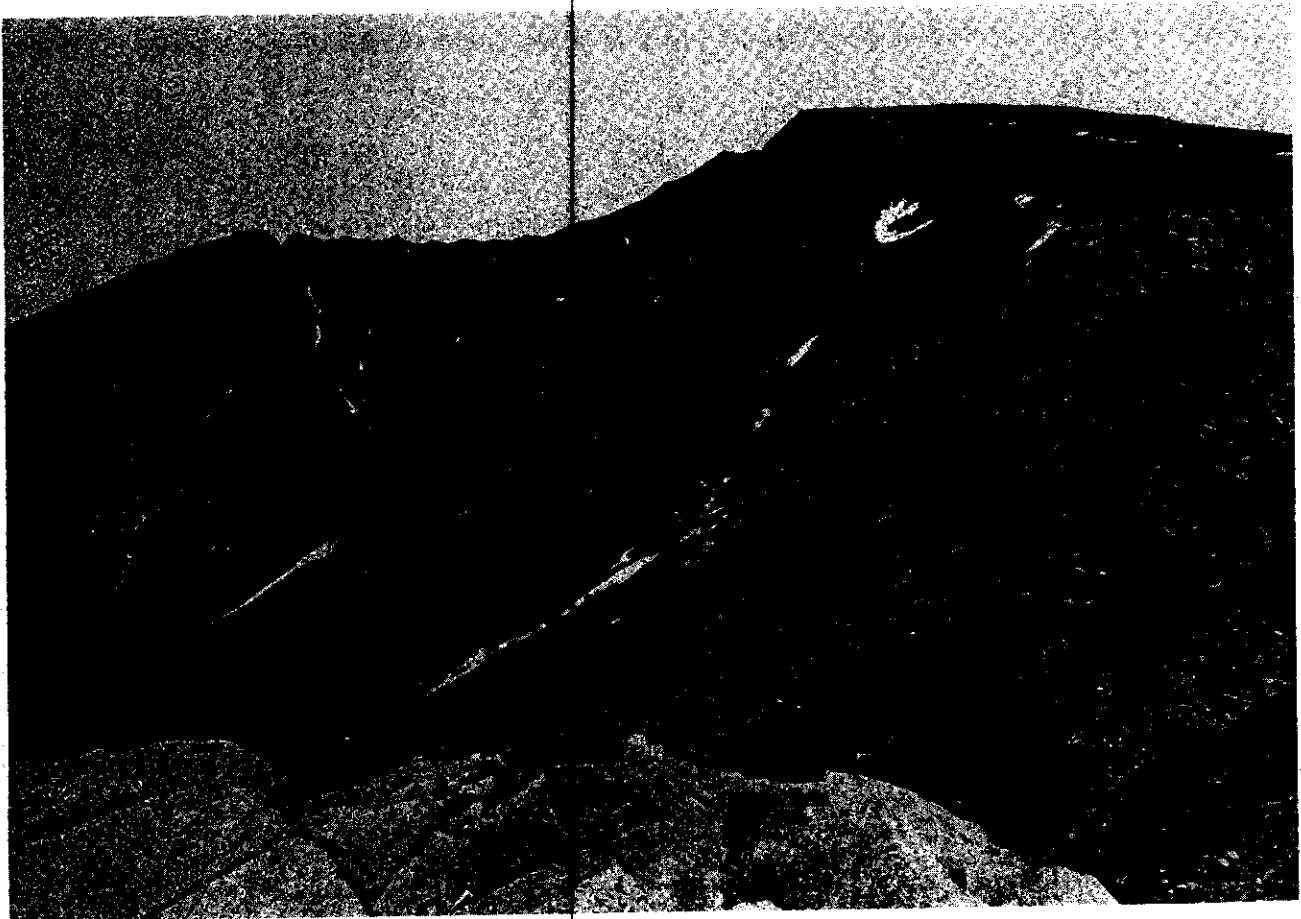


Old-Growth Forest, Subalpine Forest,
and Alpine Areas in Baxter State Park



Old-Growth Forest, Subalpine Forest,
and Alpine Areas
in
Baxter State Park

by

W. Donald Hudson, Jr., Ph.D.
Ronald Cannarella, Leah Garnett, and Katherine Huntington
Chewonki Foundation

A report prepared for the Baxter State Park Authority
64 Balsam Drive
Millinocket, Maine 04462
and
the Critical Areas Program of the State Planning Office
184 State Street
State House Station #38
Augusta, Maine 04333

Critical Areas Miscellaneous Report #31

Contribution No. 1-85
C. E. Allen Natural History Center

This work was funded by grants from the Evelyn H. Murphy Fund of the AMC, Baxter State Park Authority, and the State Planning Office. Additional support was provided by the Chewonki Foundation and private sources.

ABSTRACT

H.P. 1193 - L.D. 1579, signed by Governor Brennan on May 24, 1983, directs the State Planning Office to inventory virgin timber stands and unique alpine habitats on state-owned lands.

We define unique features at two levels for the purposes of this report. First, we include those geological, botanical, and zoological features that are rare on state-owned lands; second, we include those features that are rare on any land in the State. Virtually all unique features in the park meet both criteria.

The survey of old-growth forests (undisturbed, virgin timber, generally of some merchantable species), subalpine forest (high elevation balsam fir predominantly, though including a few isolated stands of old-growth red and black spruce), and alpine areas in Baxter State Park is the first step in completion of the task presented by the legislature. This report includes documentation of seven tracts of unique old-growth forest, three of which were discovered during this investigation. In addition, one new site not visited this summer could be added to the list of old-growth stands upon close examination. This report also includes an in-depth analysis of subalpine forest (with particular attention to age structure, growth, health, floristic diversity, and extent). This fragile forest type is characterized primarily by undisturbed stands of almost pure balsam fir. These forests exhibit many classic physiognomic characteristics of mature, old-growth forest, yet since these fir trees do not attain great girth or age, such areas were not considered for inclusion in previous studies of old-growth forest. The authors suggest that it should be recognized in a special context when discussing Maine's old-growth forests.

Two mountain tops, Katahdin and Traveler, were previously registered as Critical Areas, and using floral diversity, community structure, and general physiognomy as criteria, we recommend six other mountain tops as Critical Areas. Detailed notes on the diversity and distribution of arctic-alpine vegetation are included. These mountain tops are unique in Maine and outstanding in Eastern North America, representing the greatest reserve of rare plants north of the White Mountains of New Hampshire.

In addition, detailed information on little known areas of the park (The Klondike, Witherle Ravine) are presented in the literature for the first time. Finally, a compilation of the flora revises our understanding of its diversity, and provides a means of comparison with the last flora prepared for the area in 1901. Additions and deletions help us to understand the migration and evolution of plants through time.

We suggest continued monitoring of the unique features of Baxter State Park. The Baxter State Park Authority manages this resource for preservation, as well as interpretation for the general public. The examination of numerous sites has yielded data that will provide a baseline for future study. Since Governor Baxter's will mandates the preservation of this resource, the opportunity for future study should not be lost.

Grena et al. (1981, 1983) for old-growth forests. These vast tracts are largely undisturbed by humans, and would be described in layman's terms as "virgin timber" - if they were more readily accessible and merchantable. Though some new information and localities for old-growth forest may be found in these pages, the major contribution of this work is the characterization of the subalpine forests of Katahdin. We pursued our quarry with the sort of zeal that overtakes botanists on Katahdin, though we trust that there is more of the forest left after our work than there were plants remaining after the historic expedition of 1900.

Acknowledgements

We are grateful to a number of sources who have provided funds for this project: the Murphy Fund of the Appalachian Mountain Club, the Baxter State Park Authority, the State Planning Office, and a number of anonymous donors. The staff of Baxter State Park, especially Irvin Caverly, Jr., Supervisor, and Gerald Merry, Park Naturalist, provided services for which we are grateful. All of the Rangers and Trail Crew made our work easy by their friendly assistance with our many questions, chores, and problems.

Holly Dominie, Hank Tyler, and Naomi Edelson of the State Planning Office reviewed the drafts of this manuscript and edited them with precision. Any errors or omissions are ours, however. Dick Kelly of the State Planning office prepared the maps for publication.

We thank Charlie Cogbill for his advice and council, and Hank Tyler for supervising this work from its beginning. We have appreciated Hank's continuous support and prodding, and the diligence with which he has orchestrated the completion of the task.

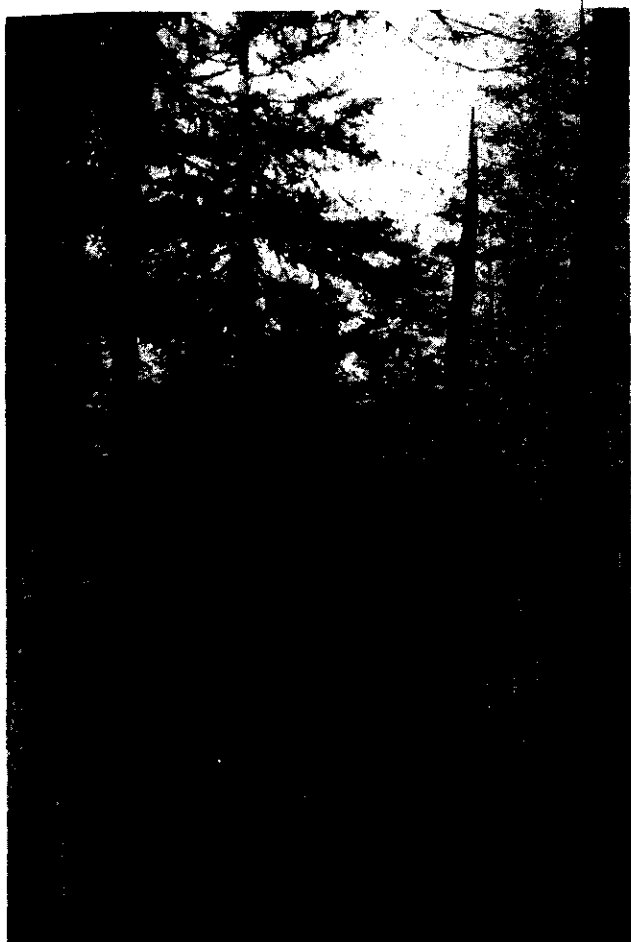
W. Donald Hudson, Jr., Ph.D.
Ronald Cannarella
Leah Garnett
Katherine Huntington

Chewonki Foundation
Wiscasset

May, 1985
revised, March, 1987

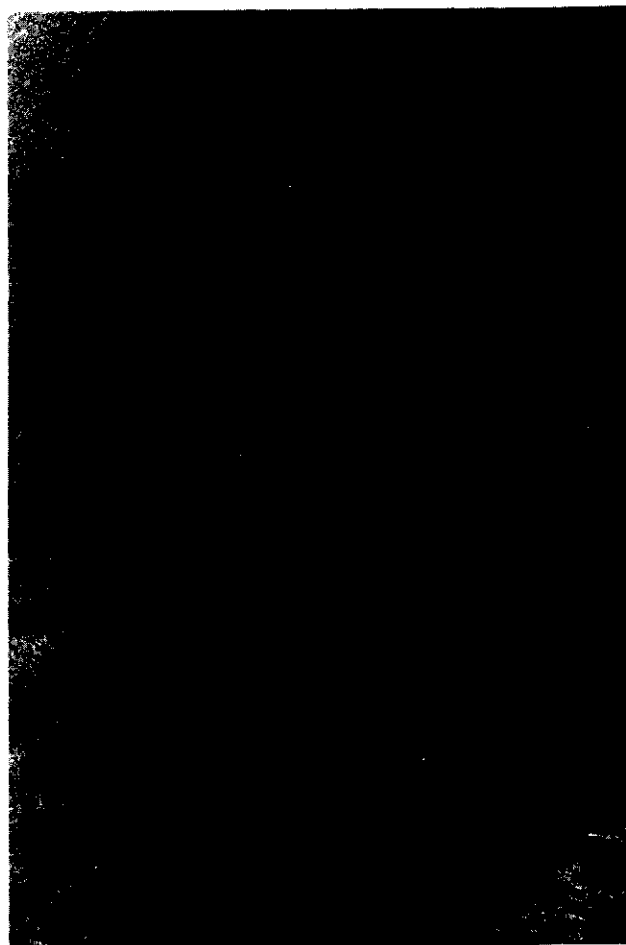
List of Tables & Figures

Table 1. Old-growth sites in Baxter State Park	5
Table 2. Subalpine forest in Baxter State Park	7
Table 3. Composition of the tree stratum (>10 cm dbh) for all stands	8
Table 4. Summary data for vegetation and site characteristics of 12 spruce-fir stands sampled in Baxter State Park, 1984 . . .	9
Table 5. Alpine areas sampled during the summer, 1984, with summary of significant features	11
Table 6. Rare vascular plants of Katahdin	54
Figure 1. T5 R9 WELS	22
Figure 2. T4 R10 WELS	27
Figure 3. T3 R10 WELS	36
Figure 4. T3 R9 WELS (Mt. Katahdin Township	49
Figure 5. T4 R9 WELS	61



Old-growth red-spruce forest on
Wassataquoik Mountain

Photos by W. Donald Hudson Jr.



Fir waves in Baxter State Park

Executive Summary and Recommendations

The object of this investigation was to summarize existing data and to generate new data to better understand the extent and character of old-growth forest, subalpine forest, and the particularly rich alpine features of Baxter State Park. This report documents these resources in detail and the conclusions are summarized below.

General observations of old-growth forest, subalpine forest, and alpine areas.

Old-growth Forests

The condition and characterization of old-growth forests in Baxter State Park was included in Natural Old Growth Forest Stands in Maine (Grena, 1981; State Planning Office, 1983). Four red spruce stands - one above Green Falls (south of Wassataquiok Lake), one above Howe Brook (between North Traveler and Traveler), one on the north slope of North Traveler, and one above Basin Ponds - have been described in the past.

Three additional old-growth stands may now be added to the list, and their ages and full descriptions are included in the body of the report. These data were gathered from various sources, including field research conducted by the authors in the summer of 1984, and research conducted by Charles Cogbill during the early 1980s.

Subalpine Forest - old-growth?

The working definition of old-growth forest (Grena, 1981; State Planning Office, 1983) includes no altitudinal parameter, nor does it limit inclusion of tree species to any particular group of long lived trees of northeastern North America. In fact, according to Grena a simple and hard definition of old-growth forest "continues to be an unresolved necessity."

Four independent components contribute to the narrow traditional old-growth concept: 1) a long history without catastrophic disturbance giving aged trees; 2) influence of natural, not man-induced, conditions for the entire existence of the forest, including initiation; 3) a developmental process consistent with replacing of the present stand; 4) and singularly large trees or aesthetically robust structure to the forest. Criteria for identification of old-growth stands must account for the first three properties: age of origin, historic integrity, and developmental dynamics. The fourth component of impressive size, despite the common perception, is not an ecological condition necessarily indicative of old-growth forest (emphasis ours).

A review of concepts associated with old-growth and regional examples described in associated terms (e.g. virgin, climax, overmature, primeval) leads to the following shared common characters of old-growth:

- 1) a coherent forest stand;
- 2) a long time without catastrophic disturbances;
- 3) influence of natural condition for its entire existence, including initiation; and

Subalpine forests of Baxter State Park

The subalpine forests include a number of physiognomic types: balsam fir/spruce forest, wave-regenerated balsam fir, old-growth red spruce, old-growth black spruce, forested peatland (the Klondike), and even the krummholz or dwarf forest of the alpine regions. Each type presents a different set of research problems. This report covers the following subalpine forest types:

Fir waves

The peculiar wave-regenerated fir forests (fir waves) of the southwestern peaks have been studied for a number of years (Sprugel, 1974, 1976, 1984; Sprugel and Bormann, 1981; Siccama, 1984). Fir waves are wind-induced, cyclic bands that constantly move through the high-altitude, subalpine forests. Bands of dead trees, regenerating trees, and mature forest ring the upper slopes of North Brother, South Brother, Mt. Coe, OJI, Barren Mt. and the Owl, as well as the western flank of Katahdin. This forest type was sampled twice during the summer, on Harvey Ridge and on the Owl. Detailed information about the composition of these fir waves and their herbaceous vegetation is listed in the site summaries for those mountains (Mt. Katahdin Township & T4 R10).

Old-growth Forests

Old-growth forests on Katahdin and the outlying peaks frequently occur within the subalpine forest. These forest stands are treated in detail in the site summaries (all townships).

The Klondike

The Klondike is a high-altitude, forested peatland of black spruce with an understory of northern bog vegetation. The high valley in which the Klondike sits is ringed by mountains, isolating it from the rest of the park. We have summarized vegetation, floristics, and surficial geology of the Klondike in the site summary (T3 R10).

Krummholz

The dwarf black spruce and balsam fir trees that rarely exceed 2 feet in height mark the boundary between subalpine forest and the barren, rocky alpine areas. Since this study does not attempt to evaluate the dynamics, composition, or growth of krummholz in the park we have noted the occurrence of krummholz in all townships, but present no detailed information.

Subalpine Balsam Fir and Spruce Forests

Previous investigations have overlooked the vast majority of the forest in subalpine regions. These forests have not been cut in the past, except for lumbering in the early part of this century on the south and east slopes of Katahdin, specifically on upper Rum Mountain, and due west of Basin Ponds. Though some portions of subalpine forest have not escaped fire, the rest makes up the majority of undisturbed forest in the park. These subalpine forests are of particular interest, in part, because they are fragile ecosystems susceptible to damage. All stands are threatened by fire, and those stands that are virtually pure fir are especially susceptible to insect infestation.

ground, needs to be done.

We based site evaluations of Katahdin and outlying peaks on a literature search and on field work conducted in the summer of 1984 (Fernald, 1901; Ewer, 1930; Stebbins, 1927, 1929; May & Davis, 1978; and others). The new information provided for Katahdin is restricted to plant distribution off the main plateau and the principal peaks.

Conclusions

Our field work brought to light significant new information about old-growth forest stands, subalpine forest (primarily balsam fir forest), and alpine areas.

1. Old-growth Forest

Seven tracts of old-growth forest are listed in the site evaluations. Four of these tracts have been field checked and recommended to the Register of Critical Areas as a result of previous reports (Grena, 1981; State Planning Office, 1983). Three new tracts are recommended here for inclusion on the Register. The present extent of old-growth stands in Baxter appears in Table 1. Detailed information appears in the site evaluations and in Appendix II.

Table 1. Old-growth sites in Baxter State Park.

Locality & Forest Type	Elevation (ft)	Size (acres)	Age (yr)	Status
North Traveler red spruce	2000' - 2450'	25	230-300	Recommended
Traveler red spruce & fir	1900' - 2400'	7+	250-300	Recommended
Center Mountain "	2775'	2	340-390	Recommended
Wassataquoik Mt. "	1900' - 2400'	20+	200-250	Recommended
The Klondike black spruce	2500' - 2800'	832	120-150	Recommended
Basin Ponds red spruce	2700' - 2800'	1.5	300-360	Recommended
Cathedral Trail black spruce	3030'	1.5	200-250	Recommended

The three new tracts recommended for review are Center Mountain red spruce, the Klondike black spruce forested peatland, and Cathedral Trail black spruce.

An eighth tract of approximately 20 acres in size may be found, upon close examination, to be old-growth forest. It is marked on the map of Traveler (Figure 1) between North Traveler red spruce and Traveler red spruce and fir. This stand was not field surveyed during 1984, owing to inclement weather, but it is clearly visible on aerial photographs of the area.

2. Subalpine Forest

Old-growth forest as defined by Grena (1981; State Planning Office, 1983)

Table 2. Subalpine forest in Baxter State Park.

Locality & Type	Township	Size (acres)	Status
Black Cat Mountain	T5 R9	18	Not Recommended
North Pogy Mountain	T5 R9	480	Not Recommended
North Traveler Mountain	T5 R9		Not Recommended
Traveler Mountain	T5 R9	[2,120]*	Not Recommended
South Traveler Mountain	T5 R9	34	Not Recommended
Center Mountain	T4 R10	90	Not Recommended
Wassataquoik Mountain	T4 R10	385	Not Recommended
Mullen Mountain	T4 R10		Not Recommended
Fort Mountain	T4 R10		Recommended
North Brother	T4 R10	[4,263]	Recommended
South Brother	T3 R10		Recommended
Mt. Coe	T3 R10		Recommended
OJI	T3 R10		Recommended
Barren Mountain	T3 R10		Recommended
The Owl	T3 R10	[5,012]	Recommended
The Klondike	T3 R10	832	Recommended
Katahdin	Mt. Katahdin Twshp.		Recommended
(including):			
North Peaks			
Northwest Basin			
Harvey Ridge			
Hunt's Spur			
Keep Ridge			
Great Basin		[5,470]	
South Turner	Mt. Katahdin Twshp.	985	Recommended
North Pogy Mountain	T4 R9	140	Not Recommended
Russell Mountain	T4 R9	2,600	Recommended
North Turner	T4 R9	665	Recommended

* Numbers in brackets represent the total acreage of subalpine forest on contiguous mountain slopes (see Figures 1-5). Acreages appear next to the last mountain listed amongst a contiguous tract of forest.

Table 4. Summary data for vegetation and site characteristics of 12 spruce-fir stands sampled in Baxter State Park, 1984.

	Ctr	SBr	HR	NwB	Fort	Coe	Owl	Cath	Hunt	NB	Kl#1	Kl#2
Elevation (ft)	2775	3530	3780	3330	3375	3670	3670	3030	3120	2820	2820	2895
Aspect	NW	W	all	NE	NE	W	NW	ENE	NW	SE	all	NW
Slope (°)	28	21	0	20	15	18	7	17	18	9	0	9
Canopy (ft)	55±24	28±7	22±4	35±7	32±5	13±2	18±3	46±12	24±4	62±11	34±5	41±5
Age (yr)	155 ±115	49 ±7	63 ±9	75 ±32	96 ±15	52 ±14	38 ±7	121 ±18	107 ±65	224 ±84	117 ±21	111 ±29
Basal Area												
sapling:	20.7	6.1	11.1	2.4	3.5	17.3	61.7	2.0	11.2	2.1	4.7	11.3
all:	30.7	33.4	22.8	57.2	46.7	27.6	66.4	28.8	21.1	27.3	20.0	27.2
(m ² /ha)												
Density (#/ha)	1450	2360	2760	2053	1740	3440	12469	1220	2570	930	1590	1640
Herb cover (%)	17	35	9	43	38	11	8	16		11	53	24
Bryo cover (%)	75	56	33	62	32	57	34	28		35	96	72
Exp. rock (%)	59	5	<1	5	7	9	0	3		14	0	<1
Dead Wood (%)	13	16	7	12	11	14	27	9		10	4	18
Species Richness (#)	8	12	8	25	12	12	15	12	11	8	20	17

Ctr=Center Mt., SBr=South Brother, HR=Harvey Ridge, NwB=Northwest Basin, Fort=Fort Mt., Coe=Mt. Coe, Owl=The Owl, Cath=Cathedral Trail, Hunt=Hunt Trail, NB=North Basin, Kl#1=The Klondike (site #1), Kl#2=The Klondike (site #2).

Table 5. Alpine areas sampled during the summer, 1984,
with summary of significant features.

Alpine Area	Township	Size (acres)	Alpine Species (n)	Special Features
§Katahdin	T3 R9*	Approx. 595.2		Richest source of alpine
Knife Edge	T3 R9	as determined	10	and arctic plants in the
The Chimney	T3 R9	by May &	10	state. May & Davis (1978)
South Basin	T3 R9	Davis, 1978,	32	list 26 physiognomic plant
Cathedral &		1985 acres as		communities. 22 species of
Dudley Trails	T3 R9	determined by	22	vascular plants occur only
Great Basin	T3 R9	recent plani-	21	on Mt. Katahdin in Maine.
North Basin	T3 R9	metry.	16	Between 40 and 50 species
Tableland	T3 R9		31	comprise the total flora.
Klondike Ravine	T3 R9		25	
Witherle Ravine	T3 R9		16	
†The Owl	T3 R10	8	12	Wind swept bald, fir waves.
OJI	T3 R10		6	No open summit.
†Mt. Coe	T3 R10	15	16	Rich veg. on summit slide.
†South Brother	T3 R10	5	12	Access to fir waves.
†North Brother	T4 R10	23	10	"
†Fort Mountain	T4 R10	15	10	Excellent views of Katahdin.
Wassataquiok Mtn.	T4 R10	<1	3	Old-growth red spruce below.
The Travelers	T5 R9			
North Traveler		15	2	Depauperate vegetation as a
§Traveler		121.6	8	result of fire.
Trout Mountain	T6 R9†			Summit burned, no alp plants
†South Turner	T3 R9	1.5	8	Excellent views

* T3 R9=Mt. Katahdin Township; † T6 R9=Trout Brook Township.

§ Registered as a Critical Area for alpine features.

† Recommended as a Critical Area for alpine features.

Zoological Features

The Katahdin Arctic Butterfly should continue to be monitored on Katahdin.

The Arthropod fauna may be the least well understood of all the animal groups in Baxter, and continued searching for new insects, spiders and mites should not stop. Though the listing of species may approach completion, the study of behavior, physiology, and evolution of alpine invertebrates remains an open field. Baxter State Park supports this sort of research, and it should be encouraged to continue.

Geological Features

Heavy human traffic has caused erosion along the most-travelled footpaths to the summit of Katahdin. Although the Trail Crew has done much work, the repair job is long and involved because the area is remote and each project requires strenuous manual labor. Additional labor may be required to assist the Trail Crew in abating above-treeline damage.

Limited areas of patterned ground are found above treeline on Katahdin, and anyone seeking to use the park in studies of this phenomenon of cold climates should be encouraged.

The Flora of Baxter State Park

A thorough botanical search of the lowlands of the park should be conducted to assemble a complete flora. Preliminary information has been included here (Appendix II). Detailed notes are on file at Baxter State Park Headquarters, Millinocket, and the Critical Areas Program, Augusta.

Areas.

Perhaps more interesting and significant are two falls that cascade off the high walls of the North West Basin and Witherle Ravine. Both falls are low volume, but their regular flow, steep pitch, and large drop are sufficient to warrant review for listing.

Botanical Features

General

The earliest European travelers to Katahdin have remarked on the peculiar arctic alpine composition of its vegetation. The common alpine heaths, including bilberry (Vaccinium uliginosum), crowberry (Empetrum nigrum), mountain cranberry (Vaccinium vitis-idaea), Labrador tea (Ledum groenlandicum), and Lapland rosebay (Rhododendron lapponicum) were all recognized from earlier records of ascents of Mt. Washington. The star-like saxifrage (Saxifraga stellaris var. comosa) was first discovered by Rev. Joseph Blake in 1856 while making the first official state botanical excursion to the mountain. It is one of the rarest plants on the mountain, as it is found nowhere else in the eastern United States. It grows in scattered areas on Mt. Albert in the Gaspé, and farther north in Labrador and Baffin Island. This plant forms dense colonies in high arctic marshes above 70° N latitude.

A number of plant species were collected or recorded from early expeditions, but have not been seen in recent times. Dr. Goodale collected a very fine sprig of few-flowered sedge (Carex rariflora), somewhere on Katahdin (Goodale, GH!), but the sedge has never been seen since that first record though numerous botanists have searched for it. The few-seeded sedge, Carex rariflora, should no longer be counted in the flora of Katahdin.

The most famous botanical expedition to Katahdin occurred in 1900 when M. L. Fernald led a group of the New England Botanical Club on an extensive trip. Based at Chimney Pond, the group poured over the near slopes, collecting hundreds of specimens of vascular plants and bryophytes. Their records were published one year later (Churchill, 1901; Fernald, 1901; Williams, 1901; Kennedy & Collins, 1901), and very few additions were made since that time (Ewer, 1930; Stebbins, 1927, 1929). Arctic-loving willow (Salix arctophila) was first discovered by Ewer (1930), and Stebbins (1927) brought back a fragment of a plant that he collected in the Chimney that was subsequently identified by Fernald as Allen's mustard (Draba allenii). The latter has never again been recorded for Katahdin. Stebbins (1927) was also the first to collect Hornemann's willow-herb (Epilobium hornemannii) on Katahdin, as well as one-spiked running clubmoss (Lycopodium clavatum var. monostachyon), the mountain variety of the white mandarin (Streptopus amplexifolius var. oreopolus), and the northern variety of the marsh willow-herb (Epilobium palustre var. labradoricum).

Fernald described a new species of sedge from the gravelly shores of Depot Pond, Carex katahdinensis. A vast number of specimens can be found in herbaria throughout New England, but the plant has not been seen since on the shores of Depot Pond.

Zoological Features

Baxter State Park and Katahdin support large populations of forest animals, including moose, deer, black bear, coyote, variegated hare, beaver, muskrat, martin, porcupine, red squirrel and a number of smaller rodents. The yellow-nosed vole is perhaps the most noteworthy small mammal in the park. It is found on only a few mountain tops in Maine.

The avian fauna includes a number of boreal species not found outside of the mountainous regions of northern Maine. These birds include water pipits, lapland longspurs and boreal chickadees. The alpine areas of the mountain are dominated by ravens and occasionally by sharp-shinned hawks. The subalpine forests support northern juncos, winter wrens, boreal chickadees, blackpoll warblers, and gray-cheeked thrushes as their most common avian fauna.

Irving Blake conducted an ecological evaluation of the upper slopes of Katahdin in 1923 (1927, 1931). His reviews of the environment and the geology of the mountain are outstanding. In his principle report (1927) he presents one of the most succinct and clear descriptions of the vegetation to be found in the literature - though he is writing primarily about the animal communities on the mountain.

Katahdin Arctic Butterfly

The most noteworthy animal on Katahdin is a medium sized butterfly in the family Nymphalidae. The Katahdin butterfly, Oeneis polixensis katahdin Newcomb is a member of the genus commonly called the Arctics. It has a close relative on Mt. Washington and one in low-elevation spruce bogs in the north. The Katahdin arctic is restricted to the plateau areas between 4,000 and 5,100 ft., and it has been seen throughout the month of July (Brower, 1982).

of the arctic-alpine communities was determined. Geographical location, elevation, aspect, slope, and general condition and floristic composition of the station were recorded.

No attempt was made to characterize arctic-alpine communities on Katahdin or the outlying peaks.

The list of alpine areas sampled on the ground includes:

Katahdin (including Keep Ridge, Pamola, the Knife Edge, Baxter Peak, the Tableland extending from the Gateway to the Northwest Plateau, Hamlin Peak and the North Peaks, all the major basins, ridges and slides)

The Owl
Witherle Ravine
OJI
Mt. Coe
South Brother
North Brother
Fort Mountain
Wassataquoik Mountain
The Travelers
Trout Mountain
South Turner

Subalpine Forests

Each stand sampled in this survey was evaluated for composition by observation of the species making up the community of plants present. In addition, a 50 meter transect was laid out along the long axis of a 50 by 20 meter grid or tenth hectare plot within each stand. Every other meter square quadrat falling on the transect was evaluated for percent cover for a total of 25 quadrats in the sample. A 50 meter canopy intercept was walked along the same tape, recording the presence or absence of closed canopy. This measure helped to quantify the overall condition of the stand.

The age structure of the stands was determined by observation of the trees' height, diameter, and the extent of disturbance. A series of increment borings was taken, both to determine the age structure, as well as to determine the oldest age class. Cores were counted in the laboratory with the aid of dissecting microscopes.

The plot study within the tenth hectare area defined in part by the 50 meter tape used as the transect was conducted in each stand. A tally of all stems within the plot was completed, measuring diameter at breast height (dbh) with a calibrated tape.

The summary of all data is included in Appendix III.

Old-Growth Forests

We examined each stand of old-growth forest recorded in the previous state-wide inventory (Grena et al., 1981, 1983). We observed the general

RESULTS of FIELD WORK - Summer 1984

We combine the data gathered in the current survey with existing information on old-growth forest and alpine areas. We reviewed sites north to south, township by township and include detailed information on age, production, and diversity in Appendices.

T5 R9 WELS

North Traveler

Quadrangle: Traveler Mountain 15', 1955

Elevation: 3144'

Date Field Checked: 8 June 1984, W. Donald Hudson, Jr.

Summary of Significant Features

1. Old-growth Forest: Two sites, one previously recommended, one suspected from review of aerial photos, but not yet field checked. The site on the north side of the mountain has been described as one of the finest in the state (State Planning Office, 1983).
2. Subalpine Forest: The forests of these slopes have been burned extensively in the past. The flora is a mixture of successional species (birch, poplar, white and red pine), though a few pockets of balsam fir-red spruce forest have survived. The subalpine forests of North Traveler are not recommended as Critical Areas.
3. Alpine Features: The alpine flora is depauperate, probably the result of fire that denuded the summit in the early part of this century. Three-leaved cinquefoil (Potentilla tridentata) is one of the few alpine plants found on the summit. This summit is not recommended as a Critical Area.

1. Old-growth Forest

a). North Traveler red spruce

Stand Age: 230 - 300 years (maximum age class)

Stand Size: 25 acres

Elevation: 2000' - 2450'

Status: Previously recommended as a Critical Area

This stand and a tract on Howe Brook are described as the only continuous series of old-growth forest up a mountainside in the park (State Planning Office, 1983). It is an even-aged stand that shows some signs of decline, but has escaped notable degradation in recent years. Some individual trees exceed 24 inches (dbh), and the canopy is limited to 60 feet by the rugged mountain climate. Major fires have burned this part of the park in this century, but this site has escaped damage.

We surveyed the stand in early June in inclement weather. The forest

is little changed from Cogbill's examination in 1981. Of all the old-growth stands in the park, this one is perhaps the most extensive and free of insect pests and natural decline.

b). North Traveler red spruce - site two

A second site for old-growth red spruce is suspected to occur east of the summit of North Traveler. It was not surveyed on foot in 1984 due to inclement weather conditions that forced a hasty retreat from the summit. Nevertheless, it shows up clearly on aerial photographs along with the North Traveler site and the site along Howe Brook. This site for old-growth is indicated on Figure 1.

2. Subalpine Forest

Size: approximately 400 acres

Status: Not Recommended as a Critical Area

The subalpine forests of North Traveler and Traveler are not recommended as Critical Areas because of their recent history of fire.

3. Alpine Features

Size: 15 acres

Status: Not Recommended as a Critical Area

The sign of coyote and bear are frequently crossed on the trail to the summit. The ground is rocky, and the summit vegetation is peculiar - unlike that of the summits to the south. A European immigrant, sheep sorrel, grows at 3000 feet. Eastern red cedar forms a small clump of krummholz on the SSW slope of the summit. Common species of the boreal forest grow in the shade of the trees, including bunchberry, blue-bead lily, Canada mayflower, and goldthread. Goldenrod, velvet-leaf blueberry, wild red or pin cherry, bluejoint grass, mountain ash, tall rattlesnake root, mountain spleenwort, interrupted fern, and two species of clubmoss also grow just below the summit.

A forest of balsam fir grows at 3,050 feet, similar to subalpine forests found on the upper reaches of most of the peaks. This remnant survived the last fire to burn the mountain.

The alpine area at the very summit of North Traveler (3,144') is 250 by 175 feet of 2 inch gravel. It is covered about 50% by three-leaved cinquefoil. Just beyond the open ground is a krummholz of fir, with some heart-leaved paper birch, mountain ash, and red spruce. The alpine area of North Traveler is not exceptional, perhaps due to the fact that the summit burned during one of the fires that ravaged the area 80 years ago.

Canada mayflower, white mandarin, marsh blue violet, Canada honeysuckle, oak fern, long beech fern, starflower, snowberry, lady fern, prickly clubmoss, and meadow rue grow with a diversity of mosses on the forest floor. Wild raisin, junberry, mountain maple, red maple, and striped maple are also found here.

2. Subalpine Forest

Size: approximately 1700 acres

Status: Not Recommended as a Critical Area

The open upper slopes of Center Ridge and Traveler dominate the landscape in the northern half of the park. The mountain has burned, and the herbaceous vegetation in both the mid-elevation forests and the alpine area is depauperate.

3. Alpine Features

Size: 121.6 acres

Status: Previously Registered as a Critical Area

May & Davis (1978) provide a brief description of the vegetation and plant communities on Traveler Mountain. The diversity of alpine vegetation is not great, probably due to slow regeneration following fire. The evidence of fire extends to the summit, as on North Traveler Mountain.

In addition to plants identified by May & Davis (1978), bluejoint grass, three-leaved cinquefoil, and velvet-leaf blueberry are found.

The most notable biological feature of Traveler is the great number of moose and deer antlers that can be found on the barren, rocky ridge.

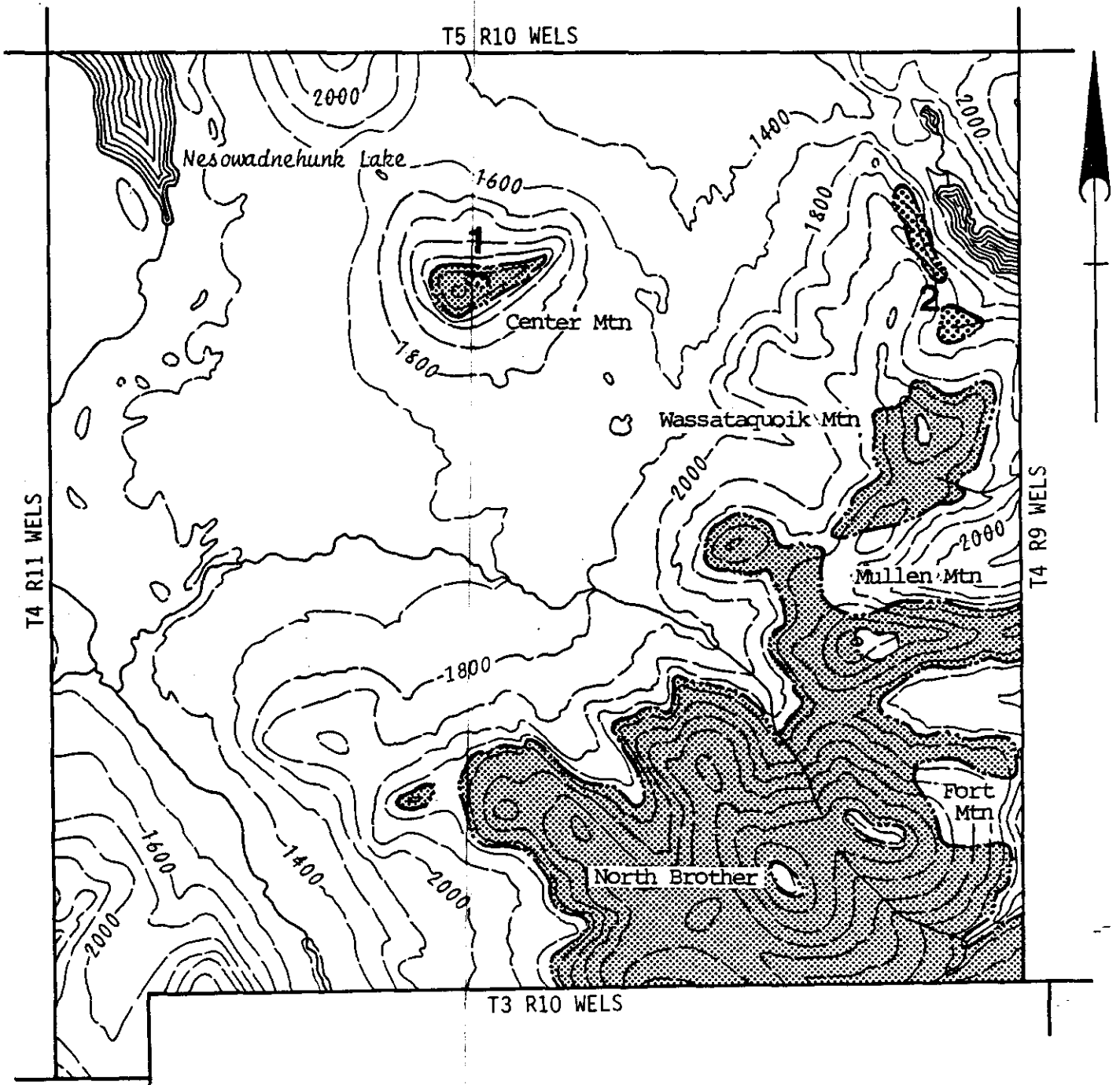
4. Waterfall

Status: Should be reviewed by an hydrologist for significance.

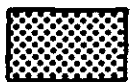
The trail to the old-growth stand on the upper Howe Brook crosses a small, but attractive waterfall several hundred feet in elevation below the stand. The surrounding forest is primarily maple, birch and poplar, the transition to boreal coniferous occurring more dramatically just above this point.

This site was not reviewed for listing as part of the previous investigation of Maine's significant waterfalls (Brewer, 1978). It should be reviewed by an hydrologist or geologist for its relative significance within the context of the earlier work.

Figure 2. T4 R10 WELS



LEGEND



Old-Growth Forest



Subalpine Forest



Alpine Areas (clear areas surrounded by subalpine forest)

1. Center Mountain red spruce
2. Wassataquoik Mountain red spruce

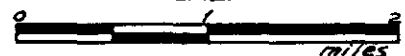
LOCATION DIAGRAM



BAXTER PARK

Contour Interval 200 feet

SCALE



by Richard Kelly

2. Subalpine Forest: The top of Wassataquoik Mountain has burned in recent times, and aside from the old-growth red spruce that extends from 1900' - approx. 2400', there remains no tract of forest that should be considered undisturbed, and, therefore, a Critical Area.
3. Alpine Features: There is nothing of note growing on the small patch of open ground at the summit of Wassataquoik Mountain. The summit was apparently forested prior to the last burning. Alpine bilberry (Vaccinium uliginosum) is one of the few alpine plants found on this summit. One of the alpine willow-herbs (Epilobium hornemannii) grows along the upper reaches of Green Falls, well below the summit at 1800'.
4. Waterfall: Green Falls has been registered as a Critical Area (Brewer, 1978).

The red spruce forests above Green Falls are remnants of the forest that once occupied this valley. Signs of fire and aggressive cutting can be found all along the trail from Russell Pond to Wassataquoik Lake.

1. Old-growth Forest

a). Wassataquoik Mountain red spruce

Forest Type: red spruce - balsam fir
 Stand Age: 200 - 250 years (maximum age class)
 Stand Size: 20+ acres
 Elevation: 1900' - 2400'
 Status: Previously recommended as a Critical Area

The old-growth stand extends well above 1900 feet, notably to the west side of the ravine that is formed by the upper reaches of Green Falls Stream (Figure 2, Area #2). The trees are all declining. The fir has been lost totally to the budworm. An undergrowth of birch is coming up between the remaining big stems of spruce, along with raspberries, bracken fern, and wood sorrel. During the bushwack through this stand to the summit of Wassataquoik Mountain we walked for hundreds of feet on fallen trunks. The canopy is not closed anywhere, and it remains to be seen if the tall spruce can withstand the current infestation.

The remnant of the stand that extends to the northwest of Green Falls, along the crest of the steep ridge that parallels the lake, is in similar condition.

Several cores were taken and no differences from previously reported samples were encountered.

2. Alpine Features

Size: >1 acre
 Status: Not Recommended as a Critical Area

This peak is most easily reached by following the stream bed that feeds Green Falls through the stand of old-growth red spruce to the top.

1. Subalpine Forest

Size: approximately 1000 acres (see Figure 2)

Status: Recommended as a Critical Area

Fort Mountain lies on the northern rim of the Klondike, northeast of the Brothers and northwest of Northwest Basin (Figure 2). An old trail leads to the summit from a point southwest of Annis Brook, but it is obscured at this low elevation. The eastern slope of the mountain is covered in a forest of successional birch, raspberries, and mountain ash, amidst a standing maze of dead and dying fir. The forest is not so badly damaged at higher elevations, and as a result, the blue blazed trail to the summit is remarkably clear above 3,100 feet.

A narrow band of krummholz extends from the summit to the fir forest below, meeting it at roughly 3,700 feet. We did not observe the same sort of decline in the krummholz as observed in the subalpine forest below. Red and black spruce replace balsam fir with elevation in the dwarf forest and the krummholz, and these trees are apparently able to withstand greater environmental abuse than the fir.

Ten trees were cored on Fort Mountain, nine fir and one birch. In all cases, the trees have not grown as well during the past five years as they did in the preceeding five. At least some of this may be attributable to the budworm, and some may be attributable to acid deposition. Whereas sulfates contribute significantly to acidification of lakes and ponds in the northeast, the contribution of nitrates is in question. Some researchers believe that these compounds act like pulses of fertilizer in subalpine and alpine soils, stimulating growth at a time of the year when trees are normally hardening for winter. The end result is direct tissue damage to leaves caused by freezing temperatures and freezing, drying winds. Needles die and drop, trees decline, and eventually succumb.

The mean age for balsam fir on Fort Mountain is 74.2 years. Detailed information on tree ring data is found in Appendix III.

Species richness is not overwhelming in this subalpine forest, yet it is more diverse than the more depauperate sites like Center Mountain. There are no unusual members of the high elevation forest herbaceous flora found at this location, though bastard toadflax grows in the subalpine forest in the hollow between the two peaks of Fort Mountain.

Nine species of herbaceous vascular plants were recorded in the transect (the frequency and cover (%) appear in brackets): mountain wood fern [8, 12.5], wood sorrel [80, 31.3], Canada mayflower [28, 3.3], goldthread [28, 19.6], blue-bead lily [24, 7], bunchberry [52, 8.4], intermediate woodfern [28, 6], starflower [40, 4.3], bristly clubmoss [8, 5].

We suspect that this location on Fort Mountain is a good place to sample as an altitudinal gradient for boreal and subalpine species of woodfern. The question is prompted by the fact that both intermediate woodfern (more common at lower elevations in the forest) and mountain woodfern grow at this elevation.

2. Subalpine Forest - Fir Waves: One of the largest concentration of well developed wave-regenerated fir forests occurs on the east slopes of North Brother. This mountain is included in the large area recommended as a Critical Area.

1. Alpine Features

Size: approx. 25 acres including large area of krummholz
Status: Recommended as a Critical Area

The summit of North Brother is reached by passing through the shallow col between South Brother and this peak (Figure 2). Fir waves are visible in the col, and along the southeast flank of North Brother.

The summit of North Brother is surrounded by a two foot krummholz that is 70% black spruce, emerging from the fir dominated subalpine forest. Diapensia and numerous heaths present on South Brother grow in gravelly areas between the patches of krummholz and boulders. The stone faced terraces below the summit show evidence of periglacial activity.

The alpine zone starts at roughly 4,050 feet on a western exposure with a 15° slope. There is a meadow roughly 70 feet in diameter dominated by Highland Rush and Bigelow's Sedge, as well as alpine bilberry, and mountain cranberry. Crowberry and mountain sandwort show up a bit further towards the summit.

The alpine zone at the top of North Brother extends about 300 feet to the west, and includes a number of heaths, sedges, and rushes. The area extends only 100 feet to the east of the summit, and this side of the summit is dominated by rocks and boulders. The western knob of North Brother is rock rubble. Tucked in behind this knob at a NNE exposure and on a 25° slope is a little patch of alpine vegetation surrounded by a rocky garland. On a N facing slope below the western knob is a well developed cushion of Diapensia growing on a blowout with a 5° slope. This little arctic alpine community is surrounded by 1 foot krummholz on patterned gravel. A similar Diapensia community extends around the knob to face South Turner (WSW) and is 10 x 10 feet in size. These Diapensia communities are made up by 30% of this plant, 40% alpine bilberry, and 20% lichens (Cetraria spp., Cladonia spp., and Parmelia spp.). Mountain sandwort grows here and there in gravelly, barren areas.

A large alpine area extends for about 400 feet to the ENE below the summit, on a 16° slope. It is mixed in a patchy way with 1 foot black spruce krummholz, and with rock. More of the Diapensia community described above is found on the patterned ground between patches of krummholz, but more vigorous growth of alpine bearberry, crowberry and Bigelow's sedge is found presumably because it is protected from prevailing winds. The greyish moss, Dicranum pilifirum grows in the old parts of cushions where the Diapensia has died. The vegetation on this exposure is 50% krummholz and 50% Diapensia/alpine bilberry dominated dwarf shrub community.

On the SE slope facing Katahdin, the krummholz extends 800 feet down the mountain. Seventy-five percent of the ground is covered by krummholz and 25 % is covered by rock. There are a few patches of four foot trees,

T3 R10 WELS

South Brother

Quadrangles: Harrington Lake, 15', (1958) and Katahdin, 15', (1949)

Elevation: 3951'

Date Field Checked: 9 June 1984, W. Donald Hudson, Jr., C. Cogbill

Summary of Significant Features

1. Subalpine Forest: The subalpine forest is almost entirely balsam fir and some budworm damage is apparent. This mountain is part of the ring that surrounds the Klondike, and is included in the subalpine forest that is recommended as a Critical Area.
2. Subalpine Forest - Fir Waves: This is a good vantage point for studying wave-regenerated fir forests on the slopes of these southwestern peaks. The fir waves are included in the area recommended as a Critical Area.
3. Alpine Features: The alpine area at the summit of South Brother is small, yet rich, including highland rush (Juncus trifidus), Diapensia (Diapensia lapponica), alpine bilberry (Vaccinium uliginosum), mountain cranberry (V. vitis-idaea), black crowberry (Empetrum nigrum), and Bigelow's sedge (Carex bigelowii). Deer's hair (Scirpus cespitosus) and highland rush (Juncus trifidus) also grow along the South Brother slide at relatively low elevation along with a number of heaths. In all, 12 species of alpine plants are found on this summit, and it is recommended as a Critical Area.

1. Subalpine Forest

Size: approximately 500 acres (see Figure 3).

Status: Recommended as a Critical Area

The subalpine forest at the top of the South Brother slide is virtually all balsam fir. Some birch grows in the plot, and no spruce was found at this elevation. There is sign of budworm damage in the tops of the fir, but they are not as devastated as in other stands. The limits of subalpine forest are indicated in Figure 3.

Data from this stand are characteristic of high elevation balsam fir forests in the park. There is no evidence of fire or cutting in the stand, and little evidence of windthrow. The age of the trees is relatively uniform and young. All of the physiognomic characteristics of old-growth forest listed earlier, other than dramatic old age, are found here.

Fourteen trees were cored in the plot. The mean age was 49 years. No tree exceeded 35 feet. Data from cores is summarized in Appendix III.

We recorded eight species of vascular plants, seven along the

transect. The frequency and cover (%) for the following species are: starflower [36, 5.5], wood sorrel [80, 22], mountain wood fern [44, 10.5], blue-bead lily [36, 21], skunk currant [4, 50], bunchberry [16, 6.25], whorled-wood aster [4, 10].

2. Subalpine Forest - Fir Waves

Size: Numerous fir waves in the col between South and North Brother, and along the E and SE upper slopes of South Brother.

Status: Part of the large area recommended as a Critical Area.

The Brothers, along with OJI and the Owl, afford the easiest access to fir waves. This is one of the sites studied by Dr. Thomas Siccama of the Yale School of Forestry and Environmental Studies. The greatest development of waves is in the shallow col between North and South Brother.

3. Alpine Features

Size: > 1 acre

Status: Recommended as a Critical Area

The trail to the base of the South Brother slide is a pleasant walk through mixed hardwood and boreal forest. The trail passes through a small stand of black spruce on a small gravelly outwash not far from the base of the slide (2,100 feet). Cotton grass, one of the white violets, bog laurel, bog cranberry, and Hudson Bay bulrush grow in a small bog near the base of the slide.

The alpine deer's hair grows on the north side of the slide at 2,250 feet. Not far above, one can find alpine clubmoss, Labrador tea, three-leaved cinquefoil, Rhodora, alpine bilberry, and a number of other heaths. Near the top of the slide heart-leaved paper birch grows in the disturbed ground. Out on the loose gravel surface of the slide are highland rush, mountain sandwort, short-tailed rush, and round-leaved sundew.

The summit is not far from the top of the slide. It is surrounded by subalpine spruce and fir and a field of large boulders. 50% of the summit area is covered by boulders and large rocks. Crevices are filled with black spruce, balsam fir, and heart-leaved paper birch krummholz. There is a small, gravelly blowout (30 x 45 feet, and cross-shaped) on the south side of the summit. Alpine bilberry, Labrador tea, mountain cranberry, highland rush, Diapensia, and crowberry grow along the edges of the blowout. There are 12 small clumps of Diapensia less than a 6 inch sq. size, and one large clump that is 3 feet in diameter. The entire middle of this clump is dead (2 x 1 ft.), and the living rim of this large cushion is growing with alpine bilberry and the lichen Cetraria nivalis.

South of the blowout is a small area of 3 inch tall black spruce krummholz (10 x 15 ft.), in the center of which grows Bigelow's sedge. This loose sedge turf also includes alpine bilberry and several species of lichen (Cladonia and Cetraria spp.).

(see Appendix III), and the overall herbaceous cover was 11%. Only two other sites had herbaceous cover as low or lower than this figure, and this may be an indirect measure of the health of the forest trees, since healthy trees create a much denser canopy and reduce the amount of light falling onto the forest floor. We recorded frequency and cover (%) for the following plants: wood sorrel [36, 16.1], goldthread [4, 5], starflower [24, 6.7], blue-bead lily [4, 5], lowbush blueberry [4, 2], and skunk currant [16, 15].

2. Alpine Features

Size: approx. 10 acres (most of which is the Mt. Coe slide)

Status: Recommended as a Critical Area

Arctic/alpine plants begin to appear along the trail to the Mt. Coe slide about .5 miles from the cutoff. Highland rush appears at 2,300 feet. The plants are growing on a shoulder of unsorted gravel and sand of glacial origin that borders stream. At 2,580 feet, below Old Jay Eye Rock on OJI, mountain sandwort appears, growing amidst abundant highland rush. Boreal bentgrass appears a bit further along where the trail crosses the stream.

The Mt. Coe slide has a 27° slope. Near the base of the slide, at 3,260 feet, one finds Bigelow's sedge and highland rush, boreal bentgrass and drooping woodreed. Ericaceae and Empetraceae abound, represented by purple crowberry and black crowberry, alpine bilberry, velvet-leaf blueberry, mountain cranberry, Rhodora, snowberry, Labrador tea, and sheep laurel. Sphagnum grows in deep mats in seepy areas, and supports round-leaved sundew, whorled wood aster, spiked woodrush, bluejoint, mountain sandwort, and an obscure white violet. Three-leaved cinquefoil grows 200 feet from the top of the slide.

The top of Mt. Coe is open and is covered by a krummholz of fir, spruce and birch. Dwarf shrub heaths also dominate the small alpine zone (45 x 60 ft.). The list of species present includes balsam fir, black spruce, heart-leaved paper birch, mountain ash, alpine bilberry, lowbush blueberry, mountain cranberry, velvet-leaf blueberry, dwarf bilberry, Labrador tea, purple crowberry, wood sorrel, starflower, blue-bead lily, bunchberry, snowberry, skunk currant, goldthread, and whorled wood aster.

The trees on the summit are not damaged by budworm, in stark contrast to the appearance of lower elevation forests viewed from all directions.

Mt. OJI

Quadrangle: Harrington Lake, 15', (1954)

Elevation: 3410'

Date Field Checked: 16 July 1984, W. Donald Hudson, Jr., Ron Cannarella,
Leah Garnett, Kate Huntington

Summary of Significant Features

1. Subalpine Forest: The forest on the north slopes of OJI is similar to that described for Mt. Coe above. It is part of the

The Klondike

Quadrangle: Harrington Lake, 15', (1954); Katahdin, 15', (1949)

Elevation: 2400' - 2900'

Dates Field Checked: 5 - 8 August 1984, W. Donald Hudson, Jr.,
Ron Cannarella, Leah Garnett

Summary of Significant Features

1. The Route: The easiest access into the Klondike is from the summit of Mt. Coe. Fir waves impede the walk up and out of this high valley along the south flank of the Northwest Plateau to Klondike Pond.
2. Surficial Geology: This semi-forested peatland lies on a hardpan of unsorted gravel, the only mineral soil is found on a few drumlin-like hills in the center of this valley, and is a high-elevation brown podzol.
3. Vegetation: The shrubby and herbaceous vegetation is that of a classic peatland - heaths and sedges predominate. The quagmire sedge, Carex limosa, is only found here in the park, and it to the flora. A complete list of the flora of the Klondike is in Appendix III.
4. Old-growth Forest: The Klondike consists of one square mile of black spruce forested peatland, the largest high elevation stand of undisturbed forested peatland in Maine. It is recommended as a Critical Area.
5. Peatland: The Klondike is a unique peatland in Maine, as well as an old-growth forest.

There is little account of the Klondike in the literature, though it must have been explored in the past. The reference to the Canadian and Alaskan wilderness is a compelling epithet, and it fits this wild stretch of forest in all respects. Botanists, zoologists and geologists have been intrigued by the potential for exciting discovery in such a remote and unknown place, luring the interested party by lying so close at hand - yet out of touch. Many have thought that a descent to Klondike Pond on the east rim of the valley is a visit to the Klondike. But the valley proper lies 1000 feet below the pond and is characterized by vegetation different from that found anywhere else in the park. Anecdotes abound of forays into the Klondike from Mt. Coe, OJI, or Annis Brook (crossed on the Northwest Basin Trail from Russell Pond to Davis Pond) in search of airplanes or adventure. But the vegetation remains undescribed, and the most common answer to the question, "What's in the Klondike?", is, "Nothing!", or, "Moose!".

In order to describe the vegetation and the surficial geology, we bushwacked from Mt. Coe to Klondike Pond, and spent two nights in the Klondike. We summarize our observations, and additional information is found in Appendices.

3. Vegetation

The forest is a wet, black spruce semi-bog growing on an organic substrate. The trees do not exceed 40 feet, and they are free of budworm damage. Black spruce flushes new leaves later in the spring than does balsam fir or red spruce, which explains how the valley remains free of infestation while the surrounding slopes are devastated.

The production of this semi-bog measures 20.0 m²/ha (basal area). This compares to 28.8 m²/ha produced on an upland black spruce forest along the Cathedral Trail. The canopy is not completely closed, owing largely to the architecture of black spruce, and there is a diversity of herbs and shrubs growing on the forest floor. Sedges and grasses are more diverse than in drier forest sites both in the shade of the black spruce, and in the open boggy meadows that line the banks of the stream. The quagmire sedge and the very depauperate sedge (Carex limosa and C. paupercula) are found in these wet sights. The former was found only in the Klondike during this survey, and is new to the park.

It is not clear what limiting factors restrict the growth of trees in some areas of the Klondike, but the proximity of these open bogs to the stream suggests that the water table may have some major effect. The bogs support lush growth of numerous heaths, sedges and grasses. Orchids are absent, save the Beard-flower, Pogonia ophioglossoides.

There are a few fire-scarred trees found in the black spruce forest, but evidence of widespread fire was not found. These isolated fire sites probably represent lightning strikes, and they indicate that the forest is not free of the threat of fire. Fire is an important limiting factor in the growth and development of black spruce semi-bogs in central Quebec (C. Cogbill, personal communication).

The aquatic vegetation is sparse. At the outlets of the ponds, and here and there in the stream, the moss Fontanalis grows. Tapegrass, and water starwort grow with a species of pondweed, Potamogeton sp., in the slow moving water of the pond.

4. Old-growth Forest

a). The Klondike black spruce (forested peatland)

Forest Type: Black Spruce Forested Peatland (or semi-bog)

Stand Age: 120 - 150 years (maximum age class)

Stand Size: approximately 832 acres

Elevation: 2500 - 2800'

Status: Recommended as a Critical Area

The vast majority of this high valley is a forested peatland or semi-bog forest of black spruce (see Worley, 1981, for a detailed review of Maine peatlands, and the relationship of this forested peatland to others in Maine), with some balsam fir, birch and alder growing there as well. There is no mineral soil in the lower portion of the valley, though a few small knolls that are noted on the topographical map do have well developed mineral soils. The undergrowth is well developed heath, and many sedges common to treeless bogs also grow throughout the forest. The

which will probably dominate the majority of mid-elevation forests around Katahdin, and is certainly the result of spruce budworm infestation. The conditions of the forest improve somewhat at higher elevations, and the windblown subalpine forest between the twin peaks of the Owl is undisturbed.

The fir waves reach the summit of the Owl. We sampled the forest midway between the two peaks in the uppermost wave of a field of waves that extends up the western flank of the mountain. Another series of waves is moving in the direction of Witherle Ravine to the northeast and below the summit of the Owl. A startling number of saplings were counted in the plot sampled (334 of the 354 stems of balsam fir counted in 1/40 ha). A precise measure of the front of the fir wave included in this sample will allow a determination of the rate at which the wave is progressing. Though mortality is low in this location, the growth in the past five years is far out-paced by the previous five.

We cored nothing but balsam fir and no tree was greater than 25 feet in height. The mean age was 37.6 years, the oldest 49 years. In the majority of cases, there is considerable discrepancy between the growth of the last five years and that of the previous five. This does not correspond with the area of dead wood standing on the plot (2.3 m²/ha) in comparison with 66.35 m²/ha of living trees.

We recorded twelve species of herbaceous and shrubby vascular plants in this plot, though fewer were found growing along the transect. Wild red cherry and mountain ash grow here in addition to spruce, fir and birch. The overall herbaceous cover was 8%, the lowest figure for any site sampled. This is most certainly a measure of the density of saplings and young trees recorded for the plot. Frequency and cover (%) for the herbaceous plants were: wood sorrel [48, 9.3], mountain wood-fern [40, 5.1], blue-bead lily [16, 5], starflower [8, 6], bunchberry [8, 3.5], and bristly clubmoss [4, 5].

We observed whorled-wood aster, Canada mayflower, and three-seeded sedge in the plot but not along the transect.

2. Alpine Features

Size: >1 acre

Status: Recommended as a Critical Area

There is severe spruce budworm damage in the forest along the trail to the Owl. It is most pronounced at 2,600 feet, where raspberry, wild red cherry, and paper birch are replacing dead fir and spruce. Fir seedlings are in great abundance beneath the berries and shrubs.

Balsam fir, black spruce, heart-leaved paper birch, mountain ash, and mountain alder grow on the east knob of the Owl (3,710 ft.). A windswept bald that faces E40°S is roughly 50 x 100 feet in size. Alpine bilberry, Labrador tea, velvet-leaf blueberry, Canada mayflower, bunchberry, three-leaved cinquefoil, highland rush, and boreal bentgrass grow throughout this dwarf shrub community. The route to Witherle Ravine leads from the summit through the fir waves at this end of the Klondike. They are very pronounced and aligned perpendicularly to the prevailing wind

Mt. Katahdin Township (T3R9)

South Turner

Quadrangle: Katahdin, 15', (1949)

Elevation: 3122'

Date Field Checked: 8 June 1984, W. Donald Hudson, Jr., C. Cogbill

Summary of Significant Features

1. Alpine Features: Fire has burned almost to the summit of this isolated peak. The alpine area is small, and not exceptionally diverse (8 species), though it is recommended as a Critical Area. The flora of South Turner is as diverse as that of Traveler, the alpine area of which is several hundred times larger. Labrador tea (Ledum groenlandicum), highland rush (Juncus trifidus), alpine bilberry (Vaccinium uliginosum), and deer's hair (Scirpus cespitosus) are amongst the plants found on the summit.

1. Alpine Features

Size: 1.5 acres

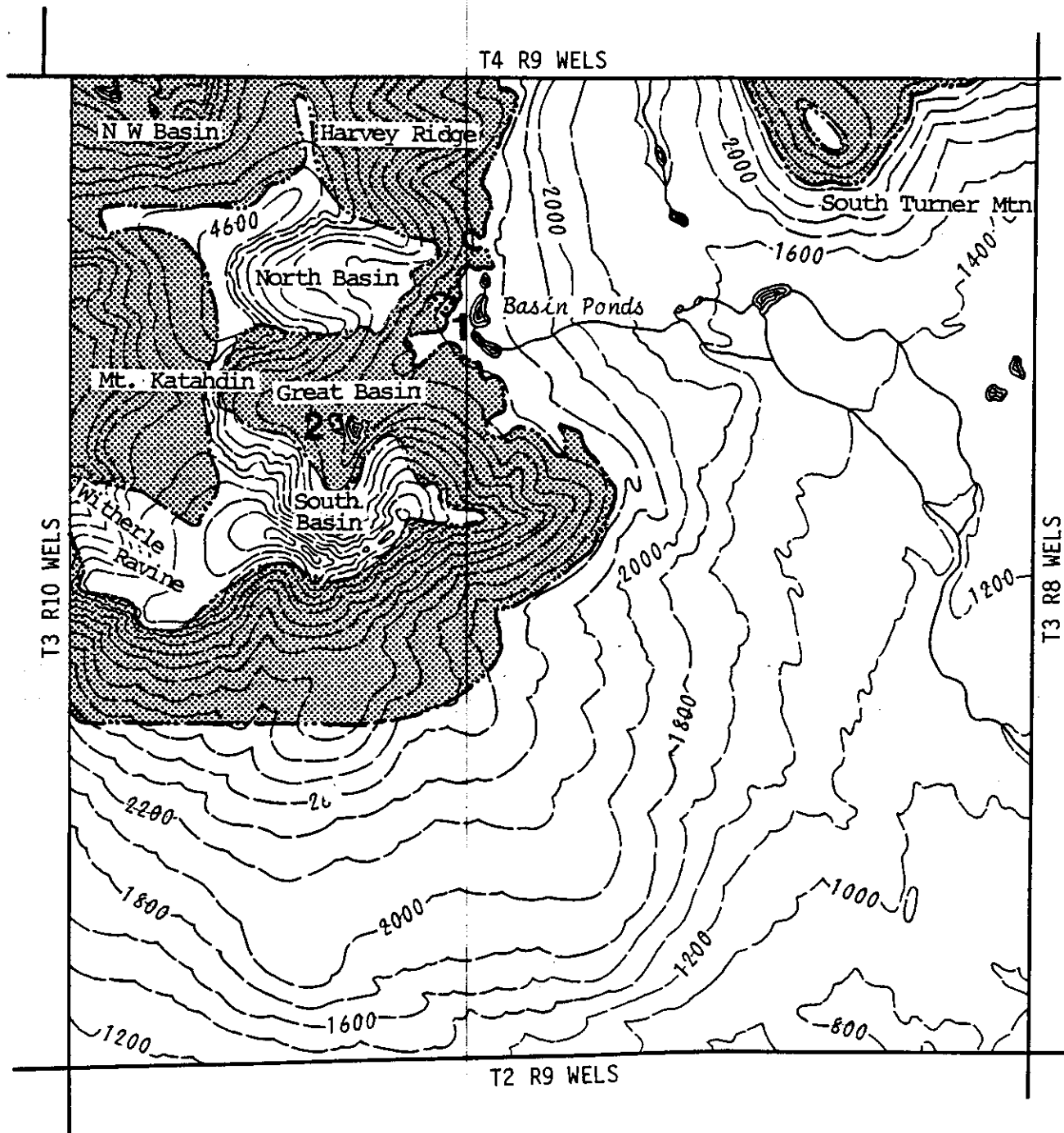
Status: Recommended as a Critical Area

The summit of South Turner is treeless. The subalpine forest to the ENE almost reaches the top of the mountain, and supports a common assemblage of plants: balsam fir, black spruce, heart-leaved paper birch, and mountain ash, as well as velvet-leaf blueberry, and Labrador tea. Eastern red cedar grows on the summit. A more diverse rush dwarf shrub heath community that includes highland rush, black crowberry, alpine bilberry, and velvet-leaf blueberry, as well as deer's hair, grows on the slopes to the WSW.

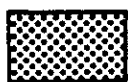
Bluejoint grass, running clubmoss, Canada mayflower ground pine, highland rush, three-leaved cinquefoil, tall rattlesnake-root, alpine bilberry, a sedge (Carex brunnescens), and black crowberry grow in an open grassy meadow south of the summit. Here there is also evidence of fire. Though evidence of fire reaches this summit, the diversity of plants is greater than on the much larger barren summit of Traveler.

Hornemann's willow-herb, Epilobium hornemannii, grows at lower elevation in the forest below the summit of South Turner. This rare plant is an herb of stream-sides and seeps in high elevation forests, and not a plant of the open, tundra-like alpine areas. The rarest plants in the park occur in similar wet habitats in the steep ravines of the South and Great Basins of Katahdin.

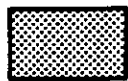
Figure 4. T3 R9 WELS
(Mt. Katahdin Twp.)



LEGEND



Old-Growth Forest



Subalpine Forest



Alpine Areas (clear areas surrounded by subalpine forest)

1. Basin Pond red spruce
2. Cathedral Trail black spruce

LOCATION
DIAGRAM



BAXTER PARK

Contour Interval 200 feet

SCALE



criss-cross the floor, and the terrain is patched with the pits and mounds that are the remnants of trees long dead and decayed. There is little sign of budworm damage at this site. The section of the North Peaks Trail that crosses near this site is apparently a favorite moose yard as the trail is literally buried in scat for a stretch of 50 yards.

We sampled 11 trees in this plot. The stand is primarily fir with a few scattered red spruce. We cored trees at the leading edge of the advancing wave. All of the standing dead fir trees in the wave showed clear signs of frost damage. Their lower trunks were splintered, indicating rupturing by ice, and not simple rot. The mean age of this stand is 62.7 years (64.4 yr for balsam fir, and 55 yr for red spruce).

We recorded six species of herbaceous vascular plants in the plot. The transect extended into the fir wave for 40 feet, and in that space we found only two small clumps of wood sorrel and bunchberry. Light is prevented from penetrating to the ground by the regeneration of young fir in this portion of the wave. Frequency and cover (%) for the following plants is included in brackets: wood sorrel [56, 10], goldthread [28, 5], Canada mayflower [8, 7.5], starflower [4, 5], bristly clubmoss [4, 5], and blue-bead lily [8, 5].

b). Northwest Basin

The trail from Davis Pond to the Northwest Plateau ascends steeply. We sampled the subalpine forest at 3,330 feet. There are no signs of fire or logging at this elevation. The canopy is closed and reaches a height of 40 feet. This forest is dominated by balsam fir (basal area of 51.6 m²/ha), with intermittent red spruce (basal area of 4 m²/ha) and heart-leaved paper birch (basal area of 1.6 m²/ha). The death of fir is marked (basal area of 24.8 m²/ha of standing dead stems). The spruce budworm is apparently responsible.

We cored 11 trees in the Northwest Basin. The mean age for fir is 62.9 years, and that of red spruce is 105.3 years. Both fir and spruce did not grow as well during the last five years as they did during the previous five, a measure of the very visible decline of the forest.

The subalpine forest growing on the steep slope to the southwest of Davis Pond has the richest flora of all the sites we examined. Twenty-five species of vascular plants are represented, including four species of fern, and a number of herbs found more commonly in lower elevation spruce/fir forests. Mountain maple and mountain ash grow here in addition to spruce, fir and birch.

We recorded 12 species of herbs along the 50 m transect. Frequency and cover (%) are in brackets: wood sorrel [84, 31.4], mountain wood fern [36, 12.2], New York fern [4, 5], whorled-wood aster [60, 8], blue-bead lily [56, 7.9], one-flowered wintergreen [4, 1], starflower [12, 5], bunchberry [4, 5], rose twisted-stalk [36, 5.5], skunk currant [8, 12.5], and raspberry [4, 5].

We found goldthread, twinflower, wild sarsaparilla, long beech fern, oak fern, false Solomon's seal, and a white violet (*Viola incognita*) in

e). North Basin Cut-off Trail - old-growth red spruce

This stand is also recommended as a Critical Area for old-growth Forest.

The stand of red spruce trees lies midway along the North Basin Cut-off Trail due east of Blueberry Knoll. The forest is growing on the moraine that marks the end of the North Basin, and as a result, the terrain is rocky and uneven. Though the larger trees seem to be withstanding the current infestation of spruce budworm, numerous smaller trees have succumbed to the pest. We noticed some decline in growth of the larger trees, but it is not as marked as in other stands.

This is an uneven aged stand with healthy regeneration of spruce. No fir larger than 15 centimeters (6 in) grows in the plot, and a fraction of the basal area is attributable to fir (.8 m²/ha, as opposed to 21.1 m²/ha of spruce). The spruce do not reach the size (as measured by dbh) that obtains for spruce in other old-growth stands on Traveler and Wassataquoik Mountain, and that may be the result of increased exposure to wind, snow, and ice in winter.

The mean age at this site is 224 years. The oldest tree sampled was 357 years. The smallest tree sampled was the second oldest - 303 years. Size does not necessarily correlate with age.

The herbaceous flora is depauperate in this stand. We noted few species along the transect, and found only two additional ones in the plot, Labrador tea and Indian pipe. As before, we measured frequency and cover (%) for the following species: velvet-leaf blueberry [64, 7], snowberry [44, 14.3].

3. Alpine Features

Size: approximately 600 acres by earlier estimates, 1985 acres by current estimates (see Figure 4)

Status: Registered as a Critical Area

We list those plants that grow only on Katahdin in Maine (Table 5), and are rare, in part, because of their restriction to arctic-alpine habitats. The majority of these plants are found also on the higher summits, steep cliffs, and cold, wet ravines of other arctic-alpine habitats in New England. Many of these plants grow abundantly in the arctic, and a few are restricted to the mountains of the northeast. Readers may refer to standard references for detailed discussions on the relationship of this flora to that of other New England mountains (Williams, 1901; Harvey, 1909), the North Atlantic region (Hulten, 1958), or the circumpolar north (Hulten, 1937, 1963, 1964, 1971; Harshberger, 1911). We included in the list only those plants that have been verified in recent years or during this study.

Edge from the West Peak (Baxter) to Pamola Peak. We did not find the plants growing there. Aside from predictable heaths and grasses, as well as some of the more common plants growing on the adjacent areas of the Tableland, northern woodrush is the only arctic-alpine plant growing along the Knife Edge. Star-like saxifrage still grows in the col between Pamola and Chimney Peaks. The plants are very low, growing in the moss and Bigelow sedge along the west wall of the col. In the time that these plants have been observed regularly (annually since 1976) they have not flowered.

2). The Chimney

A fifty-year old report (Stebbins, 1927) places star-like saxifrage growing all the way up the Chimney from the base of the South Basin to the top of the col. The localities at the top of the col are all that have been discovered in many descents and ascents of the Chimney since 1975. White mountain-saxifrage can be found sparingly between chock stones #1 and #2, and below chock stone #1 (counting from the base of the Chimney). We did not verify Stebbin's (1929) find of Allen's mustard. We are reasonably sure that we have relocated the large station of white mountain-saxifrage between the first two chock stones in which Allen's mustard was reported to grow, but there are now no traces of the mustard.

White mountain-saxifrage, northern woodrush, and species of willow-herb grow at the base of the False Chimney that rises just to the SW of the Chimney. Alpine cress, pearly everlasting, mountain cudweed, and Boott's rattlesnake-root can also grow in the Chimney. In addition to all of the alpine heaths, dwarf willow grows just below the top of the Chimney col.

3). South Basin

The most diverse assemblage of rare plants on Katahdin is in the South Basin. Growing in Sphagnum spp., Bazzania trilobata, and Scapania sp. at the source of an alpine stream are alpine cress, star-like saxifrage, alpine bistort, and proliferous fescue (this is the only station on the mountain for the latter two species - based on five years of extensive searching). Shrubby cinquefoil, northern woodrush, alpine willow-herb, and perhaps pimpernel-leaved willow-herb also grow here. Still higher in the basin (near the base of the large slab that is referred to by climbers as the Armadillo) grows alpine speedwell, willow-herbs, and cow parsnip in a small snowbank community.

4). Cathedral and Dudley Trails

The heaths dominate the vegetation of the areas above tree line on both of these trails. Alpine bilberry, velvet-leaf blueberry, mountain cranberry, and Labrador tea predominate. Also found there are black crowberry, purple crowberry, Diapensia, three-leaved cinquefoil, mountain sandwort, as well as the less common heaths: Lapland rosebay, alpine azalea, bog laurel, mountain heath, moss plant, and alpine bearberry.

We observed mountain clubmoss, highland rush, Bigelow's sedge, and the grasses crinkled hairgrass and boreal bentgrass amongst the krummholz of black spruce, fir, and heart-leaved paper birch. Mountain alder and

along the Northwest Plateau. The relationship of this dwarf tree to small birch is not clear.

The alpine communities around the North Peaks are dominated by alpine bilberry and Labrador tea (50%/50%). Alpine azalea, Lapland rosebay, and alpine bearberry are notably absent. This is strikingly different than in other places around Katahdin. The slopes of Keep Ridge on the southeastern side of the mountain are covered with a dwarf shrub community that includes virtually all of the alpine heaths found on the mountain, in addition to bearberry willow and the alpine rushes, sedges, and grasses.

We searched the springs on the Tableland and did not find any peculiar or locally rare plants, notably few-flowered sedge, Carex rariflora. Few-flowered Sedge has not been seen on Katahdin since Rev. Blake collected it in 1856. We do not include it in a flora of the mountain.

e). Klondike Ravine

The most important of the arctic-alpine species that grow in this area is arctic-loving willow. It grows in a small patch (roughly 24 x 12 feet) along the north side of a large granite slab (due east of the pond). We and others before us found only male catkins, and this may be a single individual.

A small stream crosses the trail (or rocky slide) that leads by way of some old cairns from the Northwest Plateau down to Klondike Pond. Deer's hair, Arnica, northern woodrush, crinkled hairgrass, boreal bentgrass, tall rattlesnake-root, silver willow, very depauperate sedge, and poverty grass grow along the wet banks and out on slabs of granite in the ravine. The area around Klondike Pond is rich, and is treated in the discussion of the Klondike (see discussion, T3 R10).

f). Witherle Ravine

We reached Witherle Ravine by descending the Owl to the stream that flows out to Katahdin Stream. We descended the Owl to a gravelly blowout on the southeastern most rim of the Klondike. Fir waves lace this area, and the going is difficult at times. The community of plants on this small blowout at 3,550 feet includes: lowbush blueberry, alpine bilberry, mountain cranberry, black crowberry, *Diapensia* (in great abundance), highland rush, crinkled hairgrass, boreal bentgrass, Canada mayflower, three-leaved cinquefoil, bunchberry, mountain alder, black spruce, balsam fir, mountain holly, blue-bead lily, alpine goldenrod, and whorled-wood aster. This assemblage is an interesting mix of arctic-alpine and boreal species.

We found long beech fern, bush honeysuckle, hairbell, large-leaved goldenrod, and few-seeded sedge growing on the steep slope that leads to the bottom of the ravine.

All of the species common in the boreal forest grow at the bottom of the ravine, as well as winged hazelnut and red osier. A small population of alpine willow-herb and Arnica grow in a springy hollow beside the stream at approximately 3,500 feet. A few plants of spiked woodrush and

North Turner

Quadrangle: Katahdin, 15', (1949)

Elevation: 3323'

Not Field Checked

The west and north slopes of North Turner probably burned in the same fires that scarred the Travelers (Figure 5). Caldwell (1972) reports that the granite of this peak is different from that of Katahdin, having a different grain structure.

North Turner may be approached from the summit of South Turner, bushwacking through the low spruce/fir forest along moose trails - by all reports. A small treeless area near the summit most certainly supports alpine vegetation. The diversity of plants is, however, unknown.

Russell Mountain

Quadrangle: Katahdin, 15', (1949)

Elevation: 2780'

Date Field Checked: 4 July 1984, W. Donald Hudson, Ron Cannarella, Leah Garnett, and Kate Huntington

Summary of Significant Features

1. Old-growth Forest: We examined two sites along the lower slopes of Russell Mountain for the presence of old-growth red spruce and sugar maple. We cored a few old trees, yet the sites have been disturbed by both fire and cutting in the recent past. Russell Mountain is not recommended as Critical Area for old-growth forest.
2. Subalpine Forest: The upper slopes of Russell Mountain are not as disturbed as the lower slopes. The subalpine forest above 2500' is recommended as a Critical Area, and it is contiguous with the tract of subalpine forest that circles all of Katahdin.

1. Old-growth Forest

a). Russell Mountain red spruce

Stand Age: 190 - 238 years (maximum age class)

Stand Size: not determined (scattered trees for approx. one half mile at 1 mile south Wassataquoik Stream along the Roaring Brook/Russell Pond Trail)

Elevation: 1390'

Status: Previously suspected as an old-growth stand, but not recommended as a Critical Area

The patches of tall red spruce on the east slope of Russell Mountain are easily seen from New City, along the trail from Russell Pond to the Wassataquoik leantos. We cored a number of the scattered red spruce, and

two were older than 230 years in age. There are clear signs of old cutting, and disturbance by fire. The forest is not a pure stand of spruce. There are numerous beech and yellow birch mixed in with some white pine.

We do not recommend this as a Critical Area for old-growth, though the presence of some fine specimens of red spruce along this well travelled trail no doubt draws a lot of attention.

b). Half-way Rock sugar maple & beech

Stand Age: 285 years (maximum age)

Stand Size: not determined

Elevation: 1610'

Status: Not Recommended as a Critical Area

The sugar maple, beech, and yellow birch along the trail from Roaring Brook to Russell Pond are striking. We cored a number of trees of the three species. The oldest tree was a single sugar maple (285 years), though the majority of maple ranged in age from 66 - 195 years. The trees are growing well, with incremental growth during the last five years exceeding that during the five previous years. The beech ranged in age from 132 - 171 years, and a single yellow birch was 74 years.

We found evidence of cutting and fire in this stand, and due to the average age of the trees, we do not recommend that it be registered as a Critical Area.

2. Subalpine Forest

Size: approximately 2,600 acres (see Figure 5)

Status: Recommended as a Critical Area

The steep upper slopes of Russell Mountain, particularly those along the east flank of the mountain, are scarred by landslide. Loggers did not apparently cut higher than the base of the slides at approximately 1800-2000' (Figure 5).

These upper slopes are contiguous with the subalpine balsam fir and red spruce that rings all of Katahdin and the southwestern peaks (including the Klondike). For this reason, and because of the undisturbed nature of these upper slopes, we recommend that the area be registered as a Critical Area.

- _____. 1971. The Circumpolar Plants, Part II. Almquist & Wiksell, Stockholm.
- Kennedy, G.G. and J.F. Collins. 1901. Bryophytes of Mt. Katahdin. Rhodora 3(30):177-180.
- May, D.E. and R.B. Davis. 1978. Alpine tundra vegetation on Maine mountains and its relevance to the Critical Areas Program of the State Planning Office. Planning Report No. 36.
- Rankin, D.W. 1965. The Matagammon Sandstone - a new Devonian formation in north-central Maine: U.S. Geol. Survey Bull. 1194-F, pp. F1-F9.
- Sprugel, D.G. 1974. Natural disturbance and ecosystem responses in wave-regenerated Abies balsamea forests. Dissertation. Yale University, New Haven, CT. USA
- _____. 1976. Dynamic structure of wave-regenerated Abies balsamea forests in northeastern United States. J. of Ecology 64:889-911.
- _____. 1984. Density, biomass, and nutrient-cycling changes during stand development in wave-regenerated balsam fir forests. Ecol. Monographs. 54(2):165-186.
- _____. and F.H. Bormann. 1981. Natural disturbance and steady state in high-altitude balsam fir forests. Science 211:390-393.
- State Planning Office. 1983. Natural old-growth stands in Maine and its relevance to the Critical Areas Program of the State Planning Office. Planning Report No. 79.
- Stebbins, G.L. 1927. Two plants from Mt. Katahdin. Rhodora 29 (337):15.
- _____. 1929. Some interesting plants from Mt. Katahdin. Rhodora 31(367):142-143.
- Tarr, R.S. 1899. Glaciation of Mount Katahdin, Maine. Bull. Geol. Soc. of Am. 11:433-448.
- Williams, E.F. 1901. Floras of Mt. Washington & Mt. Katahdin. Rhodora 3(30):160-165.
- Worley, I.A. 1981. Maine Peatlands: their abundance, ecology, and relevance to the Critical Areas Program of the State Planning Office. Planning Report No. 73. and Bull. 687, Vt. Agric. Exp. Sta.

3). Harvey Ridge

Cores:

Tree	DBH		hgt (ft)	bark	Increment		age (yr)
	dry (cm)	field (cm)			1-5 (mm)	6-10 (mm)	
Ab	16	18	22	6	1	2	68
Ab	12.8	12	20	-	-	-	66*
Ab	12.4	14.3	25	6	1.2	2.3	75
Ab	13	15	20	3	1	1	58
Ab	14.2	13.2	18	3	1	1	79
Ab	11	10.6	15	3	3	5	53
Ab	13.2	14.5	20	3.5	2	2	56
Ab	16	16	30	5	3	5	61
Ab	17.2	15	20	3	1	3	65
Pr	15.2	16	25	4.9	1.9	2.5	53
Pr	18.8	15.5	25	4	2	1	57

4). Northwest Basin

Cores:

Tree	DBH		hgt (ft)	bark	Increment		age (yr)
	dry (cm)	field (cm)			1-5 (mm)	6-10 (mm)	
Ab	19.6	20.4	35	3	3	4	55
Ab	18.4	19.7	25	4	3	5	55
Ab	22.8	34	42	4	2	2	109
Ab	23	23.2	35	5	3	3	62
Ab	13.2	12.5	25	2.7	1	2.5	55
Ab	25.2	25	40	5	4.9	5	50
Ab	19	19.3	30	4.5	1.3	2	67
Ab	22	24	40	6	3	3.5	50
Pr	28.4	32	30	8.5	3	5	104
Pr	39	43.5	40	2.5	1	2.3	148
Pr	24	23.2	30	5	4	5	64

7). The Owl

Cores:

Tree	DBH		hgt (ft)	bark	Increment		age (yr)
	dry	field			1-5 (mm)	6-10	
Ab	9	12	17	3	-	-	39
Ab	11.8	10.5	15	5	2	7	32
Ab	12.2	11.5	18	4	2.5	3.5	44
Ab	10	9	18	2	2	6	49
Ab	10	9.5	18	4	1	2	47
Ab	14	15.5	17	4	3.5	6.5	36
Ab	14.2	12.5	25	4	3	4	30
Ab	13	11.4	15	3	4	5	36
Ab	12.2	12.6	15	3	1.5	3.5	31
Ab		15.2	17	3	2	4	32

8). Cathedral Trail

Cores:

Tree	DBH		hgt (ft)	bark	Increment		age (yr)
	dry	field			1-5 (mm)	6-10	
Ab	24.4	23.3	40	8	3	5	119
Ab	21.8	22.6	40	7	2	3	128
Ab	27.2	30.5	70	7	5	3.5	130
Ab	17.8	22.5	45	7	2.1	2.2	127
Ab	33.6	30.3	55	11	1.9	3	144
Ab	15.2	19.8	35	7	1.5	2	116
Ab	28.4	29.8	50	8	3	4	119
Ab		25.8	36	10	1	2	- (rotten center)
Pm	31.4	31.2	50	10	1	2	192
Pm	21.2	22.6	40	3	7	4	117
Pm	13	18.1	32	3	1	2	107
Pm	27.2	30.5	70	4	.7	.8	236
Pm	23	23.7	50	4	.5	1	126
Pm	16	17.2	30	2	1	.8	96
Pm	13.2	13.8	30	1	1	1.9	105
Pm	11.8	12.3	27	3	1	1.5	116
Pm	21.8	22.5	45		3	3.5	138

12. The Klondike, site #2

Cores:

Tree	DBH		hgt (ft)	bark	Increment		age (yr)
	dry (cm)	field (cm)			1-5 (mm)	6-10	
Pm	26.4	25	50	6	.8	.9	119
Pm	15	16	40	-	2	2	114
Pm	17	15.5	35	4.9	2	2	94
Pm	21	18	40	5.5	3.5	4	124
Pm	17.6	21	40	5	.9	.7	170
Ab	14.4	15	40	3	2	3.5	86
Ab	16	19	35	5	4	4.5	77
Ab	16	19.5	45	-	3.8	5	101

Family

Genus/Species		T	1	2	3	K	5	6	K1
<u>Dryopteris spinulosa</u>	intermediate wood-fern	x		x		x		x	
var. <u>intermedia</u> (Willd.) Gray									
<u>Gymnocarpium dryopteris</u>	oak fern	x	x	x				x	
(L.) Newman									
<u>Matteucia struthiopteris</u>	ostrich fern			x					
(L.) Todaro									
<u>Onoclea sensibilis</u> L.	sensitive fern			x					
<u>Polypodium virginianum</u> L.	Polypody	x							
<u>Polystichum braunii</u> (Spenn.) Fee	Braunn's holly fern					x			
<u>Pteridium aquilinum</u> (L.) Kuhn	bracken	x	x	x	x				
Taxaceae									
<u>Taxus canadensis</u> Marsh.	American yew					x			
Pinaceae									
<u>Abies balsamea</u> (L.) P. Mill.	balsam fir	x	x	x	x	x	x	x	x
<u>Juniperus communis</u> L.	ground juniper		x						
<u>Larix laricina</u> (DuRoi.) K. Koch.	larch		x	x	x	x		x	x
<u>Picea mariana</u> (P. Mill.) B.S.P.	black spruce			x	x	x	x		x
<u>Picea rubens</u> Sarg.	red spruce	x	x		x	x	x		x
<u>Pinus resinosa</u> Ait.	red pine	x	x						
<u>Pinus strobus</u> L.	white pine				x				
<u>Thuja occidentalis</u> L.	eastern red cedar	x	x		x	x	x		
Nymphaeaceae <u>Nymphaea</u> ssp.									
<u>Nuphar variegatum</u> (Dur.) E.A. Beal	bullhead lily			x	x	x		x	
Ranunculaceae									
<u>Actaea pachypoda</u> Ell.	doll's eyes		x		x				
<u>Actaea rubra</u> (Ait.) Willd.	red baneberry	x				x	x		
<u>Clematis virginiana</u> L.	virgin's bower				x				
<u>Coptis ^{sp. Torreyi Hulten} groenlandica</u> trifolia (L.) Satsb.	goldthread				x	x	x		x
<u>Ranunculus acris</u> L.	common buttercup				x				
<u>Ranunculus flabellaris</u> Raf.	yellow water-crowfoot			x					
<u>Ranunculus flammula</u> L.	spearwort			x					
<u>Thalictrum dioicum</u> L.	meadow rue	x		x					
<u>Thalictrum polygamum</u> pubescens Pursh	meadow rue								x
Papaveraceae									
<u>Corydalis sempervirens</u> (L.) Pers.	pale corydalis		x						
Ulmaceae									
<u>Ulmus americana</u> L.	American elm			x	x		x		
Myricaceae									
<u>Myrica gale</u> L.	sweet gale			x	x		x	x	x
Fagaceae									
<u>Fagus grandifolia</u> Ehrh.	American beech			x					
Betulaceae (Corylaceae)									
<u>Betula glandulosa</u> Michx.	dwarf birch					x			
<u>Betula ~~lutea~~ alleghaniensis</u> Britt.	yellow birch	x		x	x				
<u>Betula minor</u> (Tuckerman) Fern.	small birch					x			
<u>Betula papyrifera</u> Marsh.	paper birch			x	x	x	x		x
<u>Betula ~~papyrifera~~ var. cordifolia</u> Regel	heart-leaved paper birch	x	x		x	x	x		x

Family

Genus/Species

T 1 2 3 K 5 6 K1

<u>Loiseluria procumbens</u> (L.) Desv.	alpine azalea					x	
<u>Monotropa uniflora</u> L.	Indian pipe						x
<u>Phyllodoce caerulea</u> (L.) Bab.	mountain heath					x	
<u>Rhododendron canadense</u> (L.) Torr.	Rhodora	x	x	x	x	x	x
<u>Rhododendron lapponicum</u> (L.) Wahlenb.	Lapland rosebay					x	
<u>Vaccinium angustifolium</u> Ait.	low sweet blueberry	x		x	x		x
<u>Vaccinium cespitosum</u> Michx.	dwarf bilberry					x	
<u>Vaccinium myrtilloides</u> Michx.	velvet-leaf blueberry	x	x	x	x	x	x
<u>Vaccinium oxycoccos</u> L.	bog cranberry		x	x	x		x
<u>Vaccinium uliginosum</u> L.	alpine bilberry			x	x	x	x
<u>Vaccinium vitis-idaea</u> L.	mountain cranberry			x	x	x	x
Empetraceae							
<u>Empetrum atropurpureum</u> (L.) Fern. & Wieg.	purple crowberry					x	x
<u>Empetrum nigrum</u> L.	black crowberry					x	x
Pyrolaceae							
<u>Moneses uniflora</u> (L.) Gray	one-flowered wintergreen	x	x				x
<u>Pyrola elliptica</u> Nutt.	shinleaf	x	x			x	
Diapensiaceae							
<u>Diapensia lapponica</u> L.	Diapensia					x	x
Primulaceae							
<u>Lysimachia nummularia</u> L.	moneywort						x
<u>Trientalis borealis</u> Raf.	star-flower	x	x			x	x
Saxifragaceae							
<u>Mitella nuda</u> L.	miterwort	x				x	
<u>Ribes glandulosum</u> Graver	skunk currant	x	x			x	x
<u>Ribes lacustre</u> (Pers.) Poir.	swamp black currant					x	x
<u>Saxifraga aizoon</u> L.	white mountain saxifrage					x	
<u>Saxifraga stellaris</u> P. Mill.	star-like saxifrage					x	
var. <u>comosa</u> foliolosa R.Br.							
Rosaceae							
<u>Amelanchier bartramiana</u> (Tausch) N. Roemer	mountain juneberry	x	x			x	x
<u>Amelanchier laevis</u> (Wieg.) Ahles	shadbush					x	
<u>Geum canadense</u> Jacq.	avens					x	
<u>Fragaria virginiana</u> Duchesne	wild strawberry	x				x	
<u>Potentilla erecta</u> (L.) Raeusch.	cinquefoil					x	
<u>Potentilla fruticosa</u> L.	shrubby cinquefoil					x	
<u>Potentilla norvegica</u> L.	rough cinquefoil					x	x
<u>Potentilla tridentata</u> (Soland.) Ait.	three-leaved cinquefoil	x	x			x	x
<u>Prunus pensylvanica</u> L. f.	wild red or pin cherry	x	x			x	x
<u>Prunus serotina</u> Ehrh.	black cherry					x	
Sorbus <u>Pyrus americana</u> Marsh.	mountain ash	x				x	x
Malus <u>Pyrus malus</u> sylvestris (L.) P. Mill.	apple					x	
Aronia <u>Pyrus melanocarpa</u> (Michx.) Ell.	chokeberry					x	
<u>Rubus idaeus</u> L.	raspberry	x				x	x
<u>Rubus occidentalis</u> L.	black raspberry					x	
<u>Rubus pubescens</u> Raf.	dwarf raspberry	x				x	x
<u>Spiraea latifolia</u> (Ait.) Borkh.	meadow sweet	x	x			x	x
Leguminosae							
<u>Trifolium agrarium</u> aureum Pollich	hop clover					x	x

Family

Genus/Species

T 1 2 3 K 5 6 K1

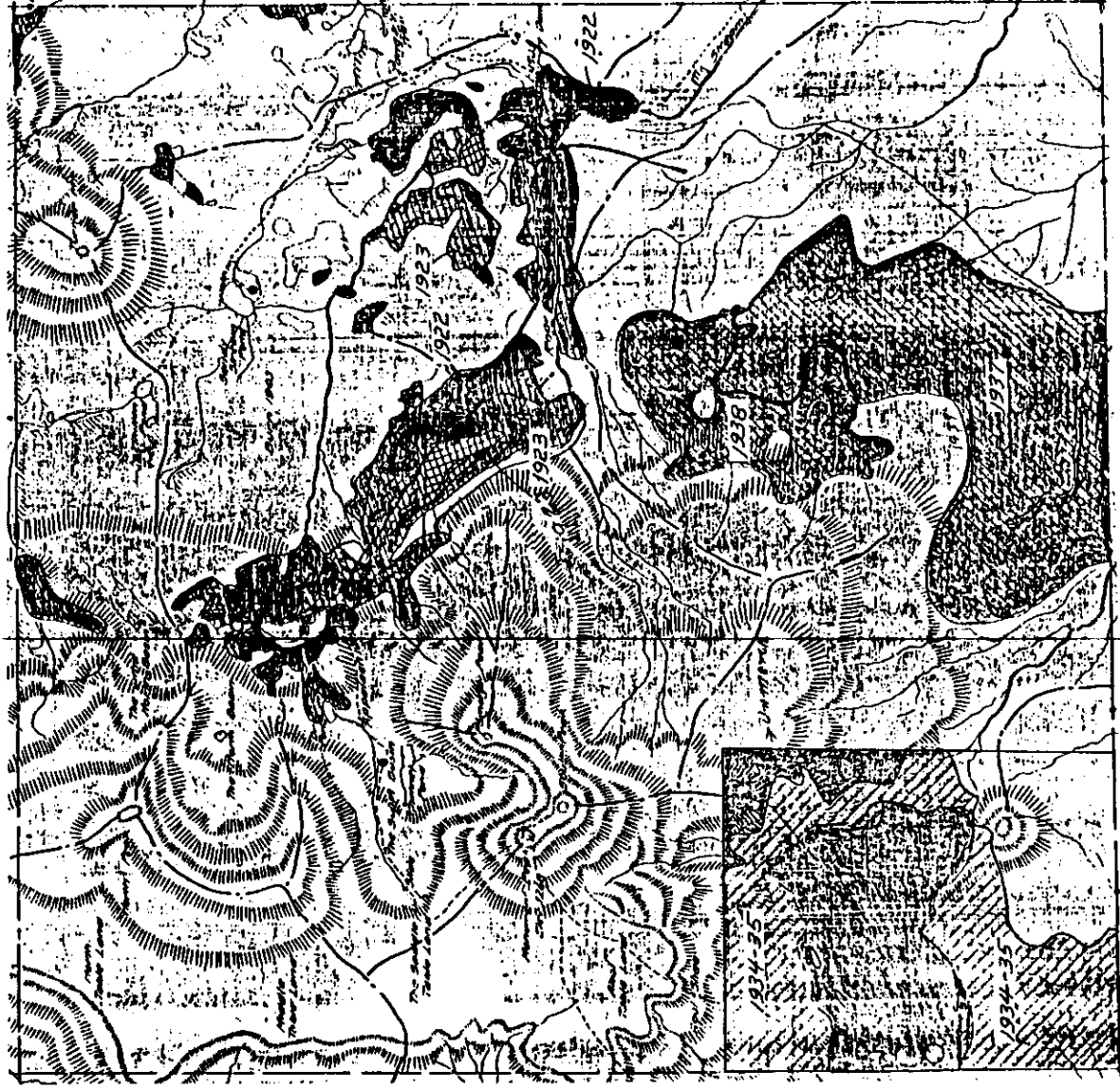
		Schwein ex Benth.						
	<u>Veronica americana</u> (Raf.)	American brooklime		x				
	<u>Veronica officinalis</u> L.	common speedwell			x			
	<u>Veronica scutellata</u> L.	marsh speedwell		x				
	<u>Veronica serpyllifolia</u> L.	thyme-leaved speedwell			x			
Oleaceae								
	<u>Fraxinus americana</u> L.	white ash	x					
	<u>Fraxinus nigra</u> Marsh.	black ash			x			
	<u>Syringa vulgaris</u> L.	lilac		x				
Lentibulariaceae								
	<u>Utricularia intermedia</u> Hayne	bladderwort		x	x			x
	<u>Utricularia vulgaris</u> L.	common bladderwort		x				
Campanulaceae								
	<u>Campanula rotundifolia</u> L.	harebell				x	x	
Rubiaceae								
	<u>Galium mollugo</u> L.	bedstraw			x			
	<u>Galium trifolium</u> Michx.	sweet-scented bedstraw		x	x			
	<u>Galium</u> sp.	bedstraw	x	x				x
Adyotis	<u>Houstonia caerulea</u> (L.) Hook.	bluets			x		x	
	<u>Mitchella repens</u> L.	partridge-berry	x					
Caprifoliaceae								
	<u>Diervilla lonicera</u> P. Mill.	bush honeysuckle			x		x	
	<u>Linnaea borealis</u> L.	twinsflower		x	x	x	x	x
	<u>Lonicera canadensis</u> Benth.	fly honeysuckle		x	x			
racemosa	<u>Sambucus pubens</u> (Michx.) Koehne	red-berried elder			x		x	
L. ssp. p. (Michx.)	<u>Symphoricarpos albus</u> (L.) Blake	snowberry			x			
	<u>Viburnum edule</u> (Michx.) Raf.	hobblebush				x	x	
	<u>Viburnum cassinoides</u> L.	wild raisin		x		x		x
Compositae								
	<u>Achillea millefolium</u> L.	yarrow			x	x	x	
	<u>Anaphalis margaritacea</u> (L.) Benth.	pearly everlasting		x		x		x
	<u>Antennaria</u> sp.	pussy toes		x		x	x	
	<u>Arnica mollis</u> Hook.	Arnica				x		x
	<u>Aster acuminatus</u> Michx.	whorled-wood aster		x		x	x	x
	<u>Aster nemoralis</u> Ait.	bog aster			x			x
	<u>Aster novae-angliae</u> L.	New England aster			x		x	
	<u>Chrysanthemum leucanthemum</u>	ox-eye daisy				x	x	
	<u>Cirsium vulgare</u> (Savi) Tenore	bull thistle				x		
	<u>Eupatorium maculatum</u> L.	Joe-pye weed						x
	<u>Eupatorium rugosum</u> Abott.	Joe-pye weed				x		
	<u>Gnaphalium sylvaticum</u> L.	woodland cudweed				x		
	<u>Hieracium auranticum</u> L.	orange hawkweed		x		x		x
	<u>Hieracium pilosella</u> L.	mouse-ear hawkweed				x		
	<u>Hieracium pratense</u> caespitosum Dumort.	tall yellow hawkweed	x	x		x		
	<u>Lactuca canadensis</u> L.	Canadian lettuce				x	x	
	<u>Prenanthes altissima</u> L.	tall rattlesnake root				x	x	x
	<u>Prenanthes boottii</u> (L.) Gray	Boott's rattlesnake root				x		x
nana (Bigelow) Torr.	<u>Prenanthes trifoliolata</u> (L.) Gray	low rattlesnake root	x					
	<u>Solidago cutleri</u> Fern.	alpine goldenrod				x	x	
Euthamia	<u>Solidago graminifolia</u> (L.) Nutt. ex Cass.	grass-leaved goldenrod				x		

Family

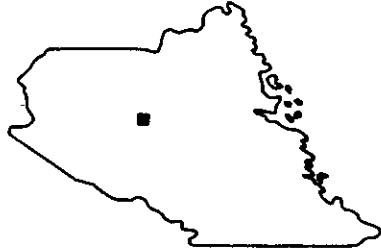
Genus/Species		T	1	2	3	K	5	6	K1
<u>Agrostis perennans</u> (Walt.) ^{Tuckerman}	Lapland bentgrass								x
<u>Bromus tectorum</u> L.	brome grass								x
<u>Bromus</u> sp.	brome grass							x	
<u>Calamagrostis canadensis</u> (Michx.) ^{Beauv.}	blue joint	x		x	x	x			x
<u>Cinna latifolia</u> (Trav. ex Goepf.) ^{Griseb.}	drooping woodreed							x	x
<u>Danthonia spicata</u> (L.) ^{Beauv.}	poverty grass						x	x	x
<u>Deschampsia flexuosa</u> (L.) Trin.	crinkled hairgrass						x	x	x
^{rubra L.} <u>Festuca prolifera</u> ^{var.} Piper	proliferous fescue						x		
<u>Glyceria canadensis</u> (Michx.) Trin.	rattlesnake grass								x
<u>Hierocloe alpina</u> (Willd.) ^{Roemer & Schultes}	sweet grass						x		
<u>Phleum pratense</u> L.	timothy					x		x	
<u>Poa compressa</u> L.	Canada bluegrass			x				x	
<u>Poa nemoralis</u> L.	wood bluegrass					x			
<u>Poa pratensis</u> L.	Kentucky bluegrass					x	x		
Liliaceae									
<u>Allium schoenoprasum</u> L.	onion					x			
<u>Clintonia borealis</u> (Ait.) Raf.	blue bead lily		x		x	x	x		x
<u>Maianthemum canadense</u> Desf.	Canada mayflower	x	x		x	x	x		x
<u>Medeola virginiana</u> L.	Indian cucumber root	x		x					
<u>Smilacina racemosa</u> (L.) Desf.	false spikenard	x			x				
<u>Streptopus amplexifolius</u> (L.) ^{DC.}	white mandarin		x		x	x			x
<u>Streptopus roseus</u> Michx.	rose twisted-stalk	x	x		x				x
<u>Trillium erectum</u> L.	stinking Benjamin	x			x				
<u>Trillium undulatum</u> Willd.	painted Trillium					x	x	x	
<u>Uvularia sessilifolia</u> L.	wild oats	x		x					
<u>Veratrum viride</u> Ait.	false hellebore					x			
Orchidaceae									
<u>Calopogon pulchellus</u> ^{tuberosus (L.) B.S.P.}	grass pink								x
<u>Cypripedium acaule</u> f. <i>blanda</i> ^{Fern.}	moccasin flower	x	x		x				
<u>Goodyera repens</u> (L.) R. Br.	rattlesnake plantain							x	
^{Platanthera} <u>Habenaria blephariglottis</u> (Willd.) ^{Lindl.}	white-fringed orchis								x
<u>Habenaria dilatata</u> (Pursh) ^{Lindl. ex Beck}	bog candle				x				
<u>Habenaria psychodes</u> (L.) ^{small}	purple-fringed orchis							x	
<u>Pogonia ophioglossoides</u> (L.) ^{Juss.}	beard flower		x					x	x

MAINE REGISTER OF CRITICAL AREAS

Township 3 Range 9 - Cutting Map



Source: Great Northern Paper Co.



Location Map

SCALE

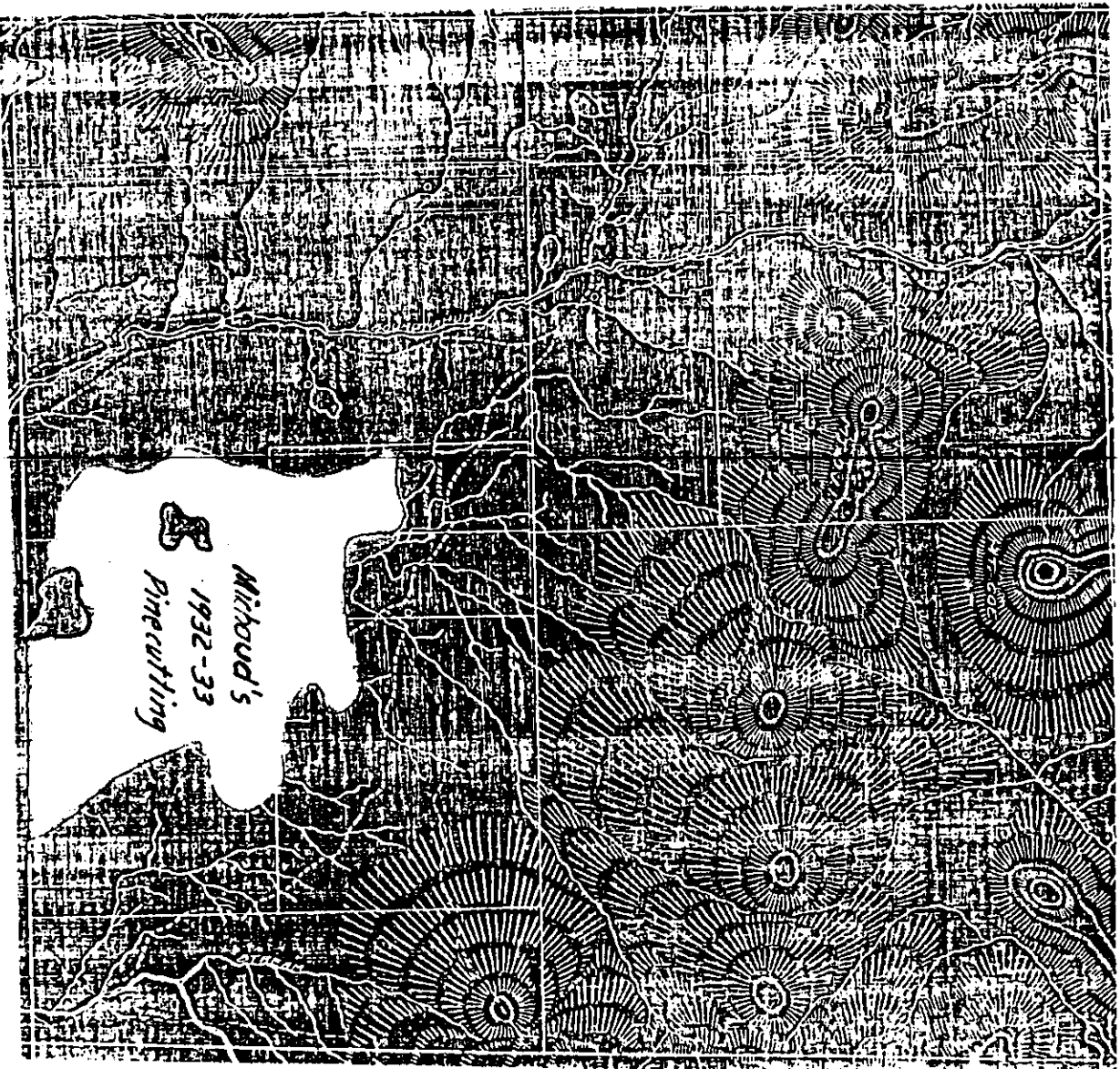
1:62,500



County - Piscataquis

MAINE REGISTER OF CRITICAL AREAS

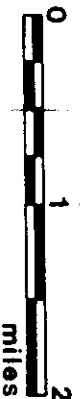
Township 3 Range 10 - Cutting Map



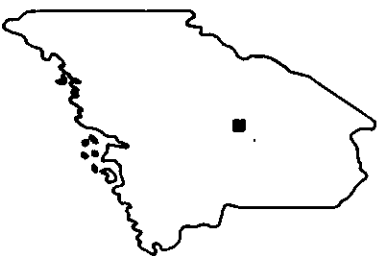
Source: Great Northern Paper Co.

SCALE

1:62,500



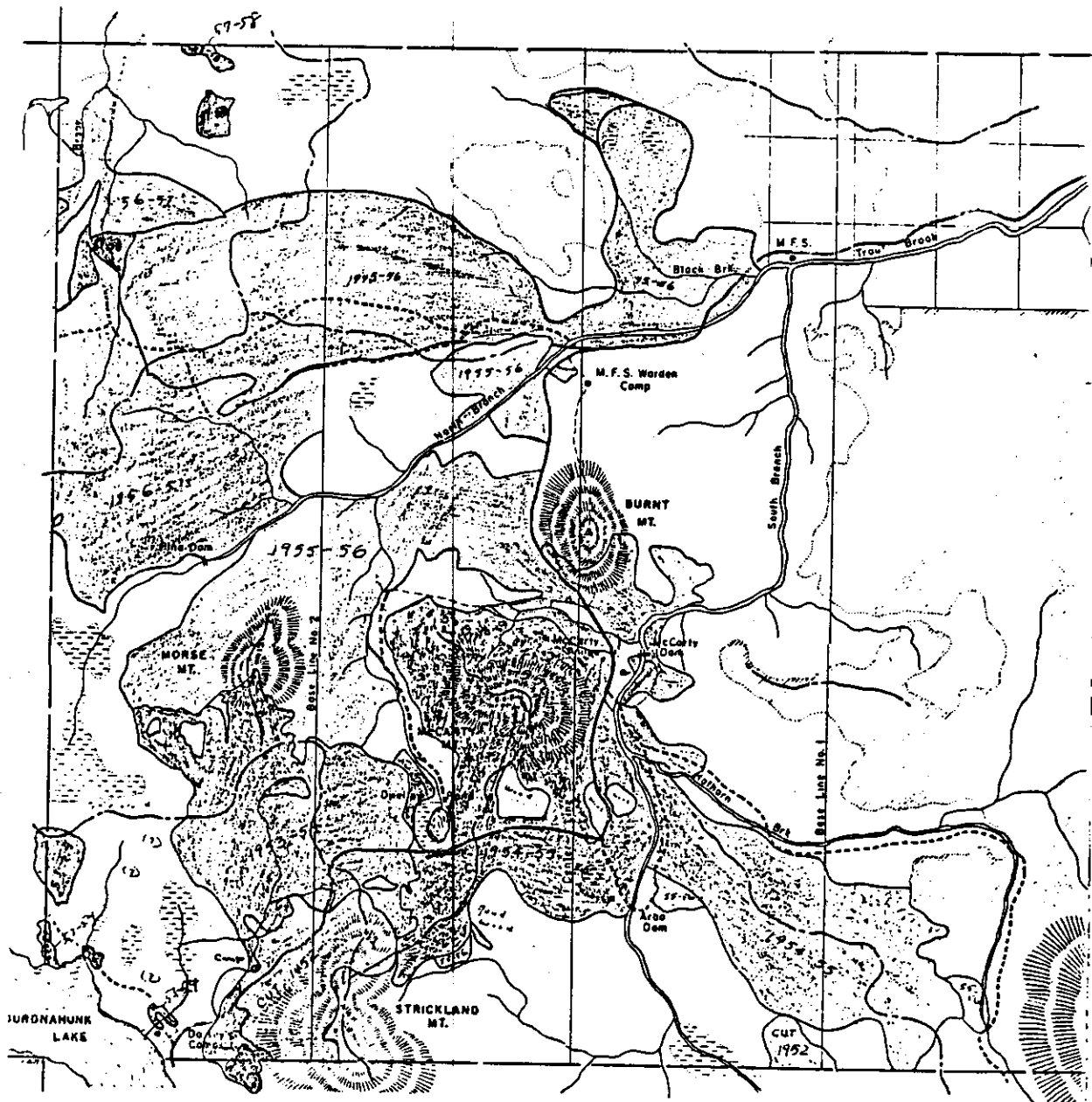
County - Piscataquis



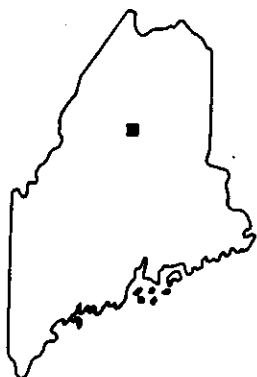
Location Map

MAINE REGISTER OF CRITICAL AREAS

Township 5 Range 10 - Cutting Map

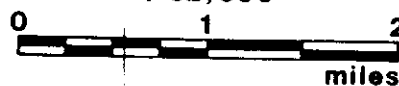


Source: Great Northern Paper Co.



Location Map

SCALE
1:62,500



County - Piscataquis