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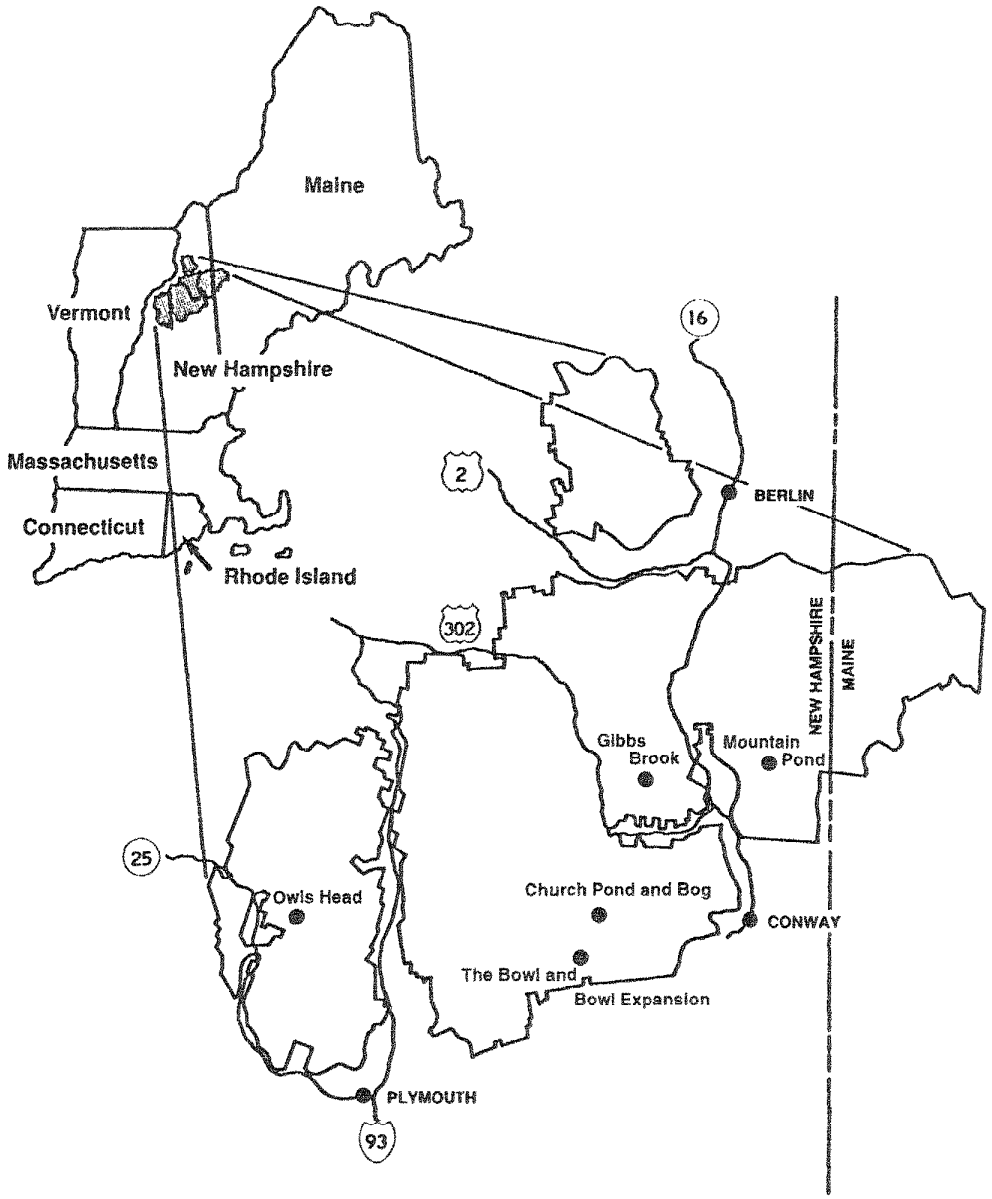
Bryophyte Survey of Six Research Natural Areas Within the White Mountain National Forest, New Hampshire

Natalie L. Cleavitt



Abstract

Bryophyte surveys were conducted in six Research Natural Areas (RNA's) and Candidate Natural Areas (CRNA's) located within the White Mountain National Forest in New Hampshire: The Bowl, Bowl Expansion, Church Pond and Bog, Gibbs Brook, Mountain Pond, and Owls Head. In all, 211 species and three varieties of bryophytes were found in these six areas. Only 42 species were common to all RNA's. Elevation change and the number of Ecological Land Types encompassed in the RNA's explained most of the variation in bryophyte diversity between the RNA's ($r^2 = 0.856$). Bryophytes account for at least half of the flora in the RNA's where surveys of vascular plants also have been conducted. Seven new state species records were discovered. Among these are the globally rare mosses *Philonotis yezoana* and *Splachnum rubrum*, which are recommended for inclusion in the New Hampshire list of rare, threatened, and endangered species.

The Author

NATALIE L. CLEAVITT earned a B.S. degree from the Department of Natural Resources at Cornell University in 1993. Since then she has been a research assistant at Cornell, where she began work on a checklist of bryophytes for the State of New Hampshire in 1994. Currently, she is a doctoral student at the University of Alberta.

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Foreword

The Forest Service Research Natural Areas Program maintains a network of 289 established areas and more than 300 candidate areas representing typical and unique natural ecosystems on national forests in the United States. These areas are managed in minimally disturbed conditions for research, monitoring, education, and protection of natural diversity and ecological processes.

Within the 14-state territory of the Northeastern Forest Experiment Station, six Research Natural Areas (RNA's) have been established, and 29 candidate areas are being considered for establishment within the next few years. Several of these areas have been the scene of active field research for many years while others are virtually unstudied.

Although the RNA program began more than 65 years ago, systematic research and monitoring on RNA's began only recently. As the Forest Service moves in the direction of ecological management, RNA's will provide essential information for comparison with similar areas managed for production of commodities.

To encourage and expedite research on RNA's, the Northeastern Forest Experiment Station is commissioning a series of botanical reconnaissance surveys for each of the established and candidate RNA's. This program began in 1991 with funding support from the RNA Matching Grant Program sponsored by the Chief of the Forest Service.

Introduction

The bryophytes are divided into three groups: Anthocerotae (hornworts), Hepaticae (liverworts), and Musci (mosses). To date, New Hampshire's bryoflora includes 5 hornwort species, 152 liverwort species, and 355 moss species. Together, bryophytes make up about 20 percent of New Hampshire's flora. Historical collecting of bryophytes in the state has focused heavily on the Presidential Range. There are many unique bryophyte habitats that have not been explored in New Hampshire. For example, in focusing on areas that have been undercollected, my statewide collecting efforts have added nearly 50 moss species to the state list.

The number of bryophyte species in a given area depends on many of the same factors that affect the diversity of vascular plants: geology, topography, and local climate. In addition, microclimate and microtopography are important factors that influence the diversity of bryophytes. For example, while the circumneutral ledges along the Wiggin Trail within the Bowl added only a single vascular plant species to the Bowl flora (Carbonneau and Allen 1995), these same ledges accounted for 10 bryophyte species that were not found elsewhere. Diversity as used in this report is simply the number of species (or species richness). No attempt was made during these surveys to quantify species eveness.

Slack (1977) found that elevation range was the most important factor for explaining variation in bryophyte diversity in New York State. In general, bryophyte diversity increases with increasing landscape diversity and the presence of specialized microhabitats (Clemants and Ketchledge 1990). Bryophytes are increasingly being recognized as good indicators of unique communities (Clemants and Ketchledge 1990; Slack 1992).

Bryophyte species have been largely undercollected and overlooked in the United States. As a result, only two states, North Carolina and Minnesota, include a list of rare bryophytes on their official lists of endangered species (Andrus 1990). Vermont has included the mosses *Plagiobryum zierii* and *Sphagnum subfulvum* with the vascular plants on its rare plant list (McQueen 1992; Slack 1992). New Hampshire currently does not include bryophyte species on its endangered plant list, though several globally rare bryophytes have been found in the state.

Methods

Bryophyte surveys were conducted in six Research Natural Areas (RNA's) and Candidate Research Natural Areas (CRNA's) located within the White Mountain National Forest in New Hampshire: The Bowl, Bowl Expansion, Church Pond and Bog, Gibbs Brook, Mountain Pond, and Owls Head. The surveys were conducted in 1995 from September 18 to October 20. The area traversed in the six sites is shown in Figures 1 through 5.

From late October to late November, specimens were verified in reference to those at the Bailey Hortorium at Cornell University. Many of the specimens collected to verify field identifications were not assigned a collection number because of their common occurrence. All specimens assigned a collection number have been deposited at the Bailey Hortorium. Duplicates of some of the extremely rare species collected, for example, *Philonotis yezoana* and *Splachnum rubrum*, will be deposited at other herbariums in addition to the Bailey. During collection, more than two-thirds of any uncommon bryophyte population was left intact.

All bryophyte collections are accompanied by data on substrate, habitat, date collected, and location. Compiling detailed information during collection is important because bryophytes tend to have specific habitat preferences that provide insight into their ecology and distributions.

Any survey of a given area is never "complete," particularly with respect to organisms the size of bryophytes. I continued to survey the RNA's until I had covered all of the unique habitat areas and no longer was collecting additional species. Then I spent an additional wrap-up day at each RNA. During the wrap-up day I traversed as much of the RNA as possible searching for habitats that I might have overlooked.

During my statewide survey efforts for the ongoing New Hampshire bryophyte checklist, I discovered many sites that included a species of *Pohlia* which has not yet been named or described. This species seems to be restricted to New England and upstate New York. In New Hampshire, it is frequent on dry but humid areas with sheltered rock ledges of all pH's, and is found in both the Bowl and Mountain Pond RNA's. Jonathan Shaw, a professor at Ithaca College and an expert on the genus *Pohlia*, plans to name and describe this species in 1996. In various lists it is referred to as *Pohlia nov. spp.* Shaw pers. comm.

The nomenclature used in this report follows Anderson and others (1990) for all mosses except *Sphagnum*, the nomenclature for which follows Anderson (1990). The nomenclature for liverworts follows Schuster (1966-1992).

Site Description for Bryophyte Habitats

The Bowl

The 206-ha Bowl RNA, located in Waterville Valley in Grafton County (Fig. 1), includes within its boundaries four Ecological Land Types (ELT's): 6, 6E, 8, and 105.[1] Elevation within the Bowl ranges from 508 to 1,215 m. The geology of ledges located south of the Wiggin Trail just before the spruce-fir transition should be investigated. The bryophyte species were typical of those found on circumneutral ledges. I tested the rock in many locations on the ledges for calcium with 10-percent HCl. The results were negative. Carbonneau and Allen (1995) pointed out that the ledges are not included within the Bowl boundaries on all maps. These ledges represent the only site in New Hampshire where the globally rare and scattered moss *Philonotis yezoana* and the infrequent mosses *Myurella julacea* and *Mnium thomsonii*

[1] Fay, Steve. 1988. White Mountain Landscapes. Unpublished report on file at White Mountain National Forest, Laconia, New Hampshire. 33 p.

are found. *Crytomnium hymenophylloides*, a globally rare moss according to Crum and Anderson (1981), also was found on these ledges. I strongly urge that these ledges be included within the final boundaries for the Bowl RNA.

The exposed bedrock of Mt. Whiteface summit provided unique subalpine habitat for *Cynodotium alpestre* and *Dicranella rufescens*. Woodland seeps, streams, ledges, and stream-bank slides also added species restricted to these habitats.

The Bowl Expansion

The topography of the 374-ha Bowl Expansion, also in Waterville Valley (Fig. 1), is less dramatic (elevation: 884 to 1,237 m) than that of the Bowl itself. There are seven ELT's within its boundaries: 2, /2, 6, 8, 14, 105, and 105D. Slopes are covered with glacial till and lack the prominent, seepy ledges within the Bowl. Mt. Passaconaway, although higher in elevation than Mt. Whiteface, lacks the latter's exposed rock ledges at the summit. More time was spent surveying stream and streamside habitat in the Bowl Expansion than in the Bowl. The greater area covered by mixed hardwood forest was combed for tree epiphytes. I suggest that the checklists for the Bowl and Bowl Expansion RNA's be merged. Species found in the Bowl Expansion but not in the Bowl itself include *Ditrichum ambiguum*, *Hygrohypnum molle*, *Isopterygium tenerum*, and *Sphagnum cuspidatum*.

Church Pond and Bog

The Church Pond and Bog, a 77-ha area located in Livermore in Grafton County and Albany in Carroll County (Fig. 2), ranges in elevation from 375 to 396 m. The ELT's within its boundaries include 6A, 11, and 12. The edge of Church Pond is dynamic, containing many microhabitats. In an area with fen characteristics along its southern edge, *Sphagnum cuspidatum*, *S. pulchrum*, and *S. torreyanum* formed a carpet with a *Carex* overstory. Areas where the bog mat extend to the edge of the pond include hummocks of *S. fuscum* and hollows dominated by *S. fallax*. In the hollows created by moose trails, *Splachnum ampullaceum* grows on piles of moose dung. At the pond's eastern and western tips, beaver waterways are sites of moist hummocks of *Osmunda*, *Carex*, and *Alnus*. The infrequent liverworts *Calypogeia neesiana* and *Riccardia latifrons* were collected from a rotting stump in this same area. Submerged in the slow-moving water of the pond itself, long strands of *Fontinalis novae-angliae* reach out from branches and rocks.

Although a unique habitat dominated by a carpet of *Sphagnum*, Church Pond Bog itself was not diverse with respect to bryophyte species. This is due primarily to the dryness of the bog and a dense shrub layer that shaded the *Sphagnum*.

Gibbs Brook

The 737-ha Gibbs Brook RNA is located mainly in Bean's Grant, Coös County (Fig. 3). The ELT's within its boundaries include 2, =2, =6, 6D, 11, 15H, 105, and 115A. Gibbs Brook (elevation: 610 to 1,314 m) is the only RNA surveyed that includes an alpine zone. Bryophyte species unique to this habitat include *Chanthodontas setiformis*, *Grimmia donniana*, *Gymnomitrion concinnatum*, *G. corallioides*, *Pogonatum dentatum*, and *Racomitrium languinosum*. While some species are truly alpine, others are associated with the alpine zone as disjuncts from a wider arctic distribution. *C. setiformis* and *R. languinosum* are examples of such arctic disjuncts. Also prevalent in the alpine zone are weedy species such as *Pohlia nutans* that can grow in many disturbed areas.

The subalpine dwarf balsam fir forest includes a lush carpet that consists primarily of *Dicranum polysetum*, *D. scoparium*, *Pleurozium schreberi*, *Ptillidium ciliare*, *Sphagnum girgensohnii*, and *S. russowii*. Perched wetlands in this zone serve as important bedding habitat for moose. The rare moss, *Splachnum rubrum*, was found growing on moose dung in a perched wetland located on the west-facing slope of Mt. Pierce.

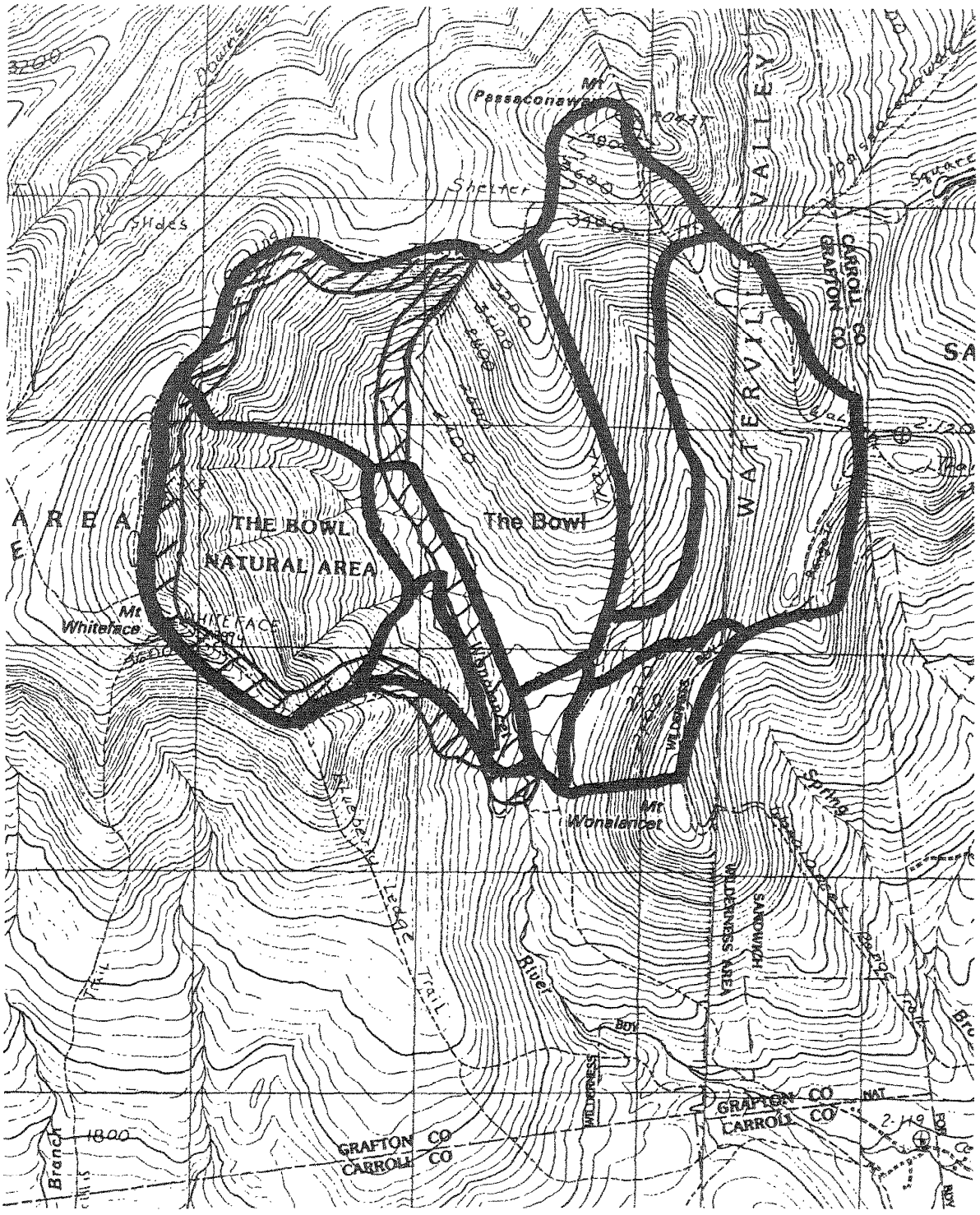
The heath bald on the northern shoulder of Mt. Jackson is a bog-like system dominated by *Gymnocolea inflata*, *Sphagnum fuscum*, and *Warnstorfia fluitans*. *Sphagnum lindbergii*, a rare arctic disjunct species in this area, was found in this heath bald. Other infrequent bryophytes collected in the Gibbs Brook RNA were *Anacamptodon splachnoides*, *Eurhynchium praelongum*, and *Scapania umbrosa*.

Mountain Pond

Mountain Pond, a 53-ha RNA located in Chatham in Carroll County (elevation: 460 to 550 m; ELT's 105 and l05D) (Fig. 4), contains four hardwood tree species that are found infrequently or are absent at the other RNA's: *Fraxinus americana*, *Ostrya virginian*, *Quercus rubrum*, and *Tilia americana*. Several researchers have investigated whether bryophytes that grow on trees prefer a particular species (Beals 1965; Palmer 1986; Studlar 1982). These studies indicate that mosses apparently arrange themselves along a gradient of preferred bark characteristics such as pH, microtopography, and permeability rather than by species specificity. Mountain Pond supported the most impressive population of *Drummondia prorepens*. *Entodon brevisetus* was found on the base of trees only at this site, which represents the driest woodland stand of those surveyed. The uncommon species *Oxystegus tenuirostris* was found on the talus boulders around an oak ridge.

Owls Head

The 260-ha Owls Head RNA, located in Benton, Grafton County (elevation: 457 to 811 m; ELT's 2 and 102C) (Fig. 5), is the best site in New Hampshire for *Sphagnum compactum*. An expansive, exposed bedrock ridge supported vast mats of *S. compactum* and *Gymnocolea inflata*. Varied moisture regimes of this fairly open bedrock ridge also supported seven species of *Polytrichum*. The moist areas associated with the largely subterranean streams that flow down from the ridge through the dry *Pinus resinosa* woods serve as habitat for the uncommon liverwort *Calypogeia fissa* subsp. *neogeae*.



—Area traversed

Figure 1.—The Bowl and Bowl Expansion Research Natural Areas, White Mountain National Forest.

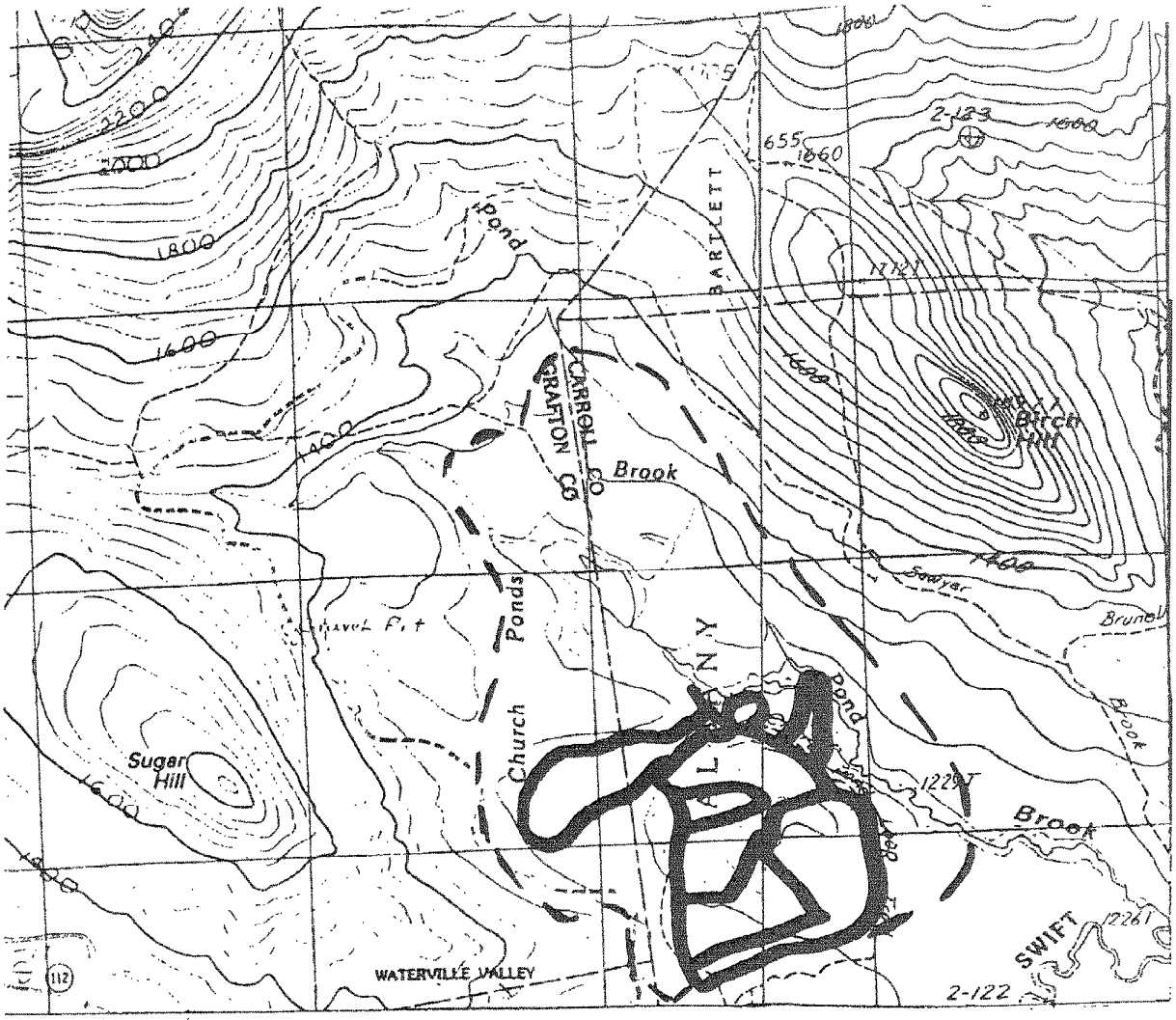
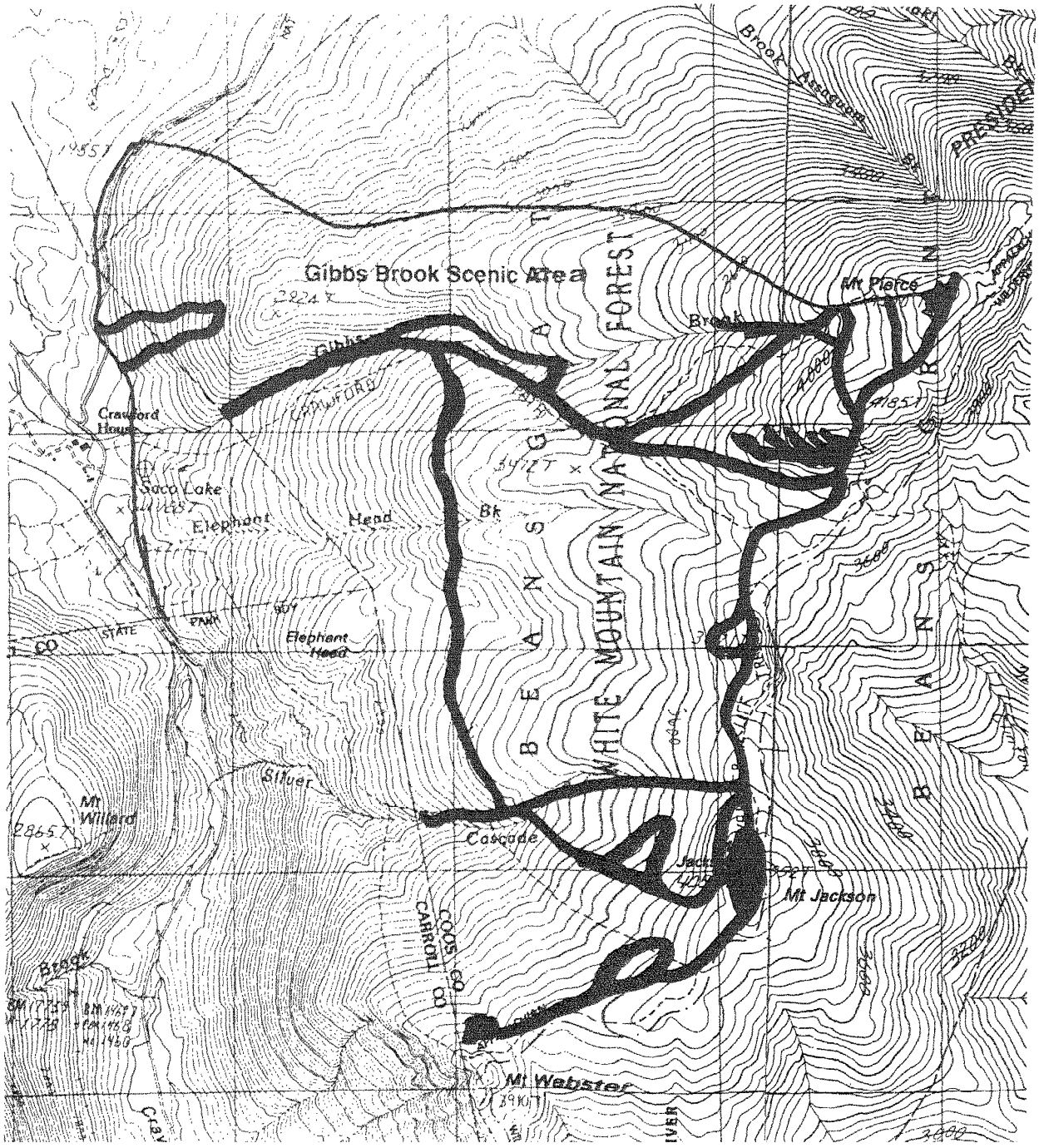
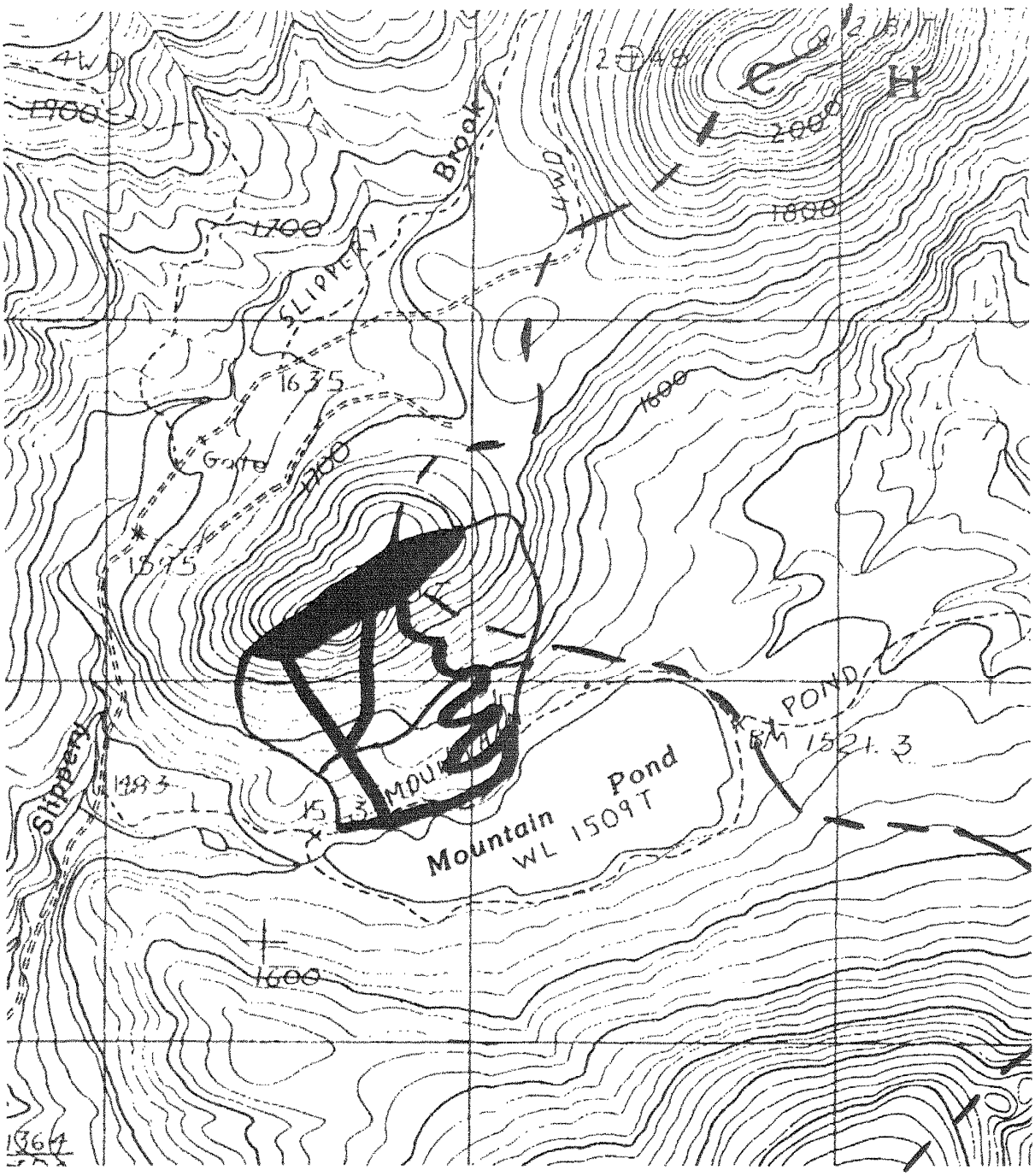


Figure 2.—Church Pond and Bog Research Natural Area, White Mountain National Forest.



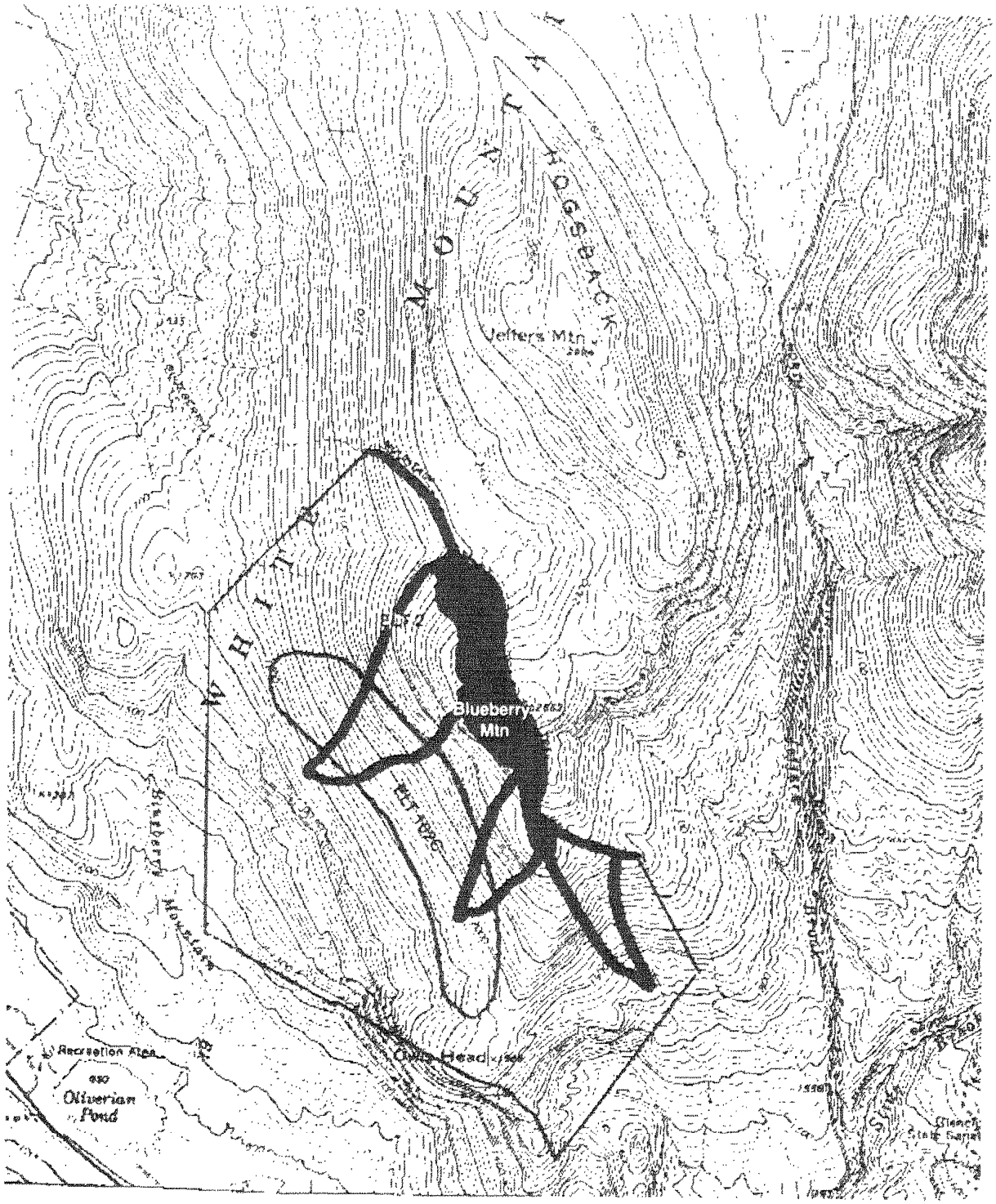
—Area traversed

Figure 3.—Gibbs Brook Research Natural Area, White Mountain National Forest.



Area traversed

Figure 4. - Mountain Pond Research Natural Area, White Mountain National Forest.



—Area traversed

Figure 5.—Owls Head Research Natural Area, White Mountain National Forest.

Results

In all, 48 liverwort species and 163 species and three varieties of mosses were collected at the RNA's. Table 1 shows the number of species found at each RNA. Gibbs Brook, The Bowl, and Bowl Expansion contain the most bryophyte species, which reflects the greater diversity of microhabitats available in these RNA's. Gibbs Brook, The Bowl, and Bowl Expansion encompass both the most area and the greatest landscape diversity as reflected in the number of ELT's. Only 12 liverwort and 30 moss species were common to all six sites.

Table 1.—Summary of bryophyte species and varieties found in six RNA's

RNA	Liverworts	Mosses	All bryophytes
All RNA's	48 spp.	163 spp. 3 var.	211 spp. 3 var.
RNA's in common	12 spp.	30 spp.	42 spp.
The Bowl	33 spp.	113 spp. 2 var.	146 spp. 2 var.
Bowl Expansion	31 spp.	104 spp. 1 var.	135 spp. 1 var.
Church Pond and Bog	23 spp.	65 spp.	88 spp.
Gibbs Brook	39 spp.	111 spp. 1 var.	150 spp. 1 var.
Mountain Pond	16 spp.	63 spp.	79 spp. 1 var.
Owls Head	21 spp.	63 spp.	84 spp.

The higher bryophyte diversity at Gibbs Brook, The Bowl, and Bowl Expansion was largely explained by the elevation change, though the number of ELT's included also was important (Table 2). Together, these two variables explained most of the variation in bryophyte diversity. However, a more significant correlation was achieved by including area, number of ELT's, and elevation change as explanatory variables. Area was the least important variable considered. Although these surveys include a small sample size (n=6), several regressions were significant (Table 2).

Table 2.—Significant correlation coefficients (r2) and p values for regressions with bryophyte richness at RNA's

Regression	r^2	p value
Elevation change	0.680	0.027
Number of ELT's	0.642	0.034
Elevation and ELT's	0.856	0.025
Elevation, ELT's, and area	0.992	0.005

Seven new species for the state were collected during these RNA surveys: *Bryhnia graminicolor, Eurhynchium hians, E. praelongum, Mnium thomsonii, Myurella julacea, Philonotis yezoana,* and *Splachnum rubrum.* A summary of survey and habitat data for all of the bryophyte species collected at the six RNA's is included in the Appendix.

Discussion

Bryophytes account for at least half of the flora in RNA's where surveys of vascular plants also have been conducted. For instance, The Bowl contained 145 species of bryophytes and 93 species of vascular plants (Carbonneau and Allen 1995). At Mountain Pond, 79 bryophyte species were found compared to 78 species of vascular plants (Crow et al. 1994). These surveys seem timely in expressing the true biodiversity of these RNA's.

The differences in species richness of the RNA's were largely explained by elevational change and the number of ELT's included in the RNA's. This agrees with the findings of Slack (1977) for New York State. In both cases, elevational change is a good proxy for quantifying landscape diversity. In addition, the size of an area is poorly correlated with diversity in both studies. Size is important to diversity only to the extent that it allows more landscape diversity to be encompassed. A good example of this comes from comparing The Bowl and Owls Head. Although Owls Head is 54 ha larger than The Bowl, Owls Head encompasses less landscape diversity and only 84 species of bryophytes while The Bowl includes 146 species and 3 varieties of bryophytes. Of course, species richness is only one measure of the ecological significance of an area. Although Owls Head contains less species than The Bowl, six species were found only in the *Pinus resinosa* stand community at Owls Head.

At Gibbs Brook I did not encounter four species of liverworts that had been noted on Mt. Pierce during previous collection efforts: *Gymnomitrion concinnatum, G. corallioides, Lophozia alpestris,* and *L. porphyroleuca* (Schuster vols. 2 and 3). However, I included these species in the checklist to more accurately reflect the number of liverworts found at Gibbs Brook. Also, at Church Pond Bog I did not find the bog liverworts *Cladopodiella fluitans* and *Kurzia setacea.* Although there are no prior bryophyte collections from this site, I suspect that these species might be more evident at this RNA during wetter years.

Although no bryophyte species currently are included in the New Hampshire state list of threatened and endangered species, I believe that *Cyrtomnium hymenophylloides, Philonotis yezoana,* and *Splachnum rubrum* meet the requirements for inclusion in the list. Also, I recommend that the circumneutral ledges along the Wiggin Trail be included within the final boundaries of the Bowl RNA as they constitute a unique habitat for bryophyte species in New Hampshire.

Literature Cited

Anderson, L. E. 1990. **A checklist of Sphagnum in North America north of Mexico.** Bryologist. 93(4): 500-501.

Anderson, L. E.; Crum, H. A.; Buck, W. R. 1990. **List of mosses of North America north of Mexico.** Bryologist. 93(4): 448-449.

Andrus, R. E. 1990. **Why rare and endangered bryophytes?** In Mitchell, R. S.; Sheviak, C. J.; Leopold, D. J., eds. Ecosystem management: rare species and significant habitats. New York State Museum Bulletin 471: 199-201.

Beals, E. W. 1965. **Ordination of some corticolous cryptogamic communities in south-central Wisconsin.** Oikos. 16: 1-8.

Carbonneau, L. E.; Allen, S. D. 1995. **Botanical reconnaissance of the Bowl Research Natural Area.** Gen. Tech. Rep. NE-189. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 26 p.

Clemants, S. E.; Ketchledge, E. H. 1990. **Flora protection: the question of rare mosses in New York State.** In Mitchell, R. S.; Sheviak, C. J.; Leopold, D. J. eds. Ecosystem management: rare species and significant habitats. New York State Museum Bulletin 471: 211-216.

Crow, G. E.; Ritter, N. P.; McCauley, K. M.; Padgett, D. J. 1994. **Botanical reconnaissance of Mountain Pond Research Natural Area.** Gen. Tech. Rep. NE-187. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 11 p.

Crum, H. A.; Anderson, L. E. 1991. **Mosses of eastern North America.** 2 vol. New York: Columbia University Press.

McQueen, C. B. 1992. **The Bryophytes of Vermont.** Evansia. 9(3): 65-88.

Palmer, M. W. 1986. **Patterns in corticolous bryophyte communities of the North Carolina Piedmont: do mosses see the forest or the trees?** Bryologist. 89(1): 59-65.

Schuster, R. M. 1966-1992. **The Hepaticae and Anthocerotae of North America east of the hundredth meridian.** vols. 1-6. New York: Columbia University Press.

Slack, N. G. 1977. **Species diversity and community structure in bryophytes: New York State studies.** New York State Museum Bulletin 428.

Slack, N. G. 1992. **Rare and endangered bryophytes in New York State and Eastern United States: current status and preservation strategies.** Biological Conservation. 59: 233-241.

Studlar, S. M. 1982. **Host specificity of epiphytic bryophytes near Mountain Lake, Virginia.** Bryologist. 85(1): 37-50.

Appendix

Bryophyte Collection and Habitat Data for New Hampshire RNA's Surveyed

In the following summary, the numbers in parentheses refer to the RNA's surveyed (1 = bryophyte species found in The Bowl; 2 = Bowl Expansion; 3 = Church Pond and Bog; 4 = Gibbs Brook; 5 = Mountain Pond; 6 = Owls Head; 7 = species found in all six RNA's).

HEPATICAE (LIVERWORTS)

Aneuraceae

Riccardia latifrons Lindb.
Collected with *Calypogeia neesiana* on decaying stump in beaver wetland at the west end of Church Pond. CLEAVITT 1349b. (3)

Blepharostomaceae

Blepharostoma trichophyllum (L.) Dum.
Common, delicate species found in moist, sheltered areas, e.g., on decaying wood on forest floor and on acid rock ledges. (1, 2, 3, 4, 5)

Calypogeiaceae

Calypogeia fissa subsp. *neogeae* Schust.
Generally in areas of high humidity and occasional inundation. Collected on soil of seasonal stream in *Pinus resinosa* woods of Owls Head. CLEAVITT 1340. (6)

C. intergristipula Steph.
Tolerant species that grows on organic and mineral substrates in areas of constant moisture. Collected on moist humus in the *Picea-Abies* zone. CLEAVITT 1351. (1, 2, 3, 4, 6)

C. muelleriana (Schiffn.) K. Müll.
Collected on moist mineral soil at base of rock ledges between Crawford Path and Mizpah Cutoff in spruce-fir zone. CLEAVITT 1254. (3, 4, 6)

C. neesiana (Mass. & Carest.) K. Müll.
Collected with *Riccardia latifrons* on decaying stump in beaver wetland at Church Pond. CLEAVITT 1349a. (3)

C. trichomanis (L.) Corda.
Collected with *Lepidozia reptans* on decaying *Picea* log along Crawford Path in Gibbs Brook. CLEAVITT 1271. (4)

Cephaloziaceae

Cephalozia bicuspidata (L.) Dum.
Common, minute species found on moist soil banks of streams and trails. CLEAVITT 1257. (1, 2, 3, 4, 6)

C. connivens (Dicks.) Lindb.
Collected on peaty trail bank along Church Pond Loop. CLEAVITT 1342. (3)

C. lunulifolia (Dum.) Dum.
Similar habitats as for *C. bicuspidata* and perhaps even more widespread. Collected in dripping rock crevices of subalpine zone on Mt. Jackson and on decordicated *Betula papyrifera* in mixed hardwoods of Gibbs Brook. CLEAVITT 1265. (1, 2, 3, 4, 6)

Nowellia curvifolia (Dicks.) Mitt.
Found on decaying logs on forest floor. More prevalent in moist spruce-fir zone along with *Ptilidium pulcherrimum* and *Lophocolea heterophylla*. (7)

Odontoschisma denudatum (Nees. ex Mart.) Dum.
Occasional on decordicated logs but most prominent on peaty trail bank of Church Pond Loop where it grows in extensive bright yellow-green patches. CLEAVITT 1172. (3)

Cephaloziellaceae

Cephaloziella rubella (Nees.) Warnst.
Collected on moist detritus near a small spring beneath a large acid boulder between Crawford Path and Mizpah Cutoff in *Picea-Abies* zone. CLEAVITT 1261. (4)

Conocephalaceae

Conocephalum conicum (L.) Lindb.
Common thallus liverwort of seeps and streamsides. (1)

Frullaniaceae

Frullania eboracensis Gottsche.
Common on hardwoods. Several specimens collected to verify that none of the less frequent species of *Frullania* were present. CLEAVITT 1269, 1499. (7)

F. tamarisci subsp. *asagrayana* (Mont.) Hatt.
Common on both softwoods and hardwoods; becoming more prevalent in *Picea-Abies* zone. CLEAVITT 1255. (7)

Gymnomitriaceae

Gymnomitrion concinnatum (Light.) Corda.
Compact liverwort restricted to the alpine zone. Reported from Mt. Pierce (also called Mt. Clinton) by Schuster. (4)

G. corallioides Nees.
Resembles *G. concinnatum* in habit and habitat. Reported from Mt. Pierce by Schuster. (4)

Marsupella emarginata (Ehrh.) Dum.
Found on faces of dripping rock ledges and on boulders in streams. Many specimens collected to check for possibility of the similar but much less frequent *M. sphacelata*. CLEAVITT 1247, 1353. (7)

Jungermanniaceae

Anastrophyllum michauxii (Web.) Buch ex Evans.
Frequent on acid ledges and boulders throughout spruce-fir zone. CLEAVITT 1217, 1266, 1346. (1, 2, 4, 6)

A. minutum (Schreb.) Schust.
Occasional on acid boulder in *Picea-Abies* zone, often with *Lophozia ventricosa*, *Bazzania denudata*, and *A. michauxii*. CLEAVITT 1352. (1, 2, 4)

Barbilophozia attenuata (Mart.) Loeske.
Frequent over acid boulders in *Picea-Abies* zone. CLEAVITT 1245, 1282. (1, 2, 3, 4, 6)

Chanthodontas setiformis (Ehrh.) Lindb.
Intricate subalpine to alpine species found in sheltered crevices of acid boulders and exposed bedrock on Mts. Jackson and Pierce. CLEAVITT 1234. (4)

Gymnocolea inflata (Huds.) Dum.
Common scorched species found on moist exposed bedrock. Particularly impressive carpet at Owls Head. CLEAVITT 1501; WILLIAMS 2. (1, 2, 4, 6)

Jamesoniella autumnalis (DC.) Steph.
Common round-leaved liverwort is found over rock and on decaying wood. CLEAVITT 1258, 1345. (7)

Lophozia alpestris (Schleich.) Evans.
Reported by R. M. Schuster from Mt. Pierce. (4)

L. porphyroleuca (Nees.) Schiffn.
Reported by R. M. Schuster from Mt. Pierce. (4)

L. ventricosa (Dicks.) Dum.
Bilobed species frequent over acid boulders in spruce-fir zone along with *Barbilophozia attenuata*, *Bazzania denudata*, and *Anastrophyllum michauxii*. CLEAVITT 1251, 1347. (1, 2, 4, 6)

Mylia anomala (Hook.)S. Gray.
Yellow-green round-leaved bog species found most often poking out of hummocks of *Sphagnum*. WILLIAMS 1. (3, 4)

M. taylorii (Hook.) S. Gray.
Frequent at moist bases of large acid boulders in *Picea-Abies* zone. CLEAVITT 1281. (1, 2, 4)

Lepidoziaceae

Bazzania denudata (Torrey ex Gott. et al.) Trev.
Common over acid boulders and detritus in spruce-fir zone along with *Barbilophozia attenuata*, *Lophozia ventricosa*, and *Anastrophyllum michauxii*. CLEAVITT 1248. (1, 2, 4)

B. trilobata (L.) Gray.
Robust dark green species common on forest floor and tree bases. (7)

Lepidozia reptans (Dum.) Dum.
Delicately pinnate species common on decaying wood and on moist soil and humus. (7)

Lophocoleaceae

Chiloschyphus pallescens (Ehrh. ex Hoffm.) Dum.
Rectangular-leaved, hunter green species found on rocks in streams. Noted by Schuster as being sensitive to sedimentation and water polution. CLEAVITT 1216. (1, 2, 4)

Lophocolea heterophylla (Schrad.) Dum.
Pale green species with lobed leaves common on dead wood along with *Nowellia curvifolia* and *Ptilidium pulcherrimum*. (7)

Metzgeriaceae

Metzgeria furcata var. *uvula* Nees.
Grows in flat interwoven bright green mats on moist bases of large old trees and rock ledges. CLEAVITT 1186, 1209. (1, 2, 5)

Pelliaceae

Pellia epiphylla (L.) Corda.
Common dark green to purple thallus species found on stream banks and moist soil. (1, 2, 3, 4)

Plagiochilaceae

Plagiochila porelloides (Torr.) Lindenb.
Common on moist rock ledges and on rocks in streams along with *Scapania nemorea* and *Marsupella emarginata*. (7)

Porellaceae

Porella platyphylla (L.) Pfeiff.
Not as common as closely related *P. platyphylloidea*, most often found on *Acer saccharum*. (1, 2, 4, 5)

P. platyphylloidea (Schwein.) Lindb.
Common, robustly pinnate species forms shelf-like growths with *Neckera* on trunks of larger hardwood trees. CLEAVITT 590. (I, 2, 4, 5)

Ptilidiaceae

Ptilidium ciliare (L.) Hampe.
Ubiquitous in carpet forming the forest floor of the subalpine fir zone. Found with *Pleurozium schreberi*, *Dicranum scoparium*, and *D. polysetum*. (1, 2, 3, 4, 6).

P. pulcherrimum (L.) Hampe.
Fringe-leaved species common on dead and live wood and less often on acid rocks. (7)

Radulaceae

Radula complanata (L.) Dum.
Common in mixed hardwoods, especially on softbarked trees such as *Fraxinus* and *Tilia*. (7)

Scapaniaceae

Diplophyllum apiculatum (Evans) Steph.
Dark green to light tan (when dried out) species found on seepy rock faces. CLEAVITT 1498. (1, 2, 4)

D. taxifolium (Wahlenb.) Dum.
Golden species found on seepy rock faces in montane habitats. Less common than *D. apiculatum*. CLEAVITT 1341. (1)

Scapania nemorea (L.) Grolle.
Common on wet rocks, often with attractive red-purple hue. CLEAVITT 1263. (7)

S. umbrosa (Schrad.) Dum.
Collected on decaying wood along Webster-Jackson Trail in *Picea-Abies* zone. CLEAVITT 1273. (4)

S. undulata (L.) Dum.
On moist humus and soil. Collected on moist bank of Webster Cliff Trail. CLEAVITT 1253. (1, 2, 4)

MUSCI (MOSSES)

Amblystegiaceae

Amblystegium serpens (Hedw.) Schimp. in B.S.G.
Frequent on tree bases and dead wood. CLEAVITT 1203, 1358. (2, 4, 5)

A. varium (Hedw.) Lindb.
Frequent on tree bases and over dead wood. Often found growing over bracket fungi on tree trunks. CLEAVITT 1280, 1348. (1, 2, 4, 6)

Calliergon stramineum (Brid.) Kindb.
Yellow-green moss found in upright clumps along edge of Church Pond. CLEAVITT 1165. (3)

Campylium chrysophyllum (Brid.) J. Lange.
Golden brown moss with wide spreading leaves, collected on circumneutral seepy ledge by Wiggin Trail. CLEAVITT 1275. (1)

Hygrohypnum eugyrium (B.S.G.) Loeske.
Robust wide-leaved species commonly found over rocks in streams along with *Eurhynchium riparoides*. CLEAVITT 1215b. (1, 2, 4)

H. molle (Hedw.) Loeske.
Occasionally on rocks in streams in montane habitats. Collected with *H. eugyrium*, *H. ochraceum*, and *Brachythecium rivulare*. CLEAVITT 1215a. (2)

H. ochraceum (Turn ex Wils.) Loeske.
Looks much like a *Hypnum* with a costa, occasional on rocks in streams. CLEAVITT 1223. (1, 2, 4)

Leptodictyum riparium (Hedw.) Warnst.
Variable species grows in springy/swampy areas in shade of woods. Collected growing over bank of Webster Cliff Trail and at base of seepy rock ledges. CLEAVITT 1249, 1355. (1, 2, 4)

Sanionia uncinata (Hedw.) Loeske.
Common over rock ledges in spruce-fir zone. CLEAVITT 1154, 1237, 1500. (1, 2, 3, 4)

Warnstorfia fluitans (Hedw.) Loeske.
Slender-leaved species common in bog pools and springs, often submerged. Collected in pools in heath bald on Mt. Jackson and edge on the *Sphagnum* mat at Church Pond. CLEAVITT 1168, 1350. (3, 4)

Andreaeaceae

Andreaea rothii Web. & Mohr.
Compact purple-black species found on dry acid boulders and exposed bedrock. CLEAVITT 1366. (1, 2, 4, 6)

A. rupestris Hedw.
Compact species often with a reddish to orange tinge, found on dry acid and moist rocks. CLEAVITT 1195. (7)

Anomodontaceae

Anomodon attenuatus (Hedw.) Hüb.
Light green to yellow with attenuate branches that curl under when dry. Common on tree bases and rock. Sometimes called "Apron moss" because of the way in which it wraps around hardwood trunks. (1, 2, 4, 5)

A. rostratus (Hedw.) Schimp.
Generally, smaller than *A. attenuatus* and more often on rock than tree bases. Seems to prefer circumneutral habitats. Collected on circumneutral rock ledges near Wiggin Trail. CLEAVITT 1362. (1, 2, 5)

A. rugellii (C. Mull.) Keissl.
Dark green, string-like species found on bases of hardwood trees. (1, 2, 5)

Aulocomniaceae

Aulacomnium palustre (Hedw.) Schwaegr.
Common yellow-green acrocarpus species found in wet depressions in woods and around edges of ponds and streams. (1, 2, 3, 4, 6)

Bartramiaceae

Bartramia pomiformis Hedw.
Occasional bluish green to yellow-green leaves and somewhat curled species forms cushions on seepy rock ledges. Called "Apple moss" because of its globular capsules. (1, 2, 4, 6)

Philonotis fontana (Hedw.) Brid.
Somewhat shiny yellow-green with red stems, grows upright in seepy habitats and along streams. CLEAVITT 1357. (1, 2, 3)

P. fontana var. *caespitosa* (Jur.) Schimp.
Macroscopically the same as *P. fontana* and grows in similar habitats. Collected at base of seepy circumneutral ledges by Wiggin Trail. CLEAVITT 1290. (1)

P. yezoana Besch. & Card. in Card.
Rare and scattered in Eastern North America. Healthy community of this species grows on seepy ledges by the Wiggin Trail. This collection represents the first in New Hampshire. CLEAVITT 1291. (1)

Brachytheciaceae

Brachythecium acuminatum (Hedw.) Aust.
Common woodland species grows at bases of trees and less often over rock and soil. CLEAVITT 1210. (1, 2)

B. oxycladon (Brid.) Jaeg.
Shiny species found in tight clumps at bases of trees and over soil, rock, and dead wood in drier woods. CLEAVITT 1206. (1, 2, 5)

B. plumosum (Hedw.) B.S.G.
Common on moist rocks in springy areas and sides of streams. CLEAVITT 1205. (1, 2, 5)

B. reflexum (Stark.) Schimp. in B.S.G.
Small common species grows on bases of hardwood trees in woods. CLEAVITT 1277. (1, 2, 4, 5, 6)

B. rivulare Schimp. in B.S.G.
Common on rocks in streams, often robust and dendroid in growth form. CLEAVITT 1242. (1, 2, 4)

B. rutabulum (Hedw.) Schimp. in B.S.G.
Found in moist, deeply shaded woods, particularly in *Picea-Abies* zone; grows on all substrates. CLEAVITT 1243. (4)

B. salebrosum (Web. & Mohr.) B.S.G.
Somewhat weedy member of the genus, common on all substrates. CLEAVITT 1238. (1, 2, 4)

Bryhnia graminicolor (Brid.) Grout.
Frequent on moist bases of hardwood trees at Mountain Pond; infrequent or absent at other sites. CLEAVITT 1185. (1, 2, 4, 5)

B. novae-angliae (Still. & Lesq. ex Sull.) Grout.
Common on moist soil and rocks in seepy areas, especially alongside of streams. (1, 2, 4)

Eurhynchium hians (Hedw.) Sande Lac.
Frequent in relatively wet woodlands. CLEAVITT 1268, 1284. (1, 2, 4)

E. praelongum (Hedw.) Schimp. in B.S.G.
Rare and scattered in Eastern North America. Collected over detritus in *Picea-Abies* zone. This collection is a new state record. CLEAVITT 1218.(4)

E. pulchellum (Hedw.) Jenn.
Occasional on soil and humus over rocks and trees. CLEAVITT 1173. (6)

Platyhynidium riparioides (Hedw.) Dix.
Common robust species found on rocks in streams. (1, 2, 4)

Bryaceae

Bryum capillare Hedw.
Grows in sterile green mats over soil in woods. Collected on oak ridge at Mountain Pond. CLEAVITT 1187. (5)

B. lisae var. *cuspidatum* (Brach & Schimp. in B.S.G.) Mast.
The most common *Bryum*, grows in variety of habitats on soil in upland areas. CLEAVITT 1372. (1)

B. pseudotriquetrum (Hedw.) Gaertn.
Common *Bryum* often found in deep red turfs in moist areas and wetlands. (3)

Pohlia annotina (Hedw.) Lindb.
Pale yellow-green species bears clusters of clear worm-like propagules in leaf axils, especially toward stem apex. Generally found on moist sandy disturbed sites. CLEAVITT 1274. (4)

P. cruda (Hedw.) Lindb.
Shiny glaucous blue to white species found on circumneutral rock ledges. Collected on ledges near Wiggin Trail, thought to be infrequent in Eastern United States. CLEAVITT 1285. (1)

P. nov. spp. Shaw pers. comm.
Grows in dry, sheltered crevices of acid and circumneutral rock ledges. Most often found in sterile light blue turfs. Seems common in suitable habitats throughout New Hampshire. CLEAVITT 1190. (1, 5)

P. nutans (Hedw.) Lindb.
The most common member of genus. CLEAVITT 1503. (7)

Buxbaumiaceae

Diphyscium foliosum (Hedw.) Mohr.
The most common member of this ephemeral family of mosses, grows on compacted and disturbed soil of stream and trail banks. Gem-like capsules with no seta rest directly on dark green to black turfs of curled rounded leaves. (1, 2, 4)

Climaciaceae

Climacium americanum Brid.
Robust species with tree-like growth habit, found on moist soil. (1, 2)

Dicranaceae

Cynodontium alpestre (Wahlenb.) Milde
Grows on mineral soil of exposed acid bedrock at alpine and subalpine sites. Frequent on Mts. Pierce, Jackson, and Webster, also collected on Mt. Whiteface. CLEAVITT 1231, 1288. (1,4)

Dicranella heteromalla (Hedw.) Schimp.
Ubiquitous species in bright green turfs with slender leaves and copious sporophytes. (7)

D. rufescens (With.) Schimp.
Similar to *D. heteromalla* but frequent only on mineral soil at subalpine and alpine sites. CLEAVITT 1260. (1, 2, 4)

Dicranum elongatum Schleich. ex Schwaegr.
Tall, slender, bright green, acrocarpus species found in moist conifer forest. CLEAVITT 1176. (1, 2, 3, 4, 6)

D. flagellare Hedw.
Common on dead wood and sometimes on humus and soil. Flagellate brood bodies at stem apices gives attenuate appearance. CLEAVITT 1368. (7)

D. fulvum Hook.
Squat dark green species found on dry acid boulders. (7)

D. fuscescens Turn.
Common on forest floor, especially in conifer woods. CLEAVITT 1164, 1233. (7)

D. montanum Hedw.
Common curly (when dry) and slender species found on rocks and bases of trees. One of few mosses that grows on both conifers and hardwoods. CLEAVITT 1369. (7)

D. polysetum Sw.
Robust, shiny green-yellow species with crinkled (undulate) leaves, common in conifer woods. (1, 2, 3, 4, 6)

D. scoparium Hedw.
Common on forest floor. Sometimes called "broom moss" because the leaves all turn in the same direction as if they had just been swept. CLEAVITT 1188. (7)

D. viride (Still. & Lesq. ex Sull.) Lindb.
Dark to medium green found on bases of trees. Has deciduous leaf tips that fall off readily when touched. (4, 5)

Oncophorus wahlenbergii Brid.
Crisped leaves with clasping bases mark this acrocarpous species. Found on moist detritus by springs and streams. CLEAVITT 1256. (1, 2, 4, 6)

Paraleucobryum longifolium (Hedw.) Loeske.
Shiny bluish green curled species found on all substrates in woodlands. Often covers boulders. CLEAVITT 592. (7)

Rhabdoweissia crispata (With.) Lindb.
Tiny species found on dry rock ledges. Often in fruit with cup-like furrowed capsules. (1, 2, 4, 6)

Ditrichaceae

Ceratodon purpureus (Hedw.) Brid.
Generally weedy species that grows on disturbed sites. Most abundant around old campfire site at Owls Head. (5, 6)

Ditrichum ambiguum Best.
Infrequent or overlooked. Collected on soil bank of Dicey Mill Trail along with *Atrichum undulatum.* CLEAVITT 1211. (2)

D. pusillum (Hedw.) Hampe.
Common species found on sandy disturbed sites. Colonized several steep stream banks in the Bowl where soil slides had occurred. CLEAVITT 1259, 1361. (1, 2, 4)

Fabroniaceae

Anacamptodon splachnoides (Frol. ex Brid.) Brid.
Infrequent in Eastern North America, called the "knothole moss" because it seems to prefer seepy knotholes of tree trunks. Collected once on large *Betula alleghaniensis* along Flume Cascade in spruce-fir zone. CLEAVITT 1228. (4)

Fontinalaceae

Fontinalis dalecarlica Schimp. ex B.S.G.
Aquatic species with three ranked leaves common on rocks in running water. (1, 4)

F. novae-angliae Sull.
Larger than *F. dalecarlica* found in slow moving water. Has somewhat greasy appearance; clings to rocks and twigs and looks somewhat like algae. CLEAVITT 1170. (3)

Entodontaceae

Entodon brevisetus (Hook. & Wils. in Wils.) Lindb.
Found on bases of hardwood trees in sunny, often dry habitats. CLEAVITT 1197. (5)

Grimmiaceae

Grimmia donniana Sm.
Grows on mineral soil of rock crevices on Mts. Pierce, Jackson, and Webster. CLEAVITT 1226. (4)

Racomitrium aciculare (Hedw.) Brid.
Common on stream rocks, often submerged. Unique in genus because of rounded apiculate leaf apices and semiaquatic habitat. (1, 2, 4, 6)

R. fasiculare (Hedw.) Brid.
As name suggests, has many "fasicles" of leaves along stem. Found in seepy montane areas, often with *Sanionia uncinata.* CLEAVITT 1222, 1283 (1, 2, 4)

R. heterostichum (Hedw.) Brid.
Common on dry acid boulders, often with *Hedwigia ciliata.* CLEAVITT 1219. (1, 2, 4, 6)

R. languinosum (Hedw.) Brid.
Arctic disjunct which is restricted to alpine zone. Its haline leaf tips make this species appear frosted. CLEAVITT 1227. (4)

Schistidium apocarpum (Hedw.) Bruch. & Schimp. in B.S.G.
Found on faces of acid and usually dry boulders. CLEAVITT 1214, 1241. (1, 2, 4, 5)

S. rivulare (Brid.) Podp.
In same habitats as *S. apocarpum* but lacks haline leaf tips. CLEAVITT 1179, 1292. (1, 2, 4, 5)

Hedwigiaceae

Hedwigia ciliata (Hedw.) P-Beauv.
Found on dry acid boulders, often with *Racomitrium heterostichum* and *Ulota hutchinsiae*. (1, 2, 4, 5, 6)

Hylocomiaceae

Hylocomiastrum umbratum (Hedw.) Fleisch. in Broth.
Bright yellow to yellow-green species found in moist spruce-fir woods. CLEAVITT 1239. (4)

Hylocomium splendens (Hedw.) B.S.G.
Multi-pinnate, robust feather species found in moist deeply shaded woods and on moist soil. Shows annual growth by layering. CLEAVITT 593. (1, 2, 4)

Pleurozium schreberi (Brid.) Mitt.
Ubiquitous red stemmed pinnate species found in damp coniferous woods. Dominates the forest carpet in the subalpine fir zone in relatively drier areas where *Sphagnum* is absent or occasional. (1, 2, 3, 4, 6)

Hypnaceae

Callicladium haldanianum (Grev.) Crum.
Green to bright yellow pleurocarpous species common over dead wood and on bases of trees. (7)

Herzogiella striatella (Brid.) Iwats.
One of primary species growing over moist ledges in spruce-fir zone. It has a furry appearance resulting from spreading leaves. CLEAVITT 1199. (1, 2, 4, 5, 6)

H. turfaceae (Lindb.) Iwats.
Less common than *H. striatella* and more complanate (flattened) in appearance. CLEAVITT 1177. (6)

Hypnum imponens Hedw.
Ubiquitous pleurocarpous species grows over soil humus and dead wood. Its pinnate stems are neatly overlain to give each stem equal amount of space and leaves curl under toward substrate. (7)

H. pallescens (Hedw.) P-Beauv.
Common on bases of trees, dead wood and rock. Smaller than *H. imponens* and much more sprawling. CLEAVITT 1360. (7)

Isopterygium tenerum (Sw.) Mitt.
Forms shiny flatten mats over bases of trees and humus. Most easily identified by presence of brood bodies in leaf axils. CLEAVITT 1208. (2)

Isopterygiopsis muelleriana (Schimp.) Iwats.
Common, attractive species found on bases of moist ledges. Has flatten habit with whitish green to gold sheen and slender leaf tips. CLEAVITT 1192. (7)

Pseudotaxiphyllum distichaceum (Mitt.) Iwats.
Complanate species with wavy leaves, occasional on moist stream banks or near springs. CLEAVITT 1155. (1, 2, 3, 4)

P. elegans (Brid.) Iwats.
Common in moist areas and on steep slopes. Often has propagules at stem apices and leaf axils. Immature plants colonize moist underledges forming attractive bright green mats. (7)

Platydictya subtilis (Brid.) Crum.
Tiny species grows with other bryophytes on bases of trees. CLEAVITT 1183, 1207, 1221. (1, 2, 4, 5)

Platygyrium repens (Brid.) B.S.G.
Dark green with brood bodies at stem apices, common on dead wood and bases of trees. Appears to be smaller version of *Leucodon brachypus*. CLEAVITT 1202, 1235. (1, 2, 3, 4, 5)

Ptilium crista-castrensis (Hedw.) DeNot.
Robust yellow-green pinnate species often grows over humus. Collected on large boulders in deeply shaded moist forest. Common in *Pieca-Abies* zone. (1, 2, 4, 6)

Pylaisiella intricata (Hedw.) Grout.
Frequent on trunks of hardwood trees, has branches that curl in a complete circle. Often found with sporophytes. CLEAVITT 1166, 1204. (7)

P. polyantha (Hedw.) Grout.
Common on all trees of the spruce-fir zone but especially over bases of *Sorbus americana* and *Betula* species. The branches tend to be less curled than *P. intricata*, though the aspect is similar and both species are commonly in fruit. CLEAVITT 1162, 1196. (7)

P. selwynii (Kindb.) Crum et al.
Infrequent relative to two other members of the genus. Curliest of these species, prefers bark crevices of large hardwood trees, especially *Acer saccharum*. CLEAVITT 1198, 1502. (2, 3, 5)

Leskeaceae

Leskeella nervosa (Brid.) Loeske.
Small dark green species ubiquitous on bases and trunks of trees. Most often found with brood bodies at ends of ascending stem apices. (1, 2, 4, 5)

Leucobryaceae

Leucobryum glaucum (Hedw.) Angstr. ex Fr.
Ubiquitous species grows in light blue to green cushions over forest floor. Has been observed making "moss balls" which are unattached to the soil. Dense cushions often appear dry on the outside while remaining wet on the inside. Sometimes known as "Mother-in-law's cushion." (7)

Leucodontaceae

Leucodon brachypus Brid.
Dirty olive green species has branches curling up out from tree trunk. Can form extensive mats, often intermixed with Orthotrichaceae. (1, 2, 4, 5)

L. brachypus var. *andrewsianus* Crum & Anderson.
Macroscopically identical to *L. brachypus* except for profusion of brood bodies at stem apices. May be slightly more frequent than *L. brachypus*. CLEAVITT 1201. (1, 2, 4, 6)

Mniaceae

Cyrtomnium hymenophylloides (Hüb.) Nyh. ex T Kop.
Tiny bluish species found on moist circumneutral rock ledges in boreal forest. CLEAVITT 1286. (1)

Mnium hornum Hedw.
Common dark green species with relatively long double-toothed leaves and streamside habitat. (7)

M. spinulosum (Volt) Schwaegr.
Frequent at bases of trees dry woods. CLEAVITT 1293, 1363. (1, 4, 6)

M. thomsonii Schimp.
Infrequent species collected at base of circumneutral ledges along Wiggin Trail. CLEAVITT 1287. (1)

Plagiomnium ciliare (C. Müll.) T Kop.
Common species on soil and rocks at streamside, often growing with *Mnium hornum*. Grows in moister habitats than the more ubiquitous *P. cuspidatum*. (1, 2, 4)

P. cuspidatum (Hedw.) T Kop.
Known as "woodsy Mnium," grows on soil, humus, and dead wood. One of the first mosses to put forth bright green sporophytes in the spring. (7)

P. ellipticum (Brid.) T Kop.
Collected on moist humus at base of seepy rock ledge. CLEAVITT 1191. (5)

Rhizomnium appalachianum T Kop.
Large-leaved robust species found in moist depressions and seeps. With orange-red tomentum covering its stem, looks like enlarged *R. punctatum*. CLEAVITT 1246. (1, 2, 4)

R. punctatum (Hedw.) T Kop.
Common ovate-leaved moss found in depressions of seeps and streamsides. (1, 2, 4)

Neckeraceae

Homalia trichomanoides (Hedw.) B.S.G.
Shiny green to golden species with entire lingulate leaves lying flat against tree trunks and rock faces. (1, 2, 4, 5)

Neckera pennata Hedw.
Often grows on hardwood tree trunks with *Porella platyphylloidea*, forms shelf-like mats standing out from tree trunks. This shiny light green undulate species prefers relatively sunny but humid habitats. CLEAVITT 601. (1, 2, 4, 5)

Orthotrichaceae

Amphidium lapponicum (Hedw.) Schimp.
Forms cushions on circumneutral seepy ledges. It is more robust and curly than *A. mougeotii* and is often found with sporophytes. CLEAVITT 1289. (1)

A. mougeotii (B.S.G.) Schimp.
Found in dull green cushions which grade to a warm yellow-brown at stem bottoms. Individual plants slender and not as contorted as *A. lapponicum* and it is almost always sterile. CLEAVITT 1278. (1)

Drummondia prorepens (Hedw.) Brid.
Resembles miniature green Christmas garland because main stem wraps around tree trunk with numerous upright branches. Only member of the family in New Hampshire with this growth form. CLEAVITT 1194, 1212. (1, 2, 4, 5)

Orthotrichum obtusifolium Brid.
Broad-leaved species with brown bean-like gemmae on the leaves. CLEAVITT 1178, 1225. (4, 6)

O. ohioense Sull. & Lesq. in Aust.
Relatively infrequent member of this genus, collected on *Acer rubrum* in woods surrounding Church Pond Bog. CLEAVITT 1158. (3)

O. sordidum Sull. & Lesq. ex Aust.
Most common member of the genus, seems to be benefiting from beech bark disease. Impressive populations observed covering the trunks of *Fagus* with bark furrowed from the disease. CLEAVITT 1182, 1370. (1, 2, 3, 4, 5)

O. speciosum var. *elegans* (Schwaegr. ex Hook. & Grev.) Warnst.
Frequent on bark of hardwood trees; distinguished from others of the genus long smooth pale capsules. (1, 2)

O. stellatum Brid.
Found on trunks of hardwood trees; has deep brown strangulate capsules and deep ribbing. CLEAVITT 1193, 1224. (2, 4, 5)

Ulota coarctata (P.-Beauv.) Hammar.
Similar to *U. crispa* and nearly as common. Its long exerted, smooth capsules pucker when moist. (7)

U. crispa (Hedw.) Brid.
Ubiquitous species found in cushions on both hardwoods and conifers. Its leaves are tightly curled when dry and its capsules are ribbed more strongly than in *U. coarctata*. (7)

U. hutchinsiae (Sm.) Hammar.
Dark green species of acid boulders where it often grows with *Hedwigia ciliata* and *Racomitrium heterostichum*; also occasional on hardwood trees. Has long exerted yellow-tan capsules. (7)

Plagiotheciaceae

Plagiothecium cavifolium (Brid.) Iwats.
Frequent on moist rock ledges, has variable growth habits. It sometimes grows with stout somewhat julaceous ascending branches with a pink tinge, but it also grows in flat shiny green mats. CLEAVITT 1181. (7)

P. denticulatum (Hedw.) Schimp. in B.S.G.
Infrequent over detritus resembling *P. laetum*. CLEAVITT 1252. (4)

P. laetum Schimp in B.S.G.
Common shiny complanate species found on steep slopes, detritus, and humus. (7)

Polytrichaceae

Atrichum angustatum (Brid.) B.S.G.
Similar to *A. undulatum* but typically more squat and with a number of older purple-red leaves toward bottom of stem. Typically found on root tips. (1, 2, 3, 4, 6)

A. crispum (James) Sull.
Yellow-green species infrequent on moist depressions in spruce-fir zone. Collected along Webster Cliff Trail. CLEAVITT 1229. (4)

A. undulatum (Hedw.) P-Beauv.
Most prevalent member of the genus, ubiquitous on stream and trail banks. Has undulate leaves as name suggests. (7)

Pogonatum dentatum (Brid.) Brid.
Bluish species fills rock crevices in the alpine zone much like a miniature stone crop plant. CLEAVITT 1244. (4)

P. pensilvanicum (Hedw.) P-Beauv.
Common colonizer of moist trail banks, this small species recognized by persistent protonema that carpets soil in yellow-green velveteen. Most often found in fruit. (1, 2, 3, 4, 6)

P. urnigerum (Hedw.) P-Beauv.
More robust than other *Pogonatums*, has stature of a *Polytrichum*. Montane species with bluish tinge. CLEAVITT 1250. (4)

Polytrichastrum alpinum (Hedw.) GL Sm.
Montane species common in spruce-fir zone. Resembles *Polytrichum commune*, though its capsules are not cube-like as in *P. commune*. CLEAVITT 1189. (1, 2, 4, 5, 6)

Polytrichum commune Hedw.
Robust dark green plant which can be mistaken for spruce seedlings. Generally grows in boggy areas; can reach height of 45 cm. CLEAVITT 1262. (1, 2, 4)

P. commune var. *perigoniale* (Michx.) Hampe.
Upland variety of *P. commune* grows in drier areas as in *Pinus resinosa* woods at Owls Head. (6)

P. formosum Hedw.
Grows in moist wooded areas, closely resembles *P. ohioense* and *P. pallidisetum*. (6)

P. juniperinum Hedw.
Called "Juniper moss", as its leaves resemble scales of juniper bush. Tends to dominate exposed bedrock of Owls Head; also found in alpine zone creating islands of plant life over bare rock. (3, 4, 6)

P. ohioense Ren. & Card.
Common in drier, sunnier upland areas. Similar to *P. pallidisetum*, but perichaetal leaves are brown. (7)

P. pallidisetum Funck.
Common in more shaded woodland areas; has undifferentiated perichaetal leaves. (7)

P. piliferum Hedw.
Compact dark purple-brown species with long haline leaf tips. Common colonizer of dry rock outcrops and sandy areas. CLEAVITT 1365. (1, 2, 3, 4, 6)

P. strictum Brid.
Closely related to *P. juniperinum* but typically differentiated by more slender, densely radiculose stems. Often grows out of *Sphagnum* hummocks in same way as *Pinus strobus* grows above other canopy trees. (3, 6)

Pottiaceae

Barbula unguiculata Hedw.
Infrequent in the White Mountains due to preference for clayey habitats. Collected on soil at base of circumneutral ledges by Wiggin Trail. CLEAVITT 1354. (1)

Oxystegus tenuirostris (Hook. & Tayl.) A.J.E. Sm.

Found on mineral soil over rock ledges. Collected on talus boulders at Mountain Pond. CLEAVITT 1180. (5)

Tortella tortuosa (Hedw.) Limpr.

Uncommon in New Hampshire because of its restriction to circumneutral rocks. Collected on circumneutral ledges by Wiggin trail. CLEAVITT 1398. (1)

Pterigynandraceae

Heterocladium dimorphum (Brid.) B.S.G.

Found threadlike mats over mineral soil in sheltered areas such as rock overhangs. CLEAVITT 1279. (1, 2)

Pterigynandrum filiforme Hedw.

Frequent on acid boulders. Common at Mountain Pond where it forms dirty green mats in crevices and depressions of boulders. CLEAVITT 1184. (1, 2, 4, 5)

Seligeriaceae

Blindia acuta (Hedw.) Bruch. & Schimp. in B.S.G.

Occasional on dry exposed rock faces. Superficially resembles *Dicranum*. CLEAVITT 1356. (1, 2, 4)

Sematophyllaceae

Brotherella recurvans (Michx.) Fleisch.

Common pleurocarpus species found growing over dead wood intermixed with *Hypnum imponens*. (7)

Sphagnaceae

Sphagnum angustifolium C. Jens.

Often growing intermixed with *S. fallax*, but usually of smaller stature. Its stem and leaves often have a pink tinge. (3)

S. capillifolium (Ehrh.) Hedw.

Common and seemingly tolerant of many habitats. Found mixed in low bog carpets but more often in conifer woods with *S. girghensohnii* and *S. russowii*. CLEAVITT 1160, 1167. (1, 2, 3, 4, 6)

S. centrale C. Jens.

One of the fat *Sphagnums* of Section Sphagnum which are best differentiated under the microscope. Collected in beaver wetland at Church Pond. CLEAVITT 1161. (3)

S. compactum D.C.

Squat, chunky species grows in carpets over seepy bedrock ridge of Owls Head. Grows from very pale green to somewhat golden. CLEAVITT 1175. (6)

S. cuspidatum Ehrh.

Often grows submerged in pools of peatlands. Known as the "drowned kitten moss" due to long, furry branch leaves. CLEAVITT 1344. (2, 3)

S. fallax (Klingrr.) Klingrr.

Common member of low carpets in peatlands. Most abundant along hollows of Church Pond Bog. CLEAVITT 1159. (3)

S. fimbriatum Wils.

Stringiest of the *Sphagnums*, identified by large fimbriate stem leaves that can be observed after stripping the stem of branches. Commonly grows on edges of peatlands. Spotted in the beaver waterways along east end of Church Pond. (3, 6)

S. fuscum (Schimp.) Klingrr.

Small, golden brown species forms tall hummocks in bog areas such as Jackson heath bald and Church Pond Bog. (3, 4)

S. girgensohnii Russow.

Ubiquitous woodland species forms carpets in poorly drained forest areas; often associated with *S. russowii*. Recognized by the stellate arrangement of its capitulum, enlarged apical bud, and fimbriate stem leaves. CLEAVITT 1236. (1, 2, 3, 4, 6)

S. lescurii Sull.

Has variable growth forms. It dominates the beaver waterways at the east and west ends of Church Pond. CLEAVITT 1169, 1343. (3)

S. lindbergii Schimp.
Rare in Eastern North America, an arctic disjunct restricted to alpine and subalpine peatlands Collected in hollow of Jackson heath bald. This collection site for *S. lindbergii* represents the second in New Hampshire. CLEAVITT 1220. (4)

S. magellanicum Brid.
The only fat *Sphagnum* species that takes on strong purplish-red pigmentation. Common and widespread throughout the world. CLEAVITT 1359. (3,4)

S. palustre L.
A fat species of various habitats, often collected in streamside wooded seeps and by lake shores CLEAVITT 1156. (3)

S. pulchrum (Lindb.) Warnst
Has strongly ranked branch leaves; often turns golden salmon pink. Has a coastal affinity and becomes rare farther west. CLEAVITT 1157. (3)

S. recurvum P-Beauv.
Collected near peaty spring along the Webster Cliff Trail. CLEAVITT 1270. (4)

S. rubellum Wils.
A deep red stellate species of bog habitats, found in low carpets or hummocks in moister areas of the bog. CLEAVITT 1171. (3)

S. russowii Warnst.
Common species that often grows with *S. girgensohnii*, which it resembles somewhat. Can be variable but most often is pink with less stellate appearance than *S. girgensohnii*. CLEAVITT 1232. (1, 2, 3, 4, 6)

S. squarrosum Crome.
Robust *Sphagnum* species found in woodland seeps. Usually recognized by its strongly squarrose branch leaves. (1, 2, 3, 4)

S. torreyanum Sull.
Larger version of *S. cuspidatum*, called the "drowned cat moss." Also found in pools and wetter areas of peatlands. Mixed with *S. cuspidatum* in fen-like area at edge of Church Pond. CLEAVITT 1344. (3)

Splachnaceae

Splachnum ampullaceum Hedw.
Frequent on moist moose and deer droppings in wetland areas. Its sporophytes are striking and colorful, exuding chemicals that attract flies which disperse the spores. CLEAVITT 1367. (3)

S. rubrum Hedw.
Extremely rare in North America, collected sterile on moose dung in perched wetland on west-facing slope of Mt. Pierce. When fruiting, the sporophytes are amazingly visible as they are a bright purple-red. CLEAVITT 1230. (4)

Tetraphidaceae

Tetraphis pellucida Hedw.
Common species that colonizes dead wood and moist soil of steep banks. Produces both copious fruit and gemmae, sporophytes have only four peristome teeth. (7)

Theliaceae

Myurella julacea (Schwaegr.) Schimp. in B.S.G.
Rare in New Hampshire, this collection on circumneutral ledges by Wiggin Trail in The Bowl represents a new state record. Grows in attractive silver green mats of ascending julaceous branches. CLEAVITT 1276. (1)

Thuidiaceae

Rauiella scita (P.-Beauv.) Reim.
Tiny pinnate species frequent on bases of hardwood trees. (1, 2, 4, 5)

Thuidium delicatulum (Hedw.) Schimp. in B.S.G.
Feather species common on moist substrates. Often turns golden greenish color in older stems. (7)