

A History of Lichen, Bryophyte, and Moonwort Collecting and Research at the USDA Forest Service Experimental Forests in Idaho

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Abstract. In Idaho, the Boise Basin, Deception Creek, and Priest River Experimental Forests (EFs) were established in 1911 and 1933 to facilitate long-term scientific research on multiple aspects related to forest management and ecology. Nestled within them are the Canyon Creek, Montford Creek, Bannock Creek, and Wellner Cliffs Research Natural Areas established in 1937, 1970, and 2004 to serve as reference areas for research, education, and monitoring of intensive management actions. Collectively, this network has advanced our knowledge on the species, distributions, and ecology of lichens, bryophytes, and moonworts in Idaho. Altogether, 40 university, government agency, and private researchers have made 1,951 observations, collections, and specimens which resulted in 1,311 lichen, 394 bryophyte, and 2 moonwort herbarium specimens. This historical account, which has not previously been compiled, chronicles the history of lichen, moss, liverwort, hornwort, and moonwort exploration on these EFs from 1916 to 2023.

Keywords. Idaho, Experimental Forests, Forest Service, lichen, bryophyte, moonwort

INTRODUCTION

The United States Department of Agriculture, Forest Service's (USDA-FS) network of long-term experimental areas, commonly referred to as Experimental Forests and Ranges, is the largest and longest-lived ecological research network in the United States (USDA 2025). The network of 84 Experimental Forests and Ranges has been established progressively since 1908. This network has a rich history and an incredible wealth of records on the ecological changes in natural and managed forest and grassland ecosystems across the United States (USDA 2025). In Idaho, three Experimental Forests have been central to facilitating long-term scientific research on multiple of aspects related to forest ecology and management, including studies involving lichens, bryophytes, and moonworts (Figure 1):

- Boise Basin Experimental Forest (BBEF), established in 1933 on the Boise National Forest, approximately 40 miles northeast of Boise in Boise County
- Deception Creek Experimental Forest (DCEF), established in 1933 on the Coeur d'Alene National Forest, approximately 12 miles east of Coeur d'Alene in Kootenai County
- Priest River Experimental Forest (PREF), established in 1911 on the Kaniksu National Forest in Idaho approximately 13 miles north of Priest River in Bonner County. The PREF facilities which provide lodging, kitchen, conference rooms, and other amenities have been particularly important for supporting numerous research operations, field trips, and workshops in the Priest River-Priest Lake area of the Idaho panhandle.

Nestled within these Experimental Forests (EFs) are Research Natural Areas (RNAs). Designated by the Forest Service, the national network of RNAs protects excellent examples of common ecosystems, preserved in their natural conditions to serve as reference areas for research, education, and in monitoring the effects of intensive management actions to National Forests of the region (Rust 2000). Idaho's EFs contain four RNAs: Canyon Creek and Montford Creek established at PREF and DCEF, respectively, in 1937; Bannock Creek established at BBEF in 1970; and Wellner Cliffs, established at PREF in 2004.

Collectively, the establishment of Idaho's EFs and their RNAs have promoted knowledge on the species, distributions, and ecology of lichens, bryophytes, and moonworts through many scientific studies, surveys, field trips, and workshops. From 1916 to 2023, 40 university, private, and government agency researchers made 1,948 observations, collections, and specimens. From these, 1,705 specimens were deposited at 48 herbaria, and represent about 223 lichen species in 90 genera, 143 bryophyte species in 86 genera, and 3 moonwort species in the genus *Botrychium* (Tables 1-4). This historical account, which has not previously been compiled, chronicles the history of lichen, bryophyte (moss, liverwort, and hornwort), and moonwort exploration at BBEF, DCEF, and PREF in Idaho from 1916 to 2023.

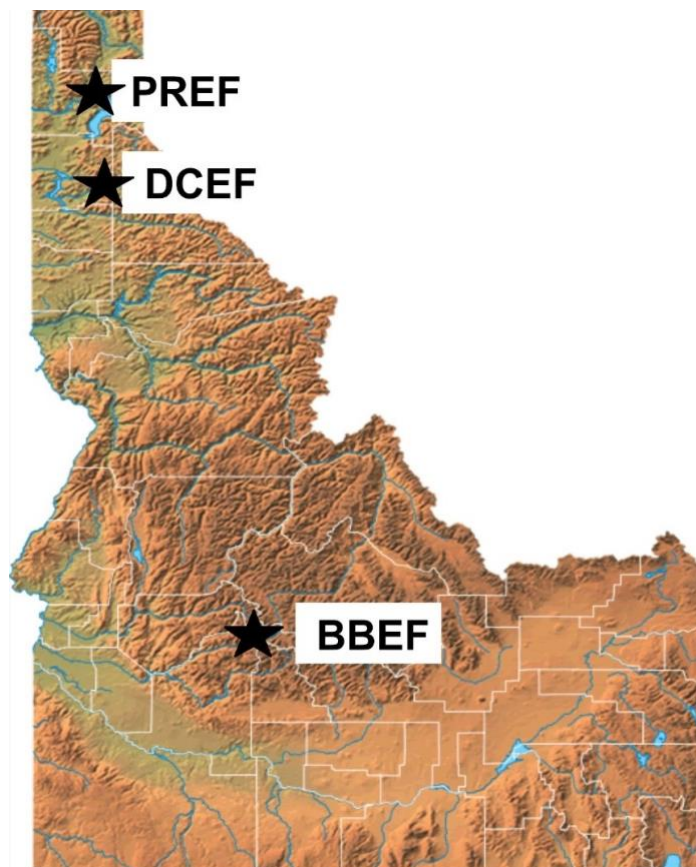


Figure 1. The general location of the Priest River Experimental Forest (PREF), Boise Basin Experimental Forest (BBEF), and Deception Creek Experimental Forest in Idaho.

METHODS

The history of lichen, bryophyte, and moonwort research at BBEF, DCEF, and PREF was obtained through literature and government agency records. These included scientific publications, PREF and DCEF annual reports and guest-registers, Forest Service Intermountain Forest and Range Experiment Station (INT) and Rocky Mountain Research Station (RMRS) data-archives, RNA establishment reports, letters, memos, field datasheets, and unpublished reports held in the archives at the RMRS-Moscow Forestry Sciences Lab (MFSL) in Moscow, Idaho. Herbarium specimens of lichens, bryophytes, and moonworts collected from these EFs were obtained from three on-line portals: Consortium of Pacific Northwest Herbaria (2025), Consortium of Lichen Herbaria (2025), and Consortium of Bryophyte Herbaria (2025). These consortia also provided the scientific names used in this paper. Throughout this paper we list at least one organism observed by each researcher to illustrate the great diversity of species encountered over the 107-year period.

LICHEN, BRYOPHYTE, AND MOONWORT EXPLORATION

After Idaho's statehood in 1890, several botanical explorations took place in Boise, Kootenai, and Bonner counties that later would include the BBEF, DCEF, and PREF. John Lieberg of the United States Geologic Survey collected hundreds of moss specimens in Bonner and Kootenai Counties between 1888 and 1902; however, no evidence was found to show that they came from what would become DCEF and PREF. James R. Weir, the USDA Bureau of Plant Industry Consulting Pathologist for Forest Service District 1 made thousands of fungal and several lichen and moss collections in northern Idaho from 1912 to 1921. His herbarium specimens only provide "Priest River" as the location, making it unknown if they came from areas within the EF. Carl Epling, a botanist who worked for two years with the USDA Office of Blister Rust Control and later taught at the University of California, made several vascular plant specimens at PREF in 1923 and 1925. Although his co-authored rough draft of the "flora of northern Idaho" (Epling and Ewan 1941) indicates that Epling studied club mosses and other "moss-like herbs", he is not known to have collected mosses at PREF.

The earliest collections of lichen and moss specimens at Idaho's EFs came from PREF in 1916 by J. A. Larsen, Director of the Forest Service Priest River Experiment Station from 1917 to 1921. He collected at least one moss and lichen in the years of 1916, 1919, 1920, 1921, and 1924, predominantly in the Benton Creek and Fox Creek areas. Notable collections included *Stereocaulon tomentosum* (wooley foam lichen), and *Sphagnum capillifolium* (red bog moss). Larsen appears to have made the collections as part of a study he was conducting at PREF on the association of plants in forest habitats of northern Idaho. He published the study in 1923 (Larsen 1923), but only reported on the association of a clubmoss ("Lycopodium sp."), herbs, shrubs, and trees.

In 1928, Robert Weidman, Director of the Forest Service Northern Rocky Mountain Forest Experiment Station, decided that the effort to create a local herbarium should be expanded. Letters show that PREF staff collected mosses and lichens and that duplicate specimens were to be kept at both the station headquarters in Missoula, Montana and at PREF. However, only three specimens of one lichen species are known to exist today. These collections of *Polycauliona candelaria* (shrubby sunburst lichen), made by PREF Superintendent J. B. "Tommie" Thompson at PREF in July 1930, are housed at Ohio State University, Harvard University, and University of Michigan herbaria.

Albert Slipp, a University of Idaho forestry graduate student, collected lichens while studying fungi native to forests in northern Idaho and northeastern Washington from 1939 to 1943. Slipp stayed at PREF facilities on several occasions, making over 250 fungal collections in the Priest River-Priest Lake area. Among his collections was *Ochrolechia oregonensis* (double-rim saucer lichen) from a gravel pit near the East River at PREF on November 11, 1939. This specimen was examined by lichenologist Irwin Brodo in his study of the genus *Ochrolechia* (Brodo 1991).

From 1940 to 1943, Rexford Daubenmire, University of Idaho Assistant Professor of Botany, and Albert Slipp used laboratory and other facilities at PREF to study the prairie-like vegetation surrounded by dense forest along Looking Glass Mountain (renamed to Gisborne Mountain in 1949). Although individual species are not named in the paper, Daubenmire and Slipp discussed how the ability of mosses to become established and thrive on bare rock surfaces on the north slope of the ridge provides seedbeds for the advent of pioneer vascular plant species, thereby playing a fundamental role in the initiation of plant development (Daubenmire and Slipp 1943).

Rexford Daubenmire collected 367 herbarium specimens at PREF from June 1940 to September 1944. These specimens include mosses and liverworts belonging to 28 species in 25 genera. One specimen was *Bucklandiella microcarpa* (yellow-green rock moss), which was found on a "rock outcrop in open forest." In 1943, he transferred to Washington State University. Over the next 30 years, Rexford Daubenmire along with his wife, Jean Daubenmire, also an accomplished botanist would conduct groundbreaking research on the classification of forest habitat types at PREF. However, their final results published in 1968 did not include moss or liverwort associations (Daubenmire and Daubenmire 1968).

Jack Secor at Washington State University initiated a doctoral study in 1949 to determine the extent at which soil characteristics associate with four forest habitat types in the Rocky Mountains of northern Idaho. He chose three sites, known as "mountain parks" or "balds" to establish plots where he intensively sampled plant species and analyzed soils. At his site on Looking Glass Mountain at PREF he made 28 moss collections belonging to 15 species in 10 genera in 1949. Included in his study was *Rhytidiopsis robusta* (pipe-cleaner moss), a species endemic to the Pacific Northwest. Secor's dissertation included the "distribution of mosses and leafy liverworts according to study-area, habitat type and substrate" (1956).

Noe Higinbotham, a professor at Washington State University from 1948 to 1980, made three moss collections from litter at Benton Spring at PREF on May 23, 1957. Two of these collections were identified as being indeterminate species of *Brachythecium* and *Cirriphyllum* by Betty Wilson Higinbotham, a bryologist at Washington State University. A year later the Higinbothams published on these genera and proposed *Brachythecium hylotapetum* as a new species (Higinbotham and Higinbotham 1958a, 1958b).

Walter Mueggler, a range conservationist for INT, studied the composition of seral shrub communities and factors that control population dynamics in northern Idaho (Mueggler 1961, 1965). The large field-study began in 1957 and included areas of DCEF. Although his study appears to have involved only the identification of tree, shrub, and herb flora, Mueggler collected *Trochophyllohypnum circinale* (coiled leaf moss) at DCEF in 1958.

Orson K. Miller, Jr., a plant pathologist at MFSL, studied fungi in the Family Gomphidaceae for his doctoral study (Miller 1963). He also conducted research on *Echinodontium tinctorium* (Indian paint fungus) at DCEF and PREF (Miller 1962). In 1962 at DCEF he collected *Pertusaria multipuncta* (warty crustose lichen) while conducting fungi for the above research.

On August 13, 1963 Rexford Daubenmire collected a moonwort at PREF near Benton Spring which later was identified as *Botrychium minganense* (Mingan moonwort). Most taxonomists agree that moonworts are primitive ferns in the genus *Botrychium*. Moonworts are very difficult to find due to their small size and a life cycle that predominantly occurs underground with only a single leaf emerging in sporadic years.

Harry D. Thiers, professor at San Francisco State College from 1959 to 1989, specialized in the study of fungi native to California. During an extended visit to PREF in the summer of 1964, together with several mycologists and assistants, he conducted a survey for fungi in the family Boletaceae. At this time, he collected 3 lichen species, including *Cladonia cariosa* (split-peg lichen).

Edmund Tylutki, a University of Idaho professor in the Department of Biological Sciences, was among other mycologists conducting research at PREF in 1964. He collected *Arctomia fascicularis* (jelly lichen) while studying poisonous and edible mushrooms native to Idaho.

Jack Lyon, a wildlife habitat researcher for INT, studied the development of forest vegetation following logging and prescribed burning in northern Idaho and northwestern Montana in 1965 and 1966. Lyon established study sites at PREF and DCEF, and then transferred the vegetation development study to Peter Stickney, an INT plant ecologist. In July 1965 Stickney collected *Marchantia polymorpha* (umbrella liverwort) near Raven Run at DCEF. In August 1966 he collected *Phaeoceros laevis* (smooth hornwort), *Hylocomiadelphus triquetrus* (big shaggy-moss), and 3 other moss species in the Benton Creek drainage at PREF. Although the DCEF plots were dropped from the studies, three 250 square-meter study-sites were established at PREF. Stickney with other Forest Service researchers estimated the combined moss and lichen percent ground cover from plots on transects at each site before the harvest and prescribed burn in 1966, and then almost annually afterwards from 1972 to 1990. After the 20-year period the combined moss and lichen ground cover ranged from approximately 4 to 48 percent on the PREF study-sites. In 2000 the study was published in a USDA technical report (Stickney and Campbell 2000). The final report listed post-treatment data for 'species attaining at least 1 percent cover on at least 1 study area for at least 1 year'; no mosses or lichens were among the post-treatment data. Over Stickney's 40-year career with the US Forest Service, he became an esteemed forest botanist, pioneering research on post-fire forest succession and ecology, and curating the Missoula Research Center herbarium.

Samuel Mazzer, a University of Michigan graduate student under Alexander Smith, stayed 50 days at PREF along with other mycologists and assistants in September and October of 1966. While collecting mostly fungal specimens, Mazzer found 5 moss species at PREF, including *Pogonatum urnigerum* (urn haircap moss).

According to the herbarium records, Anna Pechanec, a biology professor at Clark College in Vancouver, Washington, collected *Platismatia glauca* (ragbag lichen) in the upper Benton Creek drainage at PREF in June 1967. Other information suggests that it was Elmer Canfield, a graduate student at the University of Idaho, who made the collection and Pechanec who determined the identification. Records from PREF show that, although Pechanec did visit the experimental forest in September 1966, Canfield was at PREF in June 1967 conducting research on rot-fungi of western redcedar. It is not known if Pechanec was conducting specific research at PREF in 1966. However, in 1967 just two months before Canfield was at PREF, Pechanec presented at the Northwest Scientific Association's 40th annual meeting in Pullman, WA on the "Comparison of vegetation in adjacent alder, conifer, and mixed alder-conifer communities. II. Epiphytic, epixylic, and epilithic cryptogams" (Pechanec and Franklin 1968).

Also in June 1967, Harold Goree, who likely was in his first year as a PhD student at Washington State University, collected three lichen species at DCEF, including *Pilophorus acicularis* (Devil's matchstick lichen), a rare lichen in Idaho (Rosentreter personal communication). It is not known if Goree was conducting research at DCEF in 1967. Later in 1973, Goree earned his doctorate with a dissertation on a study of fungi, titled "The Hysteriaceae and Lophiaceae of Western United States" (Goree 1973).

Chuck Wellner published a history of PREF in 1976 (Wellner 1976) which listed publications associated with the EF. Included is a thesis titled "An ecological study of epiphytic bryophytes and lichens on *Pseudotsuga menziesii* in the Pacific Northwest" by George Hoffman, a University of South Dakota student. Although the list dates the thesis to 1966, the 1967 annual report and bunkhouse guest-register at PREF indicate that Hoffman conducted this study in 1967. Out of numerous written reports and studies conducted at PREF, no portion of Hoffman's thesis (ca 1967) in digital or paper formats has been found.

Theodore Esslinger, a graduate student at the University of Idaho under Dr. Anderegg, conducted a lichen study at PREF in 1969. An "outline" of Esslinger's study found in the MFSL archives indicates his research involved sampling lichens at ground level and at breast height on a variety of "individual trees" to determine associations, if any, with tree species and habitat types, and interrelations among lichen species. A Memorandum of Understanding and Agreement between Esslinger and INT allowed Esslinger use of the bunkhouse and office-laboratory, free of charge, at PREF from June 9 to September 1, 1969. Esslinger agreed to protect the facilities from damage and to provide a statement of study. Records from his personal herbarium and 22 other herbaria indicate that Esslinger made 1,163 lichen collections between June 9 and August 15 of 1969. These collections belong to 149 species in 62 genera, and include the state rare *Rhizoplaca melanophthalma* (rimmed naval lichen). Although the collected data was never fully analyzed or written as a thesis or publication, an examination of thirty specimens collected by Esslinger in 1969 at PREF led to the discovery of a new lichen species, *Cetraria idahoensis*, published in The Bryologist (Esslinger 1971). Further studies involving the chemistry and morphology of the genus *Cetraria* led to another publication in the journal Mycologia (Esslinger 1973). *Cetraria idahoensis* was taxonomically reassigned as the single species in the genus *Esslingeriana* in 1980 by Hale and Lai (Lai 1980). Lichen specimens collected by Esslinger during 1969 at PREF contributed to at least six additional publications (Brodo 1991, Brodo and Hawksworth 1977, Common and Brodo 1995, Esslinger 1973, Esslinger 1979, Lendemer 2013). Along with Anderegg, Esslinger helped pioneer the study of lichenology, and went on to teach and conduct research at North Dakota State University, authoring 109 taxa, and since 1997 managing the North American Lichen checklist.

Doyle Anderegg, a lichenologist and professor at the University of Idaho from 1967 to 2002 (Rosentreter 2021), collected three lichens at PREF on August 15, 1969. This is the same day that Theodore Esslinger appears to have collected his last lichen specimens at PREF. Anderegg made these collections on Gisborne Mountain at 5,000-foot elevation, which included *Cladonia ecmocyna* (frosted cup lichen). Anderegg (1930-2021) became an esteemed lichenologist with a long career at the university, translating European lichen floras into English, managing the lichen and moss herbarium, researching, and teaching coursework and workshops for the forest service.

William Denison, an Oregon State University (OSU) professor and mycologist, and Lawrence Pike, an OSU student or instructor, each collected four different lichen species at PREF on September 25, 1970. They probably came to PREF to attend the "West Coast Mycological Foray" held on September 25th (Carpenter 1971). The event covered three days with 86 to 100 participants. Their collections included *Rinodina oregana* (Oregon pepper-spore lichen), found on the bark of *Acer macrophyllum* (bigleaf maple) planted on the headquarters area.

The RNAs at Bannock, Canyon, and Montford were among many locations visited in 1976 by University of Idaho researchers Fred Rabe and Nancy Savage for a study on aquatic ecosystems in natural areas of Idaho (Rabe and Savage 1977). Rabe and Savage collected two moss species and observed a third at Montford Creek RNA, including *Kindbergia praelonga* (common feather-moss). In July Chuck Wellner assisted Rabe and Savage in surveying Canyon Creek RNA at PREF. They collected or observed seven moss species, including *Cinclidium stygium* (lurid cupola-moss). In October Rabe and Savage collected two moss species at Bannock Creek RNA, including *Brachythecium rivulare* (waterside feather-moss).

Alma Steele (later Alma Hanson) studied the bryophyte communities of forests in central Idaho, completing her master's degree at the University of Idaho in 1974 (Steele 1974). After graduating she continued to collect mosses in several parts of Idaho from 1974 to 1976 with researcher Robert Steele from INT. On August 1, 1976, she collected three moss species along a stream bank on the Bannock Creek RNA at BBEF, including

Amblystegium serpens (Creeping feathermoss). In 1978 she published a paper from her graduate work in Northwest Science (Steele 1978). Steele went on to work for the Payette National Forest from 1992 to 2017, serving also as Forest Botanist.

Dean Glawe, a Washington State University PhD student, collected three lichen species at PREF in 1978 and one lichen at DCEF in 1980 for a taxonomic study on diatrypaceous fungi (Glawe 1982). He found *Phaeocalicium populneum*, a lichen-forming fungus growing on black cottonwood trees at both EFs. J. D. Jensen, a Washington State University graduate student and a colleague of Glawe (Glawe and Rogers 1987) also collected this species at PREF in 1978. Glawe later became a professor at Washington State from 1996 to 2015 (CAHNRS 2015).

Roger Rosentreter, State botanist for the Idaho Bureau of Land Management (BLM) collected two lichen species in the Bannock Creek drainage at BBEF, including *Hypocenomyce scalaris* (common clam lichen) on September 2, 1985. Rosentreter, an esteemed lichenologist and botanist held this position for 33 years, and at Boise State University served as adjunct faculty since 1980, teaching, curating, and studying lichens.

A study on the use of prescribed-fire and shelterwood logging to regenerate ponderosa pine was conducted by Forest Service researchers on 110 acres at PREF from 1986 to 1997. Twenty 14-foot diameter plots were established on 6 study-units (ranging from 1.9 to 9.0 acres) in each of 3 study-blocks located on Center Ridge. The percent cover of total moss and of 33 vascular plant species was measured around 1987 before treatment and again in 1989 after treatment. Prior to treatment the average percent cover of mosses ranged from 0.4 to 12.0 on the 12 study-units where they occurred, with an average of 3.9 percent on all units. After treatment there was no measurable moss cover at any plot.

Christine Lorain, with the Idaho Department of Fish and Game (IDFG)-Natural Heritage Program (NHP), surveyed for nine moonwort species documented or suspected to occur on the Idaho Panhandle National Forest (IPNF). She stayed at PREF on July 31 and August 1 of 1990. While trying to relocate the moonwort collected by Daubenmire in 1963, Lorain found a different moonwort species, *Botrychium pinnatum* (northern moonwort) (Lorain 1990).

John Pierce, a contract botanist for the USFS in 1991 (Miles 2003), collected *Bryoria fremontii* (tree-hair lichen) on July 31st in the subalpine-fir/beargrass habitat type near Gisborne Lookout at PREF. At this time, Pierce may have been involved with a project related to the study of natural areas or sensitive plant species (Montana Native Plant Society 1991).

Bruce McCune, a lichenologist and professor at OSU, collected two lichen species on September 1, 1993 at the Montford Creek RNA at DCEF, including *Bryoria capillaris* (gray horsehair lichen). Since the 1970s McCune has studied lichens and bryophytes. In his position at OSU, since 1987, McCune has become preeminent in the field of lichenology through his research, vast array of publications, and teaching.

In July 1997 a week-long lichen workshop at PREF brought together 34 USFS and BLM participants. The event was sponsored by FS Region 1 and the Kootenai National Forest (KNF), organized by Michael Lolley and Toby Spribille, botanists on the Murphy Lake Ranger District, KNF, and taught by Bruce McCune and Roger Rosentreter. The participants collaborated in collecting lichens at two practice study-plots located near the PREF headquarters. An additional 8 study-plots were established in forest habitat types ranging in age from mature to old-growth and in elevation from creek bottoms to the top of Gisborne Mountain. Working in groups of 3-5 people participants surveyed the plots for lichens. On the 10 plots, they found 86 lichen species (McCune and Rosentreter 1998). Among the “interesting” lichen finds for Idaho were “coastal disjuncts”, epiphytic cyanolichens, rare or uncommon species (*Cladonia transcendens* and *Hypogymnia inactiva*), and a new state record of *Cyphelium karelicum* (Karelia soot lichen) (McCune and Rosentreter 1998). Additional collections of *Protoparmelia ochrococca* and *Pyrrhospora gowardiana* by McCune at PREF contributed to two publications (Brodo and Aproot 2005, Spribille and Hauck 2003).

Also in July, the Idaho Native Plant Society (INPS) conducted a vascular plant survey of the Wellner Cliffs area and found one moonwort, *Botrychium virginianum* (Ferguson and Zack 2006). Contributing to baseline information, Mike Hays, botanist on the Palouse Ranger District, Clearwater NF and participant to the lichen workshop, provided his list of 28 observed lichen species (Ferguson et al. 2006).

Due to the success of the 1997 event, another week-long lichen workshop was held at PREF from August 31 to September 4, 1998. Sponsored again by FS Region 1 and the KNF, this workshop was organized by Mark Mousseaux, IPNF Forest Botanist, and taught by Roger Rosentreter and Abby Rosso, an OSU graduate student under McCune; 22 participants attended. The group compared lichen diversity and biomass on different forest-

stand types to determine the effects of forest management on lichen communities. On PREF and the nearby Idaho State Lands, lichens were surveyed on 6 forested study-sites representing 4 stand types: recent clearcut, 15-year-old stand, two shelterwood-cut stands, and two mature stands. Published in *Evansia*, participants found 66 lichen species, including 15 species previously not found in 1997, and reported on lichen species richness and litter biomass by stand type (Rosso and Rosentreter 1999). The study concluded that shelterwood-cut stands have the greatest total lichen species richness while clearcut prescriptions have the least (Rosso and Rosentreter 1999).

Jenifer Hutchinson, an OSU graduate student under McCune, studied rare riparian lichens on the IPNF north of Whitebird, Idaho (Hutchinson 2001). Of the 81 plots surveyed, one plot occurred at the mouth of Big Creek on PREF. On this plot, Hutchinson and fellow OSU student Erin Martin found 5 of the 17 lichen species thought to be rare in Idaho at this time, including *Lobaria hallii* (gray lungwort), *Lobaria pulmonaria* (lungwort), *Ramalina dilacerata* (punctered bush), *Ramalina pollinaria* (chalky bush), and *Ramalina thrausta* angel's hair (Hutchinson 2001).

Suzanne DiGiacomo and Betsy Hammett, IPNF botanists, organized a workshop to identify and study moonworts at PREF from July 18-20, 2001. Participants came from the FS, IDFG, Idaho Transportation Department, Gustavus Adolphus College in Minnesota, and the Sierra NF in California. By 2001 eleven moonwort species were documented or suspected to occur on the IPNF.

Judith A. Harpel, USFS Regional Interagency Bryologist with the Gifford Pinchot National Forest and a leader in bryophyte conservation, and Wilfred Schofield, Professor Emeritus at the University of British Columbia since 1960 and a prominent bryologist, co-taught a bryophyte workshop at PREF from September 24-28, 2001. Participants came from the IDFG, USFS Region 1, and Idaho Panhandle, Lolo, Clearwater, Sawtooth, and Umpqua NFs. Among the participants was Karen Gray, an IDFG Natural Heritage Program botanist. From September 24-25 Gray made 37 moss, 7 liverwort, and 7 lichen collections on PREF, belonging to 41 species in 36 genera, including *Mnium lycopodioides* (ambiguous calcareous moss). Together Harpel, Schofield, and Richard Helliwell, participant and Umpqua NF botanist, made at least 111 collections, including 83 lichen and bryophyte species in 64 genera. In the proposed Wellner Cliffs RNA, Harpel and Schofield documented for Idaho, one rare liverwort, *Scapania bolanderi* (yellow-ladle liverwort), and two rare mosses, *Rhizomnium nudum* (naked leafy moss) and a new state record for *Ulotia megalospora* (large spore ulota). In the Lower Canyon Creek portion of the RNA, Harpel compiled a list of 86 bryophytes (Ferguson and Zach 2006). According to the RNA establishment report, "bryophyte and lichen diversity is unusually high on the cliffs and adjacent talus slopes" (Ferguson and Zach 2006).

A study initiated in 2003 by the USFS along Center Ridge at PREF examined the effects of forest fuel management practices (prescribed fire, thinning, and/or mastication) on soil erosion and sedimentation in small watersheds. Prior to treatment, the percent-ground cover of 25 variables was measured on 14-foot diameter plots in 10, 4-to-16-acre study-sites. Pre-treatment data found that lichen, moss, and liverwort species were present on 64 of 76 plots with ground cover ranging from 1 to 42 percent and averaging 5.1 percent. The authors did not investigate the post-treatment data for lichen, moss, and liverwort ground cover.

Karen Gray returned to PREF and stayed from September 12-14, 2003. She collected *Ahtiana pallidula* (pallid candlewax lichen) west of the headquarters area and several moss species along Priest and Upper Priest Rivers.

Toby Spribille and the INPS, Kinnikinnick Chapter (Sandpoint, ID) organized a 3-day workshop on native inland epiphytic crustose lichens at PREF in July 2004. Participants collected crustose lichens on short field excursions and identified them using Spribille's "new" taxonomic keys. The lignicolous and corticolous lichen specimens collected during the workshop led to three publications and extended the range for some species (Schmull and Spribille 2005, Spribille and Bjork 2008, Spribille and 2007). One of these finds was of *Lecidea rubrocastanea* (chestnut disc), found growing on a snag on a south-facing slope just north of the headquarters area. After continuing his studies in lichenology and fungi, Spribille became a professor at the University of Alberta in Canada.

Rikke Reese Næsborg, doctorate student at Uppsala University in Sweden collected an unidentified lichen species of *Lobaria* on October 4, 2005. It was collected from *Populus trichocarpa* (black cottonwood) near the East Side Road at PREF. Naesborg apparently stopped by the experimental forest while travelling from Montana to Washington during an extended tour of the northwestern US. Reese Næsborg later completed a doctorate study on the lichen genus *Lecania* (Reese Næsborg 2007).

Following selective logging, a study initiated at PREF by the USFS examined the effects of tree canopy-opening and site-preparation treatment (prescribed fire, grapple-piling, and mastication) on tree growth and understory establishment in 2005. On the south side of the Canyon Creek drainage, 164 14-foot diameter plots were established in 34 study-areas, ranging from 0.6 to 29.5 acres, covering 182 total acres. From August to October of 2005, 29 ground cover measurements were made, including the percent-cover of lichens, mosses, and liverworts. Pre-treatment measurements found 1-85 percent cover (6.3 percent average) of mosses on 119 plots, 1 to 4 percent cover of lichens on 35 plots, and 2-4 percent cover of liverworts on 2 plots. Post-treatment measurements of ground cover were made on 132 treated plots from October 2005 to September 2008. Post-treatment measurements found 1 to 37 percent cover of mosses on 64 plots and 1 percent cover of lichens on 18 plots. No measurable amount of liverwort cover was found on any plot post-treatment.

Lynn Kinter and Karen Gray, IDFG-NHP botanists, stayed at PREF from August 2-8, 2008 to survey for moonworts. By this time, the accumulation of research demonstrated the important association that moonwort species have with mycorrhizal fungi.

Jennifer Costich-Thompson, IPNF botanist, organized a training on moonwort identification and ecology at PREF from July 30 to August 1, 2014. PREF provided an ideal central location for teaching on the array of species found in northern Idaho.

Michael Haldeman, a biological scientist for the USFS, published on the first known occurrence of *Caeruleoconidia ochrolechia* in the US and Canada (Haldeman 2018). This lichenicolous fungus was found at DCEF and at two other locations in northern Idaho in 2015 and 2016. *Caeruleoconidia ochrolechia* is a parasitic fungus that was found on *Lepra ophthalmiza* (ragged wart lichen) and represented a new host for this fungal species.

Derek Antonelli, President of the INPS, Calypso Chapter, collected mosses in the Montford Creek RNA at DCEF in 2018 and 2019. On June 17th, 2018 he found *Rhizomnium glabrescens* (fan moss) along Montford Creek 200 meters upstream from its intersection with Deception Creek. On August 13, 2019 he collected it again with 4 other moss species, 100 meters downstream from the original site. Derek maintains the INPS's State list of rare lichen, moss, liverwort, and vascular plant species. As of 2023, Idaho's rare list included 30 lichens, 42 bryophytes, and 14 moonworts (INPS 2023).

Sponsored by the Idaho BLM, a workshop on the rare bryophytes and lichens of northern Idaho and western Montana was held at PREF from June 12-16, 2023. Botanists Andrea Pipp, Montana Natural Heritage Program, and Daphne Stone, Stone Consulting, who specialize in lichenology and bryology taught the workshop to 15 BLM and USFS participants. The instructors taught on how to identify rare, look-alike, and common species using herbarium and teaching specimens, chemical tests, microscopes, and various books. Excursions through various habitats at PREF along with presentations on lichen biomonitoring, soil crusts, and studies of rare species rounded out the workshop and created great group discussions. During the workshop Stone collected 2 lichens and 1 moss belonging to 3 species in 2 genera. Derek Antonelli collected 2 lichen species belong to 2 genera.

DISCUSSION

Compiling the history of lichen, bryophyte, and moonwort collection and research on Idaho's EFs has brought forth not only knowledge on species, but insights on scientific discoveries. The deposition of at least 1,951 lichen, moss, liverwort, hornwort, and moonwort herbarium specimens has contributed significantly to documenting species, mapping distributions, and monitoring biodiversity in Idaho. In the initial years of establishing the EFs, foresters were the primary users, collecting a few cryptogams, but not incorporating them into forest research. Later, as the field of ecology developed, the array of users to the EFs broadened to include concerted efforts to document the diversity of lichen, moss, liverwort, hornwort, and moonwort species while studying their interactions with vascular plant establishment and growth, forest and fire ecology, soils, and other environmental aspects. During the last 40 years, these EFs have become places for teaching workshops on fungal, bryophyte, and moonwort species identification, while still retaining long-term research sites, and being the place to study on-going changes in forest management and ecology. The establishment of Idaho's EFs have and continue to fulfil their mission, serving scientists today, and inspiring the next generation of scientists.

Although the authors conducted an extensive search to compile the history of lichen, bryophyte, and moonwort collecting and research, we believe more information will come forth. More records of lichens, mosses, liverworts, hornworts, and moonworts are likely to be found in public, private, and agency herbaria. We especially believe that local agency offices may house important specimens, and with additional funding and

staff support could be digitized and added to the online herbarium portals. Continued investigations into the literature, may reveal more connections between the specimens collected on EFs and resulting scientific publications. The first author would appreciate receiving any additional information and corrections in order to maintain a complete historical records of lichen, bryophyte, and moonwort collecting and research on Idaho's EFs. The authors hope that readers will come away with a greater appreciation for these experimental forests and how they facilitate learning and studying forest ecology and management.

Table 1. Lichen species observed at Priest River Experimental Forest (PREF), Boise Basin Experimental Forest (BBEF), and/or Deception Creek Experimental Forest.

Lichen Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation	Lichen Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation
<i>Abrothallus parmeliarum</i>	1997	<i>Cladonia squamosa</i>	1998
<i>Ahtiana pallidula</i>	1970, 1997, 2003	<i>Cladonia subulata</i>	1969
<i>Alectoria imshaugii</i>	1969, 1997	<i>Cladonia sulphurina</i>	1969, 1997
<i>Alectoria sarmentosa</i>	1969, 1970, 1997	<i>Cladonia transcendens</i> *	1997
<i>Allocladium adaequatum</i>	1978	<i>Cladonia umbricola</i>	1997
<i>Arctomia fascicularis</i>	1964	<i>Cladonia verruculosa</i>	1997
<i>Aspicilia cinerea</i>	1969	<i>Coenogonium pineti</i>	1969
<i>Bacidia</i> sp.	1969	<i>Collema furfuraceum</i>	1997, 1999
<i>Baeomyces rufus</i>	1969	<i>Cyphelium inquinans</i>	1969, 1997
<i>Bryobilimbia hypnorum</i>	1969	<i>Cyphelium karelicum</i>	1997
<i>Bryoria americana</i>	1969	<i>Diploschistes</i> sp.	1969
<i>Bryoria capillaris</i> ^{and 2}	1969, 1993 ² , 1997	<i>Diplotomma penichrum</i>	1969
<i>Bryoria fremontii</i>	1969, 1991, 1997	<i>Esslingeriana idahoensis</i>	1969, 1997
<i>Bryoria fuscescens</i>	1969, 1997	<i>Evernia prunastri</i>	1969, 1997
<i>Bryoria glabra</i>	1969, 1997	<i>Hypocenomyce scalaris</i> ^{and 1}	1969, 1985 ¹ , 1998
<i>Bryoria implexa</i>	1969	<i>Hypogymnia apinnata</i>	1969, 1997
<i>Bryoria pseudofuscescens</i>	1969, 1997	<i>Hypogymnia enteromorpha</i>	1969, 1997?
<i>Bryoria pseudofuscescens</i> var. <i>pikei</i>	1969	<i>Hypogymnia imshaugii</i>	1969, 1997
<i>Bryoria trichodes</i>	1969	<i>Hypogymnia inactiva</i> *	1997
<i>Buellia erubescens</i>	1969	<i>Hypogymnia metaphysodes</i>	1969, 1997
<i>Caeruleoconidia ochrolechia</i> ²	2015 ²	<i>Hypogymnia occidentalis</i>	1969, 1997
<i>Calicium abietinum</i>	1969	<i>Hypogymnia physodes</i>	1969, 1997
<i>Calicium viride</i>	1969	<i>Hypogymnia rugosa</i>	1969, 1997, 1998
<i>Caloplaca atosanguinea</i> ²	1967 ²	<i>Hypogymnia tubulosa</i>	1969, 1997
<i>Caloplaca cerina</i>	1970	<i>Hypogymnia tumidula</i>	1969
<i>Catinaria atropurpurea</i>	1969	<i>Hypogymnia wilfiana</i>	1969, 1997
<i>Cetraria sphaerospora</i>	1969	<i>Japewia tornoënsis</i>	1997
<i>Chaenotheca brunneola</i>	1969	<i>Kaernefeltia merrillii</i>	1969, 1997
<i>Chaenotheca chrysocephala</i>	1969	<i>Lecanactis salicina</i>	1969
<i>Chaenotheca furfuracea</i>	1969	<i>Lecanora argentata</i>	1969
<i>Chaenotheca trichialis</i>	1969	<i>Lecanora cadubriae</i>	1969
<i>Cladonia albonigra</i>	1997	<i>Lecanora circumborealis</i>	1969
<i>Cladonia cariosa</i>	1964, 1969, 1987, 1997	<i>Lecanora erythrophaea</i>	1969
<i>Cladonia carneola</i>	1969, 1997	<i>Lecanora fuscescens</i>	1969
<i>Cladonia cenotea</i>	1969, 1997	<i>Lecanora hypopta</i>	1969
<i>Cladonia cervicornis</i>	1997	<i>Lecanora impudens</i>	1969
<i>Cladonia chlorophaea</i>	1969, 1987, 1997	<i>Lecanora laxa</i>	1969
<i>Cladonia coniocraea</i>	1969, 1997	<i>Lecanora pacifica</i>	1969
<i>Cladonia deformis</i>	1997	<i>Lecanora pulicaris</i>	1969
<i>Cladonia ecmocyna</i>	1969, 1997	<i>Lecanora symmicta</i>	1969
<i>Cladonia ecmocyna</i> subsp. <i>intermedia</i>	1964, 1969	<i>Lecidea carnulenta</i>	1969
<i>Cladonia fimbriata</i>	1969, 1997	<i>Lecidea hypopta</i>	1969
<i>Cladonia macilenta</i> var. <i>bacillaris</i>	1969	<i>Lecidea myriocarpella</i>	1969
<i>Cladonia multiformis</i>	1969, 1988, 1997	<i>Lecidea nylanderii</i>	1969
<i>Cladonia norvegica</i> ²	1993	<i>Lecidea protabacina</i>	1997
<i>Cladonia ochrochlora</i>	1997	<i>Lecidea rubrocastanea</i>	2004
<i>Cladonia pyxidata</i>	1998	<i>Lepora multipuncta</i>	1969
		<i>Lepora multipunctoides</i>	1969

Table 1 (continued). Lichen species observed at the Priest River Experimental Forest (PREF), Boise Basin Experimental Forest (BBEF), and/or Deception Creek Experimental Forest.

Lichen Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation	Lichen Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation
<i>Lepra ophthalmiza</i>	1969	<i>Parmelia saxatilis</i>	1969, 1998, 2001
<i>Lepraria elobata</i>	1969	<i>Parmelia squarrosa</i>	1969
<i>Lepraria jackii</i>	1969	<i>Parmelia sulcata</i>	1969, 1997
<i>Leptochidium albociliatum</i>	2001	<i>Parmeliopsis ambigua</i>	1969, 1997
<i>Leptogium saturninum</i>	1997	<i>Parmeliopsis ambigua</i> var. <i>ambigua</i>	1969
<i>Letharia columbiana</i>	1997	<i>Parmeliopsis hyperopta</i>	1969, 1997
<i>Letharia vulpina</i>	1969, 1997	<i>Peltigera aphthosa</i>	1924, 1969, 1983, 1987, 1988, 1997
<i>Lobaria hallii</i>	1997, 1999	<i>Peltigera britannica</i>	1997
<i>Lobaria oregana</i>	1969	<i>Peltigera canina</i>	1969, 1970, 1983, 1987, 1988, 1997, 1998
<i>Lobaria pulmonaria</i>	1969, 1997, 1999	<i>Peltigera cinnamomea</i>	1997
<i>Lobaria</i> sp.	2005	<i>Peltigera collina</i>	1969, 1997, 2001
<i>Lopadium disciforme</i>	1969, 1997	<i>Peltigera didactyla</i>	1997, 1998
<i>Lopadium pezizoideum</i>	1969	<i>Peltigera elisabethae</i>	1997
<i>Melanelia commixta</i>	1997	<i>Peltigera horizontalis</i>	1970
<i>Melanelia exasperatula</i>	1997	<i>Peltigera kristinssonii</i>	1997
<i>Melanelia fuliginosa</i>	1999	<i>Peltigera lepidophora</i>	1998
<i>Melanelia multispora</i>	1997	<i>Peltigera leucophlebia</i>	1997
<i>Melanelia panniformis</i>	1969	<i>Peltigera membranacea</i>	1969, 1970, 1997
<i>Melanelia subaurifera</i>	1997	<i>Peltigera neopolydactyla</i>	1997
<i>Melanelia subelegantula</i>	1997	<i>Peltigera ponojensis</i>	1997
<i>Melanohalea exasperatula</i>	1969	<i>Peltigera praetextata</i>	1997
<i>Melanohalea multispora</i>	1969	<i>Peltigera rufescens</i>	1969, 1997
<i>Melanohalea subolivacea</i>	1969	<i>Peltigera venosa</i>	1969, 1970, 1997, 2023
<i>Micarea micrococca</i>	1969	<i>Pertusaria carneoalbida</i>	1969
<i>Montanelia disjuncta</i>	1969	<i>Pertusaria glaucomela</i>	1969
<i>Mycoblastus affinis</i>	1969	<i>Pertusaria multipuncta</i> ^{and 2}	1962 ² , 1969
<i>Mycoblastus sanguinarius</i>	1969	<i>Pertusaria pustulata</i>	1969
<i>Mycocalicium albonigrum</i>	1969	<i>Pertusaria stenhammari</i>	1969
<i>Myochroidea porphyrospoda</i>	1969	<i>Phaeocalicium compressulum</i>	1978
<i>Nephroma helveticum</i>	1969, 1997	<i>Phaeocalicium populneum</i> ^{and 2}	1978, 1980 ²
<i>Nephroma parile</i>	1969, 1997	<i>Phlyctis argena</i>	1969
<i>Nephroma resupinatum</i>	1969, 1997	<i>Physcia magnussonii</i>	1969
<i>Nodobryoria abbreviata</i>	1969, 1997, 1998	<i>Physcia phaea</i>	1969
<i>Nodobryoria oregana</i> ^{and 2}	1969, 1993 ² , 1997, 1998	<i>Physconia enteroxantha</i>	1969
<i>Ochrolechia androgyna</i>	1969	<i>Pilophorus acicularis</i> ² *	1967 ²
<i>Ochrolechia gowardii</i>	1969	<i>Platismatia glauca</i>	1967, 1969, 1997, 1998, 2001
<i>Ochrolechia juvenalis</i>	1969	<i>Platismatia stenophylla</i>	1969, 1997, 1998
<i>Ochrolechia montana</i> ^{and 2}	1969, 1993 ²	<i>Pleopsidium chlorophanum</i>	1969
<i>Ochrolechia oregonensis</i>	1939	<i>Polycauliona candelaria</i>	1930, 1998
<i>Ochrolechia pallescens</i>	1969	<i>Polychidium muscicola</i>	1997
<i>Ochrolechia szatalaensis</i>	1969	<i>Porpidia contrapoenda</i>	1969
<i>Ochrolechia upsaliensis</i>	1969, 2001	<i>Porpidia crustulata</i>	1969, 1997
<i>Palicella schizochromatica</i>	1969	<i>Protopannaria pezizoides</i> ^{and 2}	1969, 1993 ²
<i>Parmelia hygrophila</i>	1969, 1997, 1999, 2023	<i>Protoparmelia ochrococca</i>	1997

Table 1 (continued). Lichen species observed at River Experimental Forest (PREF), Boise Basin Experimental Forest (BBEF), and/or Deception Creek Experimental Forest.

Lichen Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation	Lichen Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation
<i>Psora nipponica</i>	2001	<i>Tuckermanopsis orbata</i>	1969, 1997
<i>Pycnora xanthococca</i>	2004	<i>Tuckermanopsis platyphylla</i>	1969, 1997
<i>Ramalina dilacerata</i>	1997, 1999	<i>Tuckermanopsis subalpina</i>	1964, 1969, 1997
<i>Ramalina farinacea</i>	1997, 1999	<i>Umbilicaria americana</i>	1969, 2001, 2023
<i>Ramalina pollinaria</i> *	1999	<i>Umbilicaria hyperborea</i>	1969, 2023
<i>Ramalina thrausta</i>	1997, 1999	<i>Umbilicaria polyphylla</i>	1969, 2001
<i>Ramboldia cinnabarina</i>	1969	<i>Umbilicaria polyrhiza</i>	1969
<i>Ramboldia gowardiana</i>	1997	<i>Umbilicaria torrefacta</i>	2001
<i>Rhizocarpon grande</i>	1969	<i>Usnea dasopoga</i>	1997
<i>Rhizoplaca melanophthalma</i> *	1969	<i>Usnea glabrata</i>	1997
<i>Rhybocarpus neglectus</i>	1969	<i>Usnea perplexans</i>	1997, 1998
<i>Rinodina oregana</i>	1970	<i>Usnea scabrata</i>	1997
<i>Rinodina trevisanii</i> ²	1967 ²	<i>Varicellaria rhodocarpa</i>	1969
<i>Schaereria dolodes</i>	2004	<i>Vulpicida canadensis</i>	1969, 1997
<i>Scytinium tenuissimum</i>	1997	<i>Vulpicida pinastri</i>	1969
<i>Solorina crocea</i>	1969, 1997	<i>Xanthoria polycarpa</i>	1998
<i>Stereocaulon tomentosum</i>	1919, 1997	<i>Xylographa soralifera</i>	1997
<i>Tetramelas chloroleucus</i>	1969	<i>Xylographa trunciseda</i>	2004
<i>Trapeliopsis granulosa</i> ^{and 1}	1969, 1985 ¹ , 1997	<i>Xylographa vitiligo</i>	1997
<i>Tuckermanopsis chlorophylla</i>	1969, 1997	<i>Xylopsora friesii</i>	1969, 1997

Table 2. Moss species observed at Priest River Experimental Forest (PREF), Boise Basin Experimental Forest (BBEF), and/or Deception Creek Experimental Forest.

Moss Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation	Moss Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation
<i>Amblystegium serpens</i> ^{and 1}	1976 ¹ , 2001	<i>Homalothecium megaptilum</i>	1966, 2001
<i>Anacolia menziesii</i>	2001	<i>Homalothecium nevadense</i>	1944, 2001
<i>Andreaea rothii</i>	1997	<i>Hygroamblystegium varium</i> ²	1976 ²
<i>Antitrichia californica</i>	2001	<i>Hygrohypnella bestii</i>	1976
<i>Atrichum crispum</i>	1943	<i>Hygrohypnella ochracea</i>	2001
<i>Atrichum selwynii</i>	1983, 2001	<i>Hylocomiadelphus triquetrus</i>	1966, 2001
<i>Aulacomnium androgynum</i>	2001	<i>Hylocomium splendens</i>	1943, 1966, 2001
<i>Bartramia pomiformis</i>	2001	<i>Isopterygium</i> sp.	1976
<i>Brachytheciastrum leibergii</i>	1949, 2001	<i>Kiaeria starkei</i>	1943
<i>Brachytheciastrum velutinum</i>	1949, 2001	<i>Kindbergia oregana</i> ^{and 2}	2001, 2019 ²
<i>Brachythecium albicans</i>	1983, 1985, 2001	<i>Kindbergia praelonga</i> ^{and 2}	1976 ² , 2001, 2019 ²
<i>Brachythecium asperrimum</i>	2001	<i>Leptobryum pyriforme</i>	1944, 2001
<i>Brachythecium cirrosum</i>	1949	<i>Lescurea incurvata</i>	1949
<i>Brachythecium erythrorrhizon</i>	1949	<i>Lescurea radicata</i>	1949
<i>Brachythecium frigidum</i>	1976, 2001	<i>Leucolepis acanthoneuron</i>	2001
<i>Brachythecium rivulare</i> ^{and 1}	1943, 1976 ¹	<i>Lewinskya laevigatum</i>	2001
<i>Bryum caespiticum</i>	1983	<i>Lewinskya rupestris</i>	2001
<i>Bucklandiella microcarpa</i>	1944	<i>Lewinskya speciosa</i>	2001
<i>Buxbaumia piperi</i>	2001	<i>Meiotrichum lyallii</i>	1943
<i>Calliergon cordifolium</i>	2001	<i>Mnium lycopodioides</i>	2001
<i>Ceratodon purpureus</i>	1943, 1949, 1983, 1987, 2001	<i>Mnium marginatum</i>	1949, 2001
<i>Cinclidium stygium</i>	1976	<i>Mnium spinulosum</i>	2001
<i>Cirriphyllum</i> sp.	1957	<i>Neckera douglasii</i>	2001
<i>Claopodium bolanderi</i>	2001	<i>Neckera menziesii</i>	2001
<i>Claopodium crispifolium</i>	2001	<i>Niphotrichum canescens</i>	1943
<i>Dicranum fuscescens</i>	1943, 1949, 2001	<i>Niphotrichum elongatum</i>	2001
<i>Dicranum scoparium</i>	1943, 2001	<i>Niphotrichum ericoides</i>	2001
<i>Dicranum scottianum</i>	1944	<i>Nyholmiella obtusifolia</i>	1944, 2001
<i>Drepanocladus aduncus</i>	2001	<i>Orthodicranum tauricum</i>	2001
<i>Drepanocladus aduncus</i> var. <i>kneiffii</i>	2001	<i>Plagiomnium insigne</i> ^{and 2}	2001, 2019 ²
<i>Encalypta ciliata</i>	2001	<i>Plagiomnium medium</i>	2001
<i>Eurhynchiastrum pulchellum</i>	1944, 2001	<i>Plagiomnium rostratum</i>	2001
<i>Fissidens bryoides</i>	2001	<i>Plagiomnium venustum</i>	2001
<i>Fontinalis antipyretica</i>	2001	<i>Plagiothecium denticulatum</i> var. <i>aptychus</i>	1942
<i>Fontinalis neomexicana</i>	2001	<i>Plagiothecium laetum</i>	2001
<i>Funaria hygrometrica</i> ^{and 2}	1965 ² , 2001	<i>Platyhypnum molle</i>	1976
<i>Grimmia doniana</i>	1943	<i>Pleurozium schreberi</i>	1921, 1983, 2001
<i>Grimmia laevigata</i>	2001	<i>Pogonatum urnigerum</i>	1966
<i>Grimmia montana</i>	2001	<i>Pohlia nutans</i>	1949, 2001
<i>Grimmia ramondii</i>	2001	<i>Pohlia wahlenbergii</i>	2001
<i>Grimmia torquata</i>	2001	<i>Polytrichastrum alpinum</i>	2001
<i>Herzogiella seligeri</i>	2001	<i>Polytrichum juniperinum</i>	1916, 1943, 1983, 1987, 1988, 2001
<i>Heteroclaadiella procurrens</i>	1943, 2001	<i>Polytrichum piliferum</i>	2001
<i>Homalothecium aeneum</i>	2001	<i>Pseudisotheceum myosuroides</i>	2001

Table 2 (continued). Moss species observed at Priest River Experimental Forest (PREF), Boise Basin Experimental Forest (BBEF), and/or Deception Creek Experimental Forest.

Moss Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation	Moss Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation
<i>Pseudisothecium stoloniferum</i>	2001	<i>Sanionia uncinata</i>	1944, 2001
<i>Pseudoleskeella nervosa</i>	1943	<i>Schistidium apocarpum</i>	2001
<i>Pterigynandrum filiforme</i>	2001	<i>Sciuro-hypnum curtum</i>	1949
<i>Ptilium crista-castrensis</i>	1920, 1966, 2001	<i>Sciuro-hypnum hylotapetum</i>	1949, 1966, 2001
<i>Ptychostomum turbinatum</i>	1943	<i>Sciuro-hypnum oedipodium</i>	1949
<i>Rhizomnium glabrescens</i> ^{and 2}	1976 ² , 2001, 2018 ² 2019 ²	<i>Scleropodium obtusifolium</i> ¹	1976 ¹
<i>Rhizomnium magnifolium</i> ^{and 2}	1976, 2001, 2019 ²	<i>Sphagnum capillifolium</i>	1920
<i>Rhizomnium nudum</i> *	2001	<i>Stereodon subimponens</i>	2001
<i>Rhizomnium punctatum</i>	1919, 1943	<i>Syntrichia norvegica</i>	2001
<i>Rhytidiadelphus loreus</i>	2001	<i>Syntrichia ruralis</i>	2001
<i>Rhytidiopsis robusta</i>	1919, 1949, 1966, 1987, 2001, 2023	<i>Tetraphis pellucida</i>	2001
<i>Rhytidiopsis</i> sp.	1957	<i>Timmia austriaca</i>	2001
<i>Roellobryon roellii</i>	1943, 1949	<i>Trochophyllohypnum circinale</i> ^{and 2}	1958 ² , 1976, 2001
<i>Rosulabryum capillare</i>	2001	<i>Ulotia megalospora</i> *	2001
<i>Sanionia symmetrica</i>	1944, 2001		

Table 3. Liverwort and hornwort species observed at Priest River Experimental Forest (PREF), Boise Basin Experimental Forest (BBEF), and/or Deception Creek Experimental Forest.

Liverwort and Hornwort Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation	Liverwort and Hornwort Species observed at PREF, BBEF ¹ and/or DCEF ² *INPS 2023 rare species	Year of Observation
<i>Anthoceros punctatus</i>	2001	<i>Lophozia</i> sp.	1943
<i>Barbilophozia barbata</i>	2001	<i>Marchantia polymorpha</i> ^{and 2}	1965 ² , 2001
<i>Barbilophozia lycopodioides</i>	2001	<i>Phaeoceros laevis</i>	1966
<i>Blasia pusilla</i>	2001	<i>Plagiochila porelloides</i>	2001
<i>Calypogeia muelleriana</i>	2001	<i>Porella cordaeana</i>	2001
<i>Cephaloziella divaricata</i>	2001	<i>Ptilidium pulcherrimum</i>	1944, 2001
<i>Cephaloziella hampeana</i>	1944	<i>Radula complanata</i>	2001
<i>Chiloscyphus polyanthos</i>	2001	<i>Scapania americana</i>	2001
<i>Chiloscyphus polyanthos</i> var. <i>rivularis</i> ¹	1976 ¹	<i>Scapania bolanderi</i> *	2001
<i>Conocephalum conicum</i>	2001	<i>Scapania umbrosa</i>	2001
<i>Fuscocephaloziopsis lunulifolia</i>	2001	<i>Scapania undulata</i>	2001
<i>Lepidozia reptans</i>	2001	<i>Schistochilopsis incisa</i>	2001
<i>Lophocolea heterophylla</i>	2001	<i>Syzygiella autumnalis</i>	2001

Table 4. Moonwort species observed at Priest River Experimental Forest (PREF).

Moonwort Species observed at PREF *INPS 2023 rare species	Year of Observation	Moonwort Species observed at PREF *INPS 2023 rare species	Year of Observation
<i>Botrychium minganense</i> *	1963	<i>Botrychium virginianum</i>	1997
<i>Botrychium pinnatum</i> *	1990		

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