum* grows exclusively on *Populus tremula* in Sweden (Tonsberg et al. 1996). The abundance of *P. tremula* is probably the result of stand-replacing fires and the richer populations of *C. curtisporum* 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 the 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-fired 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 riverine 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 (T 46 N, R 2 W, 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 ¼ 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 km^2.
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 km^2 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 km^2 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 km^2 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.

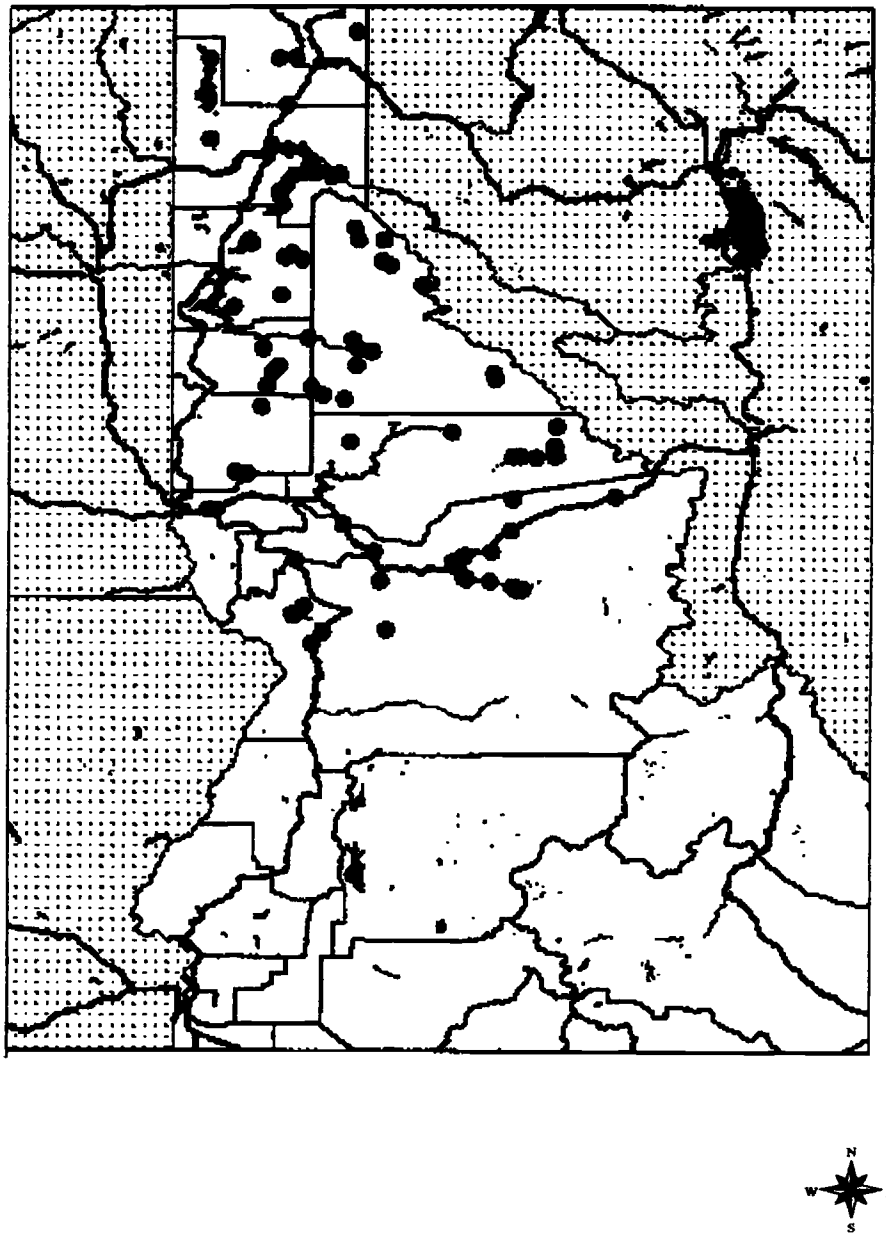


Figure A2. *Cetraria sepincola* locations in northern Idaho and the surrounding area.

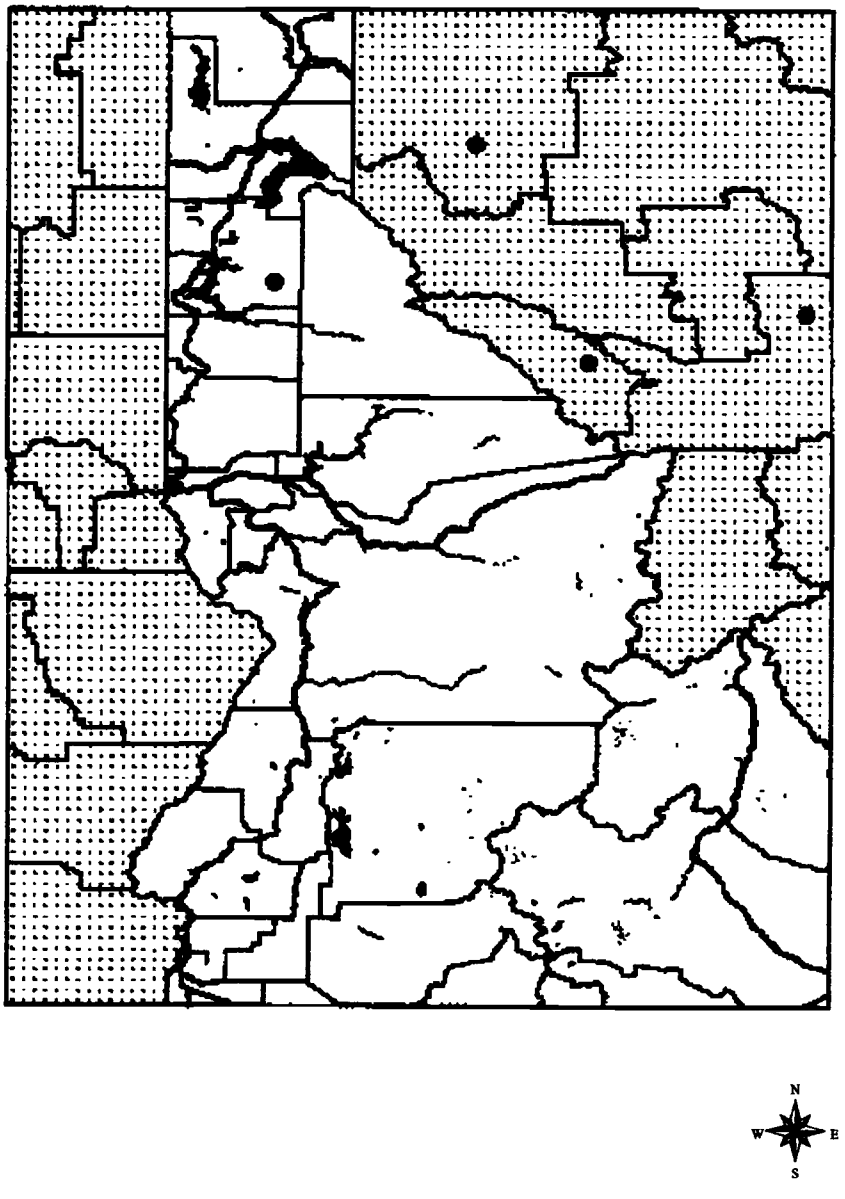


Figure A3. *Collema curtisporum* locations in northern Idaho and the surrounding area.

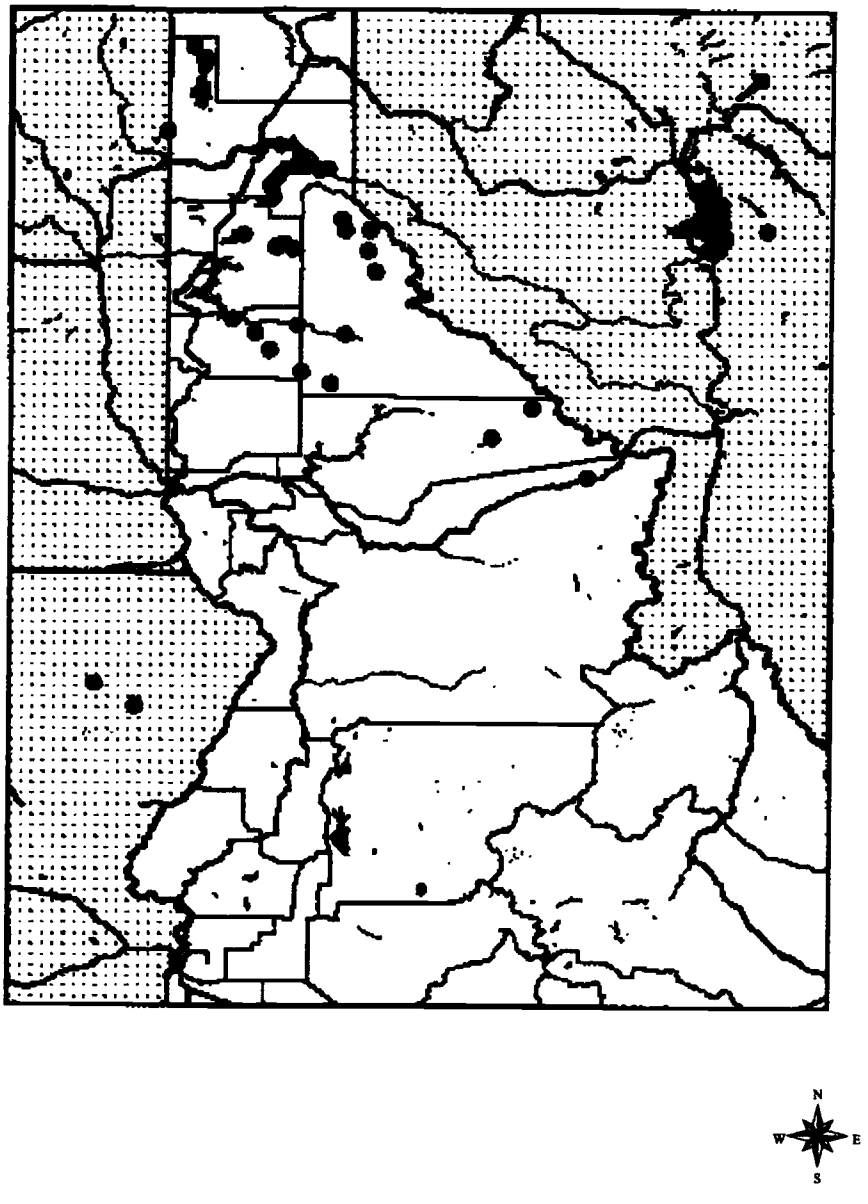


Figure A4. *Collema furfuraceum* locations in northern Idaho only.

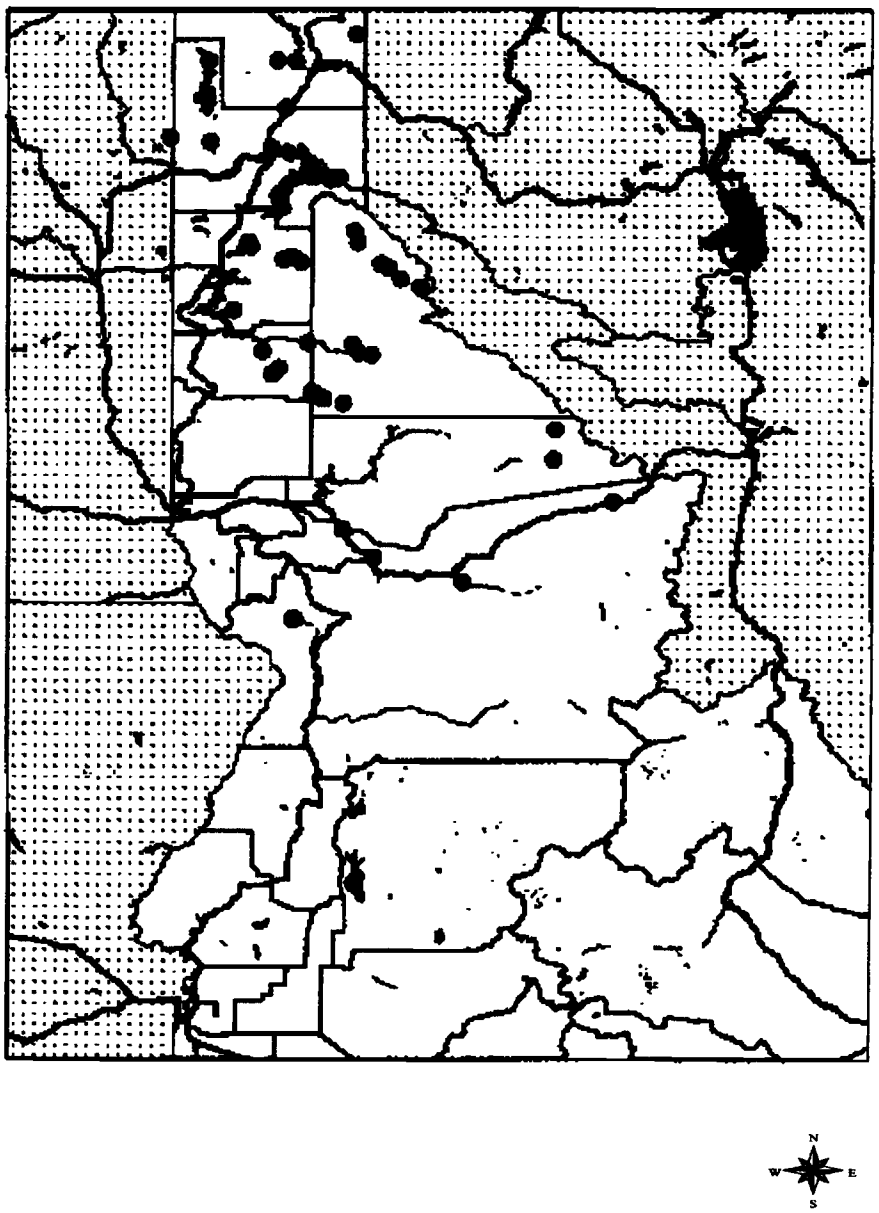


Figure A5. *Lobaria hallii* locations in northern Idaho only.

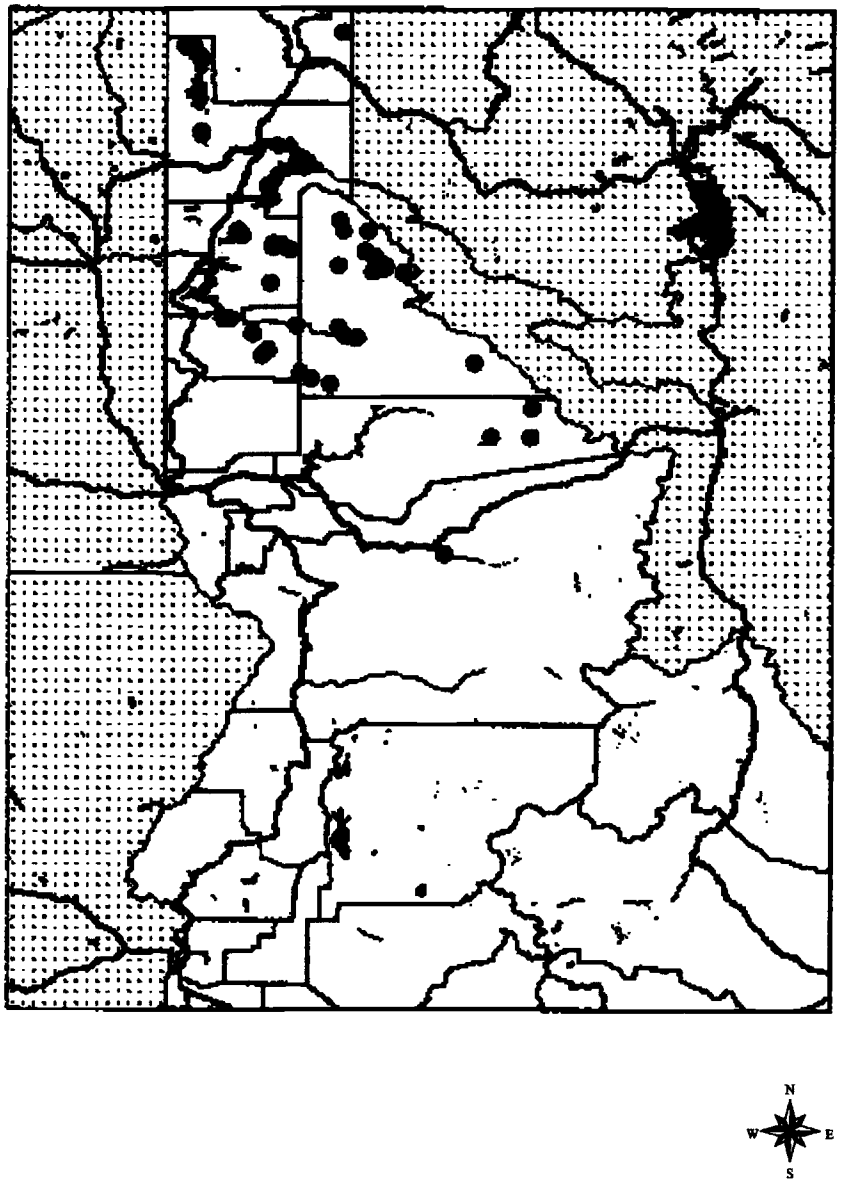


Figure A6. *Lobaria pulmonaria* in northern Idaho only.

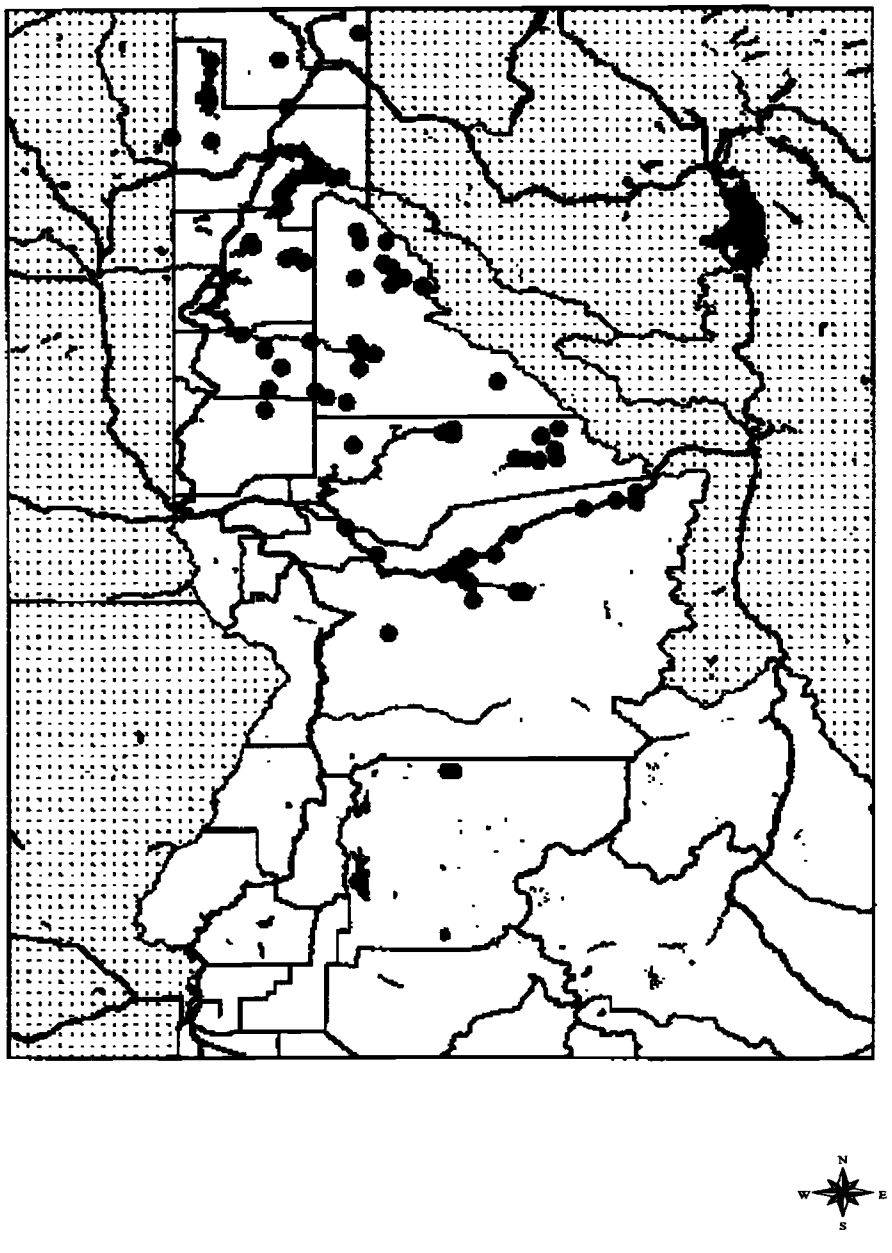


Figure A7. *Physcia semipinnata.* One location near Swan Lake in northwestern Montana.

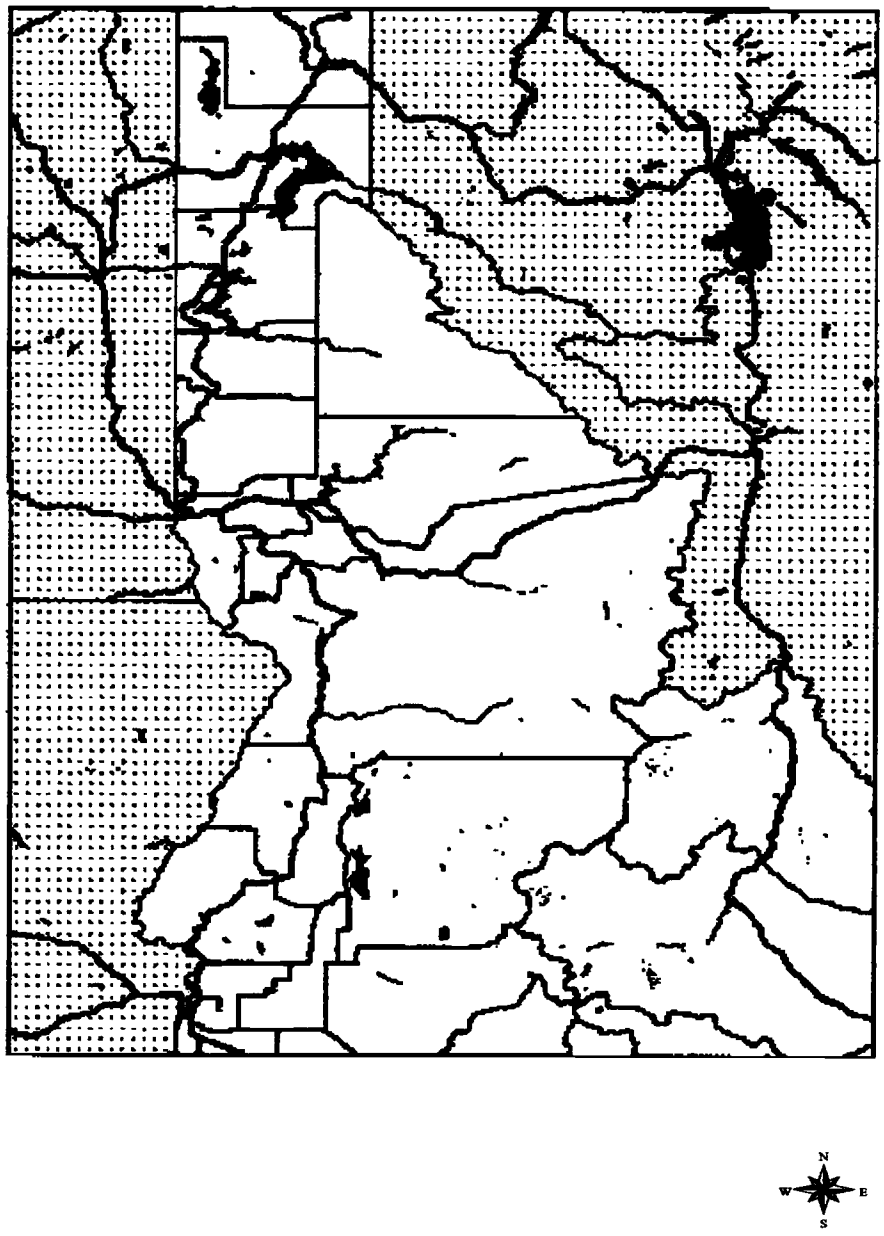


Figure A8. *Physconia americana* locations in northern Idaho and the surrounding area.

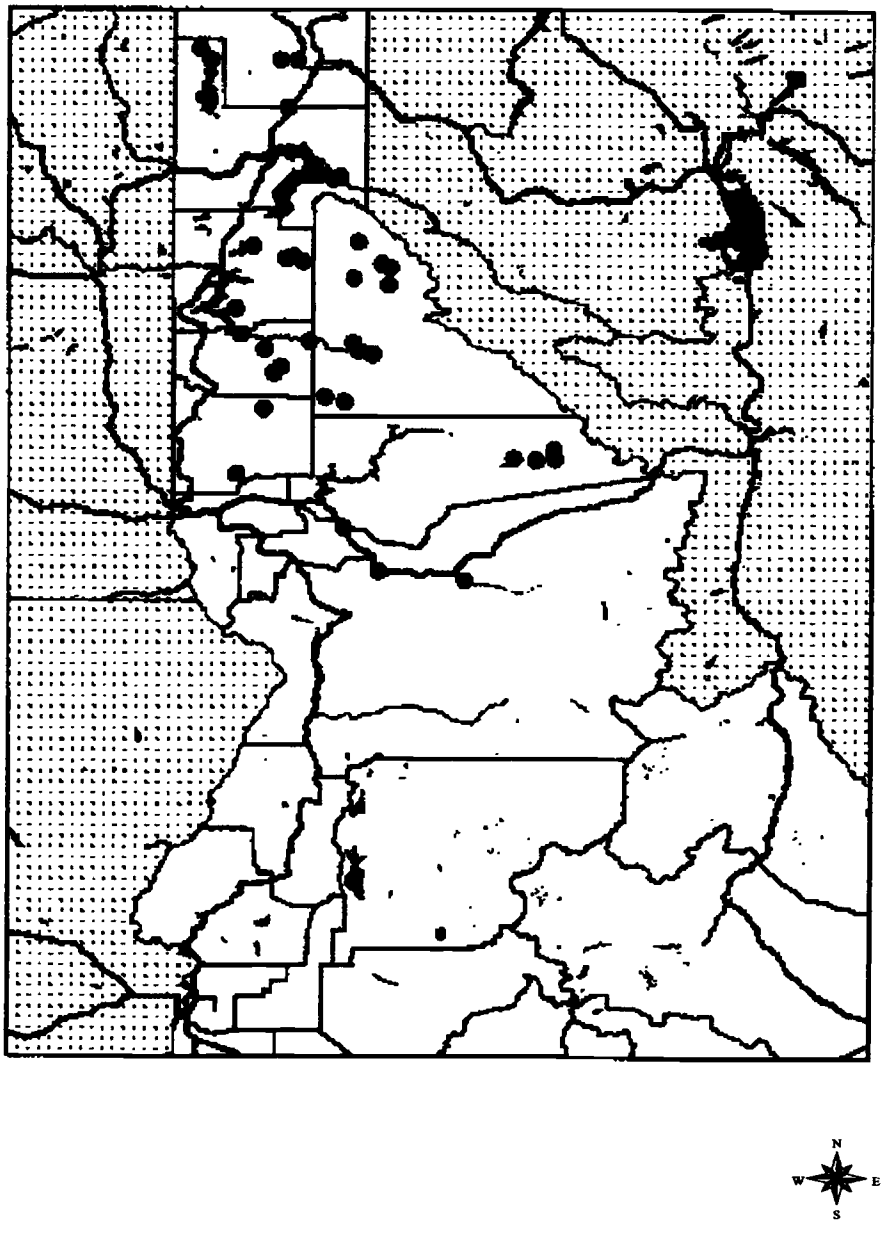


Figure A9. *Pseudocyphellaria anomala* locations in northern Idaho and the surrounding area.

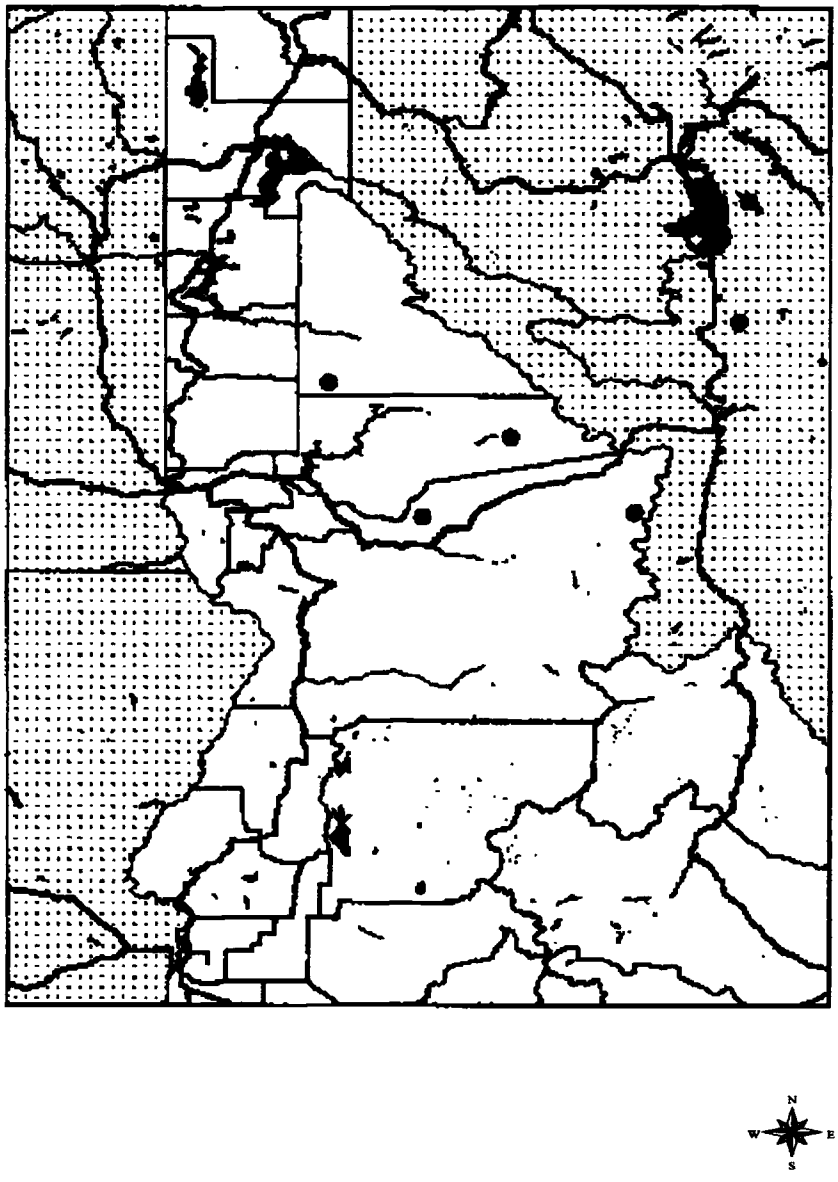


Figure A10. *Pseudocyphellaria anthraspis* locations in northern Idaho and the surrounding area.

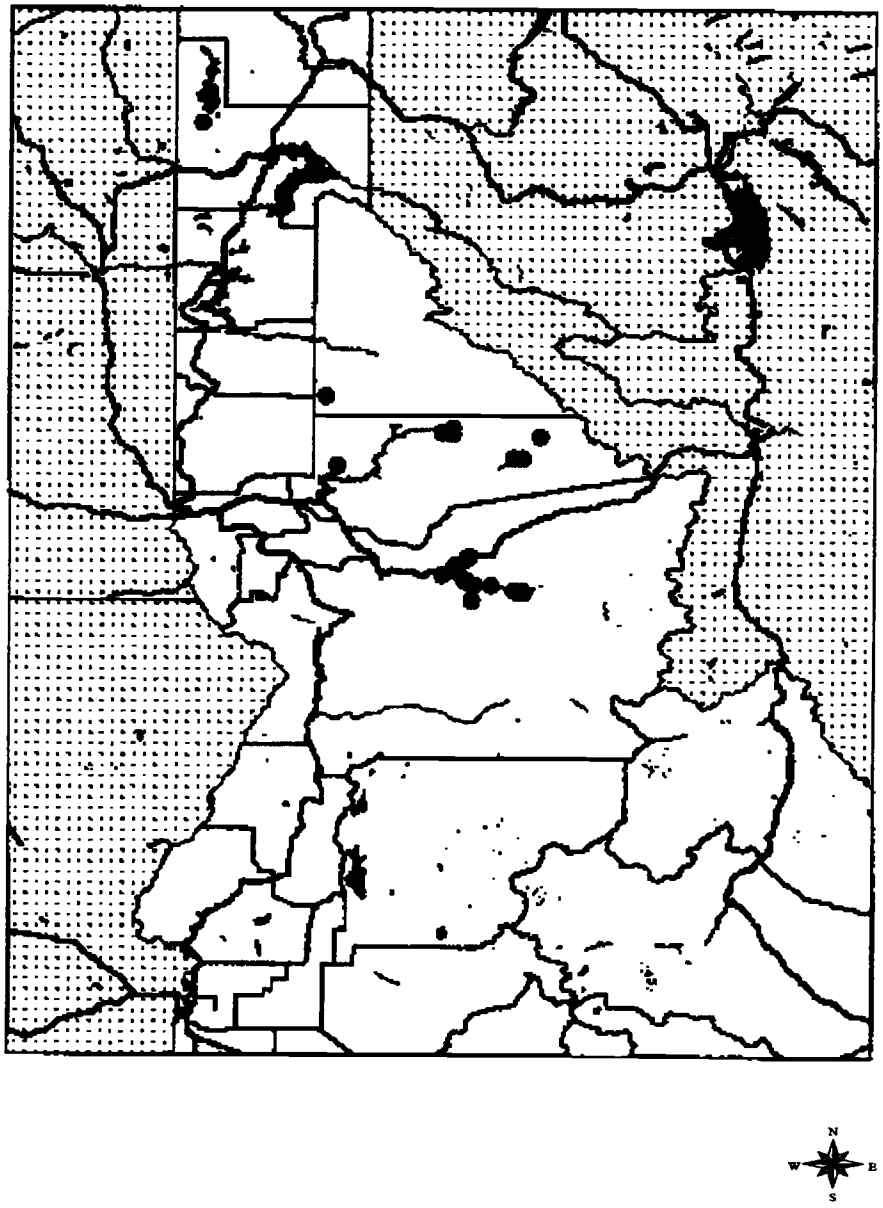


Figure A11. *Ramalina dilacerata* locations in northern Idaho only.

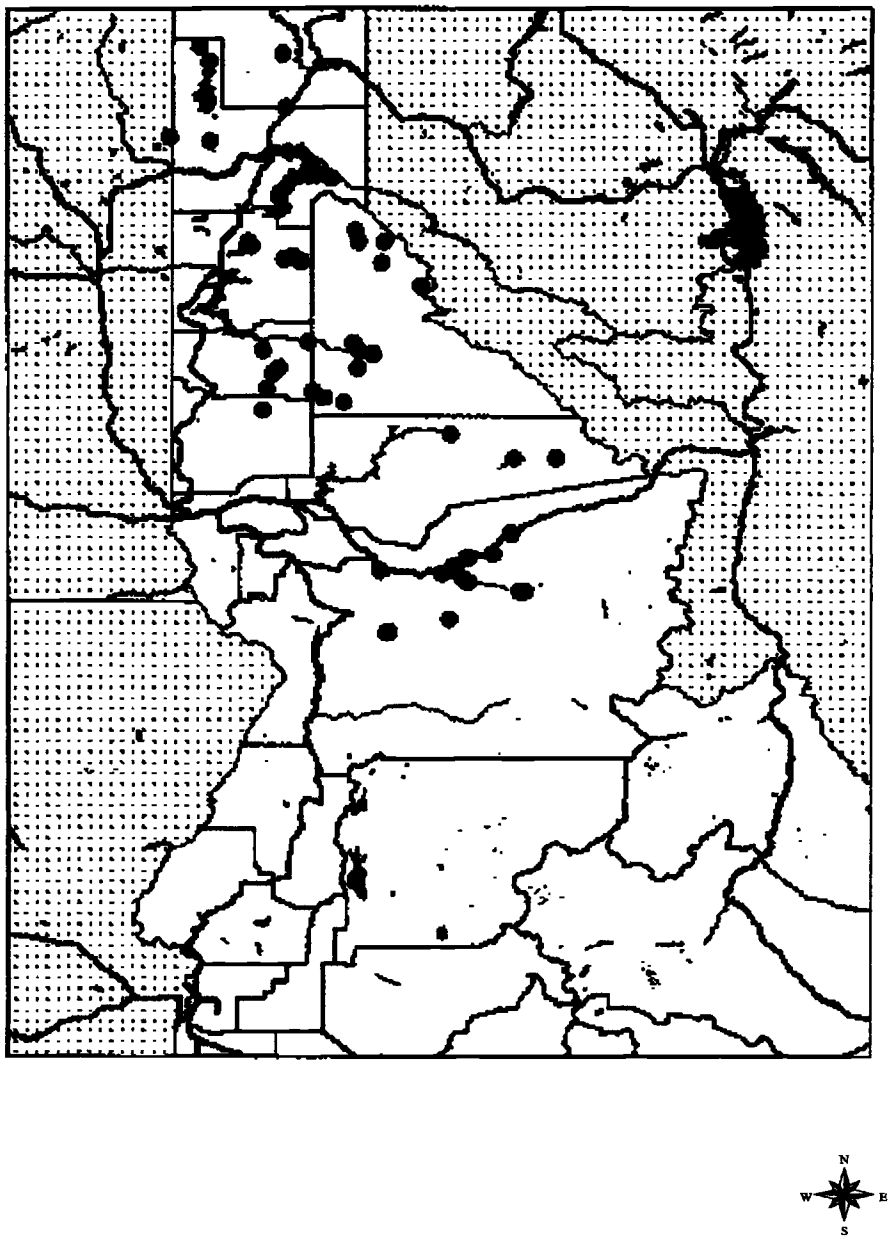


Figure A12. *Ramalina obtusata* locations in northern Idaho and the surrounding area.

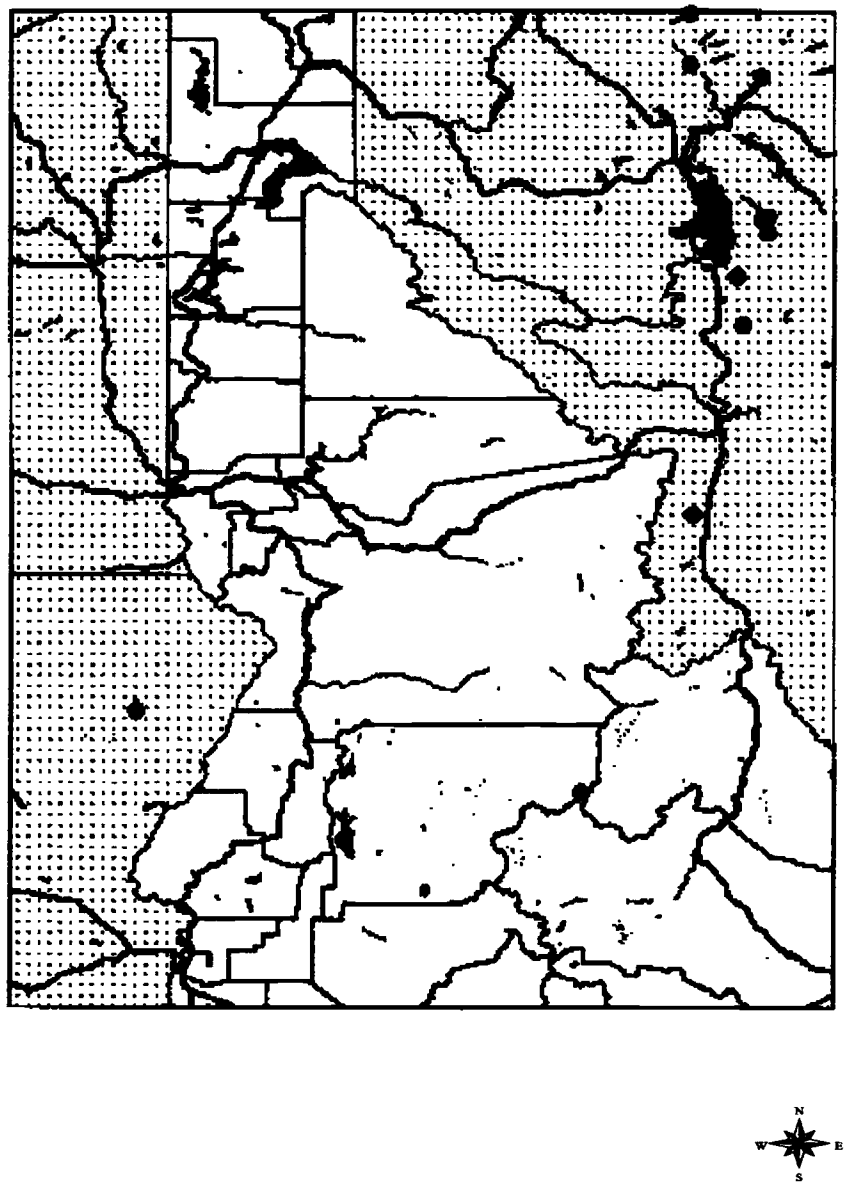


Figure A13. *Ramalina pollinaria* in northern Idaho and the surrounding area.

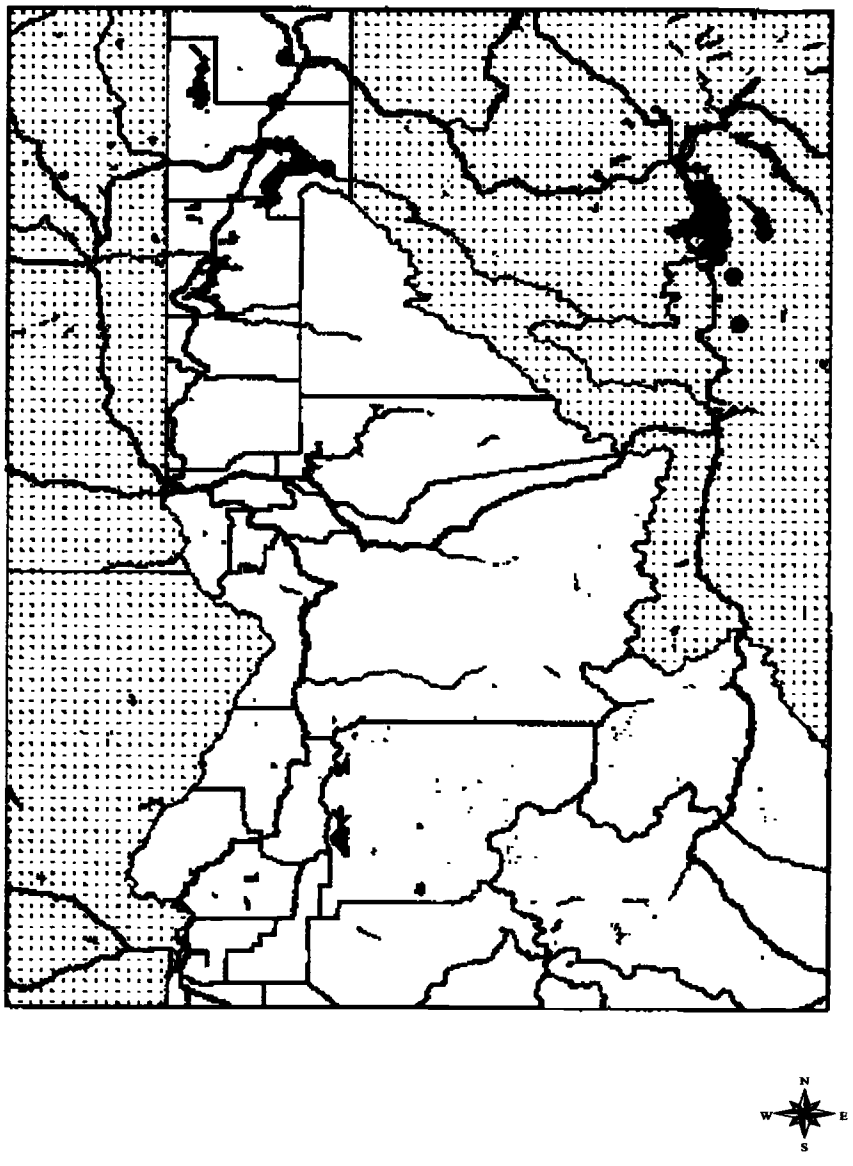


Figure A14. *Ramalina subleptocarpha* locations in northern Idaho and the surrounding area.

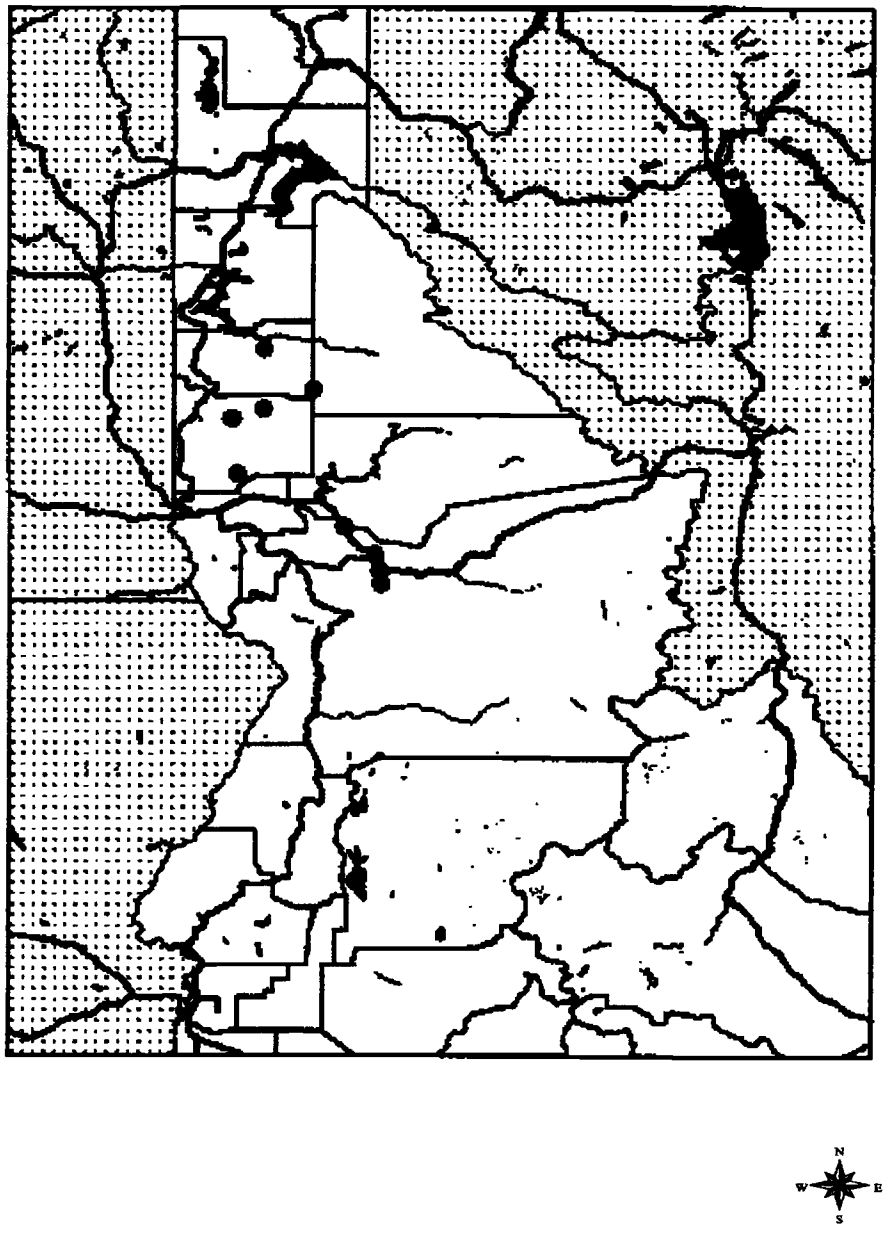
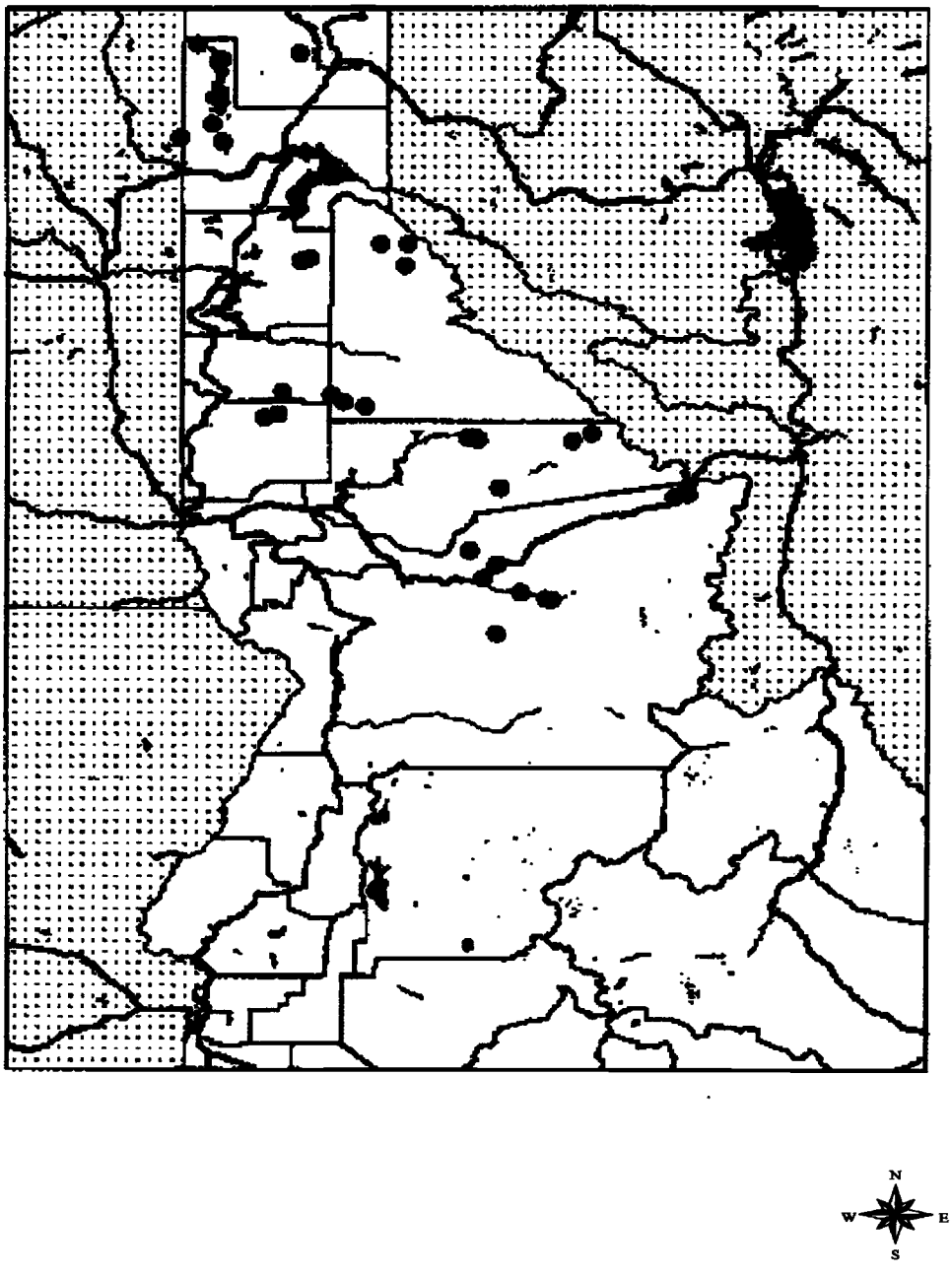


Figure A15. *Ramalina thrausta* locations in northern Idaho only.



Appendix C

Relevant Target Species Locations

Table A1. Relevant target species locations

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Cetraria sepincola	BC		Kootenai Lake	49.67	117.167	Alnus twigs	Lake Margin		Noble	7554	7/26/83	MCC
Cetraria sepincola	BC		Gray Prov. Park			Thuja	OG Thuja For	750	Rosentreter	6325	9/27/89	MCC, RR
Cetraria sepincola	ID	Kootenai	Rose Lake, Hwy 3 off I90	47.55	116.47	BETPAP	Bog	579	Goodnow		12/1/98	MCC
Cetraria sepincola	ID	Bonner	Johnson Creek CG, W of Clark Fork	48.14	116.23	BETPAP	River	629	Hutchinson	ID-913-04	8/3/99	OSC
Cetraria sepincola	ID	Bonner	Kaniksu Marsh			BETPAP	Bog		Mousseaux & Spribille	7035		COLO, UBC
Cetraria sepincola	ID	Boundary	NE of Moyie Springs, Perkins Lake			BETPAP	Lake Margin		Spribille	9726		COLO
Cetraria sepincola	MT	Missoula	Summit Lake Bog	47.375	113.623	BETPAP	Bog	1275	McCune	12293	7/17/72	MCC
Cetraria sepincola	MT	Mineral	Clark Fork R	47.117	114.785	Dead Juniper Branch	Floodplain	855	McCune	21112a	9/1/93	MCC
Cetraria sepincola	MT	Lake	Swan Lake			Betula	Edge of Picea Swamp		Rosentreter	1871	6/22/80	MCC, RR
Cetraria sepincola	MT	Lincoln	South of Libby Dam, Doe Creek	48.284	115.384	Betula	Marsh	1250	Spribille	7116		OSC, COLO
Cetraria sepincola	MT	Flathead	Magnesia Creek			BETPAP	Fen next to creek		Spribille	3936a		COLO
Cetraria sepincola	MT	Flathead	Magnesia Creek			BETPAP	Fen next to creek		Spribille	4082		COLO

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Cetraria sepincola	MT	Flathead	5 km E of Olney, Lazy Creek Meadow			BETPAP	Bog		Spribille	9704		COLO
Cetraria sepincola	MT	Flathead	Glacier National Park, Winona Lake			BETPAP	Lake Margin		Damn & Spribille	9120		GNP
Cetraria sepincola	MT	Lincoln	Northern Salish Mountains, White Creek			BETPAP	Bog		Spribille	5051		COLO
Cetraria sepincola	MT	Lincoln	Fortine Creek Watershed, Twin Meadows Creek			BETPAP	Fen at head of drainage		Spribille	7891		COLO
Cetraria sepincola	MT	Lincoln	Sunday Creek Watershed, Blessed Creek			BETPAP	Fen along Creek		Spribille	7752		COLO
Cetraria sepincola	MT	Lincoln	Fortine Creek Watershed, Basin Creek			BETPAP	Next to creek		Spribille	7927		COLO
Cetraria sepincola	MT	Lincoln	Fortine Creek, Round Fen			BETPAP	Fen		Spribille	7356		COLO
Cetraria sepincola	MT	Lincoln	South of Eureka, Dahlberg Siding, 1.4 miles N of Barnaby Lake			BETPAP	Along Railroad		Spribille	4537		COLO
Cetraria sepincola	MT	Lincoln	Edna creek watershed, Ivor Creek			BETPAP	Bog		Spribille	7440		COLO
Cetraria sepincola	MT	Lincoln	Dudley Slough Area			BETPAP	Bog		Spribille	5873		COLO

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Cetraria sepincola	MT	Lincoln	Dudley Slough Area			BETPAP	Bog		Spribille	9701		COLO
Cetraria sepincola	MT	Missoula	Swan Valley, Summit Lake			BETPAP	Bog		Kolb	179		COLO
Collema curtisporum	AK		Alaska Peninsula NWR: Mother Goose Lake	57.18	157.27	POPTRI bark	POPTRI/ALSI/Salix ~0.5 k from lakeshore	30	Neitlich & Hasselbach	1271		MCC
Collema curtisporum	ID	Benewah	Lake Chacolet, Hwy 5	47.35	116.7	POPTRI	Lakeshore	650	Hutchinson	FP-171-01, FP-171-02	8/9/99	OSC
Collema curtisporum	ID	Benewah	N of 6/3 jct, 1 km S of Mashburn Sta.	47.183	116.5	POPTRI	River	786	Hutchinson	ID-413-11	7/21/99	SRP, OSC
Collema curtisporum	ID	Latah	Rd 447, N of Clarkia	47.065	116.33	POPTRI	Creek	835	Hutchinson	ID-433-01, ID-433-02	7/21/99	SRP, OSC
Collema curtisporum	ID	Shoshone	Rd 301/east of Bridge at jct w/1905	47.005	116.17	POPTRI	Creek	937	Hutchinson	ID533	7/15/99	
Collema curtisporum	ID	Idaho	Wendover CG	46.51	114.78	POPTRI	Bog	998	Hutchinson	ID611	7/4/99	
Collema curtisporum	ID	Clearwtr	Cold Ck CG	46.721	115.3	POPTRI	Wetland	810	Hutchinson	ID-612-03	7/9/99	OSC
Collema curtisporum	ID	Clearwtr	Near Cedars CG	46.873	115.08	POPTRI	Seasonally Wet	1114	Hutchinson	ID-623-06	7/12/99	OSC
Collema curtisporum	ID	Shoshone	Big Fish Bridge, E of St. Joe	47.315	116.35	POPTRI	River	673	Hutchinson	ID711	7/23/99	
Collema curtisporum	ID	Benewah	2.5 miles SE of St. Maries	47.272	116.58	POPTRI	River	648	Hutchinson	ID721	7/22/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Collema curtisporum	ID	Kootenai	E of Honeysuckle CG	47.733	116.47	POPTRI	Creek	834	Hutchinson	ID-722-04	7/30/99	OSC
Collema curtisporum	ID	Kootenai	E of Trestle Ck	47.747	116.43	POPTRI	River	858	Hutchinson	ID723	7/30/99	
Collema curtisporum	ID	Shoshone	Huckleberry	47.266	116.09	POPTRI	River	692	Hutchinson	ID811	7/23/99	
Collema curtisporum	ID	Kootenai	Near Big Hank CG	47.819	116.09	POPTRI	River	822	Hutchinson	ID813	7/25/99	
Collema curtisporum	ID	Kootenai	Off FS208, approx. 5 mi N of Pritchard	47.709	115.97	POPTRI	Creek	760	Hutchinson	ID-822-03	7/24/99	SRP, OSC
Collema curtisporum	ID	Kootenai	FS208 N of Big Hank CG	47.876	116.11	POPTRI	Creek	852	Hutchinson	ID832	7/25/99	
Collema curtisporum	ID	Kootenai	FS412 N of Berlin Flats	47.818	115.96	POPTRI	Creek	884	Hutchinson	ID833	7/25/99	
Collema curtisporum	ID	Bonner	NW of Clark Fork	48.15	116.19	POPTRI	Creek	633	Hutchinson	ID922	8/2/99	
Collema curtisporum	ID	Bonner	Priest Lake	48.74	116.85	POPTRI	Lake Margin	746	Hutchinson	ID931	7/31/99	
Collema curtisporum	ID	Kootenai	FS206, approx. 3 miles E of Hayden Lk	47.797	116.64	POPTRI	Creek	784	Hutchinson	ID-731-02	7/29/99	SRP, OSC
Collema curtisporum	ID	Bonner	Johnson Creek CG, W of Clark Fork	48.14	116.23	POPTRI	River	629	Hutchinson	ID913	8/3/99	
Collema curtisporum	ID	Bonner	Trail to Upper Priest Lake	48.8	116.91	POPTRI	Lake Margin	748	Martin	FP192	8/15/99	
Collema curtisporum	ID	Shoshone	14 k N of Wallace, mouth of Beaver Ck at Trail Ck	47.6	115.93	POPTRI	Floodplain	1065	McCune	16519	8/1/87	MCC

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Collema curtisporum	ID	Kootenai	N Coeur d Alene R mouth of Leiberg Ck	47.72	116.38	POPTRI	Floodplain	700	McCune	21082	9/1/93	MCC
Collema curtisporum	ID	Bonner	Tripod Point,Priest Lake	48.72	116.85	POPTRI	On shoreline of Priest lake	747	Penny		6/20/97	OSC
Collema curtisporum	ID	Bonner	North End of Priest Lake	48.73	116.85	Populus Bark	Mixed TSHE/THPL	747	Rosentreter	9667	8/1/95	RR
Collema curtisporum	MT	Flathead	Glacier NP, nr Lake McDonald Lodge			POPTRI	Lakeshore	1050	DeBolt	436	10/20/84	RR
Collema curtisporum	MT	Glacier	Glacier NP, Lost Lake			POPTRI	Lakeshore	1440	DeBolt	592	7/26/86	RR
Collema curtisporum	MT	Flathead	Glacier NP, Logan Ck			POPTRI	Creek	1080	DeBolt	587	7/26/86	RR
Collema curtisporum	MT	Lake	Swan Lake	48.058	114.033	POPTRI	Lakeshore	935	McCune	9558	7/23/78	MCC
Collema curtisporum	MT	Flathead	East end of McDonald Lake, Glacier NP	48.65	113.87	POPTRI	Lakeshore	960	McCune	12374	7/23/82	MCC
Collema curtisporum	MT	Lake	Near Pt. Pleasant CG	47.82	113.83	Crataegus bark	Floodplain	944	McCune	9132	9/2/77	MCC
Collema curtisporum	MT	Lake	Swan River, Pt. Pleasant Camp	47.82	113.83	POPTRI	Floodplain	944	McCune	9128	8/24/77	MCC
Collema curtisporum	MT	Flathead	Mouth of Logan Creek, Glacier NP	48.63	113.87	POPTRI	Floodplain	1075	McCune	12369	7/23/82	MCC
Collema curtisporum	MT	Lake	Swan River			POPTRI	River	990	Rosentreter	3212	7/7/83	RR

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Collema curtisporum	MT	Flathead	Noisy Ck, Swan Mtns			PSME	PSME forest	1400	Rosentreter	2058	6/26/81	RR
Collema curtisporum	OR	Linn	Hwy 20	44.43	121.91	POPTRI	Lakeshore	1216	Hutchinson	FP211	11/23/99	
Collema curtisporum	OR	Jefferson	First Creek, Deschutes NF, Sisters District			POPTRI	River margin	1280	Hutchinson & Geiser		6/1/95	
Collema curtisporum	OR	Wallowa	Wallowa River, upstream from Wallowa Creek	45.28	117.21	POPTRI	River margin	1345	McCune	23963		MCC
Collema curtisporum	OR	Wallowa	Lostine R., near Pole Br. Picnic Area	45.4	117.43	POPTRI	Floodplain	1250	McCune	21733	8/1/94	MCC
Collema curtisporum	WA	Pend Oreille	Boswell Ranch	48.35	117.05	POPTRI	Wet Meadow	739	Hutchinson	FP391	8/11/99	
Collema curtisporum	WA	Chelan	FS511 off of FS6404, 7 mi NW of Lake Wenatchee	47deg 55.6	120deg 54.4	POPTRI	Mixed Woods	590	M.Arnot	818	10/31/96	WTU
Collema curtisporum	WA	Klickitat	Klickitat Creek, 3.5 miles NE of Goldendale			POPTRI	PIPO-QUGA assoc.		H.K. Goree	2218	1/1/69	
Collema furfuraceum	ID	Idaho	Johnson Bar CG	46.1	115.55	POPTRI	Floodplain	461	Hutchinson	FP123	6/24/99	
Collema furfuraceum	ID	Kootenai	FS208 N of Big Hank CG	47.876	116.109	Alnus	Creek	852	Hutchinson	ID-832-04	7/25/99	OSC
Collema furfuraceum	ID	Idaho	17 km south of Cottonwood/American Bar	45.913	116.428	Celtis	River	407	Hutchinson	ID-113-01	6/30/99	OSC
Collema furfuraceum	ID	Kootenai	Near Big Hank CG	47.819	116.092	POPTRI	River	822	Hutchinson	ID813	7/25/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Collema furfuraceum	ID	Benewah	2.5 miles SE of St. Maries	47.272	116.581	POPTRI/CORSTO	River	648	Hutchinson	ID721	7/22/99	
Collema furfuraceum	ID	Kootenai	E of Trestle Ck	47.747	116.429	POPTRI	River	858	Hutchinson	ID723	7/30/99	
Collema furfuraceum	ID	Bonner	Hwy 200 SW of golf course, btwn RR tracks and Lake	48.3	116.535	POPTRI	Lake Margin	632	Hutchinson	ID911	8/1/99	
Collema furfuraceum	ID	Shoshone	Rd 301/east of Bridge at jct w/1905	47.005	116.165	POPTRI/Alnus	Creek	937	Hutchinson	ID533	7/15/99	
Collema furfuraceum	ID	Idaho	Wendover CG	46.51	114.785	POPTRI/BETPAP	Bog	998	Hutchinson	ID611	7/4/99	
Collema furfuraceum	ID	Bonner	Johnson Creek CG, W of Clark Fork	48.14	116.23	POPTRI	River	629	Hutchinson	ID913	8/3/99	
Collema furfuraceum	ID	Shoshone	Huckleberry CG/Hwy50	47.266	116.091	POPTRI/PHILEW	River	692	Hutchinson	ID811	7/23/99	
Collema furfuraceum	ID	Shoshone	FS350 accross Hwy 50 from Huckleberry CG	47.262	116.087	RHAPUR/POPTRI	Creek	751	Hutchinson	ID831	7/22/99	
Collema furfuraceum	ID	Kootenai	Just E of Honeysuckle CG	47.733	116.473	ACEGLA/POPTRI	Creek	834	Hutchinson	ID722	7/30/99	
Collema furfuraceum	ID	Bonner	South End off Hwy 2	48.502	116.461	POPTRI	Lake Margin	636	Hutchinson	ID933	8/2/99	
Collema furfuraceum	ID	Clearwtr	Just N of confluence w/Kelly Ck	46.723	115.085	POPTRI	Creek	967	Hutchinson	ID631	7/10/99	
Collema furfuraceum	ID	Shoshone	FS9 SE of Prichard, 1.5 miles E of Bear	47.595	115.771	POPTRI/ABGR	Creek	1015	Hutchinson	ID823	7/25/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Collema furfuraceum	ID	Shoshone	North of Big Creek CG	47.305	116.118	POPTRI	Creek	740	Hutchinson	ID821	7/23/99	
Collema furfuraceum	ID	Kootenai	Off FS208, approx. 5 mi N of Pritchard	47.709	115.973	POPTRI	Creek	760	Hutchinson	ID822	7/24/99	
Collema furfuraceum	ID	Shoshone	Big Fish Bridge, E of St. Joe	47.315	116.349	POPTRI/ACEGLA/RHAPUR	River	673	Hutchinson	ID711	7/23/99	
Collema furfuraceum	ID	Kootenai	Rd 97 to Anderson Lake/near Springston CG	47.482	116.728	POPTRI	Wetland	647	Hutchinson	ID713	7/28/99	
Collema furfuraceum	ID	Clearwtr	Near Cedars CG	46.873	115.077	POPTRI	Seasonally	1114	Hutchinson	ID-623-07	7/12/99	SRP
Collema furfuraceum	ID	Bonner	E of Bridge on Hwy 2	48.74	116.503	POPTRI	River	639	Hutchinson	ID923	8/3/99	
Collema furfuraceum	ID	Kootenai	jct of Rds 209/422	47.721	116.383	POPTRI	Creek	800	Hutchinson	ID733	7/30/99	
Collema furfuraceum	ID	Boundary	FS435 E of the Moiye River	48.874	116.097	POPTRI	Seep	1066	Hutchinson	ID932	8/2/99	
Collema furfuraceum	ID	Bonner	Priest Lake	48.74	116.855	POPTRI	Lake Margin	746	Hutchinson	ID931	7/31/99	
Collema furfuraceum	ID	Shoshone	1 km N. of Clarkia USFS Office	47.032	116.267	CRADOU/POPTRI/ABGR	Seasonally Wet	848	Hutchinson	ID412	7/21/99	
Collema furfuraceum	ID	Boundary	Kootenai Wildlife Refuge	48.74	116.413	POPTRI	River	532	Hutchinson	ID912	8/1/99	
Collema furfuraceum	ID	Idaho	Heart of the Monster Park, on hwy 12, n of Kooskia	46.229	116.008	POPTRI	River	367	Hutchinson	ID213	6/26/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Collema furfuraceum	ID	Clearwtr	about 2 km S of Greer/Confl of Lolo/Clearwtr	46.372	116.17	POPTRI	Creek	332	Hutchinson	ID222	6/27/99	
Collema furfuraceum	ID	Shoshone	Old Seibert Rd., Near Marble Ck	47.251	116.019	POPTRI/ACEGLA/Prunus	River	707	Hutchinson	ID-512-03	7/14/99	OSC
Collema furfuraceum	ID	Benewah	N of 6/3 jct, 1 km S of Mashburn Sta.	47.183	116.497	POPTRI	River	786	Hutchinson	ID413	7/21/99	
Collema furfuraceum	ID	Bonner	NW of Clark Fork	48.15	116.188	ACEGLA/POPTRI/THPL	Creek	633	Hutchinson	ID-922-06	8/2/99	OSC
Collema furfuraceum	ID	Latah	5 miles east of Emida	47.153	116.531	ALNSIN	Creek	850	Hutchinson	ID422	8/3/99	
Collema furfuraceum	ID	Kootenai	approx. 8 km E of the north end of Hayden Lake	47.823	116.655	POPTRI	Creek	739	Hutchinson	ID732	7/29/99	
Collema furfuraceum	ID	Bonner	Near Priest River Experimental Sta.	48.332	116.85	POPTRI/PIEN	Wetland	683	Hutchinson	ID921	7/31/99	
Collema furfuraceum	ID	Shoshone	FS208 N of Prichard, Avery Picnic area	47.688	115.929	POPTRI	River	745	Hutchinson	ID812	7/24/99	
Collema furfuraceum	ID	Latah	Rd 447, N of Clarkia	47.065	116.326	POPTRI/PHILEW/CRADOU/THPL	Creek	835	Hutchinson	ID433	7/21/99	
Collema furfuraceum	ID	Idaho	1 km east of American Bar	45.912	116.416	ALNRUB	Creek	418	Hutchinson	ID123	7/1/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Collema furfuraceum	ID	Kootenai	FS206, approx. 3 miles E of Hayden Lk	47.797	116.64	POPTRI	Creek	784	Hutchinson	ID731	7/29/99	
Collema furfuraceum	ID	Shoshone	18 km N of Wallace	47.635	115.868	POPTRI	Pritchard Ck	855	McCune	16560	8/1/87	MCC
Collema furfuraceum	ID	Kootenai	N. Fk of the CDA	47.718	116.384	POPTRI	Floodplain	700	McCune	21081	9/1/93	MCC
Collema furfuraceum	WA	Pend Oreille	Boswell Ranch	48.35	117.05	POPTRI	Wet Meadow	739	Hutchinson	FP391	8/11/99	
Hypogymnia oceanica			No sites east of the Cascades.									
Lobaria hallii	ID	Kootenai	Hayden State Park	47 deg 45'	116 deg 45'	POPTRI		726	Roger Rosentreter	13385	8/26/98	RR
Lobaria hallii	ID	Kootenai	Just E of Honeysuckle CG	47.733	116.473	ACEGLA/CRADOU/POPTRI	Creek	834	Hutchinson	ID-722-06	7/30/99	OSC
Lobaria hallii	ID	Kootenai	approx. 8 km E of the north end of Hayden Lake	47.823	116.655	POPTRI	Creek	739	Hutchinson	ID732	7/29/99	
Lobaria hallii	ID	Kootenai	E of Trestle Ck	47.747	116.429	RHAPUR/POPTRI/ABGR	River	858	Hutchinson	ID723	7/30/99	
Lobaria hallii	ID	Kootenai	FS206, approx. 3 miles E of Hayden Lk	47.797	116.64	POPTRI/ALNRUB	Creek	784	Hutchinson	ID731	7/29/99	
Lobaria hallii	ID	Kootenai	jct of Rds 209/422	47.721	116.383	POPTRI	Creek	800	Hutchinson	ID733	7/30/99	
Lobaria hallii	ID	Benewah	2.5 miles SE of St. Maries	47.272	116.581	POPTRI/CORSTO	River	648	Hutchinson	ID721	7/22/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria hallii	ID	Kootenai	Wetland W of Rose Lake, same side of Hwy 3	47.54	116.489	POPTRI	Wetland	653	Hutchinson	ID712	7/28/99	
Lobaria hallii	ID	Shoshone	Big Fish Bridge, E of St. Joe	47.315	116.349	POPTRI/RHAPUR/ABGR	River	673	Hutchinson	ID711	7/23/99	
Lobaria hallii	ID	Clearwtr	Near Cedars CG	46.873	115.077	POPTRI/PIEN	Seasonally Wet	1114	Hutchinson	ID-623-05	7/12/99	SRP
Lobaria hallii	ID	Clearwtr	Cold Ck CG	46.721	115.301	POPTRI	Wetland	810	Hutchinson	ID612	7/9/99	
Lobaria hallii	ID	Shoshone	Rd 301/east of Bridge at jct w/1905	47.005	116.165	POPTRI/ACEGLA/Alnus	Creek	937	Hutchinson	ID533	7/15/99	
Lobaria hallii	ID	Shoshone	Just S of Hwy 50	47.247	116.02	CRADOU/Alnus	Creek	698	Hutchinson	ID523	7/14/99	
Lobaria hallii	ID	Shoshone	Old Seibert Rd., Near Marble Ck	47.251	116.019	POPTRI/ALNRUB	River	707	Hutchinson	ID512	7/14/99	
Lobaria hallii	ID	Shoshone	Fly Creek CG FS218	47.113	115.392	POPTRI	River	1047	Hutchinson	ID511	7/13/99	
Lobaria hallii	ID	Latah	Rd 447, N of Clarkia	47.065	116.326	POPTRI/PHILEW/CRADOU/THPL	Creek	835	Hutchinson	ID433	7/21/99	
Lobaria hallii	ID	Latah	5 miles east of Emida	47.153	116.531	POPTRI	Creek	850	Hutchinson	ID422	8/3/99	
Lobaria hallii	ID	Benewah	N of 6/3 jct, 1 km S of Mashburn Sta.	47.183	116.497	POPTRI	River	786	Hutchinson	ID-413-12	7/21/99	SRP
Lobaria hallii	ID	Shoshone	1 km N. of Clarkia USFS Office	47.032	116.267	CRADOU/POPTRI/ABGR	Seasonally Wet	848	Hutchinson	ID412	7/21/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria hallii	ID	Idaho	Across the road from Johnson Bar	46.103	115.556	POPTRI	Creek	485	Hutchinson	ID233	7/5/99	
Lobaria hallii	ID	Clearwtr	Near Kelly Forks RS	46.721	115.087	POPTRI	Wetland	962	Hutchinson	ID621	7/10/99	
Lobaria hallii	ID	Bonner	Priest Lake	48.74	116.855	POPTRI	Lake Margin	746	Hutchinson	ID931	7/31/99	
Lobaria hallii	ID	Shoshone	Huckleberry CG/Hwy50	47.266	116.091	POPTRI/ACEGLA/PHILEW	River	692	Hutchinson	ID811	7/23/99	
Lobaria hallii	ID	Shoshone	FS9 SE of Prichard, 1.5 miles E of Bear Crk Rd	47.595	115.771	POPTRI/AMEALN/ABGR	Creek	1015	Hutchinson	ID823	7/25/99	
Lobaria hallii	ID	Bonner	Near Priest River Experimental Sta.	48.332	116.85	POPTRI	Wetland	683	Hutchinson	ID-921-02	7/31/99	OSC
Lobaria hallii	ID	Shoshone	FS350 accross Hwy 50 from Huckleberry CG	47.262	116.087	POPTRI/TSHE/ABGR	Creek	751	Hutchinson	ID831	7/22/99	
Lobaria hallii	ID	Kootenai	Off FS208, approx. 5 mi N of Pritchard	47.709	115.973	ALNRUB/POPTRI	Creek	760	Hutchinson	ID822	7/24/99	
Lobaria hallii	ID	Kootenai	FS208 N of Big Hank CG	47.876	116.109	POPTRI/AMEALN	Creek	852	Hutchinson	ID832	7/25/99	
Lobaria hallii	ID	Kootenai	FS412 N of Berlin Flats	47.818	115.958	PIEN/POPTRI	Creek	884	Hutchinson	ID833	7/25/99	
Lobaria hallii	ID	Shoshone	North of Big Creek CG	47.305	116.118	RHAPUR/POPTRI	Creek	740	Hutchinson	ID821	7/23/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria hallii	ID	Kootenai	Near Big Hank CG	47.819	116.092	RHAPUR/POPTRI	River	822	Hutchinson	ID813	7/25/99	
Lobaria hallii	ID	Shoshone	FS208 N of Prichard, Avery Picnic area	47.688	115.929	POPTRI/CRADOU/BETPAP	River	745	Hutchinson	ID812	7/24/99	
Lobaria hallii	ID	Boundary	FS435 E of the Moiye River	48.874	116.097	POPTRI	Seep	1066	Hutchinson	ID932	8/2/99	
Lobaria hallii	ID	Benewah	Lake Chacolet, Hwy 5	47.35	116.7	POPTRI	Lakeshore	650	Hutchinson	FP171	8/9/99	
Lobaria hallii	ID	Idaho	Johnson Bar CG	46.1	115.55	POPTRI	Floodplain	461	Hutchinson	FP123	6/24/99	
Lobaria hallii	ID	Bonner	Ploughboy CG	48.77	116.88	POPTRI	Lake Margin	756	Hutchinson	FP193	8/12/99	
Lobaria hallii	ID	Bonner	Trail to Upper Priest Lake	48.8	116.91	POPTRI	Lake Margin	748	Martin	FP192	8/15/99	
Lobaria hallii	ID	Shoshone	West edge of Murray	47.635	115.868	POPTRI	Pritchard Ck	855	McCune	16558	8/1/87	MCC
Lobaria hallii	ID	Bonner	Near Beaver Ck CG, N end of Priest Lake	48.735	116.852	POPTRI	Lakeshore	745	McCune	22557	8/1/95	MCC
Lobaria hallii	ID	Bonner	Priest River	48.351	116.852	POPTRI	Floodplain	680	McCune	23944	7/1/97	MCC
Lobaria hallii	ID	Shoshone	14 k N of Wallace	47.601	115.935	POPTRI	Mouth of Trail Ck	1065	McCune	16516	8/1/87	MCC
Lobaria hallii	ID	Shoshone	13 km N of Kellogg	47.635	116.117	POPTRI	Mouth of Coal Ck	690	McCune	16543	8/1/87	MCC
Lobaria hallii	ID	Bonner	Upper Priest Lake RNA	48.802	116.935	ALIN	Riparian shrub-carr	750	Mousseaux	58383	7/28/97	OSC
Lobaria hallii	ID	Kootenai	Honeysuckle CG	47.752	116.468	POPTRI	TSHE forest	850	Mousseaux	58385	8/7/97	OSC
Lobaria hallii	ID	Shoshone	Near Murray	47.62	115.87	Rock	Thuja forest	854	Rosentreter	3600		RR

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria hallii	ID	Shoshone	W of Murray	47.62	115.87	POPTRI		747	Rosentreter	5015	8/19/87	RR
Lobaria hallii	ID	Bonner	Upper Priest Lake RNA	48.81	116.9	POPTRI	Lake Margin	748	Rosentreter	13451	8/3/98	RR
Lobaria hallii	ID	Shoshone	6 miles from Murray and 10 air miles N of Wallace			POPTRI	Beaver Ck		Rosentreter	5023	8/19/87	RR
Lobaria hallii	ID	Benewah	St. Maries River	0.0167	0.0167			652	Schroeder	1519	4/28/71	ID
Lobaria hallii	ID	Bonner	Chatcolet Lake	47.35	116.73	POPTRI	Lakeshore	508	Schroeder	954	10/31/70	ID, OSC
Lobaria hallii	ID	Bonner	Kaniksu NF	0.0167	0.0167			744	Schroeder	1702	8/2/71	ID
Lobaria hallii	ID	Benewah	Santa Creek	0.0167	0.0167			0	Schroeder	465	9/13/71	ID
Lobaria hallii	ID	Clearwtr						763	Gray	1109	12/3/95	ID
Lobaria hallii	ID	Clearwtr				AMAL	ABGR-PSME forest	762	Gray	1073		OSC
Lobaria hallii	ID	Benewah	Chatcolet Lake	47.35	116.7			649	Schroeder	177	3/30/71	ID
Lobaria hallii	ID	Bonner	Kaniksu NF						Schroeder	L1666	6/13/71	ID
Lobaria hallii	ID	Benewah	Chatcolet Lake	47.35	116.7				Schroeder	L749	4/18/70	ID
Lobaria hallii	ID	Shoshone	St. Joe River						Schroeder	L1548	5/9/71	ID
Lobaria pulmonaria	ID	Clearwtr	Bull Run Ck				THPL-TSHE forest	763	Anderegg	374	5/6/72	ID
Lobaria pulmonaria	ID	Idaho	Green Isle CG				ABGR-PSME forest	732	Anderegg	563	6/28/72	ID
Lobaria pulmonaria	ID	Idaho	Mill Ck						Anderegg	2914	8/20/74	ID

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID	Latah	Johnson Creek Rd				THPL-ABGR forest	1159	Anderegg	854	9/2/72	ID
Lobaria pulmonaria	ID	Latah	Big Sand Ck						Anderegg	2660	7/28/74	ID
Lobaria pulmonaria	ID	Shoshone	Merry Ck				THPL-PSME	915	Anderegg	720	7/15/72	ID
Lobaria pulmonaria	ID	Clearwtr				PSME		747	Gray	638	2/20/95	ID
Lobaria pulmonaria	ID	Idaho	Near the mouth of Apgar Ck/Lochsa	46.22	115.54		THPL forest	488	Gray	100	12/20/93	OSC
Lobaria pulmonaria	ID	Clearwtr	Aquarius RNA	46.85	115.67		THPL-ATHFEL-FEM	500	Habeck			SRP
Lobaria pulmonaria	ID	Idaho	Hwy 14 / South Fork CG	45.832	115.949	RHAPUR	River	701	Hutchinson	ID211	6/23/99	
Lobaria pulmonaria	ID	Idaho	Heart of the Monster Park, on hwy 12, n of Kooskia	46.229	116.008	CRADOU	River	367	Hutchinson	ID213	6/26/99	
Lobaria pulmonaria	ID	Idaho	1/2 mile E of Lowell	46.149	115.595	THPL	Creek	446	Hutchinson	ID221	6/25/99	
Lobaria pulmonaria	ID	Clearwtr	about 2 km S of Greer/ Confl of Lolo/Clearwtr	46.372	116.17	POPTRI	Creek	332	Hutchinson	ID222	6/27/99	
Lobaria pulmonaria	ID	Idaho	Island after Johnson Bar CG	46.09	115.538	CRADOU	River	458	Hutchinson	ID223	7/5/99	
Lobaria pulmonaria	ID	Idaho	Pete King Rd (FS453)	46.177	115.606	POPTRI/ALNRUB/THPL	Creek	532	Hutchinson	ID231	6/24/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID	Idaho	On Hwy 12 E of Lowell	46.21	115.546	RHAPUR/ALNRUB	Creek	494	Hutchinson	ID-232-01	6/26/99	SRP
Lobaria pulmonaria	ID	Idaho	Across the road from Johnson Bar	46.103	115.556	RHAPUR/POPTRI	Creek	485	Hutchinson	ID233	7/5/99	
Lobaria pulmonaria	ID	Idaho	Wilderness Gateway CG	46.339	115.315	BETPAP	River	629	Hutchinson	ID312	6/25/99	
Lobaria pulmonaria	ID	Idaho	Approx. 0.5 miles E of Selway TH at Race Ck	46.043	115.269	THPL	River	537	Hutchinson	ID313	7/3/99	
Lobaria pulmonaria	ID	Idaho	South of Selway River Road, near falls	46.045	115.297	BETPAP/THPL/TAXBRE	Creek	539	Hutchinson	ID321	7/2/99	
Lobaria pulmonaria	ID	Idaho	Approx.1 mile E on trail from Race Crk CG	46.043	115.252	THPL/RHAPUR	Creek	533	Hutchinson	ID322	7/3/99	
Lobaria pulmonaria	ID	Idaho	Wilderness Gateway CG trailhead to	46.337	115.314	PHELEW	Creek	637	Hutchinson	ID323	7/4/99	
Lobaria pulmonaria	ID	Idaho	At the end of the Selway River Road	46.044	115.284	BETPAP/ABGR	Creek	529	Hutchinson	ID331	7/2/99	
Lobaria pulmonaria	ID	Idaho	0.5 miles E on Selway trail from Race Creek	46.044	115.273	BETPAP/HOLDIS	Seep	551	Hutchinson	ID332	7/3/99	
Lobaria pulmonaria	ID	Idaho	On Hwy 12 E of Lowell	46.233	115.408	BETPAP/CRADOU	Creek	558	Hutchinson	ID333	7/4/99	
Lobaria pulmonaria	ID	Shoshone	1 km N. of Clarkia USFS Office	47.032	116.267	CRADOU/POPTRI/ABGR	Seasonally Wet	848	Hutchinson	ID412	7/21/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID	Benewah	N of 6/3 jct, 1 km S of Mashburn Sta.	47.183	116.497	POPTRI	River	786	Hutchinson	ID413	7/21/99	
Lobaria pulmonaria	ID	Latah	FS447, Palouse River Rd. OHV play area/tailings	46.969	116.583	POPTRI	Seasonally Wet	859	Hutchinson	ID421	7/16/99	
Lobaria pulmonaria	ID	Benewah	Approx 5 miles E of Emida	47.078	116.56	PIEN/ POPTRI/THPL	Creek	904	Hutchinson	ID432	8/4/99	
Lobaria pulmonaria	ID	Latah	Rd 447, N of Clarkia	47.065	116.326	POPTRI/THPL	Creek	835	Hutchinson	ID433	7/21/99	
Lobaria pulmonaria	ID	Shoshone	Fly Creek CG FS218	47.113	115.392	POPTRI	River	1047	Hutchinson	ID511	7/13/99	
Lobaria pulmonaria	ID	Shoshone	Old Seibert Rd., Near Marble Ck	47.251	116.019	POPTRI	River	707	Hutchinson	ID512	7/14/99	
Lobaria pulmonaria	ID	Clearwtr	Aquarius CG	46.841	115.619	THPL/ ABGR/ ALRU/POPTRI	River	513	Hutchinson	ID513	7/20/99	
Lobaria pulmonaria	ID	Clearwtr	FS247, confl. Beaver Ck and NFClrwtr	46.841	115.623	ALNRUB/THPL/RHAPUR	Creek	518	Hutchinson	ID-521-03	7/9/99	SRP
Lobaria pulmonaria	ID	Shoshone	Just S of Hwy 50	47.247	116.02	POPTRI	Creek	698	Hutchinson	ID523	7/14/99	
Lobaria pulmonaria	ID	Clearwtr	FS1705, approx 6 k E of Elk City	46.79	116.13	POPTRI	Seasonally Wet	932	Hutchinson	ID531	7/8/99	
Lobaria pulmonaria	ID	Shoshone	FS321, Marble Ck Rd	47.175	116.099	POPTRI	Creek	937	Hutchinson	ID532	7/15/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID	Shoshone	Rd 301/east of Bridge at jct w/1905	47.005	116.165	POPTRI/ACEGLA	Creek	937	Hutchinson	ID533	7/15/99	
Lobaria pulmonaria	ID	Idaho	Johnson Bar CG	46.1	115.55	POPTRI	Floodplain	461	Hutchinson	FP123	6/24/99	
Lobaria pulmonaria	ID	Benewah	Lake Chacolet, Hwy 5	47.35	116.7	POPTRI	Lakeshore	650	Hutchinson	FP171	8/9/99	
Lobaria pulmonaria	ID	Clearwtr	N Fk of the Clwtr	46.85	115.63	POPTRI	Creek	510	Hutchinson	FP152	8/20/99	
Lobaria pulmonaria	ID	Clearwtr	N Fk of the Clwtr on FS700 N of Aquarius CG	46.87	115.62	POPTRI	Creek	601	Hutchinson	FP151	8/20/99	
Lobaria pulmonaria	ID	Idaho	Wendover CG	46.51	114.785	POPTRI/PIEN	Bog	998	Hutchinson	ID611	7/4/99	
Lobaria pulmonaria	ID	Clearwtr	Cold Ck CG	46.721	115.301	POPTRI	Wetland	810	Hutchinson	ID612	7/9/99	
Lobaria pulmonaria	ID	Clearwtr	Black Canyon/Confl w/Kelly Creek	46.719	115.257	HOLDIS/CRADOU/PHILEW	River	842	Hutchinson	ID613	7/10/99	
Lobaria pulmonaria	ID	Clearwtr	Near Kelly Forks RS	46.721	115.087	POPTRI	Wetland	962	Hutchinson	ID621	7/10/99	
Lobaria pulmonaria	ID	Clearwtr	Kelly Creek Island, Btwn Blck Cnyn & Kelly RSta	46.713	115.182	POPTRI	Creek	892	Hutchinson	ID622	7/11/99	
Lobaria pulmonaria	ID	Clearwtr	Near Cedars CG	46.873	115.077	POPTRI/PIEN	Seasonally Wet	1114	Hutchinson	ID623	7/12/99	
Lobaria pulmonaria	ID	Clearwtr	Just N of confluence w/Kelly Ck	46.723	115.085	POPTRI	Creek	967	Hutchinson	ID631	7/10/99	
Lobaria pulmonaria	ID	Clearwtr	FS250/FS711 NFClwtr	46.721	115.301	POPTRI	Creek	816	Hutchinson	ID632	7/11/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID	Clearwtr	N. of Moose Ck/Kelly Ck	46.767	115.095	POPTRI	Creek	1134	Hutchinson	ID633	7/12/99	
Lobaria pulmonaria	ID	Shoshone	Big Fish Bridge, E of St. Joe	47.315	116.349	POPTRI/RHAPUR/CRADOU	River	673	Hutchinson	ID711	7/23/99	
Lobaria pulmonaria	ID	Benewah	2.5 miles SE of St. Maries	47.272	116.581	POPTRI	River	648	Hutchinson	ID721	7/22/99	
Lobaria pulmonaria	ID	Kootenai	Just E of Honeysuckle CG	47.733	116.473	ACEGLA/RHAPUR	Creek	834	Hutchinson	ID722	7/30/99	
Lobaria pulmonaria	ID	Kootenai	E of Trestle Ck	47.747	116.429	CRADOU/POPTRI/ABGR	River	858	Hutchinson	ID723	7/30/99	
Lobaria pulmonaria	ID	Kootenai	FS206, approx. 3 miles E of Hayden Lk	47.797	116.64	ALNRUB/POPTRI	Creek	784	Hutchinson	ID731	7/29/99	
Lobaria pulmonaria	ID	Kootenai	approx. 8 km E of the north end of Hayden Lake	47.823	116.655	POPTRI/CRADOU/BETPAP	Creek	739	Hutchinson	ID732	7/29/99	
Lobaria pulmonaria	ID	Kootenai	jct of Rds 209/422	47.721	116.383	POPTRI	Creek	800	Hutchinson	ID733	7/30/99	
Lobaria pulmonaria	ID	Shoshone	Huckleberry CG/Hwy50	47.266	116.091	ACEGLA/PHELEW	River	692	Hutchinson	ID811	7/23/99	
Lobaria pulmonaria	ID	Shoshone	FS208 N of Prichard, Avery Picnic area	47.688	115.929	POPTRI	River	745	Hutchinson	ID812	7/24/99	
Lobaria pulmonaria	ID	Kootenai	Near Big Hank CG	47.819	116.092	POPTRI	River	822	Hutchinson	ID813	7/25/99	
Lobaria pulmonaria	ID	Shoshone	North of Big Creek CG	47.305	116.118	RHAPUR	Creek	740	Hutchinson	ID821	7/23/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID	Kootenai	Off FS208, approx. 5 mi N of Pritchard	47.709	115.973	POPTRI	Creek	760	Hutchinson	ID822	7/24/99	
Lobaria pulmonaria	ID	Shoshone	FS9 SE of Prichard, 1.5 miles E of Bear	47.595	115.771	ABGR	Creek	1015	Hutchinson	ID823	7/25/99	
Lobaria pulmonaria	ID	Shoshone	FS350 accross Hwy 50 from Huckleberry CG	47.262	116.087	POPTRI/TSHE/RHAPUR	Creek	751	Hutchinson	ID831	7/22/99	
Lobaria pulmonaria	ID	Kootenai	FS208 N of Big Hank CG	47.876	116.109	POPTRI	Creek	852	Hutchinson	ID832	7/25/99	
Lobaria pulmonaria	ID	Kootenai	FS412 N of Berlin Flats	47.818	115.958	RHPU/ POPTRI/PIEN/ TSHE	Creek	884	Hutchinson	ID833	7/25/99	
Lobaria pulmonaria	ID	Bonner	Johnson Creek CG, W of Clark Fork	48.14	116.23	POPTRI	River	629	Hutchinson	ID913	8/3/99	
Lobaria pulmonaria	ID	Bonner	Near Priest River Experimental Sta.	48.332	116.85	PIEN/Alnus	Wetland	683	Hutchinson	ID921	7/31/99	
Lobaria pulmonaria	ID	Bonner	NW of Clark Fork	48.15	116.188	POPTRI	Creek	633	Hutchinson	ID922	8/2/99	
Lobaria pulmonaria	ID	Bonner	E of Bridge on Hwy 2	48.74	116.503	BETPAP/POPTRI	River	639	Hutchinson	ID923	8/3/99	
Lobaria pulmonaria	ID	Bonner	Priest Lake	48.74	116.855	POPTRI	Lake Margin	746	Hutchinson	ID931	7/31/99	
Lobaria pulmonaria	ID	Boundary	FS435 E of the Moiye River	48.874	116.097	POPTRI	Seep	1066	Hutchinson	ID-932-02	8/2/99	SRP
Lobaria pulmonaria	ID	Bonner	South End off Hwy 2	48.502	116.461	POPTRI	Lake Margin	636	Hutchinson	ID933	8/2/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID		St. Joe River			POPTRI			Jones		1/1/98	
Lobaria pulmonaria	ID		N. fk of the Coeur d'Alene			POPTRI			Jones		1/1/98	
Lobaria pulmonaria	ID	Idaho	Walton Ck	46.5	114.683	conifer	ravine	1100	McCune	10687		MCC
Lobaria pulmonaria	ID	Idaho	Two Shadows Ck, 7km W of Lowell	46.133	115.667	ALRU	Creek	502	McCune	10182	3/14/79	MCC
Lobaria pulmonaria	ID	Idaho	Wild Goose CG, Clearwtr R	45.133	115.617		Floodplain	700	McCune	17938		MCC
Lobaria pulmonaria	ID	Clearwate	Aqaurius RNA	46.85	115.667	conifer	Floodplain	510	McCune	18563	8/1/90	MCC
Lobaria pulmonaria	ID	Clearwate	Hiden Ck at N Fk Clearwtr	46.833	115.167		Floodplain	1020	McCune	18498	8/1/90	MCC
Lobaria pulmonaria	ID	Idaho	3 Devils Picnic area, Clearwtr R	45.133	115.65		Floodplain	700	McCune	17956	6/1/89	MCC
Lobaria pulmonaria	ID	Idaho	Two Shadows Ck, 7km W of Lowell	46.133	115.667	ALRU	Valley bottom	502	McCune	10166		MCC
Lobaria pulmonaria	ID	Idaho	9 km E of Lowell	46.217	115.55	moss/rock		518	McCune	10164		MCC
Lobaria pulmonaria	ID	Shoshone	18 km N of Wallace, W edge of Murray-Pritchard Ck	47.633	115.867	POPTRI	Creek	855	McCune	16557	8/1/87	MCC
Lobaria pulmonaria	ID	Shoshone	13km N of Kellogg, Mouth of Coal Ck at Lower CDA R	47.633	116.117	POPTRI	Floodplain	690	McCune	16542	8/1/87	MCC
Lobaria pulmonaria	ID	Shoshone	14 km N of Wallace, Mouth of Trail Ck at Beaver Ck	47.6	115.933	POPTRI	Floodplain	1065	McCune	16515	8/1/87	MCC
Lobaria pulmonaria	ID	Idaho		46.55	114.683			1090	McCune	16983		MCC

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID	Idaho		46.467	114.95			910	McCune	12075		MCC
Lobaria pulmonaria	ID	Idaho	Jct of Glade Ck & Lochsa R	46.217	115.533		Floodplain	580	McCune	11876		MCC
Lobaria pulmonaria	ID	Idaho	Jct of Glade Ck & Lochsa R	46.217	115.533	deciduous shrubs	Floodplain	580	McCune	11864	9/2/82	MCC
Lobaria pulmonaria	ID	Kootenai		47.717	116.383			700	McCune	21092		MCC
Lobaria pulmonaria	ID	Idaho	Lochsa R.	46	115.52	THPL	Old growth THPL forest	610	Rosentreter	9122	2/22/95	RR
Lobaria pulmonaria	ID	Idaho	Near the confluence of the Selway R.			bark	White Cap Ck	1700	Rosentreter	RR-ID-36	7/12/76	RR
Lobaria pulmonaria	ID	Bonner	Hwy 2, 10 miles W of Lolo Pass				Thuja forest		Rosentreter	RR-ID-3	8/1/77	RR
Lobaria pulmonaria	ID	Benewah	Chatcolet Lake						Schroeder	L748	4/18/70	ID
Lobaria pulmonaria	ID	Bonner	Kaniksu NF						Schroeder	L941	8/4/70	ID
Lobaria pulmonaria	ID	Boundary					Mixed conifer forest		Schroeder	L1670	6/19/71	ID
Lobaria pulmonaria	ID	Clearwtr	St. Joe NF						Schroeder	L1520	3/27/71	ID
Lobaria pulmonaria	ID	Idaho	Peasley Ck Rd				ABGR-PIEN-TABR		Schroeder	3050	8/21/74	ID
Lobaria pulmonaria	ID	Idaho	Selway R, Glover Ck						Schroeder	3099	8/22/74	ID
Lobaria pulmonaria	ID	Idaho	Clearwtr National Forest						Schroeder	L1719	7/6/71	ID
Lobaria pulmonaria	ID	Idaho						915	Schroeder	3151	6/28/75	ID

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Lobaria pulmonaria	ID	Idaho	Lochsa R.						Schroeder	L1557	5/15/71	ID
Lobaria pulmonaria	ID	Idaho	Lochsa R.						Schroeder	L1555	5/15/71	ID
Lobaria pulmonaria	ID	Idaho	Lochsa R.						Schroeder	L1561	5/15/71	ID
Lobaria pulmonaria	ID	Idaho	Nez Perce National Forest						Schroeder	L1732	7/8/71	ID
Lobaria pulmonaria	ID	Kootenai					Conifer forest		Schroeder	L1662	6/9/71	ID
Lobaria pulmonaria	ID	Latah	At Moscow				Moist, shaded forest	958	Schroeder	L351	11/8/69	ID
Lobaria pulmonaria	ID	Latah					Conifer forest		Schroeder	L301	9/13/69	ID
Lobaria pulmonaria	ID	Latah					Conifer forest		Schroeder	L1966	4/15/72	ID
Lobaria pulmonaria	ID	Latah	Moscow Mountain						Schroeder	L351	11/8/69	ID
Lobaria pulmonaria	ID	Shoshone	St. Joe River						Schroeder	L860	6/12/70	ID
Lobaria pulmonaria	ID	Bonner	Kaniksu NF						Schroeder, W. Melquist	L2066	5/22/72	ID
Lobaria pulmonaria	ID	Clearwtr	West of Elk R					839	Schwandt	339	5/30/74	ID
Lobaria pulmonaria	ID	Clearwtr	West of Elk R					839	Schwandt	338	5/30/74	ID
Lobaria pulmonaria	ID	Clearwtr	Benton Ck						Steele	01	7/15/70	ID
Lobaria pulmonaria	ID	Idaho	near 3 Devils Picnic Area, 3 mi W of Lowell	46.14	115.65		PIEN-THPL forest	438	Trana	5970	8/21/78	OSC
Lobaria pulmonaria	WA	Pend Oreille	Boswell Ranch	48.35	117.05	POPTRI	Wet Meadow	739	Hutchinson	FP391	8/11/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Physcia semipinnata	CA	Nevada	Lake of the Pines	0.0167	0.0167	Quercus douglasii	Sierra Nevada Foothills	460	Winkler	17894c		MCC
Physcia semipinnata	MT	Lake	Swan Lake CG	48.058	114.033	POPTRI	Lake Margin	935	McCune	9566	7/23/78	MCC
Physcia semipinnata	WA	San Juan	Dead Man Bay						Anderegg	10409	6/10/77	
Physconia americana	ID	Shoshone	Rd 301/east of Bridge at jct w/1905	47.005	116.165	POPTRI	Creek	937	Hutchinson	ID533	7/15/99	
Physconia americana	ID	Shoshone	Just S of Hwy 50	47.247	116.02	POPTRI	Creek	698	Hutchinson	ID523	7/14/99	
Physconia americana	ID	Boundary	Kootenai Wildlife Refuge	48.74	116.413	POPTRI	River	532	Hutchinson	ID912	8/1/99	
Physconia americana	ID	Benewah	N of 6/3 jct, 1 km S of Mashburn Sta.	47.183	116.497	POPTRI	River	786	Hutchinson	ID-413-13	7/21/99	SRP, OSC
Physconia americana	ID	Clearwtr	Cold Ck CG	46.721	115.301	POPTRI	Wetland	810	Hutchinson	ID612	7/9/99	
Physconia americana	ID	Bonner	Johnson Creek CG, W of Clark Fork	48.14	116.23	POPTRI	River	629	Hutchinson	ID913	8/3/99	
Physconia americana	ID	Latah	Hwy 99 N of Kendrick	46.642	116.72	POPTRI	Creek	757	Hutchinson	ID431	7/19/99	
Physconia americana	ID	Bonner	NW of Clark Fork	48.15	116.188	POPTRI/CR ADOU	Creek	633	Hutchinson	ID922	8/2/99	
Physconia americana	ID	Latah	FS447, Palouse River Rd. OHV play area/tailings	46.969	116.583	POPTRI	Seasonally Wet	859	Hutchinson	ID421	7/16/99	
Physconia americana	ID	Shoshone	Old Seibert Rd., Near Marble Ck	47.251	116.019	POPTRI/AL NRUB	River	707	Hutchinson	ID512	7/14/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Physconia americana	ID	Bonner	E of Bridge on Hwy 2	48.74	116.503	POPTRI	River	639	Hutchinson	ID923	8/3/99	
Physconia americana	ID	Bonner	Priest Lake	48.74	116.855	POPTRI	Lake Margin	746	Hutchinson	ID931	7/31/99	
Physconia americana	ID	Shoshone	1 km N. of Clarkia USFS Office	47.032	116.267	POPTRI	Seasonally Wet	848	Hutchinson	ID412	7/21/99	
Physconia americana	ID	Clearwtr	2 km S of Greer/ Confl of Lolo/Clearwtr	46.372	116.17	POPTRI	Creek	332	Hutchinson	ID222	6/27/99	
Physconia americana	ID	Bonner	South End off Hwy 2	48.502	116.461	POPTRI	Lake Margin	636	Hutchinson	ID933	8/2/99	
Physconia americana	ID	Latah	5 miles east of Emida	47.153	116.531	POPTRI	Creek	850	Hutchinson	ID422	8/3/99	
Physconia americana	ID	Shoshone	FS208 N of Prichard, Avery Picnic area	47.688	115.929	BETPAP/POPTRI	River	745	Hutchinson	ID812	7/24/99	
Physconia americana	ID	Kootenai	E of Trestle Ck	47.747	116.429	RHAPUR/POPTRI	River	858	Hutchinson	ID-723-01	7/30/99	ASU, OSC
Physconia americana	ID	Benewah	2.5 miles SE of St. Maries	47.272	116.581	POPTRI	River	648	Hutchinson	ID721	7/22/99	
Physconia americana	ID	Kootenai	Near Big Hank CG	47.819	116.092	POPTRI	River	822	Hutchinson	ID813	7/25/99	
Physconia americana	ID	Kootenai	Just E of Honeysuckle CG	47.733	116.473	ACEGLA/POPTRI/CRADOU	Creek	834	Hutchinson	ID-722-02	7/30/99	SRP, OSC
Physconia americana	ID	Clearwtr	N. of Moose Ck/Kelly Ck	46.767	115.095	POPTRI	Creek	1134	Hutchinson	ID633	7/12/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Physconia americana	ID	Shoshone	Big Fish Bridge, E of St. Joe	47.315	116.349	ACEGLA/POPTRI/PHYMAL	River	673	Hutchinson	ID711	7/23/99	
Physconia americana	ID	Kootenai	Off FS208, approx. 5 mi N of Pritchard	47.709	115.973	ALNRUB/POPTRI	Creek	760	Hutchinson	ID822	7/24/99	
Physconia americana	ID	Kootenai	FS206, approx. 3 miles E of Hayden Lk	47.797	116.64		Creek	784	Hutchinson	ID731	7/29/99	
Physconia americana	ID	Kootenai	Rd 97 to Anderson Lake/near Springston CG	47.482	116.728		Wetland	647	Hutchinson	ID713	7/28/99	
Physconia americana	ID	Shoshone	Huckleberry CG/Hwy50	47.266	116.091	POPTRI	River	692	Hutchinson	ID811	7/23/99	
Physconia americana	ID	Clearwtr	Kelly Creek Island, Btwn Blck Cnyn & Kelly RSta	46.713	115.182	POPTRI	Creek	892	Hutchinson	ID622	7/11/99	
Physconia americana	ID	Clearwtr	Near Kelly Forks RS	46.721	115.087	POPTRI	Wetland	962	Hutchinson	ID621	7/10/99	
Physconia americana	ID	Kootenai	jct of Rds 209/422	47.721	116.383	POPTRI	Creek	800	Hutchinson	ID733	7/30/99	
Physconia americana	ID	Benewah	Lake Chacolet, Hwy 5	47.35	116.7	POPTRI	Lakeshore	650	Hutchinson	FP171	8/9/99	
Physconia americana	ID	Idaho	Johnson Bar CG	46.1	115.55	POPTRI	Floodplain	461	Hutchinson	FP123	6/24/99	
Physconia americana	ID	Shoshone	North of Big Creek CG	47.305	116.118	RHAPUR	Creek	740	Hutchinson	ID821	7/23/99	
Physconia americana	ID	Bonner	Trail to Upper Priest Lake	48.8	116.91	POPTRI	Lake Margin	748	Martin	FP192		

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Physconia americana	ID	Idaho		46.15	115.985			365	McCune	10151		MCC
Physconia americana	ID	Idaho	Near Kooskia	46.15	115.985	POPTRI	Floodplain	365	McCune	10153	3/14/79	MCC
Physconia americana	ID	Shoshone	13 km N of Kellogg	47.635	116.117	POPTRI	Mouth of Coal Ck	690	McCune	16546	8/1/87	MCC
Physconia americana	ID	Kootenai	N. Fk of the CDA	47.718	116.384	POPTRI	Floodplain	700	McCune	21083	9/1/93	MCC
Physconia americana	ID	Shoshone	Beaver Creek	47.601	115.935	POPTRI	mouth of Trail Ck	1065	McCune	16517	8/1/87	MCC
Physconia americana	MT	Flathead	East end of McDonald Lake, Glacier NP	48.651	113.868	POPTRI	Lake Margin	960	McCune	12378	7/23/82	MCC
Physconia americana	OR	Linn	Hwy 126	44.4	122	POPTRI	Seasonally Wet/Lakesho	965	Hutchinson	FP213		
Pseudocyphellaria anomala	ID	Latah	Big Sand Ck	46.31	114.52				Anderegg	2648	7/28/74	ID
Pseudocyphellaria anomala	ID	Idaho	Hillside S of Eldorado Ck	46.29	115.66	on Abies twig	Mixed conifer forest	1086	Gray	1202	5/27/96	ID
Pseudocyphellaria anomala	ID	Clearwtr	Just W of Lolo Ck			on branch	Mixed conifer forest	927	Gray	725		
Pseudocyphellaria anomala	ID	Shoshone	Rd 301/east of Bridge at jct w/1905	47.005	116.165	ABGR	Creek	937	Hutchinson	ID-533-02	7/15/99	SRP
Pseudocyphellaria anomala	ID	Clearwtr	Kelly Crk Island, Btwn Blck Cnyn & Kelly RS	46.713	115.182	POPTRI	Creek	892	Hutchinson	ID-622-08	7/11/99	OSC
Pseudocyphellaria anomala	ID	Bonner	Grouse Mtn	48.18	116.46			853	Schroeder	1668	6/13/71	ID

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Pseudocyphellaria anomala	ID	Bonner	Selkirk Mtns, Kaniksu NF	0.0167	0.0167			762	Schroeder	2070	5/22/72	ID
Pseudocyphellaria anomala	ID	Lewis	Lapwai Ck	0.0167	0.0167			853	Schroeder	891	7/14/70	ID
Pseudocyphellaria anomala	MT	Lake	Swan Valley	47.969	113.919	ABGR	ABGR Forest	960	McCune	17632	9/1/89	MCC
Pseudocyphellaria anomala	MT	Lake	Near Mission Ck	47.326	113.969	rotton wood	Mixed conifer forest	1066	Sweet	8009	7/1/77	MCC
Pseudocyphellaria anthrapsis	ID	Clearwtr	Aquarius RNA	46.85	115.67	THPL	TSHE habitat	510	A. DeBolt	1257	7/17/89	RR
Pseudocyphellaria anthrapsis	ID	Clearwtr	Aquarius RNA	46.85	115.67	THPL	TSHE habitat	510	A. DeBolt	1275	7/17/89	RR
Pseudocyphellaria anthrapsis	ID	Mendocina	Spyrock Rd					1031	Anderegg, et al.	3303	8/15/75	ID
Pseudocyphellaria anthrapsis	ID	Clearwtr				On fallen THPL		778	Gray	364	8/26/94	ID
Pseudocyphellaria anthrapsis	ID	Clearwtr						519	Gray	750	7/15/95	ID
Pseudocyphellaria anthrapsis	ID	Clearwtr						580	Gray	749	7/15/95	ID
Pseudocyphellaria anthrapsis	ID	Idaho						439	Gray	705	5/29/95	ID
Pseudocyphellaria anthrapsis	ID	Idaho	T33N R6E SY 1/4 of the NE 1/4 Sec 22					488	Gray	182	4/25/94	ID
Pseudocyphellaria anthrapsis	ID	Idaho	7 km W of Lowell			ALRU	Two Shadows Ck	500	Rosentreter	1174	3/14/79	RR

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Pseudocyphellaria anthrapsis	ID	Idaho	Lochsa R.	46	115.52	THPL	Old growth THPL forest	610	Rosentreter	9123	2/22/95	RR
Pseudocyphellaria anthrapsis	ID	Bonner	Near Roosevelt Cedar Grove	48.42	116.9	Bark	THPL-TSHE forest	800	Rosentreter	11155	7/16/97	RR
Pseudocyphellaria anthrapsis	ID	Clearwtr	Aquarius Research Natural Area					500	Sarah C. Walker & Lichthar	43	6/16/95	ID
Pseudocyphellaria anthrapsis	ID	Clearwtr	Confluence of Elk Ck and N Fk Clearwtr	46.68	116.21	deciduous shrubs	Conifer forest	363	Schroeder	L1411	3/27/71	ID, OSC
Pseudocyphellaria anthrapsis	ID	Clearwtr	Quartz Ck					573	Schroeder	L2165	10/1/72	ID
Pseudocyphellaria anthrapsis	ID	Clearwtr	N. Canyon River					503	Schroeder	1618	10/27/73	ID
Pseudocyphellaria anthrapsis	ID	Clearwtr	N Middle Quartz Ck						Schroeder	L2165	10/1/72	ID
Pseudocyphellaria anthrapsis	ID	Clearwtr	St. Joe NF						Schroeder	L1473	3/27/71	ID
Pseudocyphellaria anthrapsis	ID	Clearwtr	St. Joe NF						Schroeder	L1448	3/27/71	ID
Pseudocyphellaria anthrapsis	ID	Idaho	Selway River						Schroeder	L1766	7/28/71	ID
Pseudocyphellaria anthrapsis	ID	Idaho	SW of Lowell, Nez Perce NF					512	Schroeder	L1731	7/8/71	ID
Pseudocyphellaria anthrapsis	ID	Idaho	Glover Ck Selway R						Schroeder	3098	8/22/74	ID

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Pseudocyphellaria anthrapsis	ID	Idaho	Clearwtr NF						Schroeder	L1714	7/6/71	ID
Pseudocyphellaria anthrapsis	ID	Idaho	Clearwtr NF						Schroeder	L1698	7/6/71	ID
Pseudocyphellaria anthrapsis	ID	Idaho	Lochsa R.						Schroeder	L1704	7/6/71	ID
Pseudocyphellaria anthrapsis	ID	Idaho	Selway R.						Schroeder	L1992	5/18/72	ID
Pseudocyphellaria anthrapsis	ID	Idaho	Clearwtr NF						Schroeder	L1717	7/6/71	ID
Pseudocyphellaria anthrapsis	ID	Idaho					Conifer forest		Schroeder	L1731	7/8/71	ID
Pseudocyphellaria anthrapsis	ID	Idaho	O'Hara CG	46.08	115.51		Selway River	477	Wagner	860	5/18/79	OSC
Pseudocyphellaria anthraspis	ID	Shoshone	1 km N. of Clarkia USFS Office	47.032	116.267	ABGR	Seasonally Wet	848	Hutchinson	ID412	7/21/99	
Pseudocyphellaria anthraspis	ID	Idaho	1/2 mile E of Lowell	46.149	115.595	THPL	Creek	446	Hutchinson	ID221	6/25/99	
Pseudocyphellaria anthraspis	ID	Clearwtr	FS247, confl. Beaver Ck and NFClrwtr	46.841	115.623	ALNRUB/THPL	Creek	518	Hutchinson	ID521	7/9/99	
Pseudocyphellaria anthraspis	ID	Clearwtr	Black Canyon/Confl w/Kelly Creek	46.719	115.257	PHILEW	River	842	Hutchinson	ID613	7/10/99	
Pseudocyphellaria anthraspis	ID	Idaho	Island after Johnson Bar CG	46.09	115.538	PYSMAL/RHAPUR	River	458	Hutchinson	ID-223-03	7/5/99	SRP
Pseudocyphellaria anthraspis	ID	Clearwtr	Cold Ck CG	46.721	115.301	POPTRI	Wetland	810	Hutchinson	ID612	7/9/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Pseudocyphellaria anthraspis	ID	Idaho	approx. 1 mile E on trail from Race Creek CG	46.043	115.252	THPL/HOL DIS	Creek	533	Hutchinson	ID322	7/3/99	
Pseudocyphellaria anthraspis	ID	Idaho	approx. 0.511 miles E of Selway TH at Race Ck	46.043	115.269	THPL/ABGR /RHAPUR	River	537	Hutchinson	ID-313-01	7/3/99	OSC
Pseudocyphellaria anthraspis	ID	Idaho	Just upstream from Rock Island	46.078	115.418	Litter	River	511	Hutchinson	ID311	6/24/99	
Pseudocyphellaria anthraspis	ID	Idaho	On Hwy 12 E of Lowell	46.21	115.546	RHAPUR/A LNRUB	Creek	494	Hutchinson	ID232	6/26/99	
Pseudocyphellaria anthraspis	ID	Idaho	South of Selway River Road, near falls	46.045	115.297	ACEDOU/A BGR	Creek	539	Hutchinson	ID321	7/2/99	
Pseudocyphellaria anthraspis	ID	Clearwtr	Aquarius CG	46.841	115.619	ALNRUB/T HPL/RHAPU R	River	513	Hutchinson	ID513	7/20/99	
Pseudocyphellaria anthraspis	ID	Idaho	Across the road from Johnson Bar	46.103	115.556	POPTRI/AB GR	Creek	485	Hutchinson	ID233	7/5/99	
Pseudocyphellaria anthraspis	ID	Idaho	0.5 miles E on Selway trail from Race Creek	46.044	115.273	BETPAP	Seep	551	Hutchinson	ID332	7/3/99	
Pseudocyphellaria anthraspis	ID	Idaho	At the end of the Selway River Road	46.044	115.284	THPL	Creek	529	Hutchinson	ID-331-03	7/2/99	OSC
Pseudocyphellaria anthraspis	ID	Idaho	Pete King Rd (FS453)	46.177	115.606	POPTRI	Creek	532	Hutchinson	ID231	6/24/99	
Pseudocyphellaria anthraspis	ID	Clearwtr	NFk Clwtr FS700 N of Aquarius CG	46.87	115.62	POPTRI	Creek	601	Hutchinson	FP151	8/20/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Pseudocyphellaria anthraspis	ID	Idaho	Johnson Bar CG	46.1	115.55	POPTRI	Floodplain	461	Hutchinson	FP123	6/24/99	
Pseudocyphellaria anthraspis	ID	Clearwtr	N Fk of the Clwtr	46.85	115.63	POPTRI	Creek	510	Hutchinson	FP152	8/20/99	
Pseudocyphellaria anthraspis	ID	Idaho	Glade Ck CG	46.22	115.53	deciduous shrubs	THPL-ABGR forest	580	McCune	11877	9/2/82	MCC
Pseudocyphellaria anthraspis	ID	Idaho	7 km W of Lowell	46.13	115.67	ALRU bark	Two Shadows Ck	500	McCune	10181	3/14/79	MCC
Pseudocyphellaria anthraspis	ID	Clearwtr	Aquarius RNA	46.85	115.67	TAXBRE branches	N Fk of the Clearwtr River	510	McCune	18559	8/1/90	MCC
Pseudocyphellaria anthraspis	ID	Idaho	Pete King Rd (FS453)	46.177	115.606	POPTRI bark	open shrubby creek	580	McCune	6252	3/22/75	MCC
Pseudocyphellaria anthraspis	ID	Clearwtr	N FK of the Clearwtr	46.83	115.167	Conifer	mouth of Hidden Ck	1020	McCune	18499	8/1/90	MCC
Ramalina dilacerata	ID	Idaho	Johnson Bar CG	46.1	115.55	POPTRI	Floodplain	461	Hutchinson	FP123	6/24/99	
Ramalina dilacerata	ID	Pend Oreille	Boswell Ranch	48.35	117.05	POPTRI	Wet Meadow	739	Hutchinson	FP391	8/11/99	
Ramalina dilacerata	ID	Idaho	FS14/1858	45.9	115.63	ALRU	Creek	1223	Hutchinson	FP122	8/22/99	
Ramalina dilacerata	ID	Bonner	Johnson Creek CG, W of Clark Fork	48.14	116.23	CRADOU	River	629	Hutchinson	ID913	8/3/99	
Ramalina dilacerata	ID	Shoshone	1 km N. of Clarkia USFS Office	47.032	116.267	CRADOU/BETPAP/ABGR	Seasonally Wet	848	Hutchinson	ID-412-01	7/21/99	SRP

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina dilacerata	ID	Shoshone	North of Big Creek CG	47.305	116.118	RHAPUR/CRADOU	Creek	740	Hutchinson	ID821	7/23/99	
Ramalina dilacerata	ID	Idaho	Wilderness Gateway CG trailhead to hotsprings	46.337	115.314	RHAPUR/AMEALN	Creek	637	Hutchinson	ID323	7/4/99	
Ramalina dilacerata	ID	Idaho	0.5 miles E on Selway trail from Race Creek	46.044	115.273	ACEGLA	Seep	551	Hutchinson	ID332	7/3/99	
Ramalina dilacerata	ID	Kootenai	E of Trestle Ck	47.747	116.429	CRADOU/POPTRI/RHAPUR	River	858	Hutchinson	ID723	7/30/99	
Ramalina dilacerata	ID	Kootenai	Just E of Honeysuckle CG	47.733	116.473	Hardwoods and ABGR	Creek	834	Hutchinson	ID722	7/30/99	
Ramalina dilacerata	ID	Benewah	2.5 mi SE of St. Maries	47.272	116.581	hardwoods	River	648	Hutchinson	ID721	7/22/99	
Ramalina dilacerata	ID	Idaho	On Hwy 12 E of Lowell	46.233	115.408	BETPAP	Creek	558	Hutchinson	ID333	7/4/99	
Ramalina dilacerata	ID	Idaho	approx. 1 mile E on trail from Race Crk CG	46.043	115.252	AMEALN	Creek	533	Hutchinson	ID322	7/3/99	
Ramalina dilacerata	ID	Idaho	Wilderness Gateway CG	46.339	115.315	RHAPUR/AMEALN	River	629	Hutchinson	ID-312-01	6/25/99	OSC
Ramalina dilacerata	ID	Kootenai	FS206, approx. 3 miles E of Hayden Lk	47.797	116.64	hardwoods	Creek	784	Hutchinson	ID731	7/29/99	
Ramalina dilacerata	ID	Kootenai	Near Big Hank CG	47.819	116.092	ABGR/CRADOU	River	822	Hutchinson	ID-813-01	7/25/99	SRP

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina dilacerata	ID	Idaho	Across the road from Johnson Bar	46.103	115.556	Maple cultivar/BET PAP	Creek	485	Hutchinson	ID-233-01	7/5/99	OSC
Ramalina dilacerata	ID	Idaho	On Hwy 12 E of Lowell	46.21	115.546	RHAPUR	Creek	494	Hutchinson	ID232	6/26/99	
Ramalina dilacerata	ID	Idaho	Pete King Rd (FS453)	46.177	115.606	RHAPUR	Creek	532	Hutchinson	ID-231-01, ID-231-02	6/24/99	OSC, WTU
Ramalina dilacerata	ID	Kootenai	approx. 8 km E of the north end of Hayden Lake	47.823	116.655	hardwoods	Creek	739	Hutchinson	ID732	7/29/99	
Ramalina dilacerata	ID	Shoshone	Huckleberry CG/Hwy50	47.266	116.091	ACEGLA/RHAPUR/CRADOU	River	692	Hutchinson	ID811	7/23/99	
Ramalina dilacerata	ID	Idaho	Island after Johnson Bar CG	46.09	115.538	CRADOU/RHAPUR	River	458	Hutchinson	ID-223-01, ID-223-02	7/5/99	SRP, OSC
Ramalina dilacerata	ID	Kootenai	jct of Rds 209/422	47.721	116.383	ALNRUB	Creek	800	Hutchinson	ID733	7/30/99	
Ramalina dilacerata	ID	Idaho	1/2 mile E of Lowell	46.149	115.595	ALNRUB	Creek	446	Hutchinson	ID221	6/25/99	
Ramalina dilacerata	ID	Idaho	Hwy 14 / South Fork CG	45.832	115.949	shrubs	River	701	Hutchinson	ID-211-01, ID-211-02	6/23/99	SRP, WTU
Ramalina dilacerata	ID	Bonner	South End off Hwy 2	48.502	116.461	CRADOU	Lake Margin	636	Hutchinson	ID933	8/2/99	
Ramalina dilacerata	ID	Idaho	approx. 0.511 miles E of Selway TH at Race Ck	46.043	115.269	ACEGLA/RHAPUR/CRADOU	River	537	Hutchinson	ID313	7/3/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina dilacerata	ID	Kootenai	FS412 N of Berlin Flats	47.818	115.958	BETPAP	Creek	884	Hutchinson	ID833	7/25/99	
Ramalina dilacerata	ID	Clearwtr	Just N of confluence w/Kelly Ck	46.723	115.085	Hardwoods	Creek	967	Hutchinson	ID-631-01	7/10/99	OSC
Ramalina dilacerata	ID	Clearwtr	FS247, confl. Beaver Ck and NFClrwtr	46.841	115.623	ALNRUB	Creek	518	Hutchinson	ID521	7/9/99	
Ramalina dilacerata	ID	Shoshone	Just S of Hwy 50	47.247	116.02	ALRU and shrubs	Creek	698	Hutchinson	ID-523-01	7/14/99	WTU
Ramalina dilacerata	ID	Shoshone	FS350 accross Hwy 50 from Huckleberry CG	47.262	116.087	RHAPUR/CRADOU	Creek	751	Hutchinson	ID-831-01, ID-832-02	7/22/99	OSC
Ramalina dilacerata	ID	Benewah	N of 6/3 jct, 1 km S of Mashburn Sta.	47.183	116.497	POPTRI/CRADOU/Alnus	River	786	Hutchinson	ID-413-04, ID-413-05, ID-413-06	7/21/99	OSC, WTU, SRP
Ramalina dilacerata	ID	Kootenai	FS208 N of Big Hank CG	47.876	116.109	AMEALN	Creek	852	Hutchinson	ID832	7/25/99	
Ramalina dilacerata	ID	Bonner	Near Priest River Experimental Sta.	48.332	116.85	Alnus/ PIEN/ POPTRI	Wetland	683	Hutchinson	ID921	7/31/99	
Ramalina dilacerata	ID	Shoshone	FS321, Marble Ck Rd	47.175	116.099	RHAPUR	Creek	937	Hutchinson	ID532	7/15/99	
Ramalina dilacerata	ID	Shoshone	FS9 SE of Prichard, 1.5 miles E of Bear	47.595	115.771	CRADOU	Creek	1015	Hutchinson	ID823	7/25/99	
Ramalina dilacerata	ID	Latah	Rd 447, N of Clarkia	47.065	116.326	ABGR/POPTRI	Creek	835	Hutchinson	ID433	7/21/99	
Ramalina dilacerata	ID	Shoshone	Old Seibert Rd., Near Marble Ck	47.251	116.019	hardwoods	River	707	Hutchinson	ID512	7/14/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina dilacerata	ID	Shoshone	Rd 301/east of Bridge at jct w/1905	47.005	116.165	Alnus	Creek	937	Hutchinson	ID533	7/15/99	
Ramalina dilacerata	ID	Shoshone	Big Fish Bridge, E of St. Joe	47.315	116.349	hardwoods	River	673	Hutchinson	ID711	7/23/99	
Ramalina dilacerata	ID	Benewah	approx 5 miles E of Emida	47.078	116.56	CRADOU	Creek	904	Hutchinson	ID-432-07	8/4/99	SRP
Ramalina dilacerata	ID	Kootenai	Off FS208, approx. 5 mi N of Pritchard	47.709	115.973	Hardwoods	Creek	760	Hutchinson	ID822	7/24/99	
Ramalina dilacerata	ID	Latah	5 miles east of Emida	47.153	116.531	CRADOU	Creek	850	Hutchinson	ID422	8/3/99	
Ramalina dilacerata	ID	Clearwtr	Near Kelly Forks RS	46.721	115.087	AMAL/ CRADOU	Wetland	962	Hutchinson	ID621	7/10/99	
Ramalina dilacerata	ID	Clearwtr	Cold Ck CG	46.721	115.301	RHAPUR	Wetland	810	Hutchinson	ID612	7/9/99	
Ramalina dilacerata	ID	Latah	FS447, Palouse River Rd. OHV play area	46.969	116.583	POPTRI/Alnus	Seasonally Wet	859	Hutchinson	ID-421-01	7/16/99	OSC
Ramalina dilacerata	ID	Idaho	Kooskia	46.15	115.985	Crataegus	Floodplain	365	McCune	10149	3/14/79	MCC
Ramalina dilacerata	ID	Idaho	Two Shadows Ck	46.134	115.668	ALRU	Floodplain	502	McCune	10169	3/14/79	MCC
Ramalina dilacerata	ID	Idaho	Glade Ck CG	46.217	115.534	deciduous shrubs	Floodplain	580	McCune	11868	9/1/82	MCC
Ramalina dilacerata	ID	Idaho	S Fk Clearwtr CG	45.835	115.935	Shrubs	Floodplain	780	McCune	12103	9/2/82	MCC
Ramalina dilacerata	ID	Bonner	N end of Priest Lk	48.735	116.852	Alnus bark	Lake Margin	745	McCune	22563	8/1/95	MCC
Ramalina dilacerata	ID	Idaho	Pete King Ck	46.167	115.601	Shrubs	Floodplain	579	McCune	6339	3/1/75	MCC
Ramalina dilacerata	ID	Boundary	Upper Priest Lake RNA	48.81	116.9		Lake Margin	780	Rosentreter	13470	8/1/98	RR

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina dilacerata	ID	Boundary	12 miles NW of Bonner's Ferry	48.77	116.48		THPL-PIMO E facing slope	600	Rosentreter	7030		RR
Ramalina obtusata	ID	Valley	Middle fork of the Salmon R, Hospital bar	44.83	114.83	rock	overhanging cliff	1202	Rosentreter	8579		RR
Ramalina obtusata	MT	Ravalli	Mill Creek canyon	46.317	114.234	ABGR bark	Mill Creek Canyon	1325	McCune	11395	5/29/81	MCC
Ramalina obtusata	MT	Flathead	E end of McDonald Lk	48.651	113.868	POPTRI	Floodplain	960	McCune	12373	7/23/82	MCC
Ramalina obtusata	MT	Lake	N Crow Ck	47.585	114	POPTRI	Bottomland	1190	McCune	16701	7/1/87	MCC
Ramalina obtusata	MT	Lake	Swan Valley	47.902	113.835	ABGR	2nd growth conifer for	990	McCune	17626	8/1/89	MCC
Ramalina obtusata	MT	Lake	Swan Valley	47.685	114.084	Picea-Betula	Swamp	890	McCune	17887	8/1/89	MCC
Ramalina obtusata	MT	Flathead	N fk of the Flathead R	48.718	114.251	Picea twigs	Floodplain forest	1050	McCune	19190	7/1/91	MCC
Ramalina obtusata	MT	Lake	Below Mission Ck Falls	47.326	113.969	ABGR bark	Mixed conifer forest	1066	McCune	7972	7/1/77	MCC
Ramalina obtusata	MT	Lake	Swan River, nr Porcupine Ck	47.885	113.868	Picea twigs	Floodplain forest	944	McCune	8593	8/25/77	MCC
Ramalina obtusata	MT	Lake	Pleasant CG	47.818	113.835	Picea twigs	Floodplain forest	944	McCune	9147	9/2/77	MCC
Ramalina obtusata	MT	Flathead		0.0167	0.0167			0	Williams	67c		UC

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina obtusata	OR	Wallowa	E fk of the Wallowa R	45.267	117.208	Conifer	PIEN-PSME forest	1345	McCune	23983	12/1/97	MCC
Ramalina obtusata	MT	Flathead	Glacier NP	48.985	114.251	Picea	Head of Kintla Lk	1225	McCune	14287	8/13/84	MCC
Ramalina pollinaria	ID	Boundary	Kootenai Wildlife Refuge	48.74	116.413	POPTRI	River	532	Hutchinson	ID-912-02, ID-912-04, ID-912-03	8/1/99	OSC, OSC, SRP
Ramalina pollinaria	ID	Bonner	South End off Hwy 2	48.502	116.461	CRADOU	Lake Margin	636	Hutchinson	ID-933-04, ID-933-05	8/2/99	OSC
Ramalina pollinaria	ID	Bonner	NW of Clark Fork	48.15	116.188		Creek	633	Hutchinson	ID-922-01	8/2/99	WTU
Ramalina pollinaria	MT	Lake	Swan River near Porcupine Ck	47.885	113.852	Picea	Creek	945	McCune	13787	7/7/83	MCC
Ramalina pollinaria	MT	Lake	Near N Crow Ck	47.585	114	Conifer	Bottomland	1190	McCune	16710	7/1/87	MCC
Ramalina pollinaria	MT	Lake	S of Hwy 35	47.685	114.084	Picea-Betula	Swamp	890	McCune	17885	8/1/89	MCC
Ramalina pollinaria	MT	Lake	Mission Ck	47.326	113.969	ABGR bark	Bottomland	1066	McCune	7971	7/28/77	MCC
Ramalina pollinaria	MT	Lake	near Pt Pleasant CG	47.818	113.835	Picea twigs	Floodplain forest	944	McCune	9146	9/2/77	MCC
Ramalina pollinaria	MT	Flathead		0.0167	0.0167			0	Williams	67a		UC
Ramalina pollinaria	MT	Flathead	Mission Falls Area, Flathead Indian Reservation			PSME Bark	PSME to THPL/TSHE Forest	970	Rosentreter	2151	7/31/81	RR

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina pollinaria	MT	Flathead	Mssion Falls Area			Twig	PSME, THPL, TSHE forest	970	Rosentreter	RR-MT-70	7/1/77	RR
Ramalina subleptocarpha	ID	Latah	0.5 mi W of Harvard, just W of Harvard/Dreary cutoff Rd	46.92	116.74	ABGR branch	Roadside	780	Gray	2171	7/15/00	BPM
Ramalina subleptocarpha	ID	Latah	Hwy 99 N of	46.642	116.72	CRADOU/P	Creek	757	Hutchinson	ID431	7/19/99	
Ramalina subleptocarpha	ID	Idaho	Heart of the Monster Park, on hwy 12, n of Kooskia	46.229	116.008	CRADOU/ POPTRI	River	367	Hutchinson	ID213	6/26/99	
Ramalina subleptocarpha	ID	Idaho	Near Stites	46.082	115.979	Prunus	River	410	Hutchinson	ID-212-02, ID-213-03, ID-212-04	6/23/99	OSC, SRP/ OSC, OSC
Ramalina subleptocarpha	ID	Clearwtr	about 2 km S of Greer/ Confl of Lolo/Clearwtr	46.372	116.17	CRADOU/P OPTRI	Creek	332	Hutchinson	ID-222-01, ID-222-03	6/27/99	SRP
Ramalina subleptocarpha	ID	Latah	FS447, Palouse River Rd. OHV play area/tailings	46.969	116.583	POPTRI/ PIEN	Seasonally Wet	859	Hutchinson	ID-421-05, ID-421-06	7/16/99	WTU, OSC
Ramalina subleptocarpha	ID	Latah	Rd 447, N of Clarkia	47.065	116.326	POPTRI	Creek	835	Hutchinson	ID-433-04	7/21/99	OSC
Ramalina subleptocarpha	ID	Benewah	2.5 miles SE of St. Maries	47.272	116.581	CRADOU/ POPTRI	River	648	Hutchinson	ID-721-02, ID-721-03	7/22/99	WTU, OSC

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina supleptocarpha	ID	Latah	Hwy 99 N of Kendrick	46.642	116.72	POPTRI	Creek	757	Hutchinson	ID-431-05, ID-431-06	7/19/99	WTU, OSC
Ramalina supleptocarpha	ID	Latah	Hwy 6 between Harvard and Princeton	46.92	116.75	POPTRI-PHAARU	Seasonally Wet	775	Hutchinson	FP141	8/7/99	
Ramalina subleptocarpha	ID	Idaho	Kooskia	46.15	115.985	Crataegus	Floodplain	426	McCune	10139	3/14/79	MCC
Ramalina subleptocarpha	WA	Whitman		46.715	118.197			805	Gray	1493		BPM
Ramalina thrausta	ID	Clearwtr	Aquarius RNA	46.85	115.67	THPL-TSHE	Riparian Forest	610	DeBolt	1271	7/1/89	RR
Ramalina thrausta	ID	Idaho	Hillside S of Eldorado Ck	46.29	115.66	Abies twig	Mixed conifer forest	1112	Gray	1205	5/27/96	OSC
Ramalina thrausta	ID	Shoshone	Rd 301/east of Bridge at jct w/1905	47.005	116.165	PIEN	Creek	937	Hutchinson	ID533	7/15/99	
Ramalina thrausta	ID	Idaho	1/2 mile E of Lowell	46.149	115.595	ALNRUB	Creek	446	Hutchinson	ID221	6/25/99	
Ramalina thrausta	ID	Latah	Rd 447, N of Clarkia	47.065	116.326	ABGR/ THPL/POPTRI	Creek	835	Hutchinson	ID433	7/21/99	
Ramalina thrausta	ID	Latah	FS447, Palouse River Rd. OHV play area	46.969	116.583	PIEN	Seasonally Wet	859	Hutchinson	ID421	7/16/99	
Ramalina thrausta	ID	Kootenai	FS412 N of Berlin Flats	47.818	115.958	PIEN/ABGR	Creek	884	Hutchinson	ID-833-02	7/25/99	OSC
Ramalina thrausta	ID	Kootenai	Just E of Honeysuckle CG	47.733	116.473	POPTRI	Creek	834	Hutchinson	ID722	7/30/99	

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina thrausta	ID	Bonner	Priest Lake	48.74	116.855	ABGR	Lake Margin	746	Hutchinson	ID931	7/31/99	
Ramalina thrausta	ID	Benewah	approx 5 miles E of Emida	47.078	116.56	PIEN/THPL/ POPTRI	Creek	904	Hutchinson	ID432	8/4/99	
Ramalina thrausta	ID	Idaho	Just upstream from Rock Island	46.078	115.418	THPL	River	511	Hutchinson	ID311	6/24/99	
Ramalina thrausta	ID	Bonner	Near Priest River Experimental Sta.	48.332	116.85	PIEN/CRAD OU	Wetland	683	Hutchinson	ID-921-04	7/31/99	OSC
Ramalina thrausta	ID	Kootenai	Near Big Hank CG	47.819	116.092	ABGR/CRA DOU/POPTR I	River	822	Hutchinson	ID813	7/25/99	
Ramalina thrausta	ID	Idaho	South of Selway River Road, near falls	46.045	115.297	THPL/ABGR	Creek	539	Hutchinson	ID321	7/2/99	
Ramalina thrausta	ID	Kootenai	E of Trestle Ck	47.747	116.429	ABGR	River	858	Hutchinson	ID723	7/30/99	
Ramalina thrausta	ID	Idaho	approx. 0.511 miles E of Selway TH at Race Ck	46.043	115.269	Cornus	River	537	Hutchinson	ID313	7/3/99	
Ramalina thrausta	ID	Clearwtr	Near Cedars CG	46.873	115.077	Abies/PIEN	Seasonally Wet	1114	Hutchinson	ID623	7/12/99	
Ramalina thrausta	ID	Kootenai	Off FS208, approx. 5 mi N of Pritchard	47.709	115.973	hardwoods	Creek	760	Hutchinson	ID822	7/24/99	
Ramalina thrausta	ID	Shoshone	1 km N. of Clarkia USFS Office	47.032	116.267	ABGR/PIEN/ POPTRI	Seasonally Wet	848	Hutchinson	ID-412-07	7/21/99	SRP
Ramalina thrausta	ID	Clearwtr	Aquarius CG	46.841	115.619	ABGR/THPL	River	513	Hutchinson	ID-513-02	7/20/99	OSC

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina thrausta	ID	Idaho	At the end of the Selway River Road	46.044	115.284	ABGR	Creek	529	Hutchinson	ID-331-01	7/2/99	WTU
Ramalina thrausta	ID	Clearwtr	N Fk of the Clwtr	46.85	115.63	THPL	Creek	510	Hutchinson	FP152	8/20/99	
Ramalina thrausta	ID	Bonner	Bridge on Hughs Fork	48.82	116.97	THPL	Creek	825	Hutchinson	FP194		
Ramalina thrausta	ID	Idaho	Nr Crooked Fork Rd, S Fk of the Clearwtr R	45.868	115.534		Cliffs above stream	1240	McCune	11696	9/2/82	MCC
Ramalina thrausta	ID	Idaho	Glade Ck CG, Lochsa R	46.217	115.534	Conifer	Glade Creek	580	McCune	11879	9/2/82	MCC
Ramalina thrausta	ID	Idaho	Shotgun Ck Rd Turnoff, crooked fork of the Lochsa	46.568	114.618	Conifer	River	1250	McCune	12135	9/3/82	MCC
Ramalina thrausta	ID	Idaho	1 km W. of Delta Grove	46.551	114.685	Conifer	Floodplain	1090	McCune	16992	7/1/86	MCC
Ramalina thrausta	ID	Clearwtr	Hidden Ck NF of the Clearwtr	46.835	115.167	ABLA	Valley bottom	1020	McCune	18539	8/1/90	MCC
Ramalina thrausta	ID	Clearwtr	N Fk of the Clearwtr, Aquarius CG	46.852	115.668	Conifer	Floodplain	510	McCune	18564	8/1/90	MCC
Ramalina thrausta	ID	Bonner	N end of Priest Lk nr mouth of upper Priest R.	48.735	116.868	Picea	THPL/TSHE/POPTRI forest	745	McCune	22552	8/1/95	MCC
Ramalina thrausta	ID	Idaho	Selway R, Rock Island	46.08	115.423	THPL	Riverside	470	McCune	24663	6/1/99	MCC
Ramalina thrausta	ID	Latah	Laird Park CG	46.95	116.65		River Forest	1158	Rosentreter	8206	9/1/93	RR

Table A1. Relevant target species locations, continued.

Species	State	County	Location	Lat N	Long W	Substrate	Habitat	Elev	Coll	CollNo	Date	Herb.
Ramalina thrausta	ID	Idaho	Glade Ck CG, Lochsa R	46.22	115.53	THPL	near Creek		Rosentreter	4004	7/1/86	RR
Ramalina thrausta	ID	Bonner	Near Roosevelt Cedar Grove	48.42	116.9	THPL-TSHE	Forest	800	Rosentreter	11163	7/1/97	RR
Ramalina thrausta	ID	Boundary	12 miles NW of Bonner's Ferry	48.77	116.48		THPL-PIMO E facing slope	600	Rosentreter	7024	8/13/91	RR
Ramalina thrausta	ID	Idaho	Glade Ck Picnic Area	46.6	115.52	THPL	Riparian Forest	366	Rosentreter	9371	7/1/95	RR
Ramalina thrausta	ID	Idaho	1km W of Devoto Grove, and E of Powll Jct	46.58	114.63	THPL	THPL-TSHE forest	1440	Rosentreter	4007	7/1/96	RR
Ramalina thrausta	MT	Flathead	Glacier NP			tree trunk			Rosentreter	RR-MT-252	6/28/77	OSC, RR
Ramalina thrausta	WA	Pend Oreille	Boswell Ranch	48.35	117.05	PIEN	Wet Meadow	739	Hutchinson	FP391	8/11/99	

Appendix D

Climatic Affinities for Species

Oceanic Species

Bryoria friabilis
Bryoria glabra
Cetraria orbata
Cladonia albonigra
Evernia prunastri
Fuscopannaria leucostictoides
Fuscopannaria pacifica
Hypocenomyce castaneocinerea
Hypogymnia apinnata
Hypogymnia enteromorpha
Hypogymnia inactiva
Lobaria pulmonaria
Melanelia fuliginosa
Melanelia multispora
Nephroma helveticum
Nephroma laevigatum
Nephroma resupinatum
Nodobryoria oregana
Peltigera membranacea
Peltigera pacifica
Physconia americana
Pseudocyphellaria anomala
Pseudocyphellaria anthraspis
Ramalina dilacerata
Ramalina farinacea
Ramalina subleptocarpha
Sphaerophorus globosus
Usnea chaetophora
Usnea diplotypus
Usnea esperantiana
Usnea filipendula
Usnea glabrata
Usnea scabrata
Usnea subfloridana
Xanthoria hasseana
Xanthoria oregana
Xanthoria polycarpa

Suboceanic Species

Alectoria imshaugii
Alectoria sarmentosa
Bryoria capillaris
Bryoria pseudofuscescens
Bryoria tortuosa
Cetraria canadensis
Cetraria merrillii
Cetraria pallidula
Cetraria platyphylla
Cladonia squamosa
Cladonia umbricola
Collema curtisporum
Esslingeriana idahoensis
Hypogymnia imshaugii
Hypogymnia metaphysodes
Hypogymnia occidentalis
Leptogium cellulosum
Leptogium saturninum
Lobaria hallii
Melanelia subelegantula
Nephroma bellum
Nodobryoria abbreviata
Parmelia hygrophila
Parmeliopsis hyperopta

Continental Species

Bryoria fremontii
Bryoria lanestris
Bryoria simplicior
Cladonia cenotea
Cladonia sulphurina
Collema occultatum
Flavopunctelia soredica
Letharia vulpina
Melanelia elegantula
Melanelia subolivacea
Parmeliopsis ambigua
Peltigera aphthosa
Peltigera canina
Phaeophyscia ciliata
Phaeophyscia hirsuta
Phaeophyscia hirtella
Phaeophyscia nigricans
Physciella chloantha
Physciella melanchra
Usnea hirta
Usnea lapponica
Xanthoria fallax
Xanthoria montana

Widespread Species

Bryoria fuscescens
Candelaria concolor
Cetraria chlorophylla
Cladonia carneola
Cladonia chlorophaea
Cladonia coniocraea
Cladonia fimbriata
Cladonia ochrochlora
Collema furfuraceum
Hypocenomyce scalaris
Hypogymnia physodes
Hypogymnia tubulosa
Melanelia exasperatula
Melanelia glabra
Melanelia panniformis
Melanelia subargentifera
Melanelia subaurifera
Nephroma parile
Parmelia sulcata
Peltigera collina
Phaeophyscia orbicularis
Physcia adscendens
Physcia aipolia
Physcia biziana
Physcia stellaris
Physcia tenella
Physconia enteroxantha
Physconia perisidiosa
Platismatia glauca
Ramalina thrausta
Xanthoria candelaria
Xanthoria fulva
Xanthoparmelia cumberlandia

Appendix E

Data Sheets

Rare Riparian Lichens of Northern Idaho Data Sheet

Surveyor_____ Date_____
First initial, last name MM/DD/YY
Plot Number_____ State_____
Geographic region (1-9) stream order class (1-3) replicate (1-3)
For Geographic regions 1= SW most, stream order class 1= major tributaries
County_____
Stream Name_____ Sub-basin_____
Landowner: USFS BLM STATE
Private
Priest, Kootenai, Pend Orielle,
Clearwater, Coeur d'Alene, St. Joe,
St. Maries, Salmon
Elevation_____ meters Latitude_____
Longitude _____

Site Characteristics
River:
Floodplain gradient_____degrees (from map)
Width of active channel:_____meters (ocular estimate)
Width of Floodplain:_____ (from map)
Channel substrate: boulder_____% cobble/gravel_____% sand/silt_____% organic-rich_____%
Floodplain cross-section type (check one):

1. Incised with no floodplain_____
2. Floodplain on one side only with talus or colluvium on the other side _____
3. Floodplain on both sides of the channel_____
4. Multiple channels on a broad floodplain _____

Site (check all that are applicable):
Seep Creek River Wetland Seasonally Wet Lake Margin Bog/Fen
Cover Percents (ocular estimates of % of plot)

1. Canopy Cover:_____%
2. Substrate: Boulder_____% Cobble/Gravel_____% Sand/Silt_____%
   Organic Rich_____% Water_____%
3. Shrubs (by height): tall > 2m_____% medium 2m-5cm_____% ground < 5cm____%
   Grass_____% Sedge _____% Rush _____% Forbs _____%

Tree Cover by Size Class
(saplings = flexible main stem, midseral = top is still growing and there are few or no dead limbs in the upper ¼, late seral = flat top (pines), dead limbs in the upper ¼)

Cottonwoods:
Sapling_____% Mid-seral_____% Late-seral _____%
Most typical dbh _____ Largest dbh _____
Other Hardwoods:
Sapling_____% Mid-seral_____% Late-seral _____%
Most typical dbh _____ Largest dbh _____
Conifers:
Sapling_____% Mid-seral_____% Late-seral _____%
Most typical dbh _____ Largest dbh _____

Stand Basal Area: Take 5 wedge prism counts, one at plot center and one at approximately equidistant points within the plot. For circular plots, take one count at plot center and one count at each cardinal direction on the perimeter of the plot.

Basal Area Factor of the prism _____

	Species 1	Species 2	Species 3	Species 4	Species 5
Center					
Point 1					
Point 2					
Point 3					
Point 4					
Totals					
BA					

To get the BA, take the total number for each species and multiply by the BAF

Fill in attached plant list.

Comments:

Draw a map of the plot. Include all features such as gravel bars, vegetation changes, plot shape, etc.

Plant Indicator List
Date_____ Plot Number _____
Location_____

Dominant plant species: record dominant trees, shrubs grasses and forbs:
_____

Bryophytes: record % cover of plot: Soil/Rock_____% Epiphytic _____%
Lichens: record dominant epiphytes:_____

Vascular Plants:
0 = absent 1 = present2 = abundant

Shrubs
Rhamnus purshiana _____
Crataegus sp._____
Menziesia ferruginea _____

Other
Gymnocarpium dryopteris_____
Lysichiton americanum _____
Nuphar polysephalum _____
Polygonum amphibium _____
Typha latifolia _____
Sphagnum with vascular plants _____
100% Sphagnum hummocks _____

Weeds
Centaurea maculosa _____
Centaurea solstitailis _____
Cynoglossum_____
Other Weeds (write in names)

Plot Number: Location:
Date:
Time:
<---All Macrolichens ----------> < --------Target Species Only ---------- >

Species	Abund (1-4)	Substrate	Location on Substrate	Shelter (1-3)

Shelter
1 = exposed, no shade
2 = partial shade
3 = full shade

Abundance
1 = < 4 individuals
2 = 4-10 individuals
3 = > 10 individuals
4 = > ½ available substrate

Location on Substrate
Base, braches, twigs
Low bole (0.5- 1.0 m)
Mid bole (1-2 m)
Upper bole (>2 m)

Appendix F.

Data Dictionary for Northern Idaho Database

For Plot Data:

Surveyor: Name of person recording the data on the plot data form.
Plot number: Geographic region (1-9) Stream order class (1= large valley bottom rivers, 2 = major tributaries, 3 = minor tributaries), Replicate (1-3).
County: The County where the plot is located.
Stream Name: The stream or river along which the plot is located.
Landowner: USFS = United States Forest Service, BLM = Bureau of Land Management, State = Lands owned by the state of Idaho, PRIV = Private ownership, including Tribal Lands, and Lands owned by Timber Companies.
Date: Given as MM/DD/YY, two digit values for month, date, year.
State: The state where the plot is located.
Sub-basin: Major drainage for the river or stream where the plot is located.
Latitude: Given as degrees and decimal degrees.
Longitude: Given as degrees and decimal degrees.
Floodplain Gradient: Change in elevation/straightest length of river section (a 1 to 5 mile distance) near where the plot is located.
Width of Active Channel: An ocular estimate of the river or stream width at the plot, recorded in meters.
Channel Substrate: Percent of river channel that was in the plot that was boulders, cobble/gravel, sand/silt, and organic rich substrate. The records are limited by what was visible from the riverbank.
Floodplain Cross-section Type: Limited to one of the following choices: 1 = incised with no apparent floodplain; 2 = floodplain on one side only, with talus or colluvium on the other side; 3 = Floodplain on both sides of the channel; 4 = multiple channels on a broad floodplain.
Site Type: Derived from the sensitive plant site form, used by the USFS: 1 = Seep, 2 = Creek, 3 = River, 4 = Wetland, 5 = Seasonally Wet, 6 = Lake Margin, 7 = Bog/Fen.
Canopy Cover: An ocular estimate of the percent of space taken up by branches, twigs, and leaves or needles when standing in the forest looking up and estimating a percent of your circle of vision.
Cover percents:
A. Percent of the plot that is not included in the river bed, but is covered by boulders, cobble/gravel, sand/silt, organic rich, water, or litter.
B. Percent of the plot that is covered by vegetation divided into shrubs, grasses, forbs, rushes. Shrubs were divided into three height classes: tall > 2 m; medium 5 cm to 2 meters; ground < 5 cm.
C. Percent of the plot with tree cover, divided into cover % of cottonwoods, other hardwoods, and conifers. The percent cover for each tree type was further divided into size classes: sapling = trees with a flexible main stem; mid-seral = trees where the top is still growing and there are few or no dead limbs in the upper quarter; late-seral = trees with flat tops (conifers) and/or dead limbs in the upper quarter.
Basal Area
Basal area in conifers was estimated by multiplying the average number by basal area factor of the prism.
Basal area in hardwoods was estimated by multiplying the average number by the basal area factor of the prism.

For Lichen Community Data

Shelter
1 = exposed, no shade
2 = partial shade
3 = full shade
Abundance
1 = < 4 individuals
2 = 4-10 individuals
3 = > 10 individuals
4 = > ½ available substrate
Location on Substrate
Base, branches, twigs
Low bole (0.5- 1.0 m)
Mid bole (1-2 m)
Upper bole (>2 m)

Location Table

Species: Current scientific name for the lichen
Location: A brief description of where the site is located
Substrate: Species of tree or shrub the lichen was found on
Habitat: A very brief description of the habitat
Coll (Collector): The person who collected the lichen
CollNo (Collection Number): The number given to the specimen by the collector, generally a unique number, but there are exceptions. My collections include specimens that won't be curated, but are important to establish location and range of the target species, so they are included by plot number.
Date: The day/month/year the specimen was collected
Herb (herbarium): The herbarium where the specimen was deposited.