RIPARIAN LICHENS OF NORTHERN IDAHO

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B. RARE LICHENS IN THE RIPARIAN HARDWOOD FORESTS OF NORTHERN IDAHO
C. *COLLEMA CURTISPORUM* DEGEL. IN RIPARIAN FORESTS OF NORTHERN IDAHO

by
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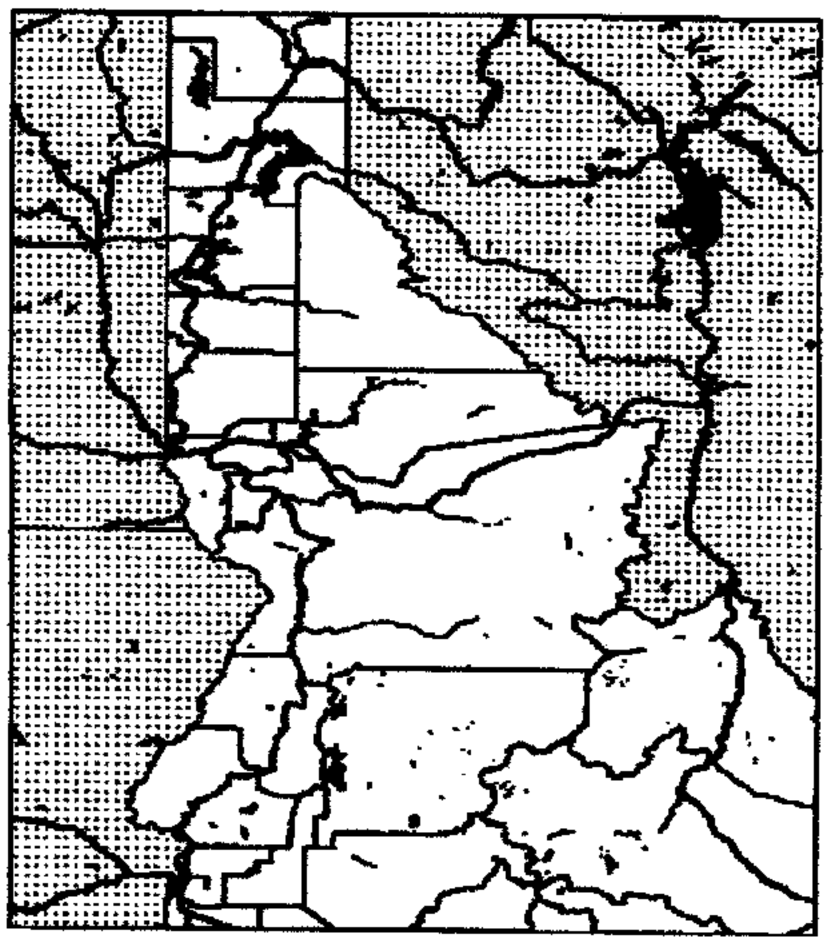

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Overview

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).

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