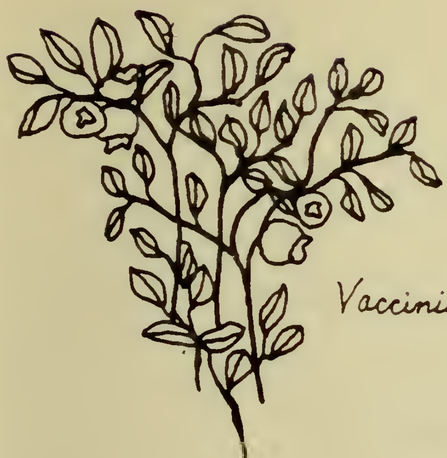

Vaccinium corymbosum

FIRE REGIMES OF THE COASTAL MAINE FORESTS OF ACADIA NATIONAL PARK

United States Department of the Interior
National Park Service
North Atlantic Region
Office of Scientific Studies
OSS 83-3

In Cooperation with the US Forest Service
Northeastern Area State & Private Forestry

Fire Regimes of the Coastal Maine Forests of Acadia National Park

by

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CHAPTER 1. THE PROJECT

USDI-National Park Service Guideline NPS-18, August 23, 1979, directs that Fire Management Plans will be developed for all areas of the National Park System having natural resources capable of burning.

In 1979, William H. Anderson, then headquartered in USDI-National Park Service's North Atlantic Regional Office, contacted USDA-Forest Service's Northeastern Area State and Private Forestry office, Broomall, Pennsylvania, concerning feasibility of the Forest Service gathering fire management data and assisting in the development of fire management plans for Acadia National Park, Maine and Cape Cod National Seashore, Massachusetts. The Forest Service's Fire Protection Staff Group in Broomall agreed to undertake this project. Authorities cited to perform this work are:

1) Interchange Agreement Between National Park Service and Forest Service - December 1, 1975 (Appendix A)

2) USDI-National Park Service Special Directive 77-4 - March 1, 1978 (Appendix B)

On September 28, 1979, National Park Service issued a purchase order covering fire management studies for the Acadia and Cape Cod Projects. Under the terms of the purchase order the Forest Service agreed to:

1. Prepare descriptive data on fire-related conditions including:

    a. Climatic patterns
    b. Wildland fuels inventory

2. Determine historical and ecological role of natural and man-caused fires.

3. Determine effects of fires.

Forest Service responsibilities in the fire planning effort are concerned primarily with data collection and evaluation. Chapter 16 of Guideline NPS-18 was used as a guide in conducting the studies. USDI-National Park Service will develop the fire management plans with some assistance from the Forest Service. The plans will be developed according to guidelines contained in Chapter 7 of NPS-18. The plans are intended to be a section of each unit's overall Natural Resources Management Plan.

Jack Horton of USFS, Broomall, PA was assigned to coordinate the Forest Service role in the projects. Dr. William Patterson of the Department of Forestry and Wildlife Management, University of Massachusetts, Amherst, Massachusetts was hired to supervise a data collection crew during the 1980 field season. A cooperative agreement was subsequently executed between the University of Massachusetts and the Forest Service. Dr. Patterson has continued to work with the Forest Service in data collection, evaluation and report writing phases of the projects under the terms of this Agreement.

This report deals only with Acadia National Park. Cape Cod National Seashore will be covered in a separate report.

CHAPTER 2. OVERVIEW

2.1. The Park

Acadia National Park lies in Hancock and Knox Counties on the eastern coast of Maine. Butcher (1977), in his "Field Guide to Acadia National Park, Maine" states that President Woodrow Wilson accepted certain lands as gifts in 1916 and proclaimed the establishment of Sieur de Monts National Monument. Three years later Congress authorized redesignation of the Monument to Lafayette National Park, the first such park east of the Mississippi River. The name of the Park was changed to Acadia in 1929.

Today the Park encompasses approximately 35,000 acres (14,000 ha) in three primary units:

Mt. Desert Island	30,000 acres (12,000 ha)
Isle au Haut	3,000 acres (1,200 ha)
Schoodic Peninsula	2,000 acres (800 ha)

There are other small, isolated areas in National Park Service ownership located on several small islands.

Fire management data were collected from the above three units of the Park. These units are described below.

2.1.1. Mt. Desert Island

Mt. Desert Island is approximately 108 square miles (281 km^2) in land area, of which about 47 square miles (122 km^2) or 47% of the Island are in NPS ownership. The Island lies between 44°13' and 44°27' North Latitude; 68°10' and 68°26' West Longitude. Elevations range from sea level to 1530-foot (466-m) Cadillac Mountain.

Mt. Desert Island is well roaded with primary and secondary roads. There is an extensive network of carriage paths which are driveable. Many of these roads are gated to the public but may be utilized by NPS for administration and protection purposes. An extensive trail system also provides access to the Park by foot.

2.1.2. Isle au Haut

Isle au Haut is located about 6½ miles (10 km) east of Stonington, Maine in the Gulf of Maine (Atlantic Ocean). The Island is located between 44°00' and 44°05' North Latitude; 68°38' West Longitude. Elevations range from sea level to 543-foot (163-m) Mt. Champlain. About one-half of the Island is in NPS ownership.

Isle au Haut is the only settlement on the Island. NPS operates a seasonal ranger station near the community.

Transportation to the Island is by boat. A road, which generally follows close to the shoreline, encompasses the Island. Trails provide additional access.

2.1.3. Schoodic Peninsula

Schoodic Peninsula is located on the eastern shore of Frenchman Bay. NPS ownership is concentrated near the southern tip of the Peninsula in the vicinity of 44°20' North Latitude; 68°05' West Longitude. Elevation in the Park ranges from sea level to 440 feet (134 m) on Schoodic Head.

The small settlements of Winter Harbor, Prospect Harbor, and Corea lie in northerly directions from the Park. A U.S. Naval installation is situated near the southern tip of the Peninsula. NPS operates a seasonal ranger station near the southern tip of the Peninsula.

Paved and unpaved roads permit adequate access for fire protection purposes.

2.2. Landform

Landforms in Acadia consist of a series of separate north-south oriented ridges with deep U-shaped valleys between. The deeper depressions are filled with water. Somes Sound contains one of these valleys, and is the only fjord on the Atlantic Coast of the United States (Butcher 1977). North and northwest exposures of major mountain ridges tend to slope gently, becoming arched or rounded near the top. South and southeastern exposures tend to be steep, sharply cut, step-like profiles. Cadillac Mountain [elevation 1530 feet (466 m)] is the highest point in the park.

Movement of continents, volcanic activity, and at least four major glaciers have played a role in the development of Acadia landforms. Butcher (1977) presents an excellent overview of their development. This publication is sold in the Park.

Soils are discussed in Chapter 7 of this report.

2.3. Climate

Acadia National Park lies in a region of cool moist climate. Temperatures at Bar Harbor range from -16°F (-9°C) in winter to 105°F (41°C) in summer with a mean annual temperature over the 41-year period 1940-1980 of approximately 46°F (8°C). Precipitation over this period averaged about 49 inches (123 cm) annually; snowfall about 5 feet (1.5 m). Due to the close proximity of Acadia National Park to the Atlantic Ocean and the location of the park with respect to southerly to southwesterly winds, fog near the coast is common.

National Park Service weather records for Bar Harbor were studied for the 41-year period 1940-1980. NPS weather observations are submitted to National Weather Service.

Weather records for the years 1969-1973 were used to compute National Fire Danger Rating System (NFDRS) indices from McFarland weather station observations. Climate is discussed in detail in Chapter 3. The NFDRS indices and their implications are discussed in Chapter 8.

2.4. Vegetation

Spruce-fir forests are common in Acadia National Park. Red spruce (Picea rubens) is the predominant species and occurs throughout the Park. White spruce (Picea glauca) occurs primarily along the shoreline but can also be found in other localities, especially in exposed areas subjected to strong moisture-laden winds. Black spruce (Picea mariana) occurs in bog areas in association with eastern larch (Larix laricina). Balsam fir (Abies balsamea) is common in the Park but is less prevalent than spruce.

Other coniferous species occur in scattered patches in the Park. These include jack pine (Pinus banksiana), red pine (Pinus resinosa), pitch pine (Pinus rigida), eastern white pine (Pinus strobus), northern white cedar (Thuja occidentalis), eastern hemlock (Tsuga canadensis). Northern hardwoods [beech (Fagus grandifolia), yellow birch (Betula alleghaniensis), sugar maple (Acer saccharum)]. Other hardwoods [especially aspen (Populus tremuloides and P. grandidentata), paper birch (Betula papyrifera) and gray birch (B. populifolia)] are quite abundant in areas burned by the Bar Harbor fire of 1947.

Davis (1961) concluded in his studies of the spruce-fir forests in coastal Maine that the cool, moist, maritime influence is more responsible for spruce-fir distribution in Maine than are soil conditions and bedrock. Abundant and well distributed precipitation and the 44° northerly latitude provide the moisture and cool temperatures for the development of the spruce-fir type. Moore and Taylor (1927) indicate spruce may be a climax species on Mt. Desert Island.

Fire appears to have played a major role in the vegetation. Downed woody fuels reach heavy concentrations in a few locations in the Park (e.g., Otter Point). Spruce, which is a shallow-rooted species, is subject to blowdown. Dense tree canopies can support destructive wildfires during droughts and at other times when weather factors combine to present adverse burning conditions. Downed fuels inventories and biomass studies were conducted during the study. Results are discussed in Chapter 5.

Several books and NPS publications discuss the vegetation present in Acadia National Park. Some of the more common species of trees, shrubs, wildflowers, ferns, mosses, lichens, etc. are discussed in layman's terms by Butcher (1977). Moore and Taylor's Vegetation of Mt. Desert Island discusses vegetation in detail. Davis (1961) studied stands in five locations on Mt. Desert Island. He tabulates tree stand characteristics including trees, bryophytes, lichens, etc.

2.5. Fauna

Numerous species of birds, mammals (land and sea), reptiles, amphibians, insects, fish (fresh and salt water) are present in Acadia National Park and adjacent coastal waters. Butcher (1977) discusses species that inhabit the Park and adjacent coastal waters. Davis (1961) studied birds, amphibians, reptiles, mammals, Carabidae and presented data concerning their abundance.

Site specific effects of fire on Acadia fauna are not available. Most of the extensive literature on fire deals with its effects on plants and soil. Few studies are quantitative, have adequate controls, and/or have been carried on long enough to assess the effects of a particular fire on birds and mammals. There are virtually no data on how varying the properties of fire will effect wildlife (Bendell 1974).

Wildlife populations may respond in a variety of ways to disturbance by fire. Often there is remarkably little change in populations despite wide fluctuations in the environment (Bendell 1974).

2.6. Recreation

Acadia National Park is heavily used by tourists. Use is heaviest between Memorial Day and Labor Day weekends, dropping rapidly after this time. In 1980 use was estimated at more than three million visitors.

A variety of recreational pursuits is available in and adjacent to the Park. NPS maintains developed campgrounds at Otter Point and Seawall on Mt. Desert Island and at Duck Harbor on Isle au Haut. Picnic areas are located near Jackson Laboratory south of Bar Harbor and at Pretty Marsh on the western shore of Mt. Desert Island. A small picnic area is located adjacent to the ranger station on Isle au Haut and at Fraser Point on Schoodic Peninsula. Many privately operated campgrounds and motels are operated on Mt. Desert Island.

NPS operates a visitor center at Hulls Cove where the public can view displays, obtain information and purchase publications.

An extensive trail system has been developed in the Park, primarily on Mt. Desert Island. The system of carriage roads (55 miles = 88 km) located on Mt. Desert Island also provides hiking, horseback riding and bicycling opportunities as well as providing access for fire and administrative purposes. Rock climbing occurs at "The Precipice" south of Bar Harbor.

NPS operates two beaches; Sand Beach (marine) and Echo Lake (freshwater). Canoeing is popular at Eagle Lake and a boat launching ramp is also maintained by NPS at Echo Lake. Marine boating is popular in the area.

Cross country skiing and snowmobiling are popular during winter.

Salt and freshwater sport fishing is allowed within the Park. Game hunting is prohibited.

2.7. Fire History and Occurrence

Major wildfires occur rather rarely in Maine and in Acadia National Park.

Brown and Davis (1973) indicate there is evidence of an extensive fire or fires in the region south of Mount Katahdin, Maine in 1795. In October, 1825 3,000,000 acres (1,200,000 ha) burned in New Brunswick, Canada and *in Maine (830,000 acres = 332,000 ha in Maine). Major fires engulfed more than 213,000 acres (85,200 ha) in Maine in 1947. Approximately 17,000 acres (6,800 ha) of this loss occurred on private and NPS ownerships on Mt. Desert Island. It should be noted that catastrophic Maine fires mentioned above occurred late in the fire season and were often the result of settler, logging or debris-burning fires. At the time of the 1947 Maine fires, fire danger rating systems were well developed, but there was a general feeling among residents that because it was late October the fire season was over. October, 1947 is the driest month on record with only 0.08 inches (.2 cm) of precipitation. More than 50 fires had been burning and worked on before winds whipped some fires out of control (Brown and Davis 1973).*

Detailed discussions of fire history, occurrence and causes are presented in Chapters 6 and 9.

Fire has played a major role in shaping vegetation in Acadia National Park. Some vegetation types are, in fact, dependent upon fire for maintenance. There appear to be opportunities for prescribed use of fire to maintain fire-dependent species and to abate fire hazard in areas of heavy, natural dead-fuels accumulation. Local sentiment appears to be against such burning, however, and a thorough public education program combined with carefully prepared and executed prescribed burn plans will be essential to the success of a prescribed burning program.

There appears to be no opportunity for use of prescribed natural fire in Acadia National Park. The small number of lightning fires that occur and the small size of these fires would accomplish few management objectives. Interspersion of structures in wildland areas and the proximity to Park boundaries of many small communities would also mitigate against use of prescribed natural fire.

Webster defines "weather" as "the general condition of the atmosphere at a particular time and place, with regard to temperature, moisture, cloudiness, etc." Fire weather and fire danger rating will be discussed in Chapter 8 of this report.

Webster defines "climate" as "the prevailing or average weather conditions of a place, as determined by the temperature and meteorological changes over a period of years." Climate, then, is expressed in terms of averages of such parameters as temperature and precipitation.

Climate is believed to exert a profound influence on the distribution of spruce-fir forests in Maine (Davis 1961). Climate also influences the moisture content of forest fuels, and the cool-moist conditions of coastal Maine suggest that fires should not spread erratically in Acadia National Park much of the time. Unusual weather conditions may, however, favor the spread of fire and result in catastrophic fires, especially during periods of drought.

National Park Service weather records were studied for the period 1940 through 1980. These data are collected by NPS and submitted to National Weather Service, which designates the Park Station as No. 0371. The station is located near Hulls Cove (44°25' North Latitude; 68°15' West Longitude). The station was located at Bar Harbor (44°23' North Latitude; 68°12' West Longitude) before it was relocated to Hulls Cove. The two locations are approximately three miles (5 km) apart. Both are at elevations of less than 500 feet (150 m) and are near Frenchman Bay on the eastern shore of Mt. Desert Island.

Monthly temperature, rainfall and snowfall data are found in Appendix C. The means of these parameters over the entire 41-year period are presented in Table 3.1. The averaging period of 41 years is considered long enough to minimize measurement errors and provide a valid picture of the climate of Acadia National Park. National Weather Service records for other time periods produce averages similar to those in Table 3.1.

Table 3.1. Climatic data summary for Bar Harbor, Maine; 1940-1980.

Month	Mean Max. Temp. (°F)	Mean Min. Temp. (°F)	Mean Temp. (°F)	Mean Rain (Inches)	Mean Snow (Inches)
Jan.	32.2	14.4	23.3	4.55	16.1
Feb.	33.1	14.9	24.0	4.06	17.5
Mar.	41.2	24.5	32.9	4.09	10.8
Apr.	52.0	33.3	42.7	3.87	2.5
May	63.8	42.3	53.1	4.16	0.1
June	72.3	50.8	61.6	3.24	0.0
July	77.3	56.6	67.0	3.07	0.0
Aug.	76.3	55.8	66.1	2.70	0.0
Sept.	67.9	49.4	58.7	4.02	0.0
Oct.	58.3	41.1	49.7	4.39	0.2
Nov.	47.6	32.5	40.1	5.72	2.3
Dec.	36.5	19.4	28.0	5.17	11.3
	54.9	36.3	45.6	49.04	60.8

The following prevailing-wind-direction data were obtained from National Weather Service Records.

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
NW	NW	NW	SW	SW	SW	SW	SW	SW	SW	SW	NW	SW

Temperatures ranged from -16°F to +105°F (-27°C to 41°C) during the period. Rainfall ranged from 35.26 inches (89.6 cm) in 1965 to 64.90 inches (164.9 cm) in 1977. By decade, yearly average rainfall at Bar Harbor was:

1940-1949	43.25
1950-1959	52.49
1960-1969	48.23
1970-1979	52.68

Snowfall ranged from 13.9 inches (35.3 cm) in 1953 to 109.6 inches (278.4 cm) in 1962. A mean of only 0.1 inch (.3 cm) fell in May and 0.2 inch (.5 cm) in October during this period. Ninety-two percent of the snowfall fell during December through March, but even during these months ground is often bare. No snowfall occurred in the months of June-September during the period 1940-80.

Coastal forests of Maine have cooler summers, warmer winters, a narrower range of temperature extremes and a longer frost-free season than those further inland. The degree to which coastal areas are cooler in summer and warmer in winter has been found to be directly proportional to the difference between inland air temperature and sea-water temperature. Annual precipitation is 3-7 inches (7.6 - 17.8 cm) higher in Coastal Maine, but summer precipitation is probably lower (Fobes 1946 as cited in Davis 1961). Lautzenheiser (1959) as cited in Davis (1961) indicates that this is due to a suppression of thunderstorm activity by the cooling of maritime effects, local sea breezes and more general winds. During the winter precipitation is much heavier on the coast due to "Northeasters". Snowfall in coastal Maine is the lowest in the State.

During summer winds blow from southwest through south about 50% of the time (Davis 1961). These winds are warmer than surface waters of the Gulf of Maine, resulting in frequent fog along the coast. The fog dissipates a few miles inland. Fog probably decreases evaporation in coastal areas, thereby compensating somewhat for lower summer precipitation. Studies by Oberlander (1956) as cited in Davis (1961) indicate that dew drip occurs only under trees fully exposed to fog-laden winds (trees in the open, heavily thinned stands, and on the fringes of dense stands). Sea winds bring moisture that differs chemically from that carried by land winds, but Davis (1961) does not feel marine salts play a significant role in the distribution of the spruce-fir forests of Maine, because these types of forests occur elsewhere. In other parts of the country marine salts play a role in the distribution of certain species [e.g., Sitka spruce (<u>Picea sitchensis</u>) on the Pacific coast (Kragina 1959 as cited in Davis 1961)].

Maine's coastal climate is cool, moist and maritime. The irregular coastline may increase the maritime influence. Thornthwaite (1931, 1941) as cited in Davis (1961) classifies coastal climate as superhumid. He classifies the remainder of eastern United States as humid, except for the higher portions of the Appalachian Mountains. Thornthwaite (1948) as cited in Davis (1961) classifies Acadia climate as perhumid, the most humid of his classifications. NFDRS (Deeming, et al. 1977) uses Thornthwaite's 1931 classification to divide the United States into climate classes for fire danger rating purposes. Their map shows coastal Maine as falling within Climate Class 3 (Humid). Only a narrow band along the Pacific coast from northern California to Canada and in southeastern Alaska is placed in Climate Class 4 (Wet) for NFDRS purposes. NPS is using Climate Class 3 in the calculation of NFDRS components and indices at Acadia. The Climate Class determines the period of time (from initiation to fully green or leafed out) during which vegetative greenup occurs in the spring.

Davis (1961) studied climate at five sites on Mt. Desert Island. Inland sites were located on Beech Hill and Pemetic Mountain; seaside sites at Bass Harbor Head and Otter Point; and an open site at Whitney Farm. Weekly temperatures were measured with maximum-minimum thermometers located 60 inches (152 cm) above the ground on the north sides of trees (in a shelter on the open site). The monthly minimum air temperature was lowest in the open field and highest in seaside stands except in June, July and August. Inland stands were intermediate. Inverse relationships apply to maximum air temperatures. The sea apparently moderates temperature extremes.

Davis (1961) indicates that thawing starts the first week of April. Open sites thaw in about two weeks. Forest floors are generally completely thawed by the last week of April, although small patches remained frozen until mid-May at all sites (June 1 on Western Mountain).

Davis (1961) measured precipitation under forest stands at Beech Hill using makeshift rain gauges. He found that less precipitation reaches the ground during lighter storms. Of an average storm of 0.38 inch (1.0 cm) of precipitation only 60% reached the forest floor. Horton (1919) concluded that about 25% of precipitation occurring in heavy storms in hardwood stands reaches the ground and concludes that loss in conifer stands would probably be somewhat greater. Davis concluded that if average precipitation were 25 inches (63.5 cm) on Beech Hill, about 50% would reach the ground.

Few studies have been conducted concerning evaporation from spruce-fir stands. However, Moore and Taylor (1927) found that evaporation under canopy in the late thicket stage was about 47% of that in the open.

Evaporation would probably be somewhat greater inland. Near the coast low evaporation rates would result in slower drying of forest fuels and would appear to greatly inhibit the spread of fire except under drought conditions when catastrophic fires can result.

The year 1947 is particularly interesting from a climatic standpoint, because 213,547 acres (85,418 ha) burned. This acreage, including the 17,188-acre (6875 ha) Bar Harbor fire, was lost in numerous large fires that occurred in the central and coastal areas of Maine.

Recorded rainfall in 1946 was the lowest (36.7 inches = 93.2 cm) since 1940 and the second lowest during the 1940-1980 period. More than average rainfall occurred at Bar Harbor in 1945, however. Rainfall for the first 7 months of 1947 was above average (29.17 inches = 74 cm vs. 27.04 inches = 68.7 cm for the long-term average). A severe dry spell began in August and persisted through October. From August through October only 3.02 inches (7.7 cm) of rainfall were recorded at Bar Harbor; down 1.3 inches from the long-term average of 11.1 inches (28.2 cm). Only 0.08 inch (0.2 cm) was recorded for October, the lowest monthly precipitation on record. Temperatures for the months of April-June were slightly less than the long-term averages for these months; those for July-September slightly higher. Average temperature for October was 7°F (3.9°C) higher than the long-term average.

Wind played an important role in fire spread during the 1947 Maine fires. This was especially true on October 23. A study of meteorological conditions on October 23 disclosed that a cold front moving in from Canada early that day was preceeded by winds of 59 mph (95 km/hr) at 2000 feet (610 m). As the front passed winds increased to 87 mph (140 km/hr) at 100 feet (30.5 m) (Butler 1978). The strong winds and the frontal passage caused erratic fire behavior.

Leaf fall apparently occurred earlier than usual in southern Maine due to moisture stress, and there was a killing frost prior to the Bar Harbor fire (Butler 1978). Southern Maine reached a Class 4 state of fire danger by the second week in October. This rating was considered to represent a "high state of flammability" under the fire danger rating system used at the time. By October 5 the State's lookout towers and storehouses had been reopened, and were operating at full strength (Butler 1978).

The events surrounding the 1947 fires show that a short, dry spell coupled with dry fuels and adverse weather conditions may result in catastrophic fires. It is hard to predict what effect the dry year of 1946 may have had on conditions leading to the Bar Harbor fire. The above average rainfall during the first half of 1947 probably offset drying of fuels that occurred during the previous year.

Recent records show that there have been several years when annual rainfall was lower than in 1947. Serious fires did not, however, occur at Acadia during these years; probably because late summer and autumn rainfall was not unusually low.

CHAPTER 4. VEGETATION

4.1. Methods

Vegetation was sampled using the relevé (sample stand) method (Mueller-Dombois and Ellenberg 1974). One, two or three relevés were randomly chosen from among the fuel-sampling points in each stand. Additional relevés were placed in several burned areas and in vegetation types not covered by the 26 fuel-survey stands (Figure 4.1). Each relevé covered a 20 m by 20 m (400 m^2) area. Küchler's Physiognomic Classification (Table 4.1) and the Braun-Blanquet Cover/Abundance Scale and Sociability Index (Table 4.2) (Mueller-Dumbois and Ellenberg 1974) were used to separate vegetation within each relevé into structural classes (or strata) to provide an estimate of cover for each stratum and to estimate the cover and describe the pattern of growth of each species within a stratum. Vegetation type, height and coverage are used to classify each stratum within a relevé. For example, E6-7i refers to a stratum of needle-leaved evergreens that are 10 to 35 m tall and cover 50 to 75 percent of the relevé area. Within a stratum, each species present is classified according to the cover/abundance scale and sociability index. A rating of 4.2 refers to a species that covers 50 to 75 percent of the relevé area and has a clumped distribution pattern.

At each relevé, data were also collected to determine the past occurrence of fire or other forms of disturbance, as well as the age structure of the stand. Several overstory and understory trees were aged in each relevé. For larger trees ages were determined at a height of one foot (30.6 cm) with an increment borer. Saplings and seedlings were cut two inches (5.1 cm) above the ground and stem cross-sections examined. Where they occurred, fire-scarred trees were aged and the scars dated as accurately as possible. The presence of charcoal in the soil was noted, as were logging stumps and windthrow mounds.

Küchler and Braun-Blanquet data were analyzed using a group of programs, RELEVE, TAB1, RELSUM and OPTAGG, originally written by E. J. Cushing of the University of Minnesota and modified by Shunjen Tsay. RELEVE is a listing, by relevé, of species occurring within Küchler classes. Species' cover/abundance and sociability values are provided and total species diversity is calculated. TAB1 is a listing of all species encountered during the sampling procedures. The list indicates which relevés individual species occur in. RELSUM provides summary data for each cover type. Values for a variety of parameters are presented. Calculations are based upon all relevés occurring within each cover type.

OPTAGG, a modification of Orloci's (1967) optimal agglomeration-polythetic clustering method, was used to mechanically group plots. Species within a plot are first assigned Importance Values (IVs) according to a convention designed by E. J. Cushing. Values are derived as follows: a) cover/abundance (c/a) values are first transformed to an entirely numerical data set (r=1, +=2, 1=3, 2=4, 3=5, 4=6, 5=7); b) transformed values for a species are summed for each relevé; c) the number of occurrences (number of

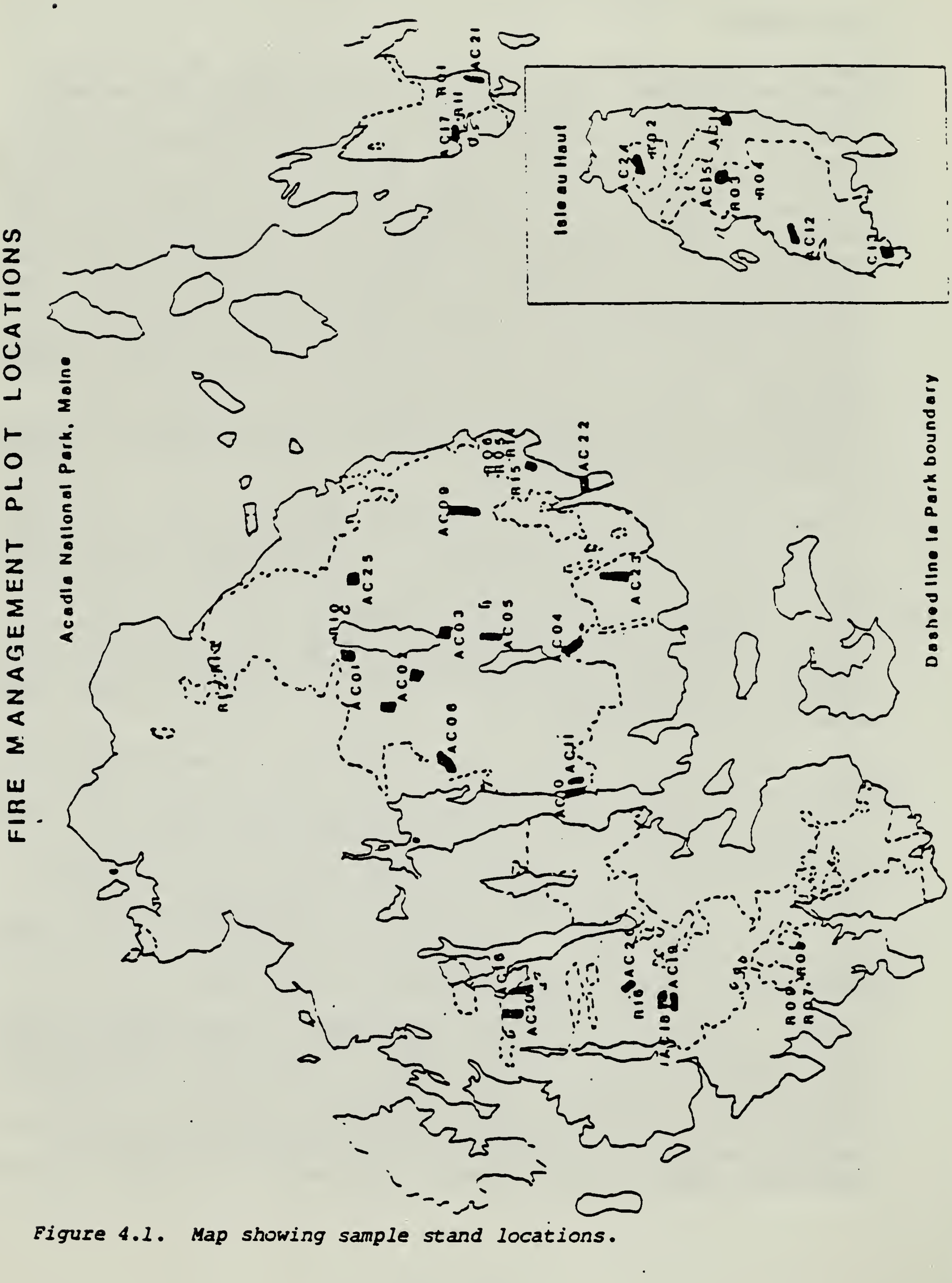


Figure 4.1. Map showing sample stand locations.

Table 4.1. *Küchler's physiognomic classification.*

Vegetation Type	Height	Coverage
B broadleaf evergreen	1 <.1m	c continuous (>75%)
D broadleaf deciduous	2 .1-.5m	i interrupted (50-75%)
E needleleaf evergreen	3 .5-2m	p parklike-patches (25-50%)
N needleleaf deciduous	4 2-5m	r rare (6-25%)
A aphyllous	5 5-10m	b barely present or sporadic (1-5%)
S semideciduous (B&D)	6 10-20m	
M mixed (D&E)	7 20-35m	a almost absent (<1%)
G graminoids	8 >35m	
H forbs		
L lichens & mosses		
C climbers		
K stem succulents		
T tuft plants		
V bamboos		
X epiphytes		

Table 4.2. Braun-Blanquet cover/abundance scale and sociability test criteria.

Cover/Abundance	Sociability
5 75-100%	5 growing in large, almost pure, population stands
4 50-75%	4 growing in small colonies, or forming larger carpets
3 25-50%	3 forming small patches or cushions
2 5-25%	2 forming dense groups or clumps
1 <1-5%	1 growing solitarily
+ seldom, with insignificant cover	
r solitary, with insignificant cover	

height strata a species occurs in) is subtracted from the above sum; d) finally, the value 1 is added to the difference arrived at in c). As an example, a species occurring in 3 strata with c/a values of 5, 3 and + would yield an IV of 7+5+2-3+1=12. A species with a single "r" occurrence would have a value of 1-1+1=1.

OPTAGG uses the matrix of IVs to produce a hierarchial dendrogram in which the classes at any one level are sub-classes of higher levels. Two similarity indices were used to generate individual dendrograms - absolute and standardized Euclidean distance. Both evaluate the distance between relevés in an n-dimensional hyperspace where n equals the total number of species (attributes) for all relevés (entities). Absolute distances are found by simply computing distances between points. By contrast, standardized distances are obtained by projecting points representing relevés onto a unit circle centered on the origin. The standard distances are then taken as the cords between the resulting points on the circle. When absolute distances are used, more emphasis is placed on species abundance than on species composition. The reverse is true for standard distance.

4.2. Analysis

Sampling provided us with information on stand structure, age, diversity and history. This information has been compiled as stand descriptions (Appendix D) and covertype summaries (Appendix E). Grouping stands and relevés by means of cluster analysis (Appendix F) allowed us to examine similarities and differences among the areas sampled. Using the information, we have been able to derive several comprehensive fire response groups. Stand descriptions, cluster analysis groups and fire response groups are included in this section of the report.

In our work we used the vegetation classes made up by Gary Waggoner of the U.S.N.P.S. Denver Service Center, with the addition of a separate class for jack pine (Table 4.3). Because we did not have access to vegetation maps and because our perspective differed from that offered by aerial photography, our interpretations have differed at times, and in some cases we have placed stands in vegetation types other than those on the maps.

Cluster analysis of relevés grouped stands into communities having some characteristics in common. These communities often resembled the types defined by Gary Waggoner, but in some cases were clustered in such a way that two or more vegetation types were included within a single community group. Similarly, some vegetation types are included within several community groups. A few stands were split in the same way. This occurred because both overstory and understory species were used to classify relevés within the clustering process.

It is important to note that with time, an area may change from one forest type, cluster analysis group or fire-response group to another. This would most commonly occur to birch-aspen and pine stands. Fire and other forms of disturbance can affect these changes, either by delaying or accelerating them.

Table 4.3. Vegetation map units for Acadia National Park.

Map Unit	Descriptive Name
1	Spruce-Fir Forest
2	White Pine Forest (includes red pine)
3	Hemlock Forest
4	Northern White Cedar Forest
7	Black Spruce-Tamarack Swamp (includes monospectic stands of each)
8	Mixed Conifer Forest
9	Birch-Aspen Forest (trees greater than 10 feet in height)
10	Birch-Aspen Scrub (trees 10 feet or less in height)
11	Northern Hardwoods Forest
12	Red Oak Forest
13	Alder Scrub
14	Mixed Hardwood-Conifer Forest
15	Salt Marsh
16	Fresh Marsh
17	Shrub Bog
18	Sphagnum-Sedge Bog
19	Floating Vegetation (spadderdock and water lily)
20	Old Fields and Meadows
22	Heath Scrub
23	Pitch Pine Forest
24	Red Maple Forest
25	Jack Pine Forest

4.2.1. Stand Descriptions

AC01 (1RA,1RB)

This spruce-fir stand is located at the northwest corner of Eagle Lake, facing east-southeast on a 15% slope. The overstory is predominantly red spruce, with white pine, hemlock and paper birch scattered throughout. It appears to have originated about 130 years ago. Dense clumps of red spruce and scattered individuals of both red spruce and balsam fir are common throughout the understory. Most understory trees are between 12 and 20 years old, but small patches of taller regeneration include trees as much as 60 years old. The only shrub found was low blueberry (Vaccinium spp.), which covers little area. The ground cover is sparse, consisting mostly of Canada mayflower (Maianthemum canadence), with starflower and grasses in scattered locations. The edges of the present stand were determined by the fire of 1947, which swept through the surrounding area but left these trees untouched. Old, cut stumps were found in the northwest corner of the stand.

AC02 (2RA,2RB,2RC)

This is an extensive northern hardwood stand facing north on a 10% slope just west of Conners Nubble. The overstory, dating from the 1947 fire, is primarily beech of sprout origin, but red maple (Acer rubrum), paper and yellow birch and bigtooth aspen are also important in some parts of the stand. Scattered trees that survived the fire of 1947 rise above the main canopy. These emergents range from 70 to approximately 110 years old. Striped maple (Acer pensylvanicum) forms a patchy intermediate layer, reaching into the canopy in much of the stand. The understory contains scattered red spruce in addition to the species mentioned above. Most trees of the understory are between 20 and 32 years old. Low blueberry, the only shrub found, is rare. The ground cover is sparse, mainly starflower (Trientalis borealis) and Canada mayflower, with small clumps of grasses and sedge. Sharply defined pit and mound topography may be a result of downed trees following the 1947 fire. Cut stumps were found in one part of the stand. A fire may have burned through part of the stand in 1901.

AC03 (3RA,3RB)

The northern hardwood stand is located on a 15% slope, facing north-northwest, between Bubble Pond and Eagle Lake. Beech and sugar maple, between 80 and 110 years old, dominate the canopy, with paper birch as a secondary component. The understory is a mixture of tall regeneration and suppressed trees, between 10 and 25 feet (3.05 and 7.6 m) tall and 40 to 70 years old. No shrubs are present. The ground cover is sparse, but diverse, containing many herbs, ferns, grasses and sedges. The 1947 fire lightly burned the western edge of the stand. Charcoal in the duff suggests that the entire area has burned in the past. Pit and mound topography is evident throughout the stand, as is beech bark disease.

AC04 (4RA,4RB,4RC)

This spruce-fir stand occupies a narrow strip of Park land along the west side of the road running from Seal Harbor north to Ocean Drive. The stand faces east on a 15% slope. The canopy is predominantly red spruce, with white pine, cedar, red maple and yellow birch mixed in. Trees from 90 to 140 years old were found within the canopy. Where older trees predominate, the canopy is open and park-like, with many downed trees beneath. Several of the oldest trees grew slowly at first, suggesting that they began as an understory or that they were subject to intense competition. The trees between 90 and 120 years old grew well from the start and were probably not beneath a dense canopy. The understory varies from one part of the stand to another. Where an open canopy of overmature individuals exist, regeneration (almost entirely red spruce and balsam fir) ranges from one to 30 feet (0.3 to 9.1 m) and 11 to 36 years old, in dense, impenetrable thickets. Where the canopy is healthy and few blowdowns have occurred, small patches of spruce and fir up to about 15 feet (4.6 m) tall and 25 years old exist. Scattered shrubs can be found. Herbs are sporadic but include several interesting species in addition to the nearly ubiquitous Canada mayflower and starflower. Charcoal was found in the duff and some cut stumps were seen. The 1864 fire that originated at the southern end of Jordan Pond probably burned through at least part of this stand.

AC05 (5RA,5RB)

This cedar stand is located on Pemetic Mountain, facing west toward Jordan Pond on a 60 to 80% slope. The canopy is patchy, with islands of pure cedar and patches of base boulder scree or ledges surrounded by a mixture of cedar, red spruce, paper birch and striped maple. The even-aged overstory originated following a fire in 1889. Small even-aged but younger patches of trees appear to have regenerated on post-fire rockslides. The understory contains many suppressed cedars, between 60 and 80 years old. Several shrub species are present but not abundant. These include mountain maple (Acer spicatum), meadowsweet (Spiraea latifolia), green alder (Alnus crispa) and roses (Rosa spp.). Herbs, ferns, grasses and sedges compose a patchy but diverse ground cover. The many charred and hollow trunks lying on the ground and the charcoal scattered almost everywhere may be remnants of the 1864 Jordan Pond fire, as well as the 1889 fire.

AC06 (6RA,6RB)

This cedar swamp stands on the low ground in an extensive mixed conifer-hardwood area along a carriage road west of Sargent Mountain. It faces northwest on a 5% slope. The overstory is primarily cedar, but red maple is also an important component of the stand. The uneven-aged canopy includes trees from 80 to more than 140 years old. The oldest trees cored were cedars. These trees grew slowly at first, suggesting that they grew under a dense canopy, which was then removed, allowing new regeneration to grow quickly for the first 20 to 30 years. Suppressed trees, 70 to 90 years old, mingle with regeneration less than 20 years old in a sparse understory.

Shrubs such as low blueberry, black alder (*Ilex verticillata*) and witch-hazel (*Hamamelis virginiana*) occur sporadically. The ground cover is lush, with many species of herbs, grasses and sedges present. Mosses, including *Sphagnum*, cover large patches of ground. Cut stumps are common throughout the area, suggesting that the present stand originated after a logging operation.

AC07 (7RA,7RB)

This red oak (*Quercus rubra*) stand is situated on a 10% slope just west of Gilmore Meadow. It's aspect is primarily east, but ranges from NNE to SSE. The even-aged overstory, which contains a small component of red maple and big-toothed aspen in addition to red oak, dates from the fire of 1947. Most trees are of sprout origin. Scattered oaks emerging from the canopy date to a fire in 1901 that spread from Aunt Betty's Pond to the Bubbles. A tall understory includes partially suppressed trees of several species, ranging from 20 to 30 years old. Several thickets of dying grey birch exist within the stand. Regeneration is sparse and very young. Blueberries and huckleberries (*Gaylussacia baccata*) are common, forming low mats or thickets beneath the trees. The ground cover consists mainly of bracken (*Pteridium acquilinum*), which forms small stands above Canada mayflower and starflower. Small patches of wintergreen (*Gaultheria procumbens*) and partridge berry (*Mitchella repens*) carpet the ground in some parts of the stand.

AC08 (8RA,8RB)

This pitch pine stand is located on a 15% slope with an eastern aspect, across from Sand Beach on Ocean Drive. Trees in the overstory are even-aged and date from the 1947 fire. The canopy is park-like at its densest, with some parts of the stand having only patches of pitch pine and red spruce surrounded by lichen-covered rocks. Mesic pockets support small thickets of grey birch and other hardwoods. Trees reach a maximum height of 16 feet (4.9 m). Regeneration, especially pitch pine, is sporadic. Blueberry, huckleberry and sheep laurel (*Kalmia angustifolia*) grow in dense, low thickets wherever mosses and lichens have built up a substrate capable of supporting them. A few herbs, grasses and sedges occur throughout the stand but cover little area. Mosses and lichens are important, colonizing bare rocks and providing a seedbed and substrate for growth of other plants. Old stumps and logs are scattered throughout the stand. Some stumps are charred on top. Others have fire scars, suggesting that more than one fire occurred before 1947. The earlier fires were less intense, leaving scarred but living trees.

AC09 (9RA,9RB)

This birch-aspen stand faces west to northwest on a 20% slope on the west side of Route 3 below Dorr Mountain. The overstory is predominantly paper birch and bigtoothed aspen. Trees are even-aged, dating from the 1947 fire. A midstory of paper birch and striped maple ranges from 15 to 25 years old. Red spruce occur in clumps through the understory. These trees are 20 to 30 years old and 2 to 6 feet (0.6 to 1.8 m) tall. Seedlings of many species are scattered throughout the stand. Several shrub species occur sporadically. The ground cover is patchy; sparse in some parts of the stand and forming a thick carpet over the ground in others. Many species of composites, grasses and sedges can be found. Logs and stumps suggest that two pre-fire stands co-existed on this site, a predominantly paper birch stand in one area and white pine in another.

AC10 (10RA,10RB)

This spruce-fir stand faces west to southwest on a 20% slope just north of the Northeast Harbor golf course. Red spruce dominates the canopy, but cedar becomes important in the damp ravines and hollows. The stand appears to have originated about 120 years ago under an open canopy that allowed fast growth during the early years. Several cedars and one red pine were found to be older, ranging from 140 to 170 years. Suppressed trees, ranging from 4 to 20 feet (1.2 to 6.1 m) and 60 to 108 years, are scattered throughout the stand. Regeneration is sparse and slow-growing except under a few small openings in the canopy, where clumps of fast-growing red spruce seedlings and small thickets of huckleberry and low blueberry can be found. The ground cover is sparse; little but scattered Canada mayflower and starflower can be found. The age structure of the stand indicates that fire may have burned through the area about 120 years ago, avoiding, or burning less intensely in, the damper areas. Thus, only cedar and scattered fire-tolerant red pines survived. The open canopy that resulted allowed rapid growth of regeneration.

AC11 (11RA,11RB)

This mixed conifer stand faces southwest on a 20% slope at the southwest corner of Norumbega Mountain, above stand AC10. The overstory is composed of red spruce, red pine, white pine and cedar. Many blowdowns and standing dead trees have left an open canopy. The stand originated about 155 to 160 years ago and has an even-aged overstory. Widely scattered rocky outcroppings support fire-scarred red pines that are 200 years or older. In some parts of the stand, a tall understory consists of suppressed trees between 85 and 132 years old. Regeneration in these places is composed of numerous seedlings of many species. In other parts of the stand, shorter suppressed trees between 65 and 100 years old intermingle with patches of red spruce and fir regeneration from 2 to 7 feet (0.6 to 2.1 m) and 30 to 50 years old. Several species of shrubs occur sporadically throughout the stand.

Herbaceous species are almost absent. The age structure of this stand suggests that an intense fire swept through the area 160 years ago, leaving only those red pines standing on rocky outcroppings, where lack of fuel lessened the fire's intensity. Today, red pine appears to be dropping out of the stand.

AC12 (12RA,12RB)

This spruce-fir stand, located on the Duck Harbor path on Isle au Haut, faces west on a 10% slope. The overstory is almost entirely even-aged red spruce, 110 to 120 years old. Large-crowned spruces with branches nearly down to the ground are scattered throughout the stand. Some of these are older than the rest of the canopy, about 135 years old. Suppressed trees are scattered in the understory. Regeneration occurs as individuals and small groups of 40 to 60 year-old trees where balsam fir has dropped out of the stand. Younger seedlings can be found along the edges of recent blowdowns. The centers of openings may be occupied by blueberry and huckleberry, along with bracken or hay-scented fern (Dennstaedia punctiloba). Throughout the rest of the stand, the ground cover is sparse. Charcoal is present in the duff, but this stand was not involved in the widespread fire of 1879.

AC13 (13RA,13RB)

This spruce-fir stand is located on Western Head, Isle au Haut. It rests on a 10% slope, with aspect ranging from east-northeast to southwest. Two different species mixtures are evident within the stand. Near the ocean, both size and age distribution are patchy. An open canopy of red and white spruce and balsam fir overtops intermediate red spruce, paper birch, balsam fir and mountain ash (Sorbus americana). Trees in the canopy range from 65 to approximately 120 years old. All grew well in their first years. Intermediate trees are mostly healthy saplings, 20 to 40 years old. Dense patches of rapidly growing regeneration are scattered throughout this part of the stand. The peaty soil supports large patches of Canada mayflower, violets and small enchanter's nightshade (Circaea alpina), as well as several other herbs. Many standing dead and downed trees can be found, most of which are balsam fir. Charcoal is present in the duff.

Farther from the ocean, the canopy becomes denser and is dominated by pole-sized red spruce, with balsam fir and paper birch as secondary components. The stand is even-aged and originated about 110 years ago. Trees grew well from the start. Suppressed red spruce are sparsely scattered just beneath the main canopy. Small patches of regeneration, primarily red spruce, are also scattered throughout the stand. Both suppressed trees and regeneration appear to have germinated in response to the death of fir trees, which have been gradually dropping out of the stand. Shrubs and herbaceous species are almost absent, but the shallow, peaty soil is almost completely carpeted by mosses and liverworts.

AC14 (14RA)

This spruce-fir stand, located along Pat's Brook near the eastern shore of Isle au Haut, sits on a small rise, having a 10% slope. Aspect is variable. The area was selectively cut in 1975, leaving a residual stand of red and white spruce. The stand originated about 100 years ago and is essentially even-aged, although a few older trees can be found. The growth of an older tree slowed temporarily 100 years ago, indicating that the present stand may have initiated as a result of the 1879 fire, which swept over much of the island. The understory contains scattered spruce trees, showing varied responses to release. Some new regeneration exists, but most has been overtopped by the hay-scented ferns, grasses and herbs that thickly carpet the ground.

AC15 (15RA)

This mixed conifer-hardwood stand faces west-southwest on Jerusalem Mountain, Isle au Haut, on slopes that range from 15 to 30%. Red spruce and cedar dominate most of the stand, with yellow birch an important component in the southeast end of the stand. The canopy has two age components; the older includes cedar and some red spruce as well as the relatively rare white pines. These trees are between 115 and 140 years old. Most of the red spruce and hardwoods in the stand are between 70 and 90 years old. The older trees grew well when young, but the younger trees grew slowly at first. Scattered suppressed conifers can be found in the understory; most are 75 to 90 years old. Regeneration is confined mainly to tiny seedlings, but dense patches of 3 to 6 foot (.9 to 1.8 m) spruce can be found in the southeast corner, where paper birch and fir have dropped out of the canopy. On rocky outcroppings, sheep laurel and huckleberry may form dense clumps. In damp ravines, ferns and lycopods (Lycopodium spp.) cover extensive areas. Charcoal is present in the duff.

AC16 (16RA,16RB)

This mixed hardwood-conifer stand faces northeast on a 10% slope on the west shore of Long Pond on Mt. Desert Island. Paper and yellow birch and red maple are important trees throughout the canopy, with other species, such as red pine and black ash (Fraxinus nigra), locally important. Most trees of the canopy are 70 to 80 years old, but along damp stream beds, older trees, between 110 and 140 years old, can be found, some with fire scars. Red spruce and balsam fir form an understory that in some parts of the stand reaches the bottom of the canopy. Where the understory is tallest, trees are approximately the same age as those of the canopy. Regeneration is sparse in these places. In other parts of the stand, both suppressed 50 to 70 year-old stems and healthy clumps of regeneration up to 30 years old can be found. Tiny hardwood seedlings can be found throughout the stand, but viable older hardwood regeneration is limited to sparsely scattered birches and striped maple, often sprouts. The ground *cover is sparse, except along streambeds, where patches of lycopods and herbs can be found. Charcoal is present beneath the duff. This, and the presence of older, fire-scarred trees along streams, suggests that the stand originated following a fire.*

AC17 (17RA)

This spruce-fir stand faces south-southwest on a 25% slope between Moore Road and the road to Schoodic Head on Schoodic Peninsula. The overstory is primarily red spruce but includes scattered balsam fir, birches, and where it approaches the ocean, white spruce. Two age groups are present within the overstory. Older trees, ranging from 135 years old to a cedar that is probably at least 200 years old, are branchy and misshapen. Many have fire scars. The rest of the canopy consists of well-pruned trees about 100 years old. Regeneration is limited to small openings where it may form dense thickets. Other openings are occupied by dense stands of sheep laurel and huckleberry or carpets of mountain cranberry (Vaccinium Vitis-Idaea). Herbaceous ground cover is sparse over most of the stand, but mosses, reindeer moss (Cladonia rangiferina) and worm lichens cover vast areas. Charcoal is present beneath the duff.

AC18 (18RA)

This spruce-fir stand is located on the southwest ridge of Western Mountain. Aspect ranges from south-southwest to west and slope from 20 to 45%. The canopy is primarily red spruce of two age classes. Large-crowned, branchy trees, 140 to 150 years old, are scattered throughout the stand, most commonly on patches of scree. Trees in the rest of the canopy are 80 to 90 years old and grew rapidly during their first 25 years or more. Suppressed red spruce occur sporadically throughout the understory. Pockets of 2 to 6 foot (0.6 to 1.8 m) even-aged spruce regeneration occupy sites where small groups of balsam fir dropped out of the stand 20 to 30 years ago. Shrubs, herbaceous plants, moss and lichens are rare. Outside of the pockets of regeneration, fallen needles provide the only ground cover. Charcoal is present beneath the duff. The canopy probably initiated following a fire that was survived by those few trees that form the older age class.

AC19 (19RA, 19RB)

This hardwood-conifer stand faces south-southwest to southwest on 10 to 50% slopes near the bottom of the southwest ridge of Western Mountain. The main canopy consists of an even-aged mixture of red maple, paper birch, red spruce, bigtoothed aspen and striped maple about 100 years old. Red spruce, red and white pine, and rarely, hardwoods emerge from this canopy and date back 140 to 150 years. A scar on an old sprout-origin red maple is 100 years old. Charcoal was found beneath the duff at the base of this tree. Scattered balsam fir and birch have been dropping out over the last 50 years. A patchy understory of red spruce and balsam fir has arisen as a *result of the openings so created. Shrubs are present, but rare. The ground cover consists mainly of scattered Canada mayflower, starflower, bracken and grass. This lower part of the slope appears to have burned 10 to 15 years before the upper slopes (AC18).*

AC20 (20RA,20RB)

This spruce-fir stand sits on top a small rise east of the north end of Hodgdon Pond. Aspect is variable and the slope is generally less than 10%. Stand AC16 lies downslope to the east. The canopy is open and patchy; large expanses of bare rock occur throughout the stand. Red spruce dominates, with red maple a minor component throughout the stand. On the dry, thin soil that prevails over most of the stand, white and pitch pine are occasionally present. In boggy hollows black spruce, cedar and larch are found. The stand originated about 70 years ago, but trees are commonly as much as 110 to 125 years old in damp areas. Many of these trees have fire scars. Two fires appear to have involved the area, one about 70 years ago and another probably about 125 years ago. The earlier fire seems to have been intense enough to burn even the damp hollows. Much of the stand supports extensive dense thickets of sheep laurel, huckleberry, bayberry (Myrica gale) and highbush blueberry (Vaccinium corymbosum). Low carpets of blueberry and occasional spreading junipers (Juniperus communis) can be found in the midst of bare or lichen-covered rock balds. Bracken, Canada mayflower and three-toothed cinquefoil (Potentilla tridentata) are the most common ground covers, scattered singly or in small patches throughout the stand.

AC21 (21RA)

This jack pine stand faces east on a 20% slope on the inland side of Wonsqueak Road on Schoodic Peninsula. The open canopy is dominated by jack pine, but red and white spruce are also present.

Trees in the canopy are uneven-aged, ranging from 60 to 115 years old. Several trees that we examined showed very slow growth during the last few decades. The understory contains many healthy jack pine and spruce trees 1 to 10 feet (0.3 to 3.0 m) tall and 25 to 40 years old. These trees, as well as the several jack pine and spruce seedlings encountered, generally occur singly. A dense layer of shrubs, including sheep laurel, huckleberry and blueberry, covers much of the stand. Openings in this shrub layer often contain small patches of crowberry (Empetrum nigrum) or mountain cranberry surrounded by bare rock, with chokeberry (Aronia melanocarpa), meadowsweet, green alder or roses growing in small pockets of organic soil on or between rocks. Herbs, such as three-toothed cinquefoil, Canada mayflower, starflower, bunchberry (Cornus canadensis) and wild sarsaparilla (Aralia nudicaulis), are scattered throughout the stand. Charcoal is present beneath the duff, but no fire-scarred trees were found. This stand probably burned about 115 years ago, and much of the soil was removed either during or shortly after the fire. Tree seedlings have been able to germinate only gradually after lichens, then moss, herbaceous plants and finally shrubs first built up a seedbed.

AC22 (22RA)

This spruce-fir stand is located at Otter Point. Throughout most of the stand, slope is less than 10%; aspect is variable. Most of the overstory has blown down over the last 30 years. The remaining overstory is a mixture of red and white spruce, the oldest trees of which date back about 160 years. Most overstory trees are about 120 years old. Younger trees, between 60 and 90 years old, and 30 to 50 feet (9.1 to 15.2 m) tall, that were released by the falling of spruces or by the earlier death of balsam firs are rapidly forming new canopies over small areas. Spruce and fir regeneration both in dense thickets and as scattered, open-grown trees, mingle with paper birch, grey birch and pin cherry (Prunus pensylvanica). Basal area of all trees over 4.5 feet (1.4 m) tall is low, only 41 square feet per acre (9.2 m^2/ha). Shrubs are common, but only raspberry (Rubus spp.) is abundant. Small plants of skunk currant (Ribes glandulosum) are scattered throughout the stand. Herbs, ferns and grasses cover extensive areas. Charcoal is present in the soil.

AC23 (23RA,23RB)

This mixed hardwood-conifer stand faces east to east-southeast on a 10 to 20% slope on Day Mountain. The canopy contains a mixture of sugar maple, red maple, yellow birch, paper birch, red spruce, bigtoothed aspen and other trees. At the bottom of the slope, the canopy is uneven-aged, with trees ranging from 60 to 150 years old. Trees in the rest of the stand are about 100 years old. The presence of charcoal in the soil suggests that a fire burned through the area about 100 years ago, dying out at the bottom of the slope. Red spruce, fir and striped maple between 15 and 40 years old occur frequently in small clumps, where fallen aspen, paper birch and spruce trees have left gaps in the canopy. These trees compose most of the viable regeneration. Shrubs are rare. The ground cover is sparse but diverse, including several herbs and ferns as well as grasses and sedges.

AC24 (24RA)

This pitch pine stand faces northwest on a 10% slope on Champlain Mountain, Isle au Haut. Pitch pine is joined by a lesser component of red spruce in the open canopy. Most of the stunted trees date back 96 or 97 years to when a fire swept through the stand. Fire scars on an older stem indicate that a previous fire may have occurred about 120 years ago. There is little regeneration. Tiny seedlings and young trees of pitch pine and red spruce are present, but rare. The ground is almost completely covered by a dense, two-storied growth of shrubs. Huckleberry, sheep laurel and bayberry make up the taller layer and the shorter layer is composed of low blueberry and wintergreen. The sparse ground cover consists mainly of widely scattered individuals of Canada mayflower and cow-wheat (Melampyrum lineare) beneath the shrubs. Small patches of bare rock are scattered throughout the stand.

AC25 (25RA)

This birch-aspen stand faces north on a 20% slope on the north ridge of Cadillac Mountain. The canopy is patchy, in some spots dense and in others non-existent. Paper birch and grey birch dominate the stand, with red spruce, balsam fir, red oak and pin cherry as secondary components. The stand is even-aged, dating from the fire of 1947. The trees are stunted, rarely attaining a height of even 20 feet (6.1 m). An understory of spruce and fir is from 10 to 27 years old. Shrubs, especially blueberry, sweet-fern (Comptonia perigrina) and withe-rod (Viburnum cassinoides), are common, growing singly or in small groups. The herbaceous ground cover is lush in some places, but non-existent in others. Large patches of bare rock occur throughout the stand. Stumps of trees that died in the fire of 1947 indicate that spruce and oak were common in the previous stand.

AC26 (26RA)

This old-growth spruce stand faces NNE on slopes averaging 30% on the West Peak of Bernard Mountain. The few remaining overstory trees are barely living. Standing dead snags are common. Dead trees litter the ground, sometimes forming piles of trunks as much as 6 feet (1.8 m) deep. Healthy regeneration is common throughout the stand. Red spruce and balsam fir grow singly, in small patches and large thickets. These trees range from 4 to 12 feet (1.2 to 3.7 m) tall and 10 to 20 years old. Paper birch is also common, generally about the same age as the spruce and fir but 12 to 18 feet (3.7 to 5.5 m) tall. Mountain ash is present sporadically. Low blueberry and skunk currant are frequently present, but don't form a continuous shrub layer. Hay scented fern and spinulose woodfern (Dryopteris spinulosa) are common. Wild sarsaparilla, bunchberry, Canada mayflower and starflower are present throughout in small numbers. Clumps of sedge are common. Mountain cranberry, large cranberry (Vaccinium macrocarpon), Sphagnum moss and liverworts form a patchy carpet over a mat of organic matter which, in turn, covers large boulders.

The overstory seems to have blown down over a period of years, rather than during a single windstorm. Many of the trees may have been dead for some time before they were blown over. Charcoal was found on most plots, but no fire scars were found on the few surviving overstory trees. This suggests that the stand originated following a fire.

This stand is most like stand AC22, the blown-down spruce stand at Otter Point. The stand at Otter Point began to blow down sooner than at Bernard Mountain, thus regeneration is older and taller and fewer trees, living or dead, remain standing. Downed woody fuel loading is considerably lower in the Bernard Mountain stand, but still much higher than fuel loadings for other stands in ANP, and standing dead snags further increase fire hazard.

R01

This open jack pine stand is located near the end of the Schoodic Head Road, on Schoodic Peninsula. The stand faces east on a slope of about 20%. Red spruce is a secondary component in the uneven-aged canopy. Pine and spruce trees in the canopy fall into two age classes; older trees between 115 and 120 years old and younger trees from 75 to 85 years old. The understory contains scattered spruce and pine regeneration between 30 and 50 years old, as well as tall, sturdy clumps of black alder and green alder. Ericaceous shrubs form extensive dense thickets [sheep laurel, huckleberry and rhodora (Rhododendron canadense)] or carpets (mountain cranberry and blueberry) over much of the stand. Herbaceous ground cover is sparse. Large patches of bare rock occur throughout the stand. Charcoal was found beneath the roots of several downed spruces, at least one of which belonged to the older of the two age classes present in the canopy. This suggests that the older trees germinated after a fire.

R02

This pitch pine stand faces north on a 10% slope near the summit of Champlain Mountain, Isle au Haut. Pitch pine and red spruce between 15 and 30-feet (4.6 and 9.1 m) tall and 85 to 100 years old form an open canopy. One emergent pitch pine was found to be 125 years old. This stand may have been burned by the same fires that appear to have burned farther down the mountain (AC24) almost 100 years ago and earlier, about 120 years ago. No young pitch pines and very few red spruce seedlings or saplings were found. A dense stand of heath shrubs, principally huckleberry and sheep laurel, carpets the area. Several herbs are scattered beneath the shrubs, and small patches of bracken interrupt the shrub cover.

R03

This red maple swamp lies on flat ground near the western end of the Bowditch Trail on Isle au Haut. The deciduous overstory, about 100 years old, is beginning to break up. Red spruce and balsam fir form a tall understory, reaching into the canopy. These trees are from 35 to 100 years old. Large clumps of speckled alder (Alnus rugosa) and black alder are scattered throughout the area. Sheep laurel and leatherleaf (Chamaedaphne caluculata) occur more sporadically. Skunk cabbage (Symplocarpus foetidus) forms a continuous ground cover in which bugleweed (Lycopus spp.), violets (Viola spp.), grasses and other less common herbaceous plants intermingle. Large chunks of charcoal can be found throughout the muck soil. The area appears to have burned during the fire of 1879.

R04

This cedar bog is located on a flat stretch of ground near the western end of the Herrick Trail on Isle au Haut. The canopy is nearly closed and consists mainly of 20 to 40-foot (6.1 to 12.2 m) tall cedars between 85 and 120 years old, with an occasional small red maple. Large, branchy cedars that may be 150 or more years old are scattered throughout the stand. Suppressed cedars, red spruce and red maple occur sporadically in the understory. Sturdy but small clumps of sheep laurel are common, with several other shrubs present sporadically. Grasses and skunk cabbage form a continuous but thick ground cover with sedges and many herbs present in smaller amounts. A carpet of *Sphagnum* moss overlies 1-1/2 to 2-foot (0.5 to 0.6-m) deep peat. Although there is no indication of fire within the bog, cedars in the surrounding uplands are scarred.

R05

This birch-aspen stand faces north on a 10% slope at the south end of The Bowl. The canopy contains red maple and pin cherry in addition to paper birch. Bigtoothed and trembling aspen appear to have been common until recently. Beavers have cut nearly all of them. Small clumps of red spruce occur throughout the understory. The area burned in the fire of 1947 and both canopy and most understory trees date from that time. Stumps and downed trees indicate that the previous stand was dominated by red spruce and was probably about 110 years old in 1947. Several species of shrubs, most commonly withe-rod, can be found in the understory. Herbs, especially starflower and bracken, are also common.

R07

This relevé was taken in a pocket of paper birch and bigtoothed aspen within a patchy mixed birch, aspen and red spruce stand facing east on a 15% slope on the site of the 1933 Tremont Fire. Although the canopy is dominated by birch and aspen, red spruce, white pine, balsam fir and red maple are also present. Most of the trees are between 40 and 47 years old, but two older spruces emerge from the canopy, suggesting that this species was important in the pre-fire stand. Balsam fir, red spruce and paper birch, 29 to 36 years old, form a scattered understory. Withe-rod, green alder and sheep laurel occur in small clumps above a nearly continuous carpet of blueberry. The small gaps within this carpet are filled with bunchberry and other herbs.

R08

This open red pine stand faces southeast on a 5% slope on the site of the 1933 Tremont Fire. Large, old red pines are widely scattered throughout the area with small red pine, red spruce, balsam fir, paper birch and bigtoothed aspen sprinkled beneath them. The older pines are 90 to 130 years old. Many were scarred by the fire in 1933, some by an earlier fire that may have occurred about 90 years ago. The smaller trees are 1 to 35 years old. Much of the stand is covered by a dense layer of shrubs, including withe-rod and such ericaceous species as huckleberry. Grasses and herbs are rare. Large patches of bare or lichen-covered bedrock and boulders are present.

R09

This spruce-fir stand faces south-southeast on a 12% slope on the site of the 1933 Tremont Fire. Red spruce and red maple, 40 to 60 years old, form a nearly closed canopy. The older trees are fire-scarred. Maples in the canopy are of sprout origin. Red spruce, balsam fir and red maple are common throughout the understory; the conifers occurring singly and red maple both singly and in clumps. Shrubs are rare. The sparse ground cover is composed of several herbaceous species.

R10

This relevé was done in a small red and white pine stand on a small, flat promontory at the north end of Eagle Lake. Pines about 135 years old, with scattered red maple, form an interrupted canopy. Beneath this is a tall understory of red spruce, balsam fir and red maple. Most of these trees are between 45 and 50 years old and have grown rapidly. Beneath these are slower-growing spruce and fir, 20 to 50 years old, mixed with large, sturdy clumps of mountain holly and spreading patches of huckleberry, sheep laurel and low blueberry. Several herbs are sparsely scattered throughout the stand. Charcoal was found beneath the roots of a blowdown.

R11

This spruce-fir stand faces south-southwest on a 5% slope on Schoodic Peninsula. The open canopy contains red spruce 105 to 115 years old. Dense spruce and balsam fir regeneration up to 45 years old fills many of the gaps created by windthrown trees. Shrubs and herbs are rare. Downed and standing dead trees are mainly spruce, with lesser amounts of paper birch and balsam fir. Charcoal is abundant under several blowdowns, suggesting that the overstory originated after a fire. Wet soil contributes to slow tree growth and rapid stand decay.

R12

This 10-acre (4.0 ha) strip of heath scrub faces northwest on an approximately 15% slope between Lake Wood and Fawn Pond. The area burned in 1947 and again about 1974. Between 20 and 25% of the surface is bare rock. The rest is vegetated by heath shrubs, especially blueberry, sweetfern and huckleberry, with small patches of red oak and other hardwoods, mostly of sprout origin. Scattered red pine and white pine seedlings can be found. The herbaceous ground cover is sparse but diverse.

Red oak seems to have dominated the previous stand, with smaller components of red pine and red maple present. Stumps cut before the fire of 1947 show 55 to 65 years of growth. Just outside the burned area are two large red pines of poor form, about 120 years old. This suggests that the stand that burned in 1947 had its origin about 120 years ago, probably following a fire, and was logged at some time within the three decades prior to 1947.

R13

This red oak stand faces northwest on a 5 to 10% slope between Lake Wood and Fawn Pond. Red pine and red maple accompany the oak in an interrupted canopy that dates back to the fire of 1947. An extensive understory containing red and white spruce, red and white pine and paper and grey birch reaches nearly into the canopy. Huckleberry, low blueberry and sweet fern are common but do not form dense thickets. Sturdy red and white pine seedlings can be found. Herbs and grasses are rare. This stand is adjacent to R12 and appears to have been logged at the same time. Stumps show evidence of at least two fires, probably light, before 1947.

R14

This mixed spruce and birch stand faces east on a 15% slope across Ocean Drive from Sand Beach. It is just west of AC08. Red spruce, paper birch and grey birch form an overstory that is occasionally interrupted by open patches. The trees date to the fire of 1947 and most are 3 to 12 feet (0.9 to 3.7 m) tall. Red maple and trembling aspen are sporadically present. A patchy shrub layer includes black huckleberry, low blueberry, sheep laurel, and sweet fern. Bracken fern occurs commonly but singly, rather than in clumps. Several composites are present sporadically. Small clumps of grass are common. Moss and lichens carpet patches of ground. There is little or no soil -- merely a mat of organic matter covering bedrock. Five to 10 square feet (0.5 to 0.9 m^2) patches of open bedrock are scattered throughout the area. Fuel scattered on the ground can be traced to two sources; logs remaining from the salvage operation after the fire of 1947 (various diameters) and birches and aspens that have died within the last few years [1 to 2 inches (2.5 to 5 cm) in diameter]. Stumps from the pre-fire stand are scattered throughout. Most are 6 to 12 inches (15.2 to 30.5 cm) in diameter, a few are as much as 18 inches (45.7 cm) in diameter. A white pine that was killed by the fire and then cut down was between 120 and 150 years old in 1947.

The stand is an analogue to AC09 and AC26. Both R14 and AC09 regenerated following the fire of 1947. AC26 is regenerating following the break-up of the previous old-growth stand, but has a substrate similar to that of R14 - bedrock and boulders covered by a mat of organic matter. Birch and aspen in R14 are slightly shorter than the spruce instead of much taller, as in AC09. Growth rates for all species are less in R14 than in AC26, but if AC26 were to burn, regeneration would likely follow a similar course to that of R14. In AC26, as in R14, spruce outcompetes birch rather than being suppressed beneath a birch canopy as in AC09 and other stands having a mineral substrate.

R15

This birch stand faces SE on 30% slopes along the trail leading from Ocean Drive to The Bowl. The predominantly paper birch overstory dates back to the 1947 fire. Beech, black cherry (Prunus serotina), sugar maple and red maple are scattered throughout the dense, 15 to 30-foot tall canopy. Healthy beech suckers are sporadically present and seedlings of red maple, sugar maple, paper birch and black cherry can be found. Withe-rod is present but rare. Sedge forms a continuous ground cover in which hawkweed (Heiracium sp.) is also common. Other herbs, such as common speedwell (Veronica sp.), coralroot (Corallhoriza sp.), wild sarsaparilla, starflower and several species of composites are sporadically present.

Boulders are common, as are blowdown mounds that appear to predate the fire of 1947. Stumps found within the relevé indicate that paper birch was abundant in the overstory of the previous stand, with pole-sized spruce reaching into the canopy and a few very large white pines emerging above the canopy.

Superficial resemblances to many stands can be found, yet R15 lacks spruce and aspen, both of which are commonly found in all other relevés in which paper birch is abundant. As the birches die out and are replaced by beech, sugar maple and red maple, the stand may, in time, most closely resemble AC03, a northern hardwood stand.

4.2.2. Cluster Group Analysis

Cluster analysis, by both standard and absolute distance methods, broke up the relevés into two large and one small group. They are 1) relevés on mesic or nutrient-rich sites (excluding northern hardwoods), 2) relevés on xeric or nutrient-poor sites, 3) northern hardwoods. Each group is further broken down into smaller groups that are discussed below. Where standard and absolute distance measures disagreed on these finer distinctions, we chose the grouping more relevant to our purposes. Dendrograms discussed in the following sections are included in Figures 4.2 and 4.3.

1) Mesic or nutrient-rich communities

This group contains spruce, mixed conifer, conifer-hardwood and cedar stands. Shrubs are rare or only sporadically present in these stands. None burned during the fire of 1947, but many had burned previously.

1RA, 12RB, 13RB, R11

Red spruce dominates both the canopy and understory in these relevés. Fir and paper birch are also present. Canada mayflower is the most common herbaceous species. Shrubs are rare.

Canopies are dense in all relevés except R11, which is on a damper site than the others. This combination of a somewhat patchy canopy and damp soil allows more species diversity in R11, where such species as mountain cranberry, cedar and mountain holly (Nemopanthus mucronata) were found.

AC11 (11RA and 11RB), AC18 (18RA), AC19 (19RA and 19RB)

These are mixed conifer stands with scattered hardwoods. Red spruce is important in all three stands. Cedar, fir and red maple are also present. Paper birch, red pine and white pine are each present in four of the five relevés. Red pine is common in the overstory of AC11 and scattered throughout AC19, but no viable regeneration was found in either stand. Low blueberry is scattered in the understory, along with several herbaceous species. In AC11, there are scattered patches where over-mature trees are dying and the canopy is breaking up. Throughout most of that stand, as well as the others, the canopy is dense.

13RA, AC14 (14RA), AC22 (22RA)

Red spruce dominates the patchy canopies of these relevés. Paper birch is also present in all three relevés. Fir is important in 13RA and 22RA, white spruce in 13RA and 14RA. Two of the many herbaceous understory species are hay-scented fern and Canada mayflower.

The overmature canopy of AC22 has suffered heavy windthrow damages over the last 20 years. Few overstory trees remain. Stand AC14 was selectively cut in 1975. About half of the overstory remains. Relevé 13RA, in close proximity to the ocean, appears to suffer from salt-spray damage. Many dead trees remain standing in the overstory. Others have been broken or windthrown. Understory species indicate that 13RA and 14RA are damper than 22RA.

1RB, 4RA, 4RB, 10RA

Red spruce dominates these relevés, with scattered fir, red maple and red oak also present. White pine and paper birch can each be found in three of the four relevés. Several other species of trees were each found in one or two of the relevés. Starflower, Canada mayflower and low blueberry are sparce, but present. Scattered clumps of red spruce and fir regeneration can be found.

4RC, AC06 (6RA and 6RB), 10RB, AC15 (15RA)

These are mixed conifer stands with red spruce and cedar predominating. Hardwoods, especially yellow birch and red maple, are scattered throughout. Variable topography within these stands allows red spruce to dominate the drier high spots and cedar to dominate damp low spots. The group encompasses a wide range of site conditions, and thus of species mixes. Relevé 4RC, located on a 15% slope, has the most uniform topography. Red spruce strongly dominates the patchy canopy. A dense thicket of red spruce and fir regeneration covers the site. Herbs and shrubs are rare. At the opposite extreme is stand AC06, located in a flat, swampy area with small hillocks standing above the swamp. Cedar and red maple dominate the lowlands, with red spruce standing upon the hillocks. Regeneration is sporadic and shrubs are rare, but a lush herbaceous ground cover is present.

AC05 (5RA and 5RB)

Cedar dominates the overstory in both relevés of this stand. The patchy canopy contains strips of pure cedar intermingled with mixed cedar, red spruce, paper birch, striped maple and several less common hardwood species. Mountain maple, roses, and meadowsweet are among the many species of shrubs scattered throughout the stand. The ground cover is diverse but sporadic. Loose boulder scree underlying the site provides a soil that is well-drained in spite of more than adequate water sources. This cedar stand is thus more susceptible to drought and fire than the other predominantly cedar sites (AC06 and R04) that we examined.

AC16 (16RA and 16RB), AC23 (23RA and 23RB)

Mixed hardwoods and conifers form the canopies of these two stands. Both are located on 10 to 20% slopes, with streams running down through the stands. Common species include paper and yellow birch, red spruce, fir, white pine, aspen and red and striped maple. Sugar maple and black ash, although less common, are present in both stands. In the depressions alongside streams, yellow birch and black ash can be found above lush herbaceous ground covers. On higher ground fewer understory species are present and paper birch, red spruce, white pine and aspen are more common in the overstory.

R03, R04

The overstories of these two wet-site communities have little in common. Relevé R03 is in a red maple swamp and R04 is in a cedar bog. Both sites, however, have a nearly continuous herbaceous ground cover dominated by skunk cabbage and grasses. Leatherleaf, black alder and sheep laurel are common shrubs at both sites.

2) Xeric or nutrient-poor communities.

This group contains pine, oak, birch-aspen and some spruce stands. Heath stands cover large areas in the understories of most of these stands. Many were burned in the fire of 1947. Of those that did not, three burned in 1933. Most of the others show evidence of repeated severe fires. Poor, shallow, often dry soils are common.

AC08 (8RA and 8RB), 20RA, AC24 (24RA), R02, R08

These pine stands and relevés have all burned repeatedly. Pitch pine is present in all but R08, in which red pine is the dominant tree species. All have open, sparse canopies. Exposed bedrock fills gaps in the dense heath shrub understories of these stands. Although all sites show an initial burst of regeneration immediately following the most recent fire, seedlings have continued to become established as humus gradually clothes the exposed rock surface.

AC21 (21RA), R01

Jack pine dominates the patchy canopies of these two relevés, both on Schoodic Peninsula. White spruce is also common in AC21, which is close to the ocean. In R01, red spruce is common. Heath shrubs, primarily black huckleberry and sheep laurel, cover 25 to 75% of the sites. As in the previous group of stands, exposed bedrock is common. Species such as mountain holly indicate the presence of damp pockets between rocks.

12RA, AC17 (17RA), 20RB, R09, R10

Red spruce dominates the canopies of all but one of these relevés. The canopy of R10 is mixed red and white pines with red spruce just below. Heath shrubs, especially black huckleberry, low blueberry and sheep laurel, are common. Although these sites are mesic, they have extremely shallow soils, with bedrock in most cases immediately beneath the organic layer.

AC07 (7RA and 7RB), R12, R13

Red oak is the major tree species on all of these sites. Red maple and grey birch are also present. Red oak and red maple are more important in AC07 than in R12 and R13, both of which contain red pine. Low shrubs occur in small thickets or as a thin-canopied understory layer. Low blueberry and sweetfern are common throughout. Black huckleberry occurs densely in scattered locations.

Although R12 and R13 both contain red pine, seedlings were found only in the more recently burned R12. Stand AC07 contains more species than either R12 or R13, and its overstory trees are much taller.

AC09 (9RA and 9RB), AC25 (25RA), R05, R07

Birch and aspen dominate the canopies of these stands and relevés, with red spruce common in the understory, or as an intermediate layer just beneath the canopy. Stand AC09 has a plant assemblage indicative of a more mesic site than the others. Striped maple, beech and ash are scattered throughout the understory. Stand AC25 is very much different, being underlain by shallow, droughty soils. Grey birch assumes equal dominance with paper birch in the stunted canopy of this stand. In R07, red spruce is beginning to reach into the canopy. This relevé is further along than the others in the common birch-aspen to red spruce transition.

3) Northern hardwoods

This smaller group contains relevés from stands AC02 and AC03, the two northern hardwood stands sampled. Sheltered, mesic sites support beech, sugar maple and other hardwoods in dense canopies. Beech is the most important overstory species. Beech, striped maple and red spruce are the most common seedlings and saplings.

AC02 (2RA, 2RB and 2RC)

The fire of 1947 swept through this stand, leaving only a few living trees, which still remain, emerging from the main canopy of beech suckers, birches and maples. Several species of herbs, such as starflower, asters (Aster spp.) and Canada mayflower, are scattered with grasses throughout the stand.

AC03 (3RA and 3RB)

Only the western edge of this stand was touched by the fire of 1947. Beech and sugar maple comprise the bulk of the canopy. Red spruce is less common in the understory of this stand. Scattered herbs, grasses and patches of Christmas fern (Polystichum acrostichoides) and wood form the ground cover.

Figure 4.2. Optimal Agglomeration on standard distance.

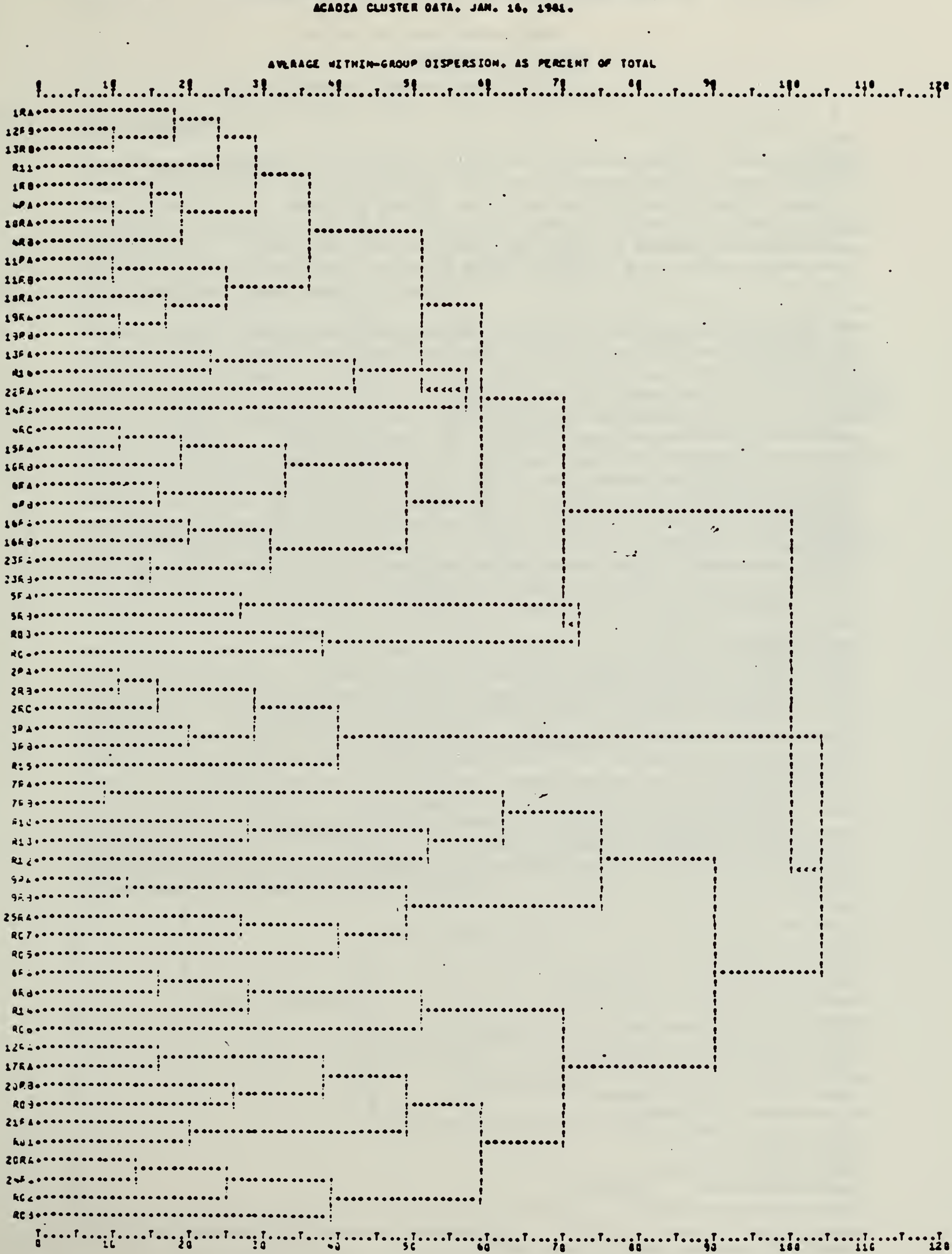
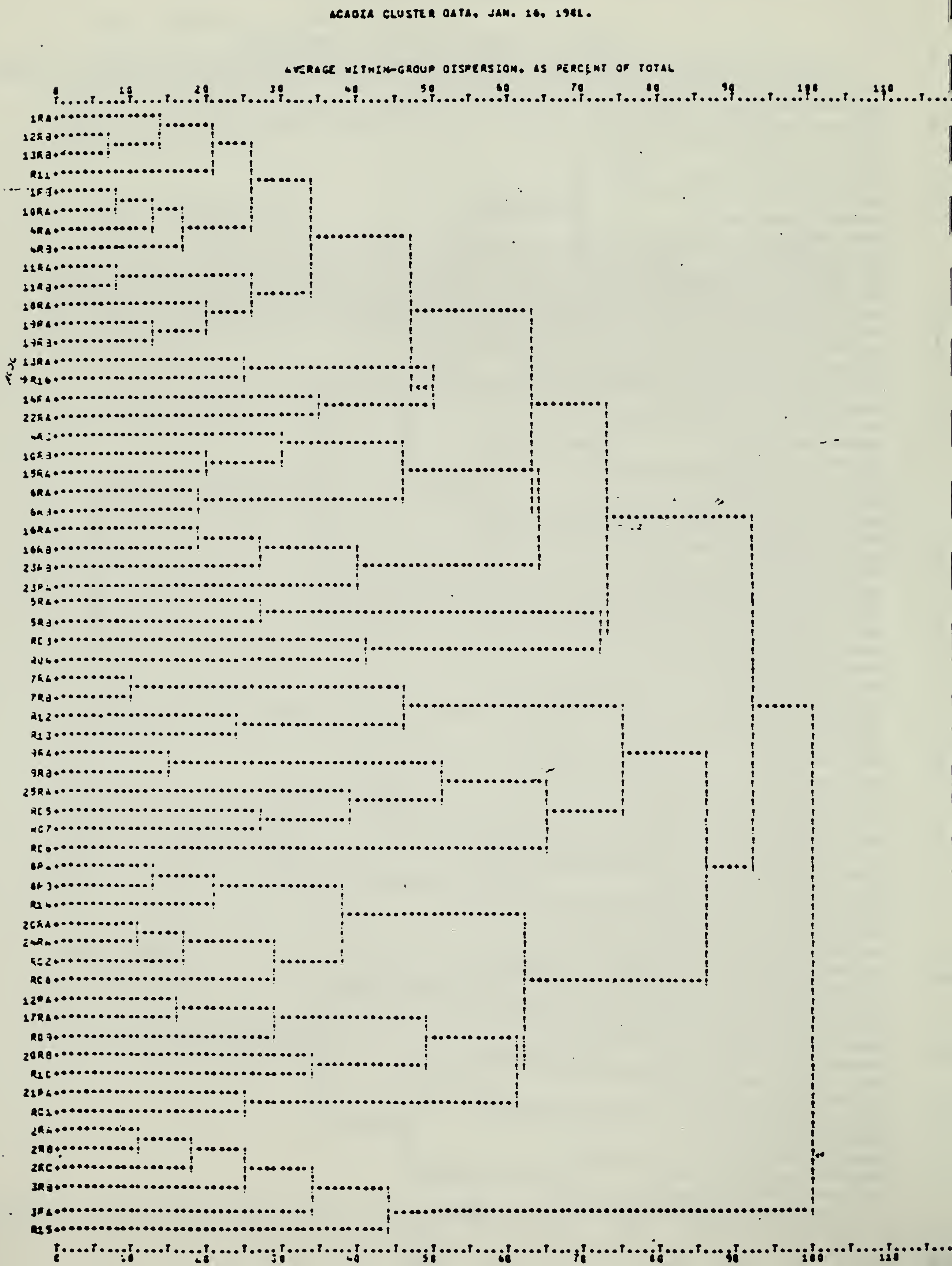


Figure 4.3. Optimal agglomeration on absolute distance.



CHAPTER 5. FUELS

5.1. Methods

Fuels were examined in 26 stands chosen as representative of Park forests (See Figure 4.1). Characteristics of sample stands are listed in Table 5.1. Within each stand, sampling points for standing and downed fuels were located at two-chain (132 feet = 40.2 m) intervals along transects run two chains apart. Where possible, at least 20 sampling points were located within a stand to minimize standard error. Stands AC14, AC21, AC22 and AC26 contained fewer sample points.

At each point, downed woody fuels were surveyed along planes extended in randomly determined directions from the point (Brown 1974). Sampling planes were 50 feet (15.2 m) long for fuel greater than three inches (7.6 cm) in diameter, 12 feet (3.7 m) long for one to three inch (2.5 to 7.6 cm) pieces and six feet (1.8 m) long for pieces of fuel less than one inch (2.5 cm) in diameter. Specific gravities for most species were obtained from the U.S. Forest Products Laboratory (1974). Those for jack pine were found in Alban (1978), and Ledig, et al. (1975) gave values for pitch pine. A median value was assigned to shrubs, as no specific gravities for shrubs were found. Mean diameters were determined for each species by sampling enough twigs to obtain 25 diameters within each size category, then summing and obtaining mean values. Average secants were taken from Brown (1974). The constants d^2 and s are presented for each species in Appendix G. Calculations of the weight of fuel per acre followed Brown (1974).

Standing biomass was determined at each sample point using variable-radius and mil-acre plots. Trees and shrubs greater than 4.5 feet (1.4 m) tall were sampled on variable-radius plots using a ten factor Cruz-All. Diameters to the nearest 0.1 inch (2.5 mm) were recorded by species. Live and dead trees were tallied separately. Trees and shrubs less than 4.5 feet (1.4 m) tall were recorded by one foot (0.3 m) height classes on mil-acre plots, with live and dead stems of each species tallied separately. Biomass was calculated using equations and coefficients (Appendix H) supplied by H. E. Young of the University of Maine's Complete Tree Institute (Young, et al. 1980). A program designed by Shunjen Tsay, a graduate student at the University of Massachusetts, calculated biomass, basal area and density from plot data.

Table 5.1. Characteristics of stands sampled for fuel loading, Acadia National Park

Cover Type Stand	Stand	Age	Slope	Aspect	Composition
			FUEL MODEL H		
1 (Spruce-Fir)	AC01	130	15%	ESE	R.Spruce, W.Pine, Hemlock, P.Birch
	AC04	90-140	15%	E	R.Spruce, W.Pine, Cedar, R.Maple, Y.Birch
	AC10	120	20%	SW	R.Spruce, Cedar
	AC12	110-120	10%	W	R.Spruce
	AC13	65-120	10%	ENE to SW	W.Spruce, B.Fir, R.Spruce, Mt.Ash
	AC17	100-135	25%	SW	R.Spruce, B.Fir, Birches, W.Spruce
	AC18	80-150	20-45%	SSW to W	R.Spruce
4 (N.W.Cedar)	AC05	90	60-80%	W	Cedar, R.Spruce, P.Birch, S.Maple
	AC06	120	5%	NW	Cedar, R.Maple
8 (Mixed Conifer)	AC11	155-160	20%	SW	R.Spruce, R.Pine, W.Pine, Cedar
14 (Mixed Hdwd. - Conifer)	AC15	70-140	15-30%	WSW	R.Spruce, Cedar, Y.Birch
			FUEL MODEL K		
1 (Spruce-Fir)	AC14	100	10%	Variable	R.Spruce, W.Spruce
			FUEL MODEL Q		
1 (Spruce-Fir)	AC20	70	≤10%	Variable	R.Spruce, R.Maple
23 (Pitch Pine)	AC08	34	15%	E	P.Pine
	AC24	97	10%	NW	P.Pine
25 (Jack Pine)	AC21	60-115	20%	E	J.Pine, R.Spruce, W.Spruce
			FUEL MODEL G		
1 (Spruce-Fir)	AC22	120	≤10%	Variable	R.Spruce, W.Spruce
	AC26	>150	30%	NNE	R.Spruce, B.Fir, P.Birch
			FUEL MODEL R		
9 (Birch-Aspen)	AC09	34	20%	W to NW	P.Birch, Bigtooth Aspen
	AC25	34	20%	N	P.Birch, G.Birch, R.Spruce, B.Fir, R.Oak, P.Cherry
11 (N. Hardwood)	AC02	34	10%	N	Beech, R.Maple, P.Birch, Y.Birch, Bigtooth Aspen
	AC03	80-110	15%	NNW	Beech, S.Maple, P.Birch
12 (Red Oak)	AC07	34	10%	NNE to SSE	R.Oak, R.Maple, Bigtooth Aspen
14 (Mixed Hdwd - Conifer)	AC16	70-80	10%	NE	P.Birch, Y.Birch, R.Maple, R.Pine, B.Ash
	AC19	100	10-50%	SSW to SW	R.Maple, P.Birch, R.Spruce, Bigtooth Aspen, Striped Maple
	AC23	60-150	10-20%	E to ESE	S.Maple, R.Maple, Y.Birch, P.Birch, R.Spruce, Bigthooth Aspen

5.2. Analysis

Fuel is the most important single factor influencing fire ignition, buildup and behavior (Brown and Davis 1973). The importance of factors such as climate, season and weather lies in their ability to influence the availability of fuels. Ignitions cannot become major conflagrations unless dry fuel is available to nurture the initial sparks and allow spread of flames beyond the point of ignition.

Important natural fuels include duff, litter, grass and forbs, downed dead branchwood, logs, stumps, shrubs, standing dead snag trees and the foliage, twigs and small branches of live trees. Knowledge of the major classifications of fuel is essential to an informed discussion of their influence on fire. The effect that any given fuel loading has upon the ignition, spread, intensity and duration of a fire varies according to the size, species and spatial arrangement of the fuel. Not only dead plant material, but living plants also, must be considered.

An important factor in the assessment of a fuel's availability is its moisture content. The probability of ignition and the intensity of burning increase as fuel moisture content decreases. In live trees, another important factor is the presence of aromatic oils, which increase inflammability (Mutch 1970, Brown and Davis 1973). Conifers and some of the heath shrubs, such as leatherleaf and sheep laurel can be highly flammable because their foliage has both aromatic oils and a low moisture content (Little 1964, Brown and Davis 1973). The living foliage of most hardwoods, having a high moisture content and no aromatic oils, is not flammable except under extreme conditions.

The moisture content of dead fuels fluctuates in response to precipitation, relative humidity and temperature. The speed, or timelag, with which this fluctuation occurs differs with the size of individual fuel particles; dead fuels are thus assigned to timelag classes according to their size (Deeming, et al. 1977). Small pieces of fuel respond faster to climatic changes than larger pieces of fuel, and thus have shorter timelags.

The time taken for fuels to decay differs from one species to another. Most hardwoods decay rapidly (3-5 years for large limbs), unlike most northern conifers (Brown and Davis 1973). Slower rates of decay cause more fuel to accumulate. Decayed, punky wood behaves differently than sound wood, igniting much more easily, often with a single spark. Decayed wood of standing dead trees (snags) can produce many flying sparks and embers.

Both dead and live fuels are commonly placed into three categories, ground, surface and aerial, according to the vertical strata in which they are found (Brown and Davis 1973). Ground fuels include duff, muck, peat, tree roots, punky wood and occasionally sawdust. These fuels support glowing combustion once their moisture content has been reduced to less than 20%. Fires in ground fuels often follow surface fires and persist for some time, smoldering but seldom breaking into flame. Ground fires are more difficult to control than those in surface or aerial fuels, often causing new surface ignitions long after a fire was thought to have been mopped up. Generally they are more destructive, removing organic matter that may have taken years to accumulate, and killing more vegetation than surface or crown fires.

Surface fuels include fallen foliage and undecayed twigs and bark (litter) as well as grasses and forbs, shrubs less than four feet tall, tree seedlings and downed branches, logs and stumps. The most commonly burned surface fuel is loose litter. Spruce and other small-needled conifers produce a compact litter that burns in much the same way as a ground fire. The most dangerous fire carriers among the surface fuels are fine fuels that are loosely arranged and well-aerated, such as dead leaves or needles still attached to branches, and dry grasses and forbs. These fuels are highly inflammable and serve as kindling to ignite larger dead wood. Although large downed limbs, logs and stumps are not readily inflammable until after a long period of drought, they can considerably increase the life of a fire and its temperature.

Live shrubs and tree regeneration are also important fuels within this stratum. Their inflammability is highly variable. Coniferous regeneration and heath shrubs may accelerate the rate of a fire's spread while serving as bridges between surface litter and canopy vegetation, thus assisting in the initiation and spread of crown fires.

Trees and shrubs, both living and dead, taller than four feet are classified as aerial fuels. Dead standing trees, often having punky wood or shaggy strips of deteriorating bark, are an important component of crown fires. Living trees may also provide a fuel source. The foliage of northeastern hardwood species generally will not carry fire, but the needles of coniferous trees, with their low moisture content and aromatic oils, will burn readily in dry weather. The dead branches of poorly pruning species such as spruces act as a ladder up which fire can climb to reach tree crowns.

Within the boundaries of Acadia National Park, fuel loadings vary considerably, from the low downed fuel accumulations of the relatively non-flammable hardwoods, through the very high downed fuel loadings of inflammable windthrown spruce stands to the seral heath-conifer communities where downed fuel is rare but the vegetation is extremely inflammable. Adjacent to the Park, recently logged stands, with high fuel loadings, threaten Park forests with the possibility of raging wildfires.

Fuel loadings for 26 stands within or adjacent to the Park are shown in Table 5.2 and Figures 5.1-5.5. Downed woody fuels by timelag classes, standing live and dead fuels by height class and average duff depth are given for each stand. Mean values for each fuel model and cover type, as well as the mean over all the stands, are given in Table 5.3.

Table 5.2. Total fuel amounts by stand for Acadia National Park

	NFDRS		Downed Woody Fuels (Tons/Acre)			Sound	Rotten		Standing Woody Fuels (Tons/Acre)				
									Live		Dead		Duff
Cover Type	Fuel Model	Stand	1-hr	10-hr	100-hr	1000-hr	1000-hr	Total	V.R. Plot	M-A Plot	V.R. Plot	M-A Plot	Depth (in.)
1	H	AC01	2.28	2.09	1.34	3.67	3.52	12.90	91.0	0.276	8.12	0.021	2.61
	H	AC04	1.14	0.65	0.52	1.02	3.94	7.27	93.3	8.858	8.13	0.041	5.74
	H	AC10	0.88	0.99	1.88	2.70	2.73	9.18	89.1	0.213	4.60	0.001	4.90
	H	AC12	1.83	0.93	1.85	4.78	3.65	13.04	60.9	0.169	12.05	0.025	6.47
	H	AC13	1.73	1.68	1.96	3.98	2.43	11.78	66.5	0.074	17.05	0.001	6.21
	K	AC14	4.77	4.21	5.51	11.02	2.29	27.73	44.0	0.223	2.31	0	7.19
	H	AC17	1.71	0.87	1.20	6.10	2.65	12.53	96.9	0.254	10.58	0.006	4.73
	H	AC18	1.92	0.98	2.48	0.73	1.39	7.50	90.7	0.205	8.19	0.003	4.98
	Q	AC20	0.49	0.59	0.52	0.73	0.67	2.99	24.6	1.101	2.34	0.099	3.25
	G	AC22	0	3.14	5.05	29.30	26.37	63.86	17.5	0.021	9.48	0.115	2.81
	G	AC26	0.60	2.61	2.69	0	29.16	35.06	12.5		7.20		
4	H	AC05	1.01	0.71	0.88	0.59	4.05	7.51	49.1	0.039	1.59	0.002	1.50
	H	AC06	0.53	0.79	1.37	4.35	1.70	8.74	100.5	0.041	10.21	0	4.95
8	H	AC11	0.76	1.27	1.75	4.19	2.62	10.79	100.0	0.198	8.68	0.002	5.88
9	R	AC09	1.01	2.18	1.57	0.31	1.72	6.79	34.3	0.012	0.65	0.006	1.23
	R	AC25	0.24	0.94	0.71	0.44	1.21	3.43	0.8	0.634	0	0.164	0.80
11	R	AC02	1.12	3.46	1.34	1.23	2.82	9.97	103.1	0.002	2.54	0.081	2.30
	R	AC03	0.85	2.10	2.57	3.21	3.07	11.80	59.4	0.038	3.58	0.028	1.00
12	R	AC07	0.84	2.17	0.69	0.66	0.44	4.80	91.1	0.042	0.49	0.046	1.62
14	H	AC15	1.04	1.08	1.25	4.59	3.64	11.61	76.3	0.079	10.46	0.001	4.04
	R	AC16	1.09	1.19	2.04	1.09	2.54	7.95	81.2	0.259	7.03	0	3.53
	R	AC19	0.84	0.81	1.07	2.53	0.99	6.24	75.8	0.098	4.95	0.007	2.75
	R	AC23	0.60	1.01	1.74	1.13	1.94	6.42	62.5	0.138	6.04	0.014	2.40
23	Q	AC08	0.31	0.46	0.58	6.52	3.76	11.63	7.2	0.193	0	0.016	0.92
	Q	AC24	0.35	0.59	0.06	0	0.09	1.09	48.7	2.034	2.20	0.303	1.30
25	Q	AC21	0.54	0.22	0	0.15	0	0.91	48.7	0.979	6.29	0.430	2.30

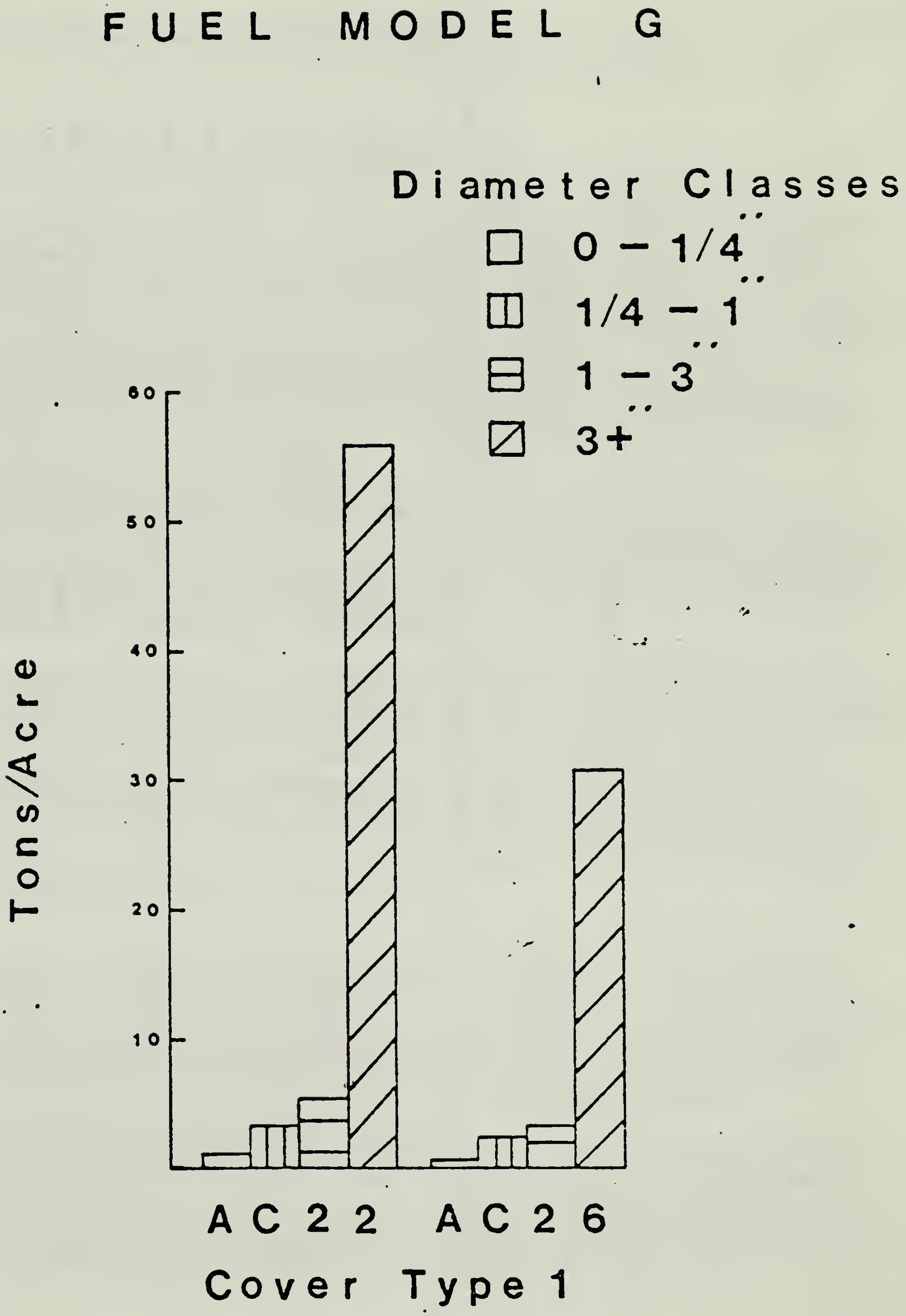


Figure 5.1 Fuel loading by diameter class for stands classified as fuel model G.

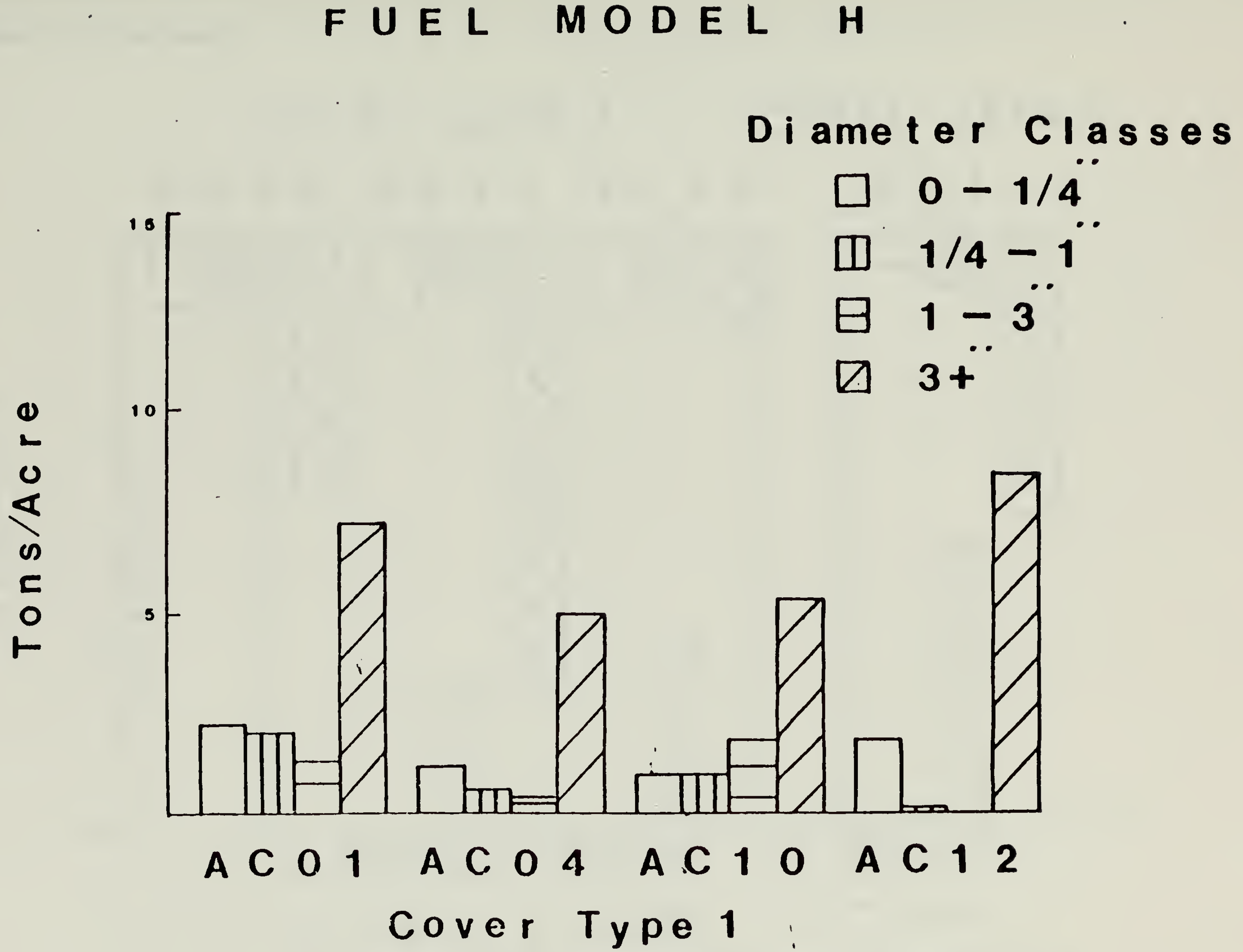


Figure 5.2 Fuel loading by diameter class for stands classified as fuel model H.

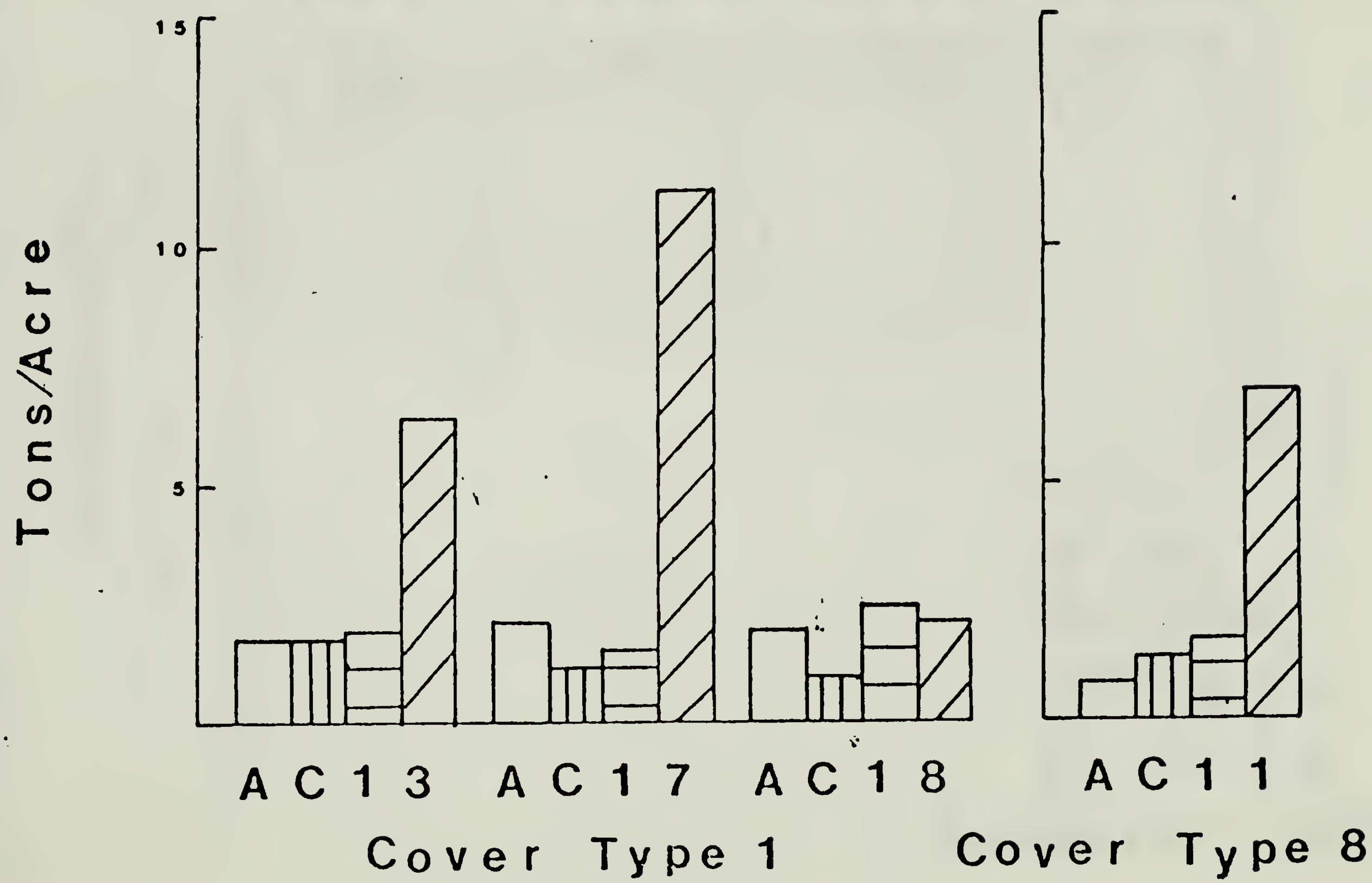


Figure 5.2. (Continued)

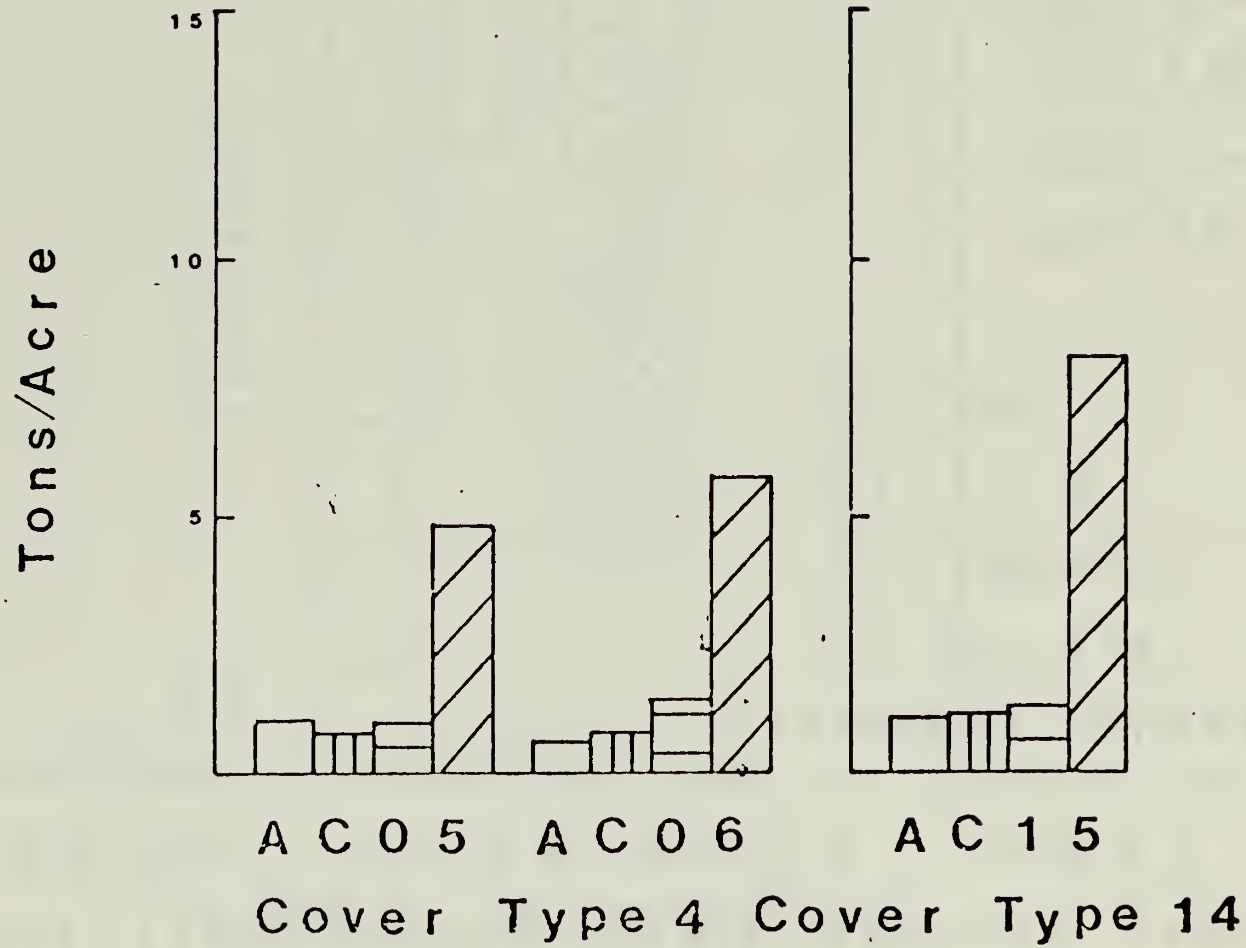


Figure 5.2 (Continued)

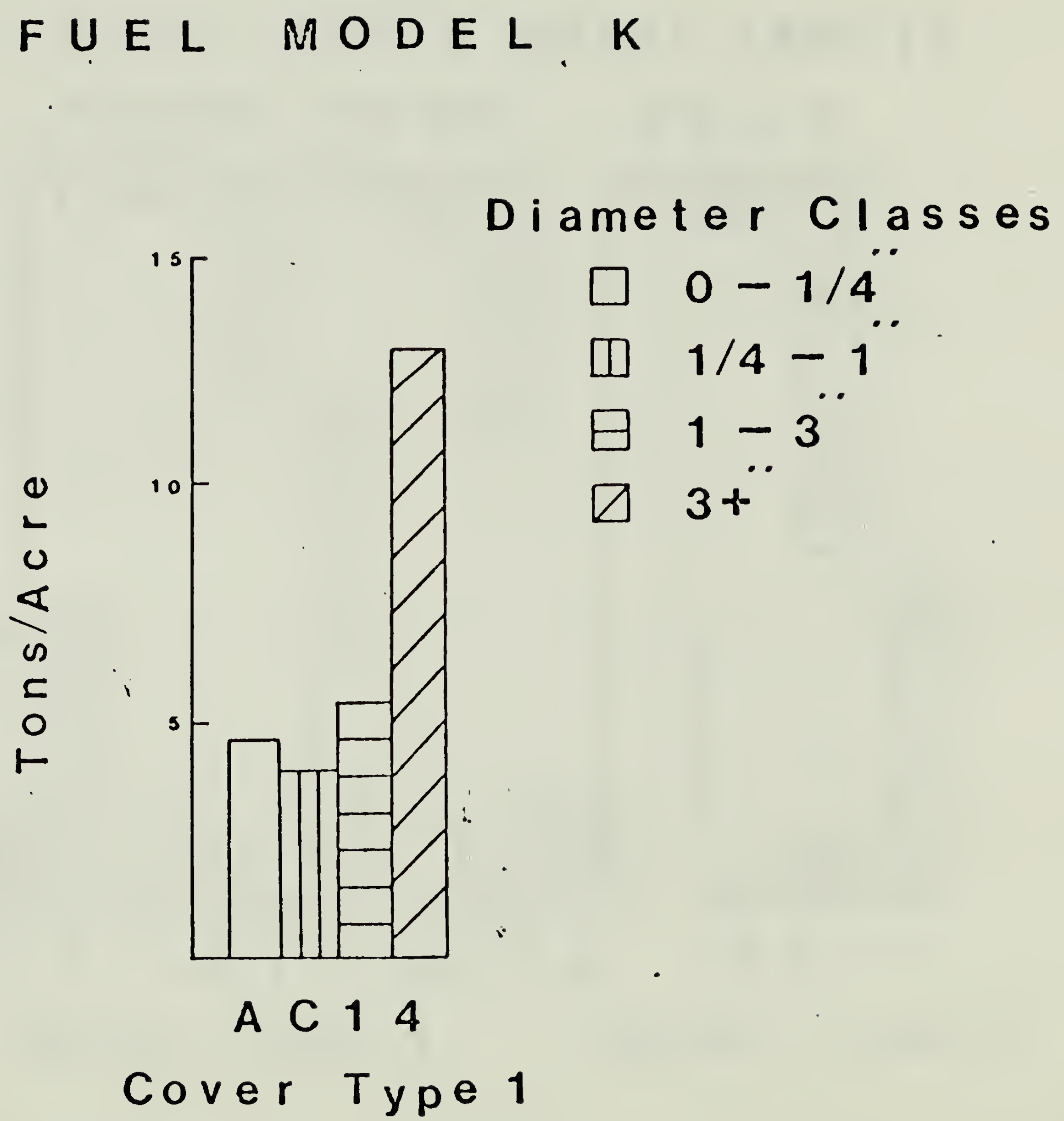


Figure 5.3 Fuel loading by diameter class for stands classified as fuel model K.

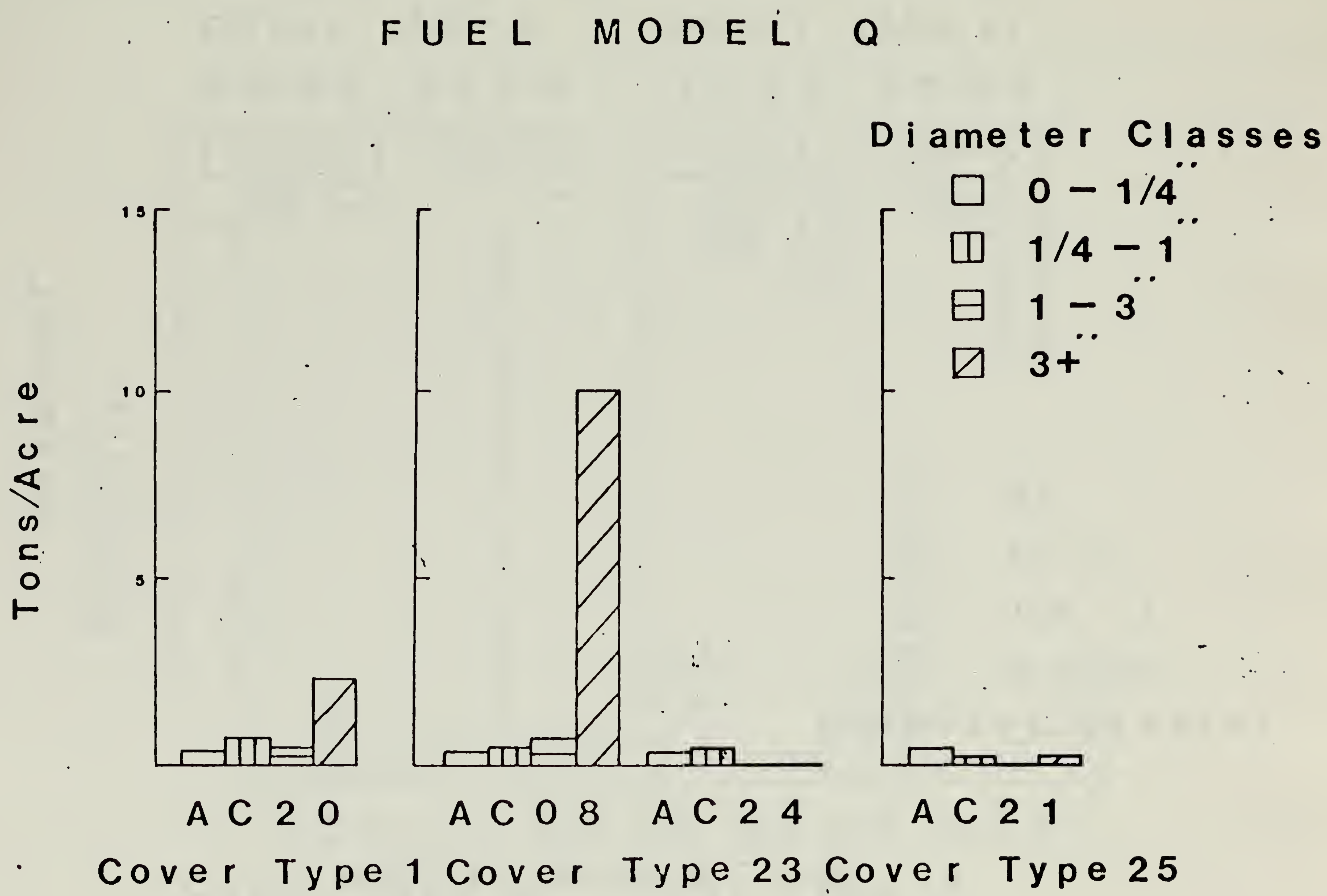


Figure 5.4 Fuel loading by diameter class for stands classfied as fuel model Q.

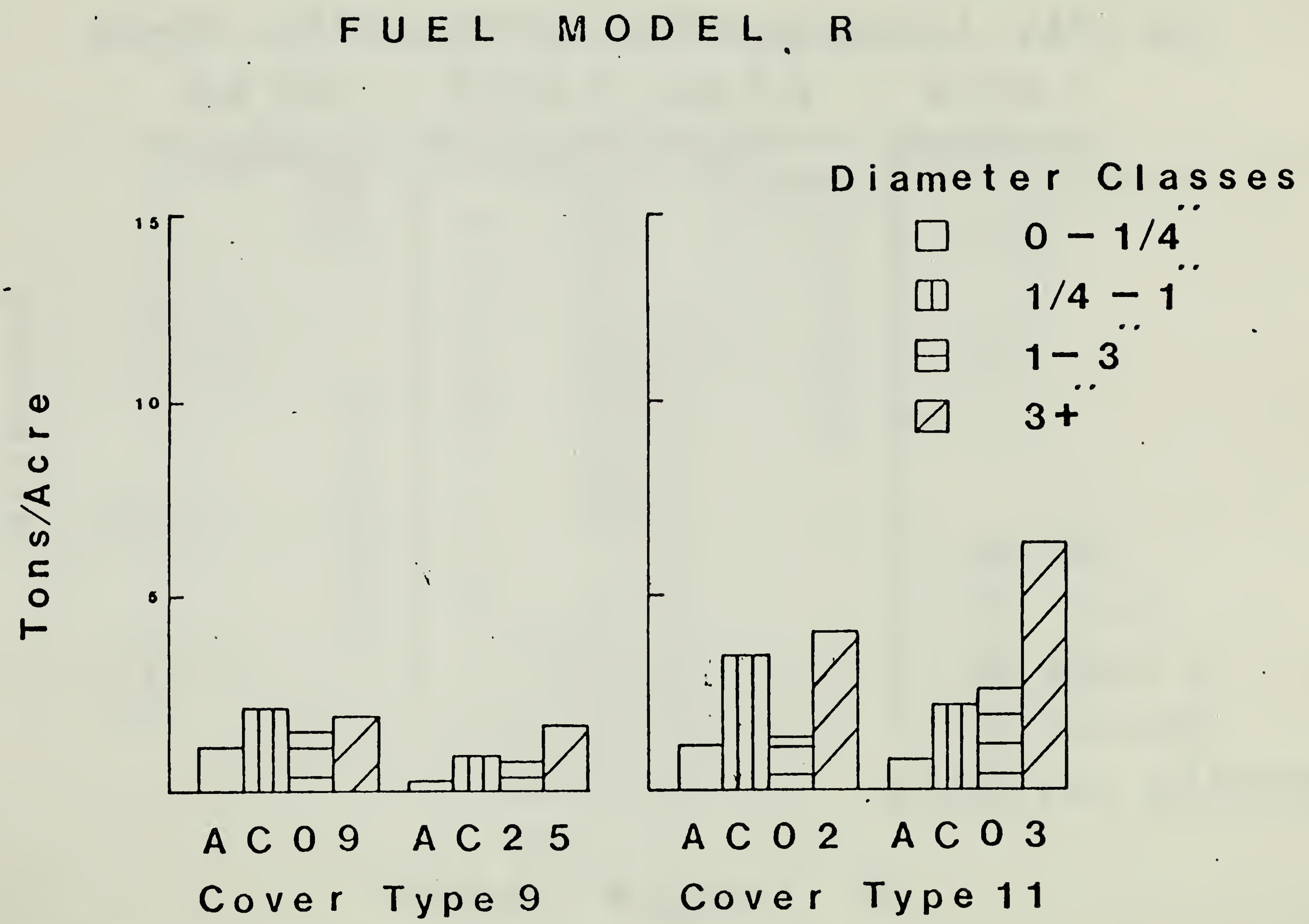


Figure 5.5 Fuel loading by diameter class for stands classified as fuel model R.

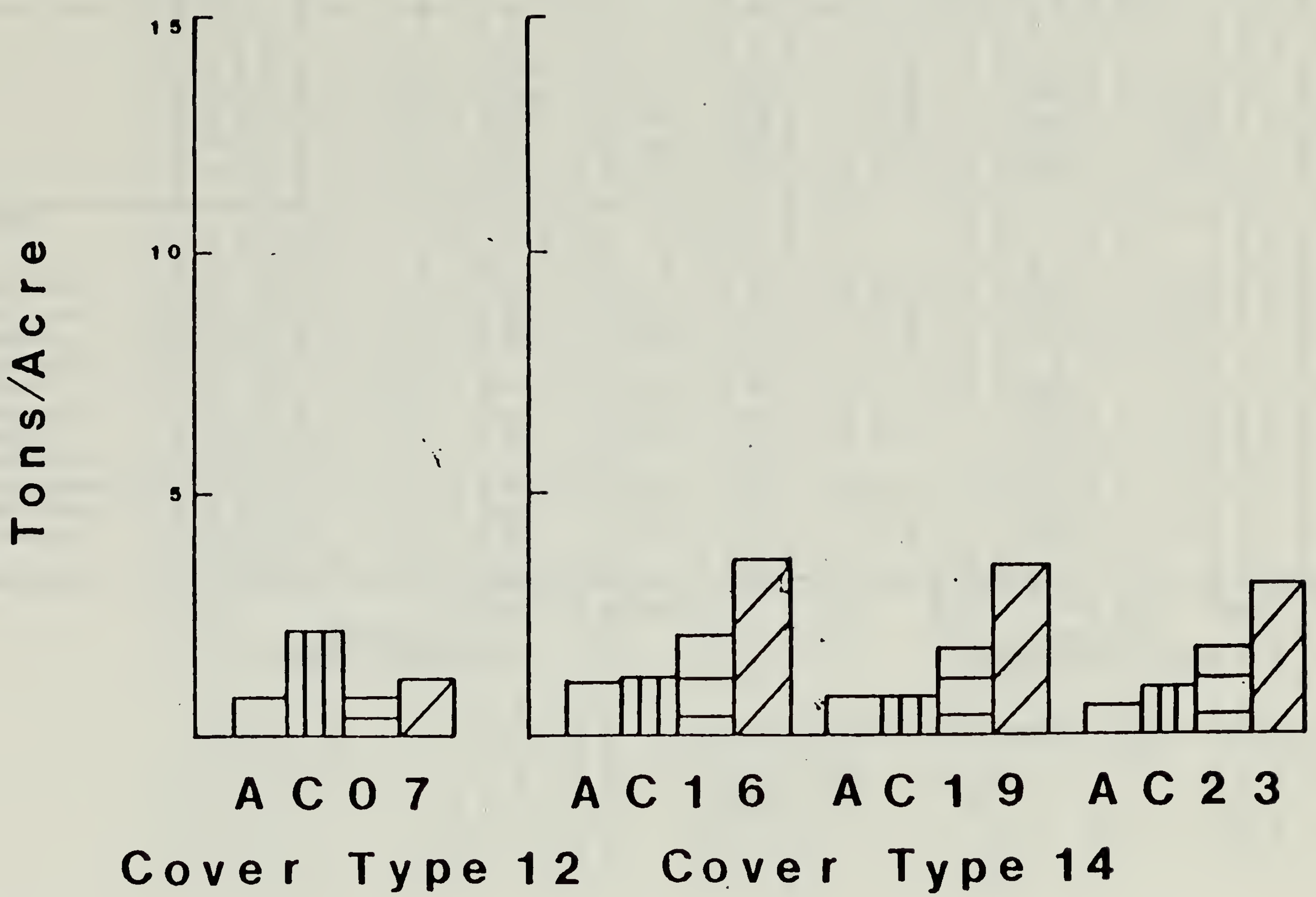


Figure 5.5 (Continued)

Table 5.3. Average fuel values by cover type and NFDRS fuel model.

Cover Type	DOWNED WOODY FUELS (Tons/Acre) 1-hr	10-hr	100-hr	Sound 1000-hr	Rotten 1000-hr	Total	STANDING WOODY FUELS (Tons/Acre) Live V.R. Plot	Live M-A Plot	Dead V.R. Plot	Dead M-A Plot	Duff Depth (in.)
1 Spruce-Fir	1.58	1.70	2.27	5.82	7.16	18.0	62.0	0.334	8.18	0.031	4.89
4 Cedar Forest	0.77	1.10	1.12	2.62	2.89	8.1	74.8	0.040	5.90	0.001	3.22
8 Mixed Conifers	0.76	1.27	1.75	4.39	2.62	10.9	100.0	0.198	8.68	0.002	5.88
9 Birch-Aspen Forest	0.62	1.51	1.14	0.38	1.46	5.1	17.5	0.323	0.32	0.85	1.02
11 N Hardwoods	0.98	2.78	1.96	2.22	2.94	10.9	81.3	0.02	3.06	0.05	1.65
12 Red Oak	0.84	2.17	0.69	0.66	0.44	4.8	91.1	0.042	0.49	0.046	1.62
14 Mixed Hdwd-Conifer	0.89	1.02	1.52	2.34	2.28	8.1	79.0	0.144	7.12	0.006	3.18
23 Pitch Pine	0.33	0.53	0.32	3.26	1.92	6.4	27.9	1.114	1.10	0.160	1.11
25 Jack Pine	0.54	0.22	0	0.15	0	0.9	48.7	0.979	6.29	0.430	2.30
Fuel Model											
G	0.30	2.88	3.87	14.65	27.77	49.5	15.1	0.021	8.30	0.115	2.81
H	1.40	1.04	1.37	3.56	3.02	10.4	82.7	0.214	8.15	0.009	4.73
K	4.79	4.21	5.51	11.02	2.28	27.8	44.0	0.223	2.31	0	7.19
Q	0.40	0.43	0.29	1.85	1.12	4.1	32.3	1.077	2.71	0.212	1.94
R	0.82	1.72	1.47	1.33	1.84	7.2	66.0	0.153	3.16	0.043	1.95
Total Mean	1.13	1.37	1.54	3.87	3.24	11.2	65.129	0.325	5.901	0.056	3.42

The most important fuel in hardwood stands is leaf litter. The seasonal availability of fallen leaves as a fuel prompted researchers to classify stands in which hardwoods predominate under National Fire Danger Rating System (NFDRS) Fuel Model R during late spring and summer months and NFDRS Fuel Model E from leaf fall to leaf out (Deeming, et al. 1977). Although leaf litter seasonally provides flash fuel, little else is present to sustain a fire once it has consumed the litter in most stands. Thus, fires in hardwood stands tend to be light and of short duration. However, in much of the Park, adjacent, inflammable conifer stands as well as the presence of conifer understories may increase the likelihood of damage to hardwoods. In addition, differences in characteristic fuel loading from one type to another cause fire danger to differ somewhat between types.

In red oak stands (Cover Type 12, Figure 5.5) fire danger increases relative to other hardwood types during autumn. Oak litter is resistant to matting and wetting and is thus a highly inflammable surface fuel. The retention of dead leaves on juvenile trees and branches provides an extremely inflammable ladder by which surface fires can reach the canopy. Most oak stands within the Park are young, dating from the 1947 Bar Harbor fire, thus fuel loading has not yet peaked. As these stands age, and downed woody fuels accumulate, the potential intensity and duration of fires will also increase.

Most of the Park's birch-aspen stands (Cover Type 9, Figure 5.5) also originated after the 1947 fire. As they age, their downed fuel loads will be increased by birch and aspen that drop out and are replaced by conifers presently in the understory. While they remain in the understory these conifers are an available fuel source that cannot be ignored. During fall droughts, when leaf litter is also available, a light surface fire could quickly ignite the inflammable coniferous foliage.

The northern hardwood stands sampled had considerably higher downed woody fuel loads than either the red oak or birch-aspen stands (see Cover Type 11, Figure 5.5). This is probably because of the higher portion of older trees in the northern hardwood stands. These trees have been dropping out gradually and contributing downed fuels. However, the additional loading does not increase downed fuels to a dangerous level. The stands also contain more snags, which are unlikely to cause major crown fires but may cause spot fires.

Most of the mixed hardwood-conifer stands sampled are predominately hardwood and thus fall under NFDRS Fuel Models E and R. Downed woody fuel loading (Cover Type 14, Figure 5.5) is low, as is live fuel in the form of shrub and tree regeneration (Table 5.3). Fire danger is low except in severe dry spells. Fire will usually be confined to light surface burns, but the possibility of crown fires cannot be dismissed where an admixture of conifers exists within the overstory.

Within the Park, coniferous stands dominate the landscape. The conifers are represented by four fuel models, with most stands classified under Fuel Model H (Figure 5.2). This model includes stands within the spruce-fir, cedar, mixed conifer and mixed hardwood-conifer cover types (Cover Types 1, 4, 8 and 14). Although not highly inflammable, fire danger is higher in these than in the hardwood stands. These are healthy stands without heavy accumulation of downed woody fuels, although pockets of windthrown trees may be scattered throughout the stands. Fires within these stands will generally spread slowly except where such pockets exist. Although shrubs and woody regeneration are sparce, poorly pruned spruces and numerous snags in some types provide a means by which surface fires can crown out. Once ignited, crown fires may be difficult to control because of the inflammable nature of coniferous foliage.

All the cedar stands that we sampled fell within Fuel Model H. Loading of all fuels in this type is at or below the overall mean. Cedar trees are well-pruned to a height of several feet by browsing deer, but their shaggy bark contains aromatic oils and is highly inflammable. Where cedar stands are on swampy or boggy soils, fire danger is very low. During moderate droughts, fire danger may, however, greatly increase where cedar occurs on moist slopes with shallow bedrock. Once ignited, surface fires can easily climb the inflammable cedar trunks to crown out.

The only mixed conifer stand examined, AC11, contains many patches where snags and windthrown trees create a situation that more closely approximates Fuel Model G than H. Overall, however, the conditions of Model H prevail. Where spruce dominates, closely packed litter and poorly pruned trees increase susceptibility to ground and crown fires. In lower-lying areas, patches of cedar, with damp moss covering the forest floor, might serve to slow a fire, reduce its intensity or force it to change course. The patchy nature of mixed conifer stands causes the spread and intensity of fire to be patchy.

Stand AC15 is representative of those mixed hardwood-conifer stands where conifers predominate. Classified under Fuel Model H, this stand has higher accumulations of downed woody fuels, more snags and deeper duff than the other mixed hardwood-conifer stands. The probability of wildfire is thus greater. As in mixed conifer stands, fires are likely to be patchy.

Among the cover types found within Fuel Model H, fire danger is greatest for spruce-fir. High accumulations of one-hour timelag fuels increase the probability of successful ignition. The duff is deep beneath a compact litter, providing optimal conditions for the spread of ground fires. The abundance of snags and poorly pruning trees contribute aerial fuels for crown fires.

Only stands AC22 at Otter Point and AC26 on Western Mountain were classified under Fuel Model G (Figure 5.1). These spruce-fir stands have been subject to severe blowdown over many years. Downed woody fuel loadings for all except one-hour fuels are very high. Because most blowdowns occurred some time ago, the finest fuels have decayed and many of the other dead fuels are rotten. Canopy density is so low that a crown fire could not be sustained over much of the area, but the numerous snags would serve as a source of burning sparks and embers to ignite spot fires. Stands such as these, which fall completely under Fuel Model G, may now be of less importance than the pockets of G fuel that exist within, and threaten the healthy vegetation of many stands that are best characterized as Fuel Model H. The abundance of maturing spruce-fir stands at Acadia suggests, however, that Fuel Model G stands may increase dramatically in importance over the next several decades.

Stand AC14, on Isle au Haut, was classified under Fuel Model K (Figure 5.3). This model is designed to be used where slash remains after partial cuts in conifer stands, thus it is not applicable to Park lands. However, cutover stands adjacent to Park lands could be major fire hazards. The high loading of downed woody fuels poses a severe risk of rapidly spreading surface fires. This risk may be lessened by consolidation of slash into widely separated piles. However, even widely scattered slash piles can be dangerous under extreme conditions, burning intensely and throwing off flames and embers to great distances.

Fuel Model Q includes coniferous stands subjected to frequent or severe fire disturbance, where heath-conifer communities have developed. The principal fuels are inflammable shrubs in a dense understory. Surface fires are almost certain to involve this shrub layer, and thus have a high probability of crowning out. The admixture of dead shrubs scattered throughout is probably sufficient to sustain a fire except during the initial flushes of growth, when moisture content of living shrubs is at its highest. These stands often suffer from moisture stress, during which times the nearly ubiquitous mosses and lichens are available as quickly igniting fine fuels.

The stands sampled in this fuel model include pitch pine, jack pine and a spruce-fir stand (Figure 5.4). An extensive heath-red pine community on the site of the 1933 Tremont Burn also belongs to this fuel model. Differences in accumulation of fuel seemed less a result of the vegetative communities than of the time since a stand was last burned and the severity of that and previous fires. Recent severe burns are characterized by large areas of rock being colonized by mosses and lichens, with small patches of shrubs and trees where soil pockets remain. As lichens and mosses make the rock habitable, shrubs and trees slowly spread over the site. Where disturbance has been less severe, or more time has passed since disturbance, shrub and tree coverage will be nearly complete. Thus, fires are generally lighter where they are more frequent.

6.1. Introduction

Although Ahlgren (1974) questions the usefulness of fire history studies because they do "not reveal the biological principles involved," most ecologists and fire managers recognize the value of determining the historical role of fire within a management unit. Heinselman (1975) observes that it is only through these kinds of studies that we can "evaluate the actual frequency and intensity of fire perturbations in the primeval ecosystems from which evolved the plants and animals our technological society depends on." Understanding the effects of fire by studying contemporary fires is important, but S. A. Little notes that "Varying fire history alone can cause great changes in the composition of forests or specific sites within a climatic area" (Little 1974). Wein and Moore (1977) observe that "It is important to know both the prehistory of fire (in thousands of years), which assists in the understanding of the evolution of ecosystems, and also the history of fire to determine if industrial man has changed the significance of fire." It is for all these reasons that we have studied the fire history of Acadia National Park.

Fire history studies encompass not only the examination of old burns to determine long-term effects but also the reconstruction of the patterns of fire occurrence over longer periods of time. We have undertaken both types of studies in an attempt to determine what role fire has played in the development of the vegetation of Acadia. A discussion of the results of field studies can be found in Chapter 4.

We used several methods to determine when fires occurred and their causes in both the pre- and postsettlement eras (before and after approximately 1760 A.D.). We examined written records and used dendrochronological studies to learn when and where fires occurred during the past two centuries. For earlier times we examined the charcoal and pollen content of sediments from The Bowl, a small pond west of the Beehive near Sand Beach.

6.2. Written Records

6.2.1. State and Regional Fire Histories. Regional summaries of fire occurrence are provided by Coolidge (1963) and Wein and Moore (1977). Although these provide little specific information about Mt. Desert Island, they are helpful in assessing the role of fire in a regional context. Coolidge's "History of the Maine Woods" provides an excellent overview of fire occurrence during the postsettlement era. He identifies major fires between 1761 and 1947 (Figure 6.1). The largest of these were generally associated with the initial settlement of the various sections of Maine. Harvesting of pine for the construction of ships and buildings produced large quantities of highly flammable slash. This abundance of fuel created hazardous conditions, especially when logged-over lands were burned in an attempt to clear them for agriculture. The advent of railroads in the mid-1800's added additional hazards. Early engines were not equipped with spark arrestors, and flaming brands from wood and later coal-burning locomotives were a major source of ignition.

NOTES ON MAP OF THE LARGER BURNED AREAS

Fire in any year noted did not burn all of the area shown. The older burns, if not reburned, now bear abundant reproduction and even merchantable timber.

The scattering of areas burned shows that even outside of the areas of greater risk, fires may occur at unexpected times.

FIRES OF 1761 AND 1762. Williamson states that these fires burned through Lebanon, Maine, although the [illegible] of the Forest Commissioner [illegible] of Newfield. [illegible] Falmouth and North Yarmouth, [illegible] north of Westbrook and Portland.

FIRES OF 1795 AND 1825. The burned area described in the record of the 1795 fire along the West Branch of the Penobscot [illegible] part of the 1825 burn, [illegible] area to the [illegible]. The 1795 burn [illegible] with that of 1825 (A). The records are not definite. See appendix.

FIRE OF 1837. The record is 1[illegible] acres, or [illegible] townships. The Forest Commissioner's map, showing about [illegible] townships burned, [illegible]

A. Fires of 1[illegible], 19[illegible], 19[illegible], and [illegible], Katahdin [illegible]
B. Fires of 1[illegible], 1[illegible], 1[illegible], [illegible], and 19[illegible], largely in Franklin County.
C. T. [illegible], Hancock County. Fires of 1[illegible], 1870, 1[illegible], and 19[illegible].
D. Fire of 1[illegible], Washington County. Also fires in 1[illegible] and 1870.
E. [illegible] Washington County. Burned repeatedly for many years.
F. Fires in 1[illegible], Washington County, T. 2[illegible], [illegible], 3[illegible], and 36. Also T. 2[illegible] and [illegible] in 19[illegible]
G. Fires of 19[illegible].
H. Fire of 1[illegible], [illegible] and Hamlin.
I. [illegible] fire, 1[illegible]. Also [illegible] acres burned 1[illegible].
J. [illegible] Stream, 1[illegible]
K. [illegible] County, 1[illegible] T. [illegible], R. 11 and 12, and in 1[illegible] T. 19, R. 1[illegible], T. [illegible], R. 1[illegible] and [illegible] T. [illegible], R. 17.
L. 1[illegible], [illegible] County, T. 5 and 6, R. [illegible], and T. 5, R. 13.
M. 1[illegible], Garfield. Also T. [illegible], R. 4, west of Danforth.
N. 19[illegible] fire, Hancock County, T. 31, 3[illegible], and 33.
O. 19[illegible] fires
P. 19[illegible] fires, Franklin and Somerset Counties.
Q. Fires of 1[illegible] and 1[illegible], Washington County, additional to fire of 1[illegible].
R. Map in Forest Commissioner's [illegible] acres burned [illegible] Princeton, [illegible] and T. 2[illegible], E. D., but in report of fires that year total of only [illegible] acres in these towns is shown.

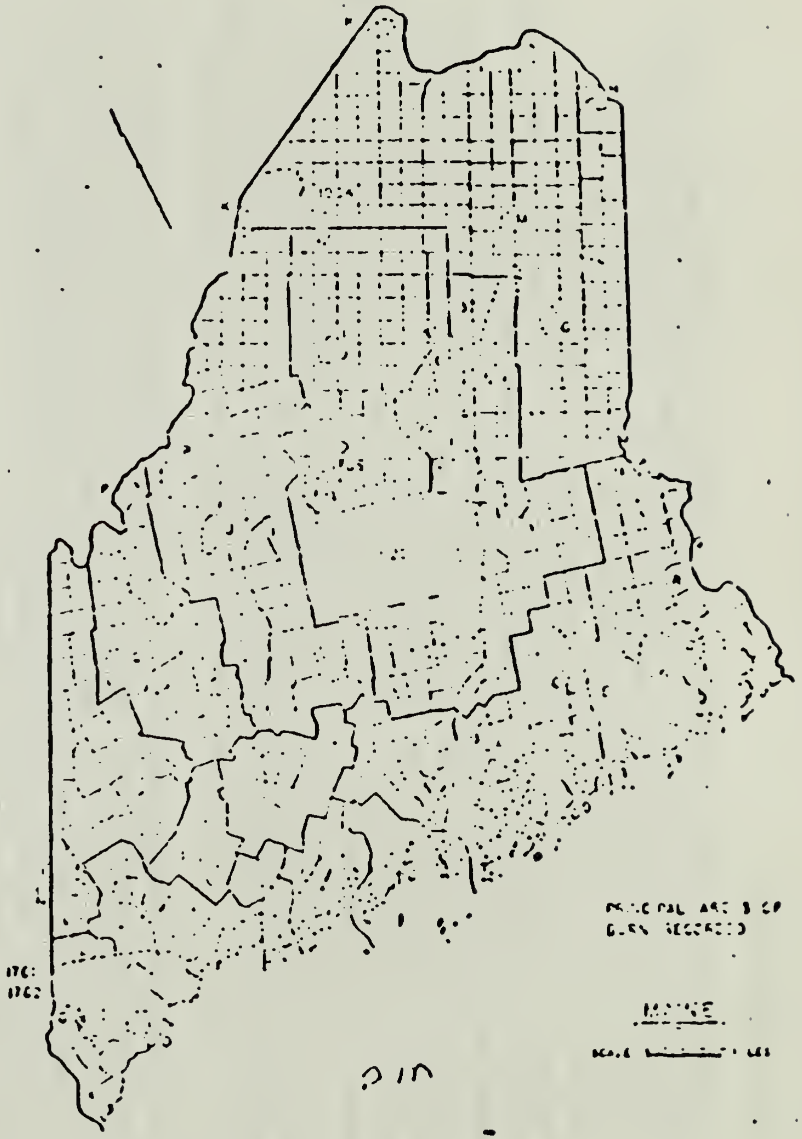


Figure 6.1. Historical Maine forest fires, 1761-1947 (from Coolidge 1963).

The largest and most famous of the early fires was the Miramichi, which burned nearly 1300 square miles (3380 km^2) or five percent of the state in 1825. The most recent major fires were those that burned more than 300 square miles (780 km^2) in October, 1947.

Coolidge (1963) summarized records for the first half of the 20th Century and found that between 1903 and 1954 there were 14,483 reported fires or an average of 278 fires per year. For the period as a whole, .18% of the forested land burned annually. Prior to the establishment of effective fire prevention measures in 1913, the annual rate of burning was .38%. These figures yield fire rotation periods (the time it would take an area equivalent to that of all the forested lands to burn at least once) of 550 and 263 years respectively. It is unlikely that either of these figures represent presettlement conditions. The 1903-1913 estimate (263 years) may be too low because logging and land clearing activities were at a peak. Since that time, fire prevention and control activities have been successful in reducing the area burned and, possibly, the number of ignitions.

Humans have been the primary source of ignitions during most of the postsettlement era in Maine, but lightning fires have also been common. Coolidge (1963) notes that nearly a quarter (22%) of all ignitions in 1952 were by lightning. During 1916-1924, five percent of all ignitions were from lightning, and in 1953, eight percent. Between 1920 and 1940 approximately 15% of all fires in northern Maine were lightning-caused (Fobes 1944), and in 1954, 11% of all fires were caused by lightning (Banks and Holt 1966). These data suggest that despite year-to-year variations, natural ignitions occur during most years and thus forest fires can never be completely eliminated by prevention measures.

Records of the Office of the Forest Commissioner of the State of Maine provide more detailed summaries for the 20th Century. Table 6.1 combines data summarized by Coolidge (1963) for 1903-1960 and data provided by the Maine Forest Service (1961-1980). The data show that the number of fires occurring annually has increased steadily since 1903 (Figure 6.2). Although patterns related to fire weather conditions are evident, it is likely that the trend towards increasing numbers of fires is largely a reflection of improved detection and reporting procedures.

The pattern of fire occurrence changed markedly in the 1940's, and comparisons of data collected before and after that period may be of little value. The data on areal occurrence (Figure 6.3) bare this out. Total acres burned and the size of average fires has decreased dramatically since 1947 -- the last truly catastrophic fire year. The number of fires reached an all-time high in 1980, but average size (2 acres) equaled the lowest values reported in the 78-year reporting period. Decreases in the size of fires indicates increased reporting of small fires and improved suppression capabilities.

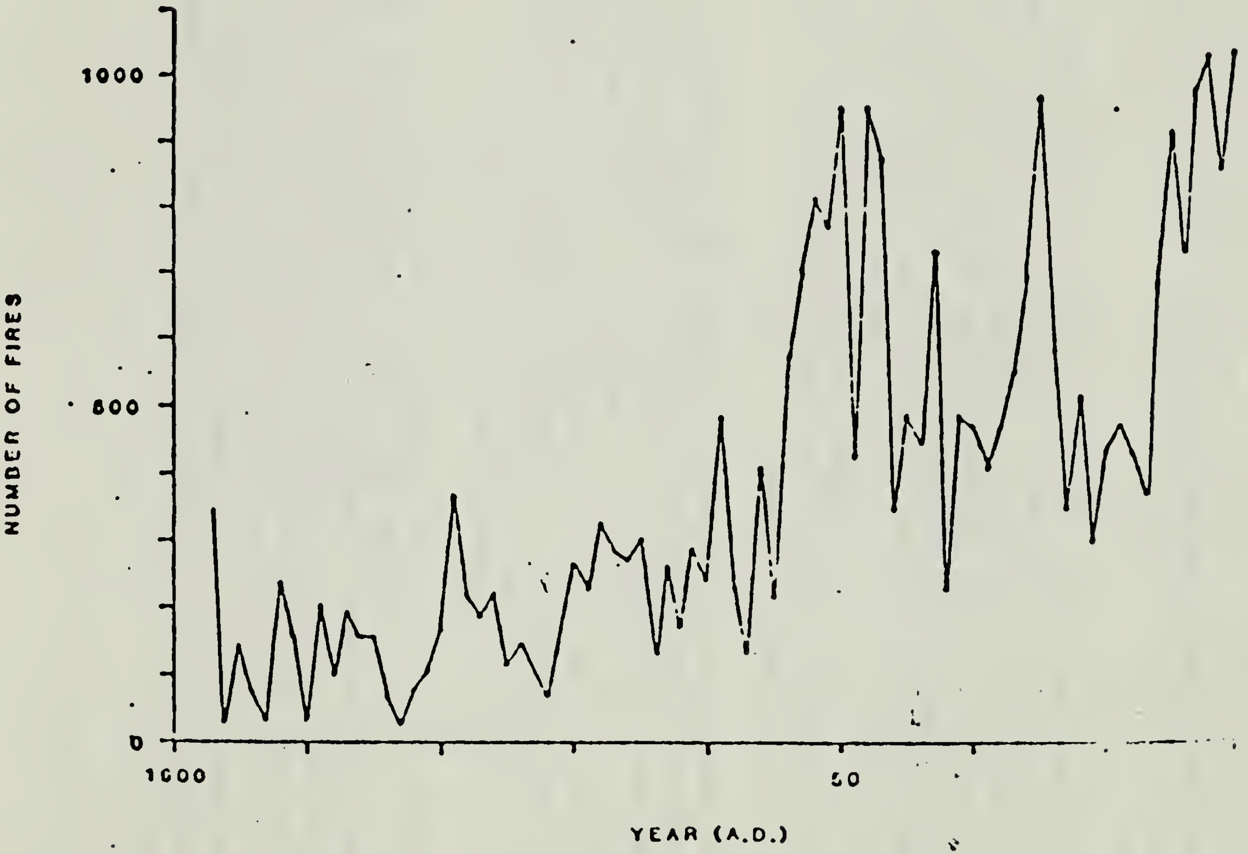


Figure 6.2. Annual forest fires in Maine, 1903-1980.

Figure 6.3. Annual acreage of forest land burned in Maine, 1903-1980.

Table 6.1. Summary of fire occurrence data for the State of Maine, 1903-1980.

Year	Number of Fires	Acreage	Acres/Fire
1903*	345	267,587	776
1904	31	6,958	224
1905*	142	30,416	214
1906	67	7,621	114
1907	33	4,524	137
1908*	237	142,130	600
1909	157	39,028	249
1910	30	848	28
1911*	202	111,077	550
1912	99	20,240	204
1913*	194	30,214	156
1914	157	15,716	100
1915*	156	25,657	164
1916	72	11,616	161
1917	28	458	16
1918	79	8,938	113
1919	104	5,020	48
1920*	165	39,803	241
1921*	362	68,830	190
1922	216	21,388	99
1923*	181	70,339	389
1924*	220	40,357	183
1925	115	6,053	53
1926	144	12,212	85
1927	109	11,620	107
1928	64	2,814	44
1929	168	2,465	15
1930*	263	33,309	127
1931	226	4,807	21
1932*	321	42,827	133
1933	281	15,294	54
1934*	266	136,370	513
1935	301	18,828	63
1936	136	1,640	12
1937	262	5,713	22
1938	173	16,139	93
1939	287	7,433	26
1940	240	4,111	17
1941*	481	40,350	84
1942	225	4,993	22
1943	131	7,168	55
1944*	408	24,203	59
1945	214	4,950	23
1946	576	10,327	18
1947*	700	213,547	305
1948	814	7,241	9
1949*	763	21,052	28
1950*	951	18,051	19

Table 6.1. Continued.

Year	Number of Fires	Acreage	Acres/Fire
1951	421	3,685	9
1952*	948	24,695	26
1953*	877	14,558	17
1954	341	3,180	9
1955	490	1,782	4
1956	443	2,580	6
1957*	726	30,967	43
1958	221	1,562	7
1959	485	6,571	14
1960	472	2,810	6
1961	402	2,481	6
1962	463	3,438	7
1963	544	1,808	3
1964	695	3,582	5
1965*	972	16,480	17
1966	580	1,361	2
1967	347	1,619	5
1968*	516	6,248	12
1969	300	2,399	8
1970	430	1,011	2
1971	476	767	2
1972	430	1,652	4
1973	374	1,508	4
1974	684	2,266	3
1975	911	1,973	2
1976*	727	6,360	9
1977*	975	10,075	10
1978	1,024	3,170	3
1979	851	3,829	4
1980	1,029	2,555	2

* Severe fire years — see text for explanation.

Decadal summaries (Table 6.2) emphasize the changing pattern of fire occurrence. With the exception of 1903-1910 the relationship between number of fires and acres burned is weak. This suggests that the data can probably be broken into two main subsets: 1) a large number of small fires that either do not spread or are extinguished readily by rain or human suppression, and 2) a few very large fires that burn extensive areas. Before 1950 large catastrophic fires occurred at about 15-year intervals, but since that time no major fires have occurred. The large number of fires in 1965 and during the past few years may reflect a continuation of the earlier pattern, but either conditions for major outbreaks have not been met or suppression activities were unusually effective.

We chose 25 subjectively-defined "severe fire years" to examine the weather factors contributing to major outbreaks of forest fires. Because detection and suppression activities have altered fire patterns we selected what appeared to be the years of greatest fire activity in each of the eight, 10-year periods (eight years for 1903-1910). For the selected years we then examined the patterns of rainfall (Baron et al. 1980) for the months of April through October for Orono; a station centrally located within the state. We based our comparisons on records from a single station because long-term, state-wide, monthly data were not available to us. An analysis of the data (Table 6.3) shows that 80% of the "severe fire years" had below-average June precipitation; 60% had below-average precipitation for five of the seven months and more than 80% of the years had at least one month where precipitation was less than half the long-term (1869-1978) monthly average (see also Table 6.4). The driest month on record (October 1947) resulted in widespread burning throughout the state. The fact that 1947 had near normal annual precipitation (37.5 inches vs. an average of 39.8 inches) and precipitation for September 1947 was above normal at Orono emphasizes the importance of short but intense periods of drought in contributing to severe burning conditions. Coolidge (1963) notes that "Even during wet years there is a week or two of dry weather in March or April when fires will run, burning grass and surface material."

Table 6.2. Decadal summaries of average annual fire occurrence data for Maine, 1903-1980.

Period	Ave. No. of Fires	Ave. Acres Burned	r-value[1] No.vs.Acres	Average Ac/Fire
1903-1910	130	62,389	.90	293
1911-1920	126	26,874	.50	175
1921-1930	184	26,938	.53	129
1931-1940	249	25,316	.29	93
1941-1950	556	35,188	.07	62
1951-1960	542	9,239	.66	14
1961-1970	525	4,043	.66	7
1971-1980	748	3,416	.23	4

[1]correlation cooefficient

Table 6.3. Total precipitation in inches at Orono for selected months during severe fire years, 1903-1978.

Year	April[1]	May	June	July	August	September	October
1903	1.7	0.7	2.1	6.5	2.2	1.2	3.4
1905	2.2	3.5	3.1	2.2	2.1	3.2	0.8
1908	2.4	4.6	1.3	2.8	4.7	0.8	6.0
1911	1.2	0.8	4.6	4.4	2.9	3.0	1.9
1913	3.6	3.1	1.4	5.9	3.1	4.4	7.3
1915	3.3	5.0	2.5	6.7	4.7	1.2	2.6
1920	4.5	1.5	2.2	3.4	2.2	5.7	2.4
1921	3.0	0.7	1.0	1.9	2.4	2.0	2.0
1923	7.0	1.9	2.9	3.9	1.6	2.1	2.9
1924	4.0	3.0	2.5	1.9	3.7	3.3	1.4
1930	1.5	3.2	2.2	3.0	1.8	2.3	2.8
1932	3.2	3.3	1.5	4.6	5.2	5.7	5.6
1934	4.8	1.5	5.6	4.2	2.7	5.6	3.4
1941	0.8	1.6	1.2	1.6	1.4	1.0	2.2
1944	2.6	0.6	3.2	1.1	0.9	6.5	4.4
1947	2.1	5.8	5.1	4.8	1.2	3.5	0.2
1949	2.3	3.4	1.2	2.4	1.6	2.8	2.9
1950	3.1	0.5	2.6	2.2	5.1	1.4	1.5
1952	1.5	4.3	2.2	0.3	2.5	2.3	3.6
1953	5.3	2.6	0.6	2.9	2.3	3.6	5.3
1957	2.0	1.1	2.5	1.6	1.3	2.6	1.2
1965	2.7	1.6	1.3	0.7	5.6	2.6	3.1
1968	2.1	4.2	2.8	0.6	2.9	1.8	2.9
1976	4.1	3.8	2.8	7.7	4.1	1.8	4.5
1977	2.2	1.6	8.4	1.7	4.2	5.9	5.3
Long Term Mean	2.9	3.1	3.2	3.2	3.1	3.4	3.7

[1] Underlined values are lower than the long-term mean for the month.

Table 6.4. Percentage of years with below-average monthly precipitation for 25 "severe fire years" and all other years, 1903-1978.

Class	April	May	June	July	August	September	October
				Percent Below Average			
Severe fire years	56	56	80	60	64	68	72
Other years	57	51	55	53	53	55	61

Analysis of statewide data suggests that forest fire control activities during the 20th Century have been effective in increasing the number of fires detected and decreasing the areal extent of individual fires. Nevertheless, severe fire years appear to occur at 15 to 20 year intervals. The observed cyclisity is probably related to recurring weather patterns, but a more detailed analysis of statewide weather data would be necessary to determine the nature of these patterns.

A recent fire history study in New Brunswick helps place the Maine data in a regional perspective. Wein and Moore (1977) found that for the province as a whole 690,000 ha (2,700 square miles) burned between 1920 and 1975. The average size of individual fires has declined from 20 ha in 1920 to 4 ha in 1975; this reflecting the increased effectiveness of fire control activities. Between 1929 and 1975, lightning accounted for about seven percent of all ignitions, but in 1948 20% of all fires were lightning-caused. An analysis of regional distribution showed that more lightning fires started in northcentral and northeastern areas than along the coast.

Most fires in New Brunswick occur in May. Overall, recreation (25%) and woods operations (16%) have been the most important causes of forest fire. Railroads caused nearly one-fourth of all fires during the 1920's and '30s, but today account for only four percent (A similar pattern probably exists for Maine). Wein and Moore (1977) calculate fire rotation periods for different forest types in New Brunswick. Their results vary from 230-240 years for red spruce-hemlock-pine to 625 years for sugar maple-yellow birch-fir and sugar maple-hemlock-pine. Low fire frequencies (long rotation periods) occur in high altitude fir-pine-birch and sugar maple-ash forests, but the lowest values are for coastal spruce-fir forests near the head of the Bay of Funday.

<u>6.2.2. Local Fire History.</u> State and regional records provide a broad framework within which we can assess the fire regime at Acadia, but the Park's unique vegetation combines with weather patterns to require a more careful examination of local fire histories. Comparisons of long-term weather data (Table 6.5) show although Bar Harbor is only 100 km from Orono, coastal influences result in an additional 9 inches (22.8 cm) of precipitation annually. Spring and fall months in particular are wetter at Bar Harbor. These constitute the principal fire seasons, and it is likely that increased rainfall along the coast reduces fire frequency.

To assess local fire regimes we examined historical accounts of the settlement of the area as well as individual fire reports of the National Park Service. Although Park Service records are more detailed, they are only available for approximately the last 50 years and several gaps occur. For earlier information we reviewed newspaper articles and historical accounts available at the Bar Harbor Historical Society. Some of this information was summarized by Moore and Taylor (1927) who traced the history of the development of the vegetation of Mt. Desert Island.

The first known written accounts of Mt. Desert were by Diego Rebero, a Portugese mariner who visited the Maine coast in 1529 (Butcher 1977). Samual de Champlain explored the area and named the island in 1604. Accounts of these early explorers suggest that fire may have been a component of presettlement ecosystems.

The earliest attempts to settle the area were at Somes Sound in 1613. These failed, however, and it was not until 1761 that Abraham Somes established the first permanent settlement at Somesville. With the exception of native Indian populations, about which we know little, humans probably had little effect on the fire regime up to this time.

Table 6.5. Average long-term precipitation (in inches) for April thru October for Orono and Bar Harbor.

	Month						
Station	April	May	June	July	August	September	October
Orono	2.9	3.1	3.2	3.2	3.1	3.4	3.7
Bar Harbor	3.7	3.7	3.2	3.2	3.1	4.0	4.4

Moore and Taylor (1927) identify four, sometimes overlapping, phases in the exploitation of the Island's vegetation:

Phase 1 - 1760's to mid 1800's; selective logging of white pine.

Phase 2 - late 1700's (probably) to mid 1800's; logging of larger spruce.

Phase 3 - mid 1800's to early 1900's; both large and small spruce logged extensively. Several large fires occurred during this phase as a result of both accidental burning of the large quantities of slash and burning associated with land-clearing activities.

Phase 4 - early 1900's; pulpwood cutting of small spruce and fir. Fires were less common, in part because slash laws enacted by the town of Bar Harbor resulted in safer disposal of logging residues. Also, the establishment of Sieur de Monts National Monument (now Acadia National Park) in 1916 resulted in improved fire patrol procedures.

Some man-caused fires occurred during Phases 1 and 2, but most major fires occurred during Phase 3 (Table 6.6). This pattern differs from the situation statewide, where the most intensive burning was associated with initial settlement.

Human activity during the 19th Century significantly altered the spatial and temporal variability of Acadia's vegetation. Widespread cutting and burning resulted in many even-aged red spruce stands. During much of the current century stands have been growing to maturity and many will soon become overmature and begin to break up. In the next few decades fuel loadings may increase dramatically. These changes are a direct result of the pattern of logging and fire occurrence of the 19th Century and subsequent preservation policies of the Park Service.

Figure 6.4 shows the location of fires reported by the Park since 1937. The Appendix contains a statistical summary of Park fire records. Data pertinent to fire protection are discussed in Chapter 9. This Section provides a general overview of the fire situation in the Park since 1937 and compares it with earlier fire regimes.

During most years few fires burn at Acadia and small acreages are affected (Table 6.7 and Table 9.4). For the 24 years for which complete records are available an average of nine fires and 371 acres (148 ha) burned each year. These figures include the 8750-acre (3,500 ha) [17,188 acres (6,875 ha) including all lands, federal and private] Bar Harbor fire of 1947. If this fire is excluded an average of only 7 acres (2.8 ha) burn each year. Estimated fire rotations are 94 years including 1947 and 5,000 years excluding 1947. Fire is an insignificant factor in Acadia National Park if the 1947 fire is considered a freak occurrence that could never happen again. We feel, however, that such a conclusion would be short-sighted. Our examination of weather data (Chapter 8) suggests that major fire years recur, albeit at rather long intervals. The nature of fuel patterns (Chapter 5) is such that large accumulations result from periodic blowdowns and large accumulations of fuel persist for a decade or more. When severe fire weather coincides with large fuel buildups, fires are almost certain to result. Studies elsewhere show that the most careful fire prevention programs are insufficient to prevent major fires under critical fire conditions.

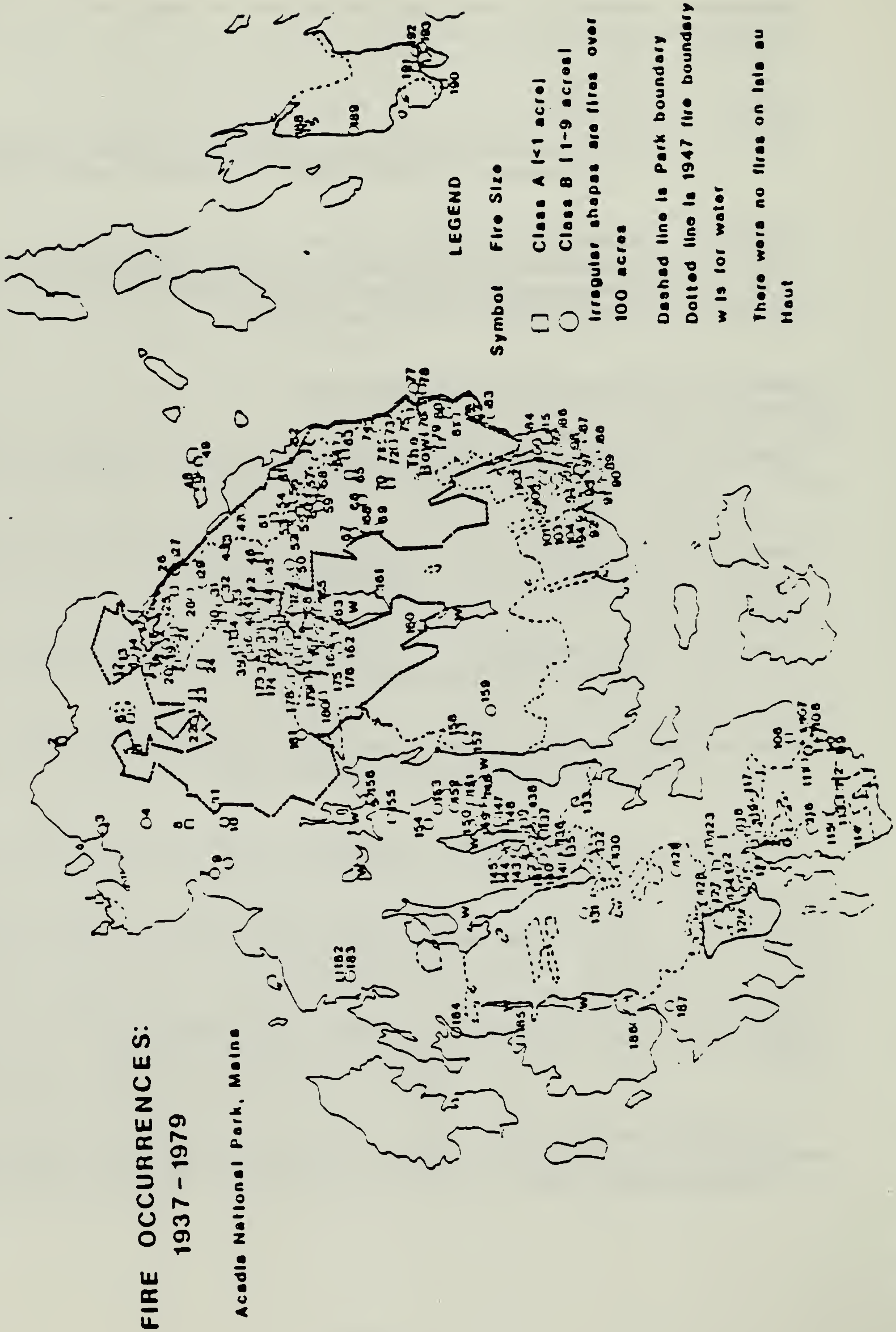
Too few data are available to evaluate the accuracy of the estimated 94-year fire rotation. We can, however, arrive at a somewhat more realistic figure by assuming that only small acreages were burned between 1956 and 1974. Park personnel have confirmed that no major fires occurred during the period, and if we divide the total acreage burned between 1937 and 1979 (8913 acres = 3,565 ha) by 43 we arrive at an average of 207 acres (83 ha) burned/year. This value yields a corrected fire rotation of 168 years. These two estimates (94 and 168 years) approximate the maturation cycle of red spruce on many of the sites we examined. All of our sample stands contained charcoal in the duff, and a 100 to 150 year fire rotation seems more reasonable than does a 5,000-year one.

Although Park records are incomplete, they suggest several general conclusions. The most important of these is the fact that at Acadia most fires are man-caused. Fires are most likely to occur during periods of

Table 6.6. Summary of major fires in the area of Acadia National Park during the postsettlement era.

Year	Incident
1848	Fire started by small boy swept over hundreds of acres on northeastern Mt. Desert Island (Moore and Taylor 1927).
1864	Fire which may have started in lumber camp on south shore of Jordan Pond and swept up south slopes of Pemetic and Penobscot Mountains burning vegetation and soil. (G. E. Street; Moore and Taylor).
1879	Most of Isle au Haut burned.
1889	Large fire burned on Cadillac Mountain; perhaps the worst fire of the period (Moore and Taylor).
1889	Fire spread from Eastern shore of Jordan Pond to top of Pemetic Mountain (Bar Harbor Record).
1896	Six hundred acre (240 ha) fire burned for three days west of Otter Creek (Bar Harbor Record).
1896 or 1898	Vegetation suggests extensive fire on north ridge of Cadillac Mountain (Moore and Taylor).
1901	Fire burned from Aunt Betty's Pond to North Bubble Mountain, destroying about 1,000 acres (400 ha).
1930	Fire burned several days in small growth in Aunt Betty's Pond - Sargent Mountain area.
1947	Bar Harbor Fire -- 17,188 acres (6,875 ha).

Figure 6.4.


FIRE OCCURRENCES:
1937 - 1979
Acadia National Park, Maine
LEGEND
Symbol Fire Size
Class A (<1 acre)
Class B (1-9 acres)
Irregular shapes are fires over 100 acres
Dashed line is Park boundary
Dotted line is 1947 fire boundary
w is for water
There were no fires on Isle au Haut

Legend for fires shown in Figure 6.4

No.	Yr.	No.	Size	Ignition Source
1	1978	2	A	Debris Burning
2	1941	6	A	Debris Burning
3	1941	9	B	Other
4	1941	14	B	Other
5	1940	10	A	Smoker
6	1940	4	A	Other
7	1968	4	B	Other
8	1941	2	A	Debris Burning
9	1965	15	B	Smoker
10	1941	1	A	Incendiary
11	1939	13	A	Other
12	1966	5	A	Smoker
13	1975	1	A	Smoker
14	1978	1	A	Incendiary
15	1965	6	A	Smoker
16	1947	1	A	Smoker
17	1940	24	A	Smoker
18			A	Smoker
19	1939	3	A	Smoker
20	1940	9	A	Smoker
21	1970	3	A	Incendiary
22	1939	2	B	Debris Burning
23	1937	7	A	Smoker
24	1937	9	A	Smoker
25	1940	22	A	Smoker
26	1949	3	B	Debris Burning
27	1949	2	B	Debris Burning
28	1940	8	B	Incendiary
29	1947	4	B	Smoker
30	1953	4	A	Smoker
31	1940	20	B	Smoker
32	1940	23	B	Incendiary
33	1939	5	A	Smoker
34	1937	8	A	Smoker
35	1937	3	A	Incendiary
36	1939	7	A	Smoker
37	1939	6	A	Smoker
38			A	Smoker
39	1938	2	A	Smoker
40	1939	8	B	Smoker
41	1939	15	B	Incendiary
42	1964	1	A	Smoker
43	1964	5	A	Incendiary
44	1955	5	A	Incendiary
45	1953	1	A	Other
46	1939	11	A	Incendiary
47	1965	1	B	Other
48	1958	8	A	Debris Burning
49	1963	1	A	Smoker
50	1947	1	B	Smoker
51	1976	2	A	Other
52	1946	4	B	Other
53	1944	1	B	Smoker
54	1939	1	A	Incendiary
55	1941	3	A	Smoker
56	1939	12	B	Smoker
57	1941	4	B	Smoker
58	1942	2	A	Smoker
59	1949	12	B	Smoker
60	1939	10	A	Incendiary
61	1963	9	A	Other
62	1962	1	A	Smoker
63	1953	2	B	Smoker
64	1955	4	A	Other
65	1953	2	A	Smoker
66	1976	1	B	Other
67	1948	4	B	Incendiary
68	1963	4	A	Other
69	1946	2	B	Smoker
70	1968	5	A	Other
71	1963	2	A	Other
72	1965	10	A	Smoker
73	1968	2	A	Smoker
74	1938	1	A	Smoker
75	1964	4	A	Incendiary
76	1942	3	A	Incendiary
77	1952	5	B	Smoker
78	1965	5	A	Smoker
79	1975	3	A	Smoker
80	1965	2	B	Other
81	1962	3	A	Smoker
82	1965	4	A	Smoker
83	1977	2	B	Other
84	1950	4	A	Smoker
85	1949	7	B	Smoker
86	1965	7	A	Smoker
87	1965	18	A	Smoker
88	1965	11	A	Smoker
89	1973	3	B	Incendiary
90	1965	16	A	Smoker
91	1949	14	B	Smoker
92	1955	6	A	Smoker
93			B	Smoker
94	1944	2	B	Smoker
95	1955	10	A	Incendiary
96	1955	7	A	Incendiary
97	1947	2	B	Incendiary
98	1964	2	A	Incendiary
99	1964	6	A	Smoker
100	1953	5	A	Smoker

Legend for fires shown in Figure 6.4 continued

No.	Yr.	No.	Size	Ignition Source
101	1949	10	B	Smoker
102	1965	8	A	Smoker
103	1952	4	B	Incendiary
104	1949	4	B	Incendiary
105	1947	3	B	Incendiary
106	1965	20	A	Smoker
107	1962	6	A	Incendiary
108	1966	3	A	Smoker
109	1962	8	A	Incendiary
110	1950	5	A	Other
111	1954	1	A	Smoker
112	1955	7	A	Incendiary
113	1951	1	B	Incendiary
114	1949	5	B	Smoker
115	1964	3	B	Incendiary
116	1949	12	A	Smoker
117	1946	3	B	Smoker
118	1954	2	A	Smoker
119	1940	7	A	Smoker
120	1966	1	A	Other
121	1955	2	A	Debris Burning
122	1955	12	A	Incendiary
123	1965	15	B	Incendiary
124	1953	6	A	Smoker
125	1965	14	B	Smoker
126	1937	5	B	Smoker
127	1940	18	A	Smoker
128	1946	5	B	Smoker
129	1940	5	B	Smoker
130	1941	7	A	Debris Burning
131	1949	11	B	Smoker
132	1952	1	B	Other
133	1965	12	A	Smoker
134	1950	6	A	Smoker
135	1965	13	A	Smoker
136	1940	11	B	Smoker
137	1965	13	A	Smoker
138	1955	8	B	Smoker
139	1950	1	B	Smoker
140	1940	14	B	Smoker
141	1941	12	B	Smoker
142	1940	19	B	Smoker
143	1940	21	B	Smoker
144	1940	17	B	Smoker
145	1941	11	B	Smoker
146	1950	2	A	Other
147	1962	7	A	Incendiary
148	1966	6	A	Smoker
149	1941	13	B	Smoker
150	1962	5	B	Other
151	1965	9	A	Smoker
152	1968	3	B	Smoker
153	1966	4	B	Smoker
154	1965	12	B	Other
155	1938	4	A	Smoker
156	1955	3	A	Debris Burning
157	1978	1	B	Incendiary
158	1975	2	A	Smoker
159	1947	6	B	Smoker
160	1941	15	B	Smoker
161	1966	2	A	Smoker
162	1970	5	B	Smoker
163	1940	2	A	Smoker
164	1940	3	A	Smoker
165	1953	3	A	Smoker
166	1937	1	A	Smoker
167	1940	13	B	Smoker
168	1949	16	B	Smoker
169	1938	5	B	Smoker
170	1937	4	B	Smoker
171	1937	9	B	Smoker
172	1941	8	B	Smoker
173	1939	14	A	Smoker
174	1940	12	B	Smoker
175	1940	16	B	Smoker
176	1938	3	A	Smoker
177	1942	4	A	Smoker
178	1950	3	A	Smoker
179	1938	4	A	Smoker
180	1940	6	A	Smoker
181	1937	2	B	Smoker
182	1937	6	A	Smoker
183	1937	8	B	Smoker
184	1949	15	B	Smoker
185	1949	13	A	Smoker
186	1962	2	B	Smoker
187	1965	3	B	Other
188	1962	4	A	Smoker
189	1952	3	B	Smoker
190	1955	11	A	Smoker
191	1941	10	B	Smoker
192	1947	3	B	Smoker
193	1952	7	B	Smoker
194	1952	6	B	Smoker

Table 6.7. Summary of fires in Acadia National Park: 1937-1979.

Year	No.	Acres
1937	10	37.25
1938	6	12.20
1939	13	38.23
1940	24	15.79
1941	15	7.67
1942	4	16.18
1943	0	0
1944	2	0.02
1945	0	0
1946	5	9.50
1947	6	8750.00
1948	0	0
1949	17	0.50
1950	6	0.01
1951	1	1.40
1952	8	0.01
1953	6	0.10
1954	2	0.001
1955	12	17.26
1956-1974 fire data not available for all years - where available, acreage often not recorded.		
1975	3	0.25
1976	2	1.50
1977	2	.75
1978	4	4.00
1979	0	0

peak visitor use (July and August and on Sundays) and visitors cause more than 50% of all fires. Most fires are small (< 0.5 acre = 0.2 ha) and many burn as much outside the Park as inside. Incendiarism by citizens irate at federal policies is a common problem, and most incendiary fires start on Park land. Spring fires are more likely to start on private land as a result of debris burning. In some areas, such as Isle au Haut, small logging operations on land adjacent to the Park create dangerous accumulations of slash (stand AC14; see Table 5.2, Chapter 5). All of these facts emphasize the importance that Park administrators should place on cooperating with adjacent landowners and town fire departments.

Historical accounts almost always cite human carelessness as the cause of the major fires that burned during the 19th Century. Although documentation is poor, there is little evidence that lightning has ever been a major source of ignitions. Within the Park, records for the years 1937-1979 show that only five of 204 fires (2.5%) were lightning caused. This value is substantially lower than the statewide figures cited earlier and probably reflects the higher precipitation values along the coast. Lightning without an associated heavy rain storm rarely occurs at Acadia.

Although lightning fires are uncommon on Mt. Desert Island, we feel that fire frequently burned the presettlement forest, but most fires were probably set by native Indians. Whether or not Indian-caused fires should be considered natural is a question of semantics. It is more important to recognize that fire has been a dominant force influencing the vegetation of Mt. Desert Island.

6.3. Dendrochronology

We used tree-ring studies to supplement fire history data available from written accounts. By examining increment cores and sections from trees, the bases of which have been scarred by fire, it is possible to count annual rings back to the time when scars were formed and determine quite accurately when fires occurred. Dendrochronology had been used effectively to obtain fire histories in Minnesota, the Northern Rockies, and elsewhere (Heinselman 1973, Arno 1980), but it has been little used in the forests of the Northeast.

A number of factors combined to limit the usefulness of dendrochronology in our study. Reconstructions from fire scars can extend back only as far as the maximum age of the trees available for study, and most tree species at Acadia are relatively short-lived. Many common species (e.g., balsam fir, aspen and paper birch) rarely attain ages exceeding 100-150 years. This, combined with the fact that most stands in the Park were cut during the 19th Century, results in few opportunities for reconstructions that predate 1800. Even short-term reconstructions are hampered, because all of the most common species are easily killed by fire. Only relatively thick-barked species such as red, white and pitch pine can survive fires that are hot enough to kill a part of the cambium and form scars. These *species occur at Acadia, but they were among the first to be cut by settlers and few old trees remain. Of the other species, those that are scarred by fire are highly susceptible to insect and disease organisms that enter through the damaged tissue. The trees soon die, and the information preserved in them is lost.*

Despite the limitations described above we were able to date fire scars in some stands (Table 6.8). Scars were especially useful in verifying that a fire known from written records swept through a particular stand. As an example, at plot AC24 on Champlain Mountain, Isle au Haut there are widely scattered pitch pine that are somewhat larger than most trees in the stand. Increment cores show that many of these trees are 120+ years old, whereas the smaller trees are only 96-100. Fire scars on the older trees date to about 1880 and verify that the stand was burned at the time when written accounts tell of widespread burning on the island (see Table 6.7).

The oldest fire scars we found were on red pines in stand AC11 on the western slope of Norumbega Mountain, where a few scattered trees more than 200 years old were found growing on bedrock outcrops. Scars at the base of the trees date to approximately 1820 A.D., and most trees in the stand are 150 to 160 years old. We conclude that fire swept the side of the mountain, probably soon after the initial lumbering of the virgin forest.

The older trees are of poor form and have grown slowly because of their position on shallow soils. These trees were probably left by loggers interested in larger trees, and as a result provided seed to revegetate the site. The presence of 160-year-old white pine, cedar and spruce suggests that individuals of these species also survived the fire of 1820, but the older trees have since succumbed to insects and diseases.

Most stands that we sampled contained no fire-scarred trees. We aged several trees at each relevé, however, and even-aged overstories and charcoal preserved in the forest floor suggest that most stands in the Park arose following logging and burning in the 19th Century. It is possible that some charcoal dates from earlier fires, however. We sampled an area on Western Mountain that according to Davis (1961) was the only virgin red spruce stand on the Maine coast. The stand blew down after Davis sampled it in 1958, and we found abundant charcoal in the root masses of turned-over stumps.

Within the area of the 1947 fire a few scarred trees that survived the fire could usually be found. This was true for maple, beech, oak and occasionally aspen and birch, and is informative for it identifies areas where the fire was not severe enough to kill all of the overstory trees. The boles of most of these older trees were badly decayed, however, and only rarely could we obtain information on earlier fires.

The general lack of fire-scarred trees at Acadia precludes the reconstruction of fire histories for the Park as a whole. The scarcity of trees older than 200 years further limits the observations we can make to post-settlement times. It is for these reasons that we turned to lake sediment studies to determine the role of fire in the presettlement forest.

Table 6.8. Summary of fire scar data for sample stands at Acadia National Park.

Stand	Species	Age	Fire Scars
AC02	Sugar maple	Unknown	n.d.[1] but appeared to be from 1947 (rot)
	Paper birch	70-75(60 at 2')	~1947 (rot)
AC03	Trembling aspen	~95 (80 at DBH)	~1950
	Sugar maple	Unknown	scarred badly 20 years ago
AC07	Red oak	Unknown	1947
	Red oak	~75-80(68 at 15")	1947
	Red oak	Unknown	1947
	Red oak	75-80(60-65 at DBH)	1947
AC08	Pitch pine	~75 in 1947	1912)
	Pitch pine	~80-85 in 1947	~1895) identification of stumps, only probable
	Pitch pine	75-85 in 1947	1896)
AC10	N. White cedar	Unknown	n.d. on dead tree
AC11	Red spruce	Unknown	before 1854 (rot so couldn't date exactly)
	Red pine	~260	~1820
AC16	Black ash	~100(95 at 12")	~1915
AC17	Red spruce	~130(124 at 12")	1880
AC18	Red spruce	at least 145 (at least 140 at 12")	1920
AC19	Red maple	Unknown	1880 on a clump of maple sprouts
	Big tooth aspen	Unknown	n.d.
	Big tooth aspen	>100	two scars n.d.
AC20	Red spruce	100-105 when died 1975	~1910-1915
	Red spruce	Stump	two scars n.d.
AC24	Pitch pine	145-150(139 at 12")	1859, 1883
	Pitch pine	Unknown	>86 years ago (rot)
R01	Jack pine	Unknown	~75 years ago
R07	Red spruce	Unknown	n.d. but probably 1933 (rot)
R08	Red pine	≥105(≥100 at 12")	1889
R09	Red spruce	~60(54 at 12")	1932
R12	Red pine	115-120(108 at 12")	n.d.
R13	Red pine	Stump	n.d. but fire occurred when tree was 30-32 yrs at 12") cut before 1947
	Unidentifiable	Stump	two: n.d., 2¼" from center and 20-40 yrs. later) cut before 1947

[1] n.d. indicates scar could not be dated.

6.4. Lake Sediment Studies.

Reconstruction of presettlement fire patterns is difficult in areas such as Acadia where few virgin stands remain. Some insights can be gained from observations made by early settlers, but these only pertain to conditions as they are at the time of settlement. Day (1953), for example, reviews the writings of colonists and concludes that Indians practiced widespread burning in southern New England. Apparently Indians burned to clear fields for cultivation, to facilitate travel through the woods and perhaps to manipulate vegetation for improved wildlife habitat. We have no way of knowing, however, how long these activities persisted before the arrival of Europeans or the extent to which burning was an important regional influence. In addition, the assumption that colonists accurately reported what they saw may not be valid. Russell (1979) argues that reports of burning by Indians may have been greatly exaggerated.

We know that Indians frequented the Maine coast, but evidence that they intentionally burned the woods has not as yet been uncovered. Accounts by early explorers identify some areas as having been recently burned, but we know little about the causes or extent of these fires.

To determine if the presettlement forests of Acadia burned we examined sediments from The Bowl—a small, deep pond at an elevation of 400' (120m) near the Beehive on Mt. Desert Island. Samples were taken from a .55-m long core obtained from 12.5 m of water by R. B. Davis in March, 1979. Pollen and charcoal in the samples were concentrated using techniques described by Faegri and Iversen (1975), and sub-samples were examined microscopically.

Pollen and charcoal analyses were first used for fire reconstructions by Iversen (1941), who determined that Stone Age men practiced slash and burn agriculture in Europe more than 5,000 years ago. More recently Swain (1973, 1978), Cwyner (1978), Patterson (1978) and others have used these techniques to examine the role of fire in the presettlement forests of North America. Davis (1967) sampled Eagle Lake on Mt. Desert Island but limited his study to sediments of the last two centuries. He was able to detect charcoal from the 1947 fire, but Eagle Lake is large and integrates vegetation patterns over a large area, and Davis could identify few fire-related changes in vegetation. It is for this reason that we pursued our study. Because The Bowl is small it better reflects changes in its immediate watershed. In addition, our samples extend well back into presettlement time.

The results of our analyses are summarized in a pollen diagram (Figure 6.5) and in the Appendix. The size of the individual charcoal fragments was estimated, and the ratio of charcoal area to pollen is used as an indicator of fire activity (Patterson and Nordheim, in preparation). Values (Table 6.9, Column 1) are plotted on the pollen diagram.

Pollen percentages are useful both as an indicator of vegetation response to fire and as a stratigraphic time scale. An increase in the percentages of agricultural herbs (e.g., Ambrosia, Rumex, and GRAMINEAE) at 20-23 cm in *the sediments denotes the time of European settlement (~1760-1800 A.D.). If 23 cm is assumed to date to 1760 A.D., then the bottom-most sample (55 cm) can be dated by extrapolation at ~1450 A.D. This assumes that in the uppermost sediments (0-23 cm) each centimeter represents 9.5 years (1979 -1760 = 219 ÷ 23 = 9.5). This figure is probably somewhat low, because surface samples from a core are often less compact than those below. It might be reasonable, therefore, to assume that below 10-15 cm each centimeter represents 12-13 years. We used an average value of 11 years/cm for the core as a whole and obtained an estimated basal date of 1375 A.D. Radiometric dating of the sediments (e.g., Pb^{210} and C^{14} analyses) would provide a more precise chronology, but we have as yet been unable to perform these analyses.[1]*

Although the pollen diagram shows no major shifts in importance among pollen types, several subtle changes are evident during the ~600-year period that the core represents. Percentages for beech and hemlock are at present about half those of 600 years ago. Both species were minor components of the presettlement forest, and their ranges appear to have been restricted further by activities associated with settlement. Fir has never comprised more than one to two percent of the total pollen and is much less important to the "spruce-fir" forests of coastal areas than those further inland. Fir is a poor pollen producer, but its low percentages appear to properly reflect its position in the vegetation. On our study plots, fir was most common in areas that had recently blown down. Mature stands of spruce usually contained a few poorly formed, suppressed fir, and the downed fuel in these stands was often comprised of fir. Browsing by deer may limit the importance of fir at Acadia, especially on Isle au Haut.

Spruce pollen percentages have doubled at The Bowl during the past 600 years, but at 10-15% values are still quite low. Davis (1967) found spruce percentages as high as 30 percent for surface samples from Eagle Lake. The low values we report may reflect local conditions at The Bowl. Unlike many parts of Acadia, birch stands occupy much of The Bowl's watershed, which lies within the boundaries of the 1947 fire. High percentages of birch pollen in older sediments suggest that in the vicinity of The Bowl birch may have always been more abundant than spruce.

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[1]After the completion of this report we received the results of Pb^{210} analyses performed by Dr. Stephen Norton of the University of Maine's Department of Geological Sciences. His data place the time of settlement (1760 A.D.) somewhat lower in the sediments than do interpretations of the pollen data (28 cm vs 23 cm). If we use the sedimentation rate calculated from Pb^{210} data (0.131 cm/yr vs 0.105 cm/yr based on pollen interpretations) to interpret fire frequency based upon charcoal peaks we find that fires occur at shorter intervals than we would estimate using pollen data.

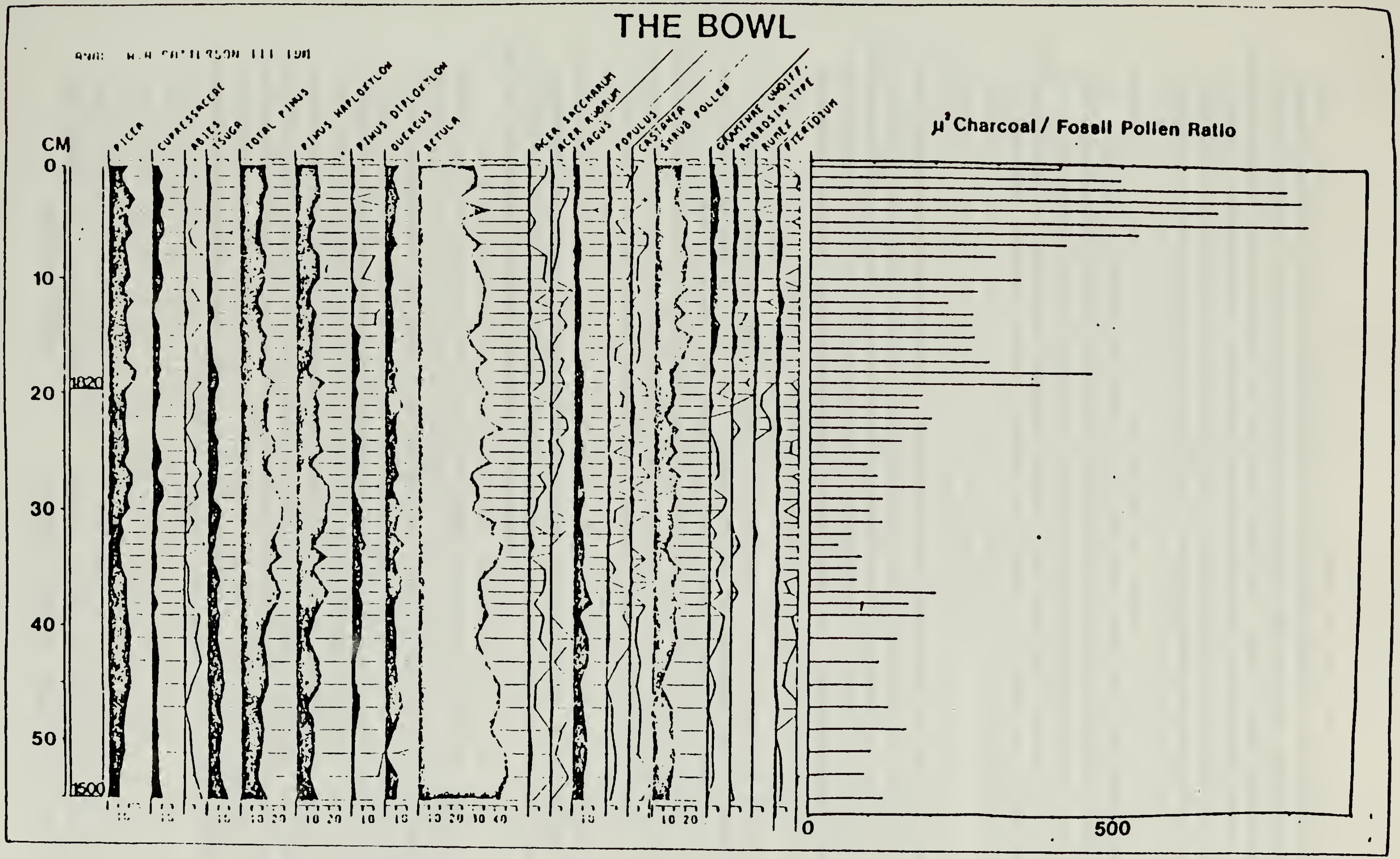

Figure 6.5 Summary pollen and charcoal diagrams for The Bowl, Mt. Desert Island, Maine.

Between 20 and 40 cm (1800-1500 A.D.) increases in pine pollen at the expense of cedar and spruce may reflect climatic cooling associated with the Little Ice Age. Swain (personal communication) examined several sites in North America and has identified subtle changes in vegetation that he feels are caused by this event. We would have to perform additional analyses to determine the apparent significance of these changes at The Bowl.

Pollen percentages show that of the major pine species white pine (Haploxylon) is more important than the Diploxylon pines (red, pitch and jack). Our vegetation surveys show that red, white and pitch pine currently grow near The Bowl, with red pine being the least abundant. The nearest naturally occurring jack pine stands are on Schoodic Peninsula, 15 km to the east.

Birch is the major tree taxon represented in the pollen diagram throughout the 600-year period that the core represents. Percentages have declined gradually from 40 percent at the base of the core to 25 percent today. The decline is due in part to the increased importance of herbs and shrubs and spruce since settlement. Of greater interest in this study, however, are cyclical fluctuations in presettlement percentages that appear to be related to fire activity. These will be discussed later.

The charcoal profile shows clear evidence of a fire at about 38 cm (~1550 A.D.)[2] and another at 28 cm (~1670 A.D.).[3] A charcoal peak shortly after time of settlement (20-23 cm)[4] may have been associated with land clearing activities. Subsequent widespread burning is represented by large increases in charcoal values above 20 cm. These culminate in a recent peak caused by the 1947 fire, which burned the entire watershed of The Bowl.

Pollen analysis shows similar vegetation responses to each of the two presettlement fires. When charcoal values reach a peak, birch percentages fall and the sum of the conifer percentages (including all pines, spruces, fir, hemlock, larch and cedar) increases. This is best illustrated by the ratio of conifer to birch grains (C:B in Table 6.9 and Figure 6.6). Shortly after charcoal concentrations decline, percentages of birch rise and conifers fall. Because of the reciprocal nature of percentage data, decreases in the C:B ratio could be explained either as a decrease in the total amount of birch pollen reaching the lake with no change in conifer influx, as an increase in conifer pollen influx with no change in birch, or as a simultaneous increase in conifer influx and decrease in birch influx. In assessing the response of the vegetation to fire it is important to separate these possible effects. To do this we examined the absolute amounts of pollen in the sediments. When we prepare sediments for analysis we add a standard amount (75,000 grains/cc) of reference pollen (Eucalyptus globulus) to each sample. Eucalyptus has a distinctive pollen

[2] About 1690 A.D. based on Pb^{210} dating
[3] About 1760 A.D. based on Pb^{210} dating
[4] About 1820 A.D. based upon Pb^{210} dating

grain, and we tally its occurrence on slides at the same time that we count fossil grains. If we assume that all sediment samples represent the same number of years (i.e., there is no variation in sedimentation rates), then fluctuations in the ratio of a fossil pollen type to Eucalyptus grains represent variations in the influx of that type to the sediments. Sedimentation rates probably have varied, but without a more precise stratigraphic time scale we have no way of knowing the extent to which this is a problem. For now we must simply accept that some of the variation in the data is related to changing sedimentation rates. Despite this limitation the data show patterns that strongly suggest that pollen influx has varied in response to fire. This is especially true for the interval from 19-55 cm, where much of the variation in the C:B ratio appears to be related to changes in birch influx (Figure 6.6). The correlation coefficient (r) for C:B vs. B:E is -.70, whereas that for C:B vs. C:E is +.26. When C:B changes, some of the effect is due to increasing conifer influx, but decreasing birch influx is far more important.

We interpret changes in the pollen profile following fire as a function both of direct response of the vegetation and of changing pollen source area (the geographic area from which pollen that reaches the pond is derived). Evidence discussed earlier suggests that birch has been a major component of the vegetation surrounding The Bowl for the past 600 years. Today's forest is dominated by an overstory of 36-year-old paper birch, with some spruce of the same age in the understory. When fires burn the watershed they kill the thin-barked birch and the influx of birch pollen to the basin declines. For Mt. Desert Island as a whole, conifers are a more significant component of the vegetation than birch, and immediately after a fire the proportion of regional conifer pollen reaching The Bowl rises relative to locally produced birch pollen. The C:B ratio rises and remains high until birch revegetates the burned area. Although individual birch stems are sensitive to fire, the plants reproduce both by stump sprouts and by seed regeneration that is favored by exposed mineral seed beds. As maturing birch begin to produce pollen, the influx of birch pollen again surpasses that of regional conifer pollen, and the C:B ratio falls. Figure 6.7 depicts a simple model of this process.

Both grey and paper birch are common on Mt. Desert Island, and we have found that we can separate the effects of fire on the two species. Grey birch is short-lived and shrubby and is common on recently disturbed sites. Paper birch, on the other hand, lives 70 to 100 years and is a common overstory component of deciduous and mixed conifer-deciduous forests. It too benefits from disturbance, but it persists much longer than grey birch, which is shaded out after 30-40 years. We can distinguish the pollen of these two birches on the basis of size, with grey birch having grains that are typically smaller. Our plot of the proportion of birch grains <22 in diameter vs. sediment depth (Figure 6.8) shows that high values usually coincide with charcoal peaks (especially at 36-39 cm and 27-28 cm). After each peak percentages of total birch pollen rise when charcoal values and the proportion of small birch grains fall. This suggests that after a fire both grey and paper birch colonize the burned-over land. Grey birch quickly reaches reproductive maturity and for perhaps 10-20 years contributes an increased proportion of the total birch pollen reaching the

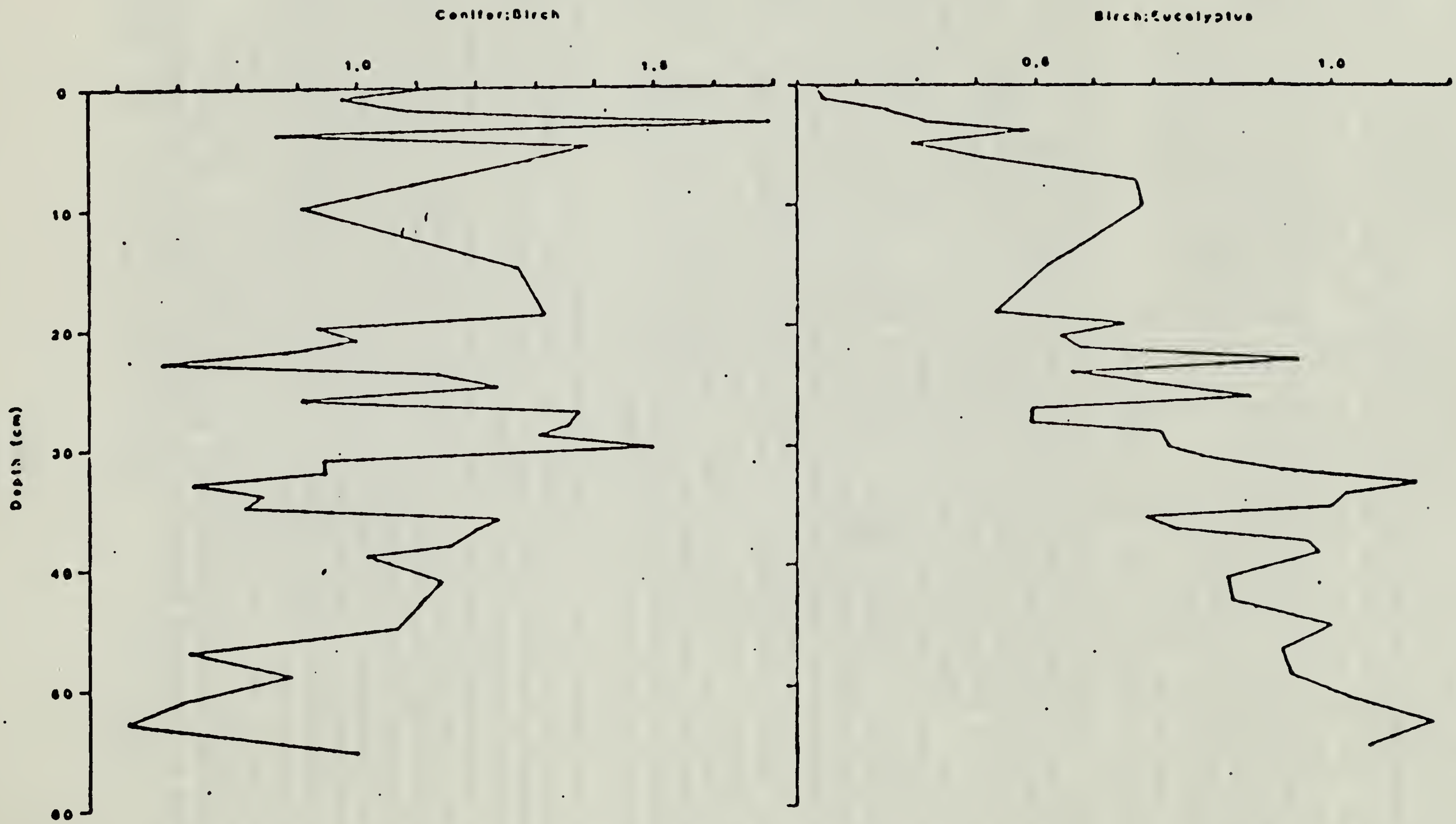

Figure 6.6. *Ratios of conifer to birch and birch to Eucalyptus for The Bowl.*

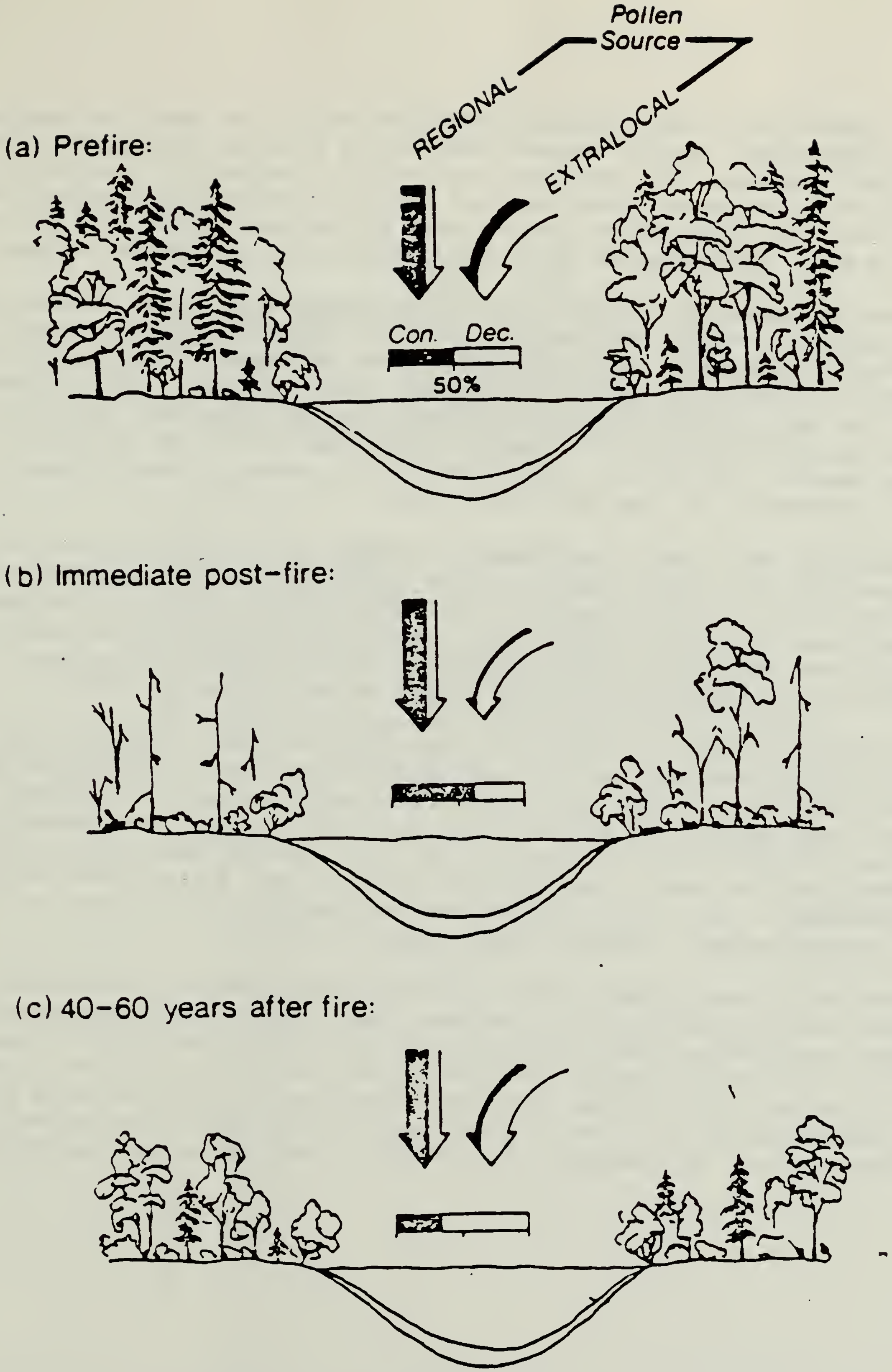

Figure 6.7. Conceptual model of the effects of fire on the influx of conifer and deciduous pollen to The Bowl.

Prior to a fire (a) abundant locally produced deciduous tree polen -- principally birch -- offsets the greater abundance of conifer pollen in the regional pollen rain. Deciduous influx declines as birch forests are destroyed by fire (b). As anew forest regenerates, production of deciduous pollen peaks several decades after the fire (c).

pond. Paper birch then overtakes grey birch and at the same time begins producing pollen. Several decades following a fire the percentage of total birch pollen rises. Our data show that at this time most of the birch pollen is in the larger size group and hence is predominantly paper birch. We suspect that paper birch produces more pollen than grey birch, and if this is so it would explain the delayed rise in total birch percentages.

Our results emphasize the fact that pollen percentages do not reflect post-fire changes in vegetation composition until regenerating plants reach reproductive maturity. We examined both grey and paper birch near The Bowl in 1981 and found that grey birch had many staminate aments whereas paper birch had few. Although paper birch dominates the watershed, total birch pollen percentages are only slightly higher than before the 1947 fire. Modern samples from The Bowl thus show that it takes at least 30 years for birch percentages to rise following a fire.

Our analysis shows that fires burned the presettlement forests surrounding The Bowl and that these fires maintained birch as a larger component of the vegetation than is typical on Mt. Desert Island today. Early fires were probably set by Indians; perhaps as a means of propogating paper birch. Indians used the bark of paper birch for utensils, canoes and wigwam covers, and as a means of starting fires (Harlow and Harrar 1969).

The large quantities of charcoal in the modern sediments suggests that the 1947 fire may have been more intense than earlier fires. Our vegetation studies show that if fire is excluded from Acadia's forests, tolerant spruce trees replace the shorter-lived deciduous species. An abundance of old spruce snags, including one that was more than 150 years old in 1947 suggests that The Bowl's watershed may not have been burned since the time of settlement. Thus fuel accumulations were probably much higher in 1947 than before the more frequent presettlement fires.

Because of The Bowl's small size, the conclusions from our sedimentary studies are most applicable to the area immediately surrounding the pond. Higher presettlement birch percentages at Eagle Lake (Davis 1967) suggest, however, that the process we describe may have been operating over a wider area. Lorimer (1977) argues that fire rotations for interior-Maine spruce-fir forests are on the order of 1,000 years. Our results conclusively demonstrate that this was not the case for coastal sites such as The Bowl.

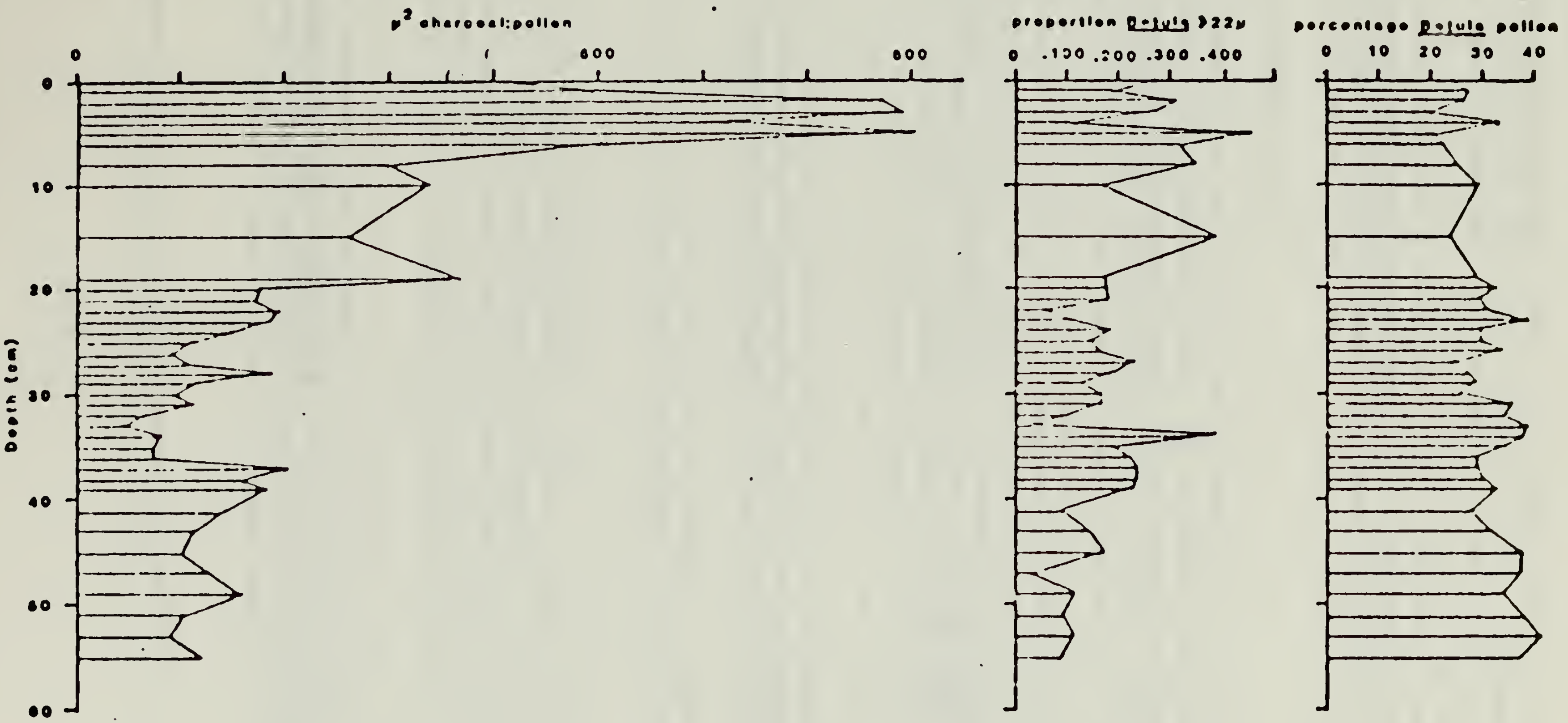

Figure 6.8 Profiles for charcoal content, proportion of Betula pollen types and total Betula pollen percentages for the Bowl.

Table 6.9 Summary of pollen and charcoal values for the Bowl.

Depth (cm)	Ratio μ^2 charcoal:pollen	Proportion *Betula* <22μ	Total *Betula* percent	Ratio Conifers:Birch	Ratio Birch:Eucalyptus[A]	Ratio Conifers:Eucalyptus[A]
0	401	.264	25.4	1.14	.13	.15
1	495	.189	27.2	0.97	.14	.14
2	771	.304	26.5	1.09	.25	.27
3	741	.264	19.8	1.69	.31	.53
4	623	.104	33.4	0.86	.49	.30
5	802	.461	20.4	1.33	.29	.40
6	506	.315	22.9	1.23	.41	.53
7	-	-	-	-	-	-
8	297	.343	25.2	1.09	.67	.73
9	-	-	-	-	-	-
10	338	.157	29.2	0.90	.68	.75
11	-	-	-	-	-	-
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	-	-	-	-	-	-
15	261	.389	23.5	1.26	1.31	.65
16	-	-	-	-	-	-
17	-	-	-	-	-	-
18	-	-	-	-	-	-
19	366	.167	28.8	1.31	.43	.56
20	178	.173	32.3	.93	.65	.60
21	171	.180	29.3	1.00	.54	.54
22	195	.059	30.9	.59	.58	.64
23	189	.103	38.9	.67	.94	.63
24	149	.182	23.5	1.13	.56	.63
25	110	.143	29.3	1.23	.74	.91
26	92	.152	33.4	.90	.26	.77
27	109	.229	24.5	1.37	.49	.67
28	185	.183	27.5	1.35	.49	.66
29	117	.122	23.1	1.30	.71	.92
30	96	.167	25.5	1.50	.72	1.10
31	116	.162	35.5	.94	.78	.73
32	70	.150	34.0	.94	.91	.85
33	47	.030	33.7	.72	1.14	.83
34	82	.239	37.4	.84	1.02	.95
35	76	.180	34.7	.81	1.00	.81
36	76	.222	23.7	1.23	.63	.83
37	204	.235	29.0	1.19	.73	.87
38	156	.235	29.8	1.15	.96	1.11
39	182	.226	32.1	1.01	.99	.99
41	144	.091	27.2	1.14	.82	.93
43	116	.144	31.4	1.10	.83	.92
45	102	.162	37.5	.93	1.00	.96
47	130	.031	37.3	.71	.91	.65
49	159	.111	33.9	.83	.93	.82
51	103	.096	33.0	.70	1.04	.72
53	92	.108	41.3	.61	1.17	.71
55	115	.036	37.3	.93	1.06	.99

[A] Low surface values are the result of dilution in less compact sediments.

CHAPTER 7. FIRE EFFECTS

7.1. Vegetation

7.1.1. Fire Response Groups. Most of the forest stands of Acadia National Park can be arranged into five fire-response groups. Placement of stands within these groups must take into account both the potential inflammability of the stand and the effects of fire upon it. The groups are 1) spruce and cedar stands with few shrubs in the understory (includes most mixed conifer and conifer-hardwood stands), 2) pine stands, having dense shrub understories (some spruce stands fit into this category), 3) birch-aspen stands, 4) red oak stands and, 5) northern hardwood stands.

1) Spruce and Cedar Stands

In these stands the natural fire cycle appears to be tied to the maturation cycle of the dominant trees. Downed woody fuel accumulations remain moderate until the canopy breaks up, at which time they increase rapidly, then remain high for as long as 10 to 20 years. Throughout the 19th and early 20th Centuries, fires in these types occurred frequently, as logging operations left behind heavy accumulations of highly inflammable slash. The demise of lumbering as an important industry and the increase in fire suppression activities as the 20th Century advanced have led to a decreased frequency of fires since 1930. Ironically, the further exclusion of fire from the area may lead to a repeat of the catastrophic fire of 1947. At the present time only isolated pockets of overmature spruce and cedar exist. If, however, more extensive conifer stands were to mature and break up, a hazardous and highly inflammable situation would exist.

At present, stands AC14, AC22 and AC26 have heavy accumulations of downed woody fuels. In AC14, slash from logging is neatly piled, but, because of large amounts of fine fuels, it presents a clear fire hazard.

Windthrown trees lie criss-crossed on the ground in stands AC22 and AC26. Most of the fine downed fuels have decayed, but live and dead standing brambles and shrubs provide fine fuels and increase the fire hazard.

Stand AC13 has many standing dead trees that presently increase the probability that fires, once started, will crown out. In the not-too-distant future many of these trees will have blown down, dramatically increasing downed woody fuel accumulations. Stands AC04 and AC11 may also become problems, as their canopies are beginning to break up.

Following an intense fire, it is not unusual for paper birch and trembling or bigtooth aspen to seed in on newly exposed mineral soil along with red spruce. Both paper birch and aspen are fast-growing and soon overtop the spruce, which may remain in the understory for as many as 60 years. As the hardwoods begin to die off, spruce trees are released from *suppression and grow up into the canopy. There is thus a gradual transition from an initial mixture of red spruce, paper birch and aspen seedlings, through a birch-aspen stand, to spruce-hardwoods and eventually a spruce stand. Spruce seedlings germinate well in litter, thus spruce stands can regenerate themselves in the absence of fire or following light fires that do not burn off the entire organic horizon from the forest floor.*

2) Pine Stands

Red pine, pitch pine and jack pine occupy only a small percentage of the total area of Acadia National Park. Pitch pine reaches the limits of its range in this part of Maine. Jack pine is near the limits of its range.

All three are fire-adapted species. Fire enhances the establishment of seedlings, which seldom survive on thick layers of litter. Some ecotypes of pitch pine and jack pine have serotinous cones that open only in response to heat. Mature individuals of all three species can survive repeated light or moderate fires. Pitch pine, unlike other eastern conifers, sprouts vigorously after fires.

In the absence of fire, seedlings of other species are likely to become established, replacing the overstory pines as they die. In most of the stands that we examined, this process is slow. The gradual growth of lichens and mosses over exposed bedrock and boulders will provide a seedbed for pine seedlings for years to come in stands AC08 and AC24.

In other areas the process is near completion. Much of Norumbega Mountain, where AC11 is located, appears to have been covered by red pine in the past. The exclusion of fire from this area during the past 100 years has changed the complexion of this forest, encouraging the dominance of red spruce as it prohibits the establishment of red pine seedlings. Some fine red pine stands along Sargent Drive share this same fate if fire exclusion continues. Eventually, most of the pitch pine and jack pine stands of Acadia National Park will also give way to less fire-adapted species, in most cases, red spruce.

3) Birch-Aspen Stands

These stands often spring up after fire has exposed mineral soil, preparing a seedbed. Within Acadia National Park and its vicinity such stands often have a sparce understory of equal age. Unless a second fire occurs after the stand reaches maturity, the birch-aspen overstory will eventually give way to spruce. Thus fire plays an important role in the perpetuation of this forest type.

The potential exists for a fire cycle to develop about the maturation cycle of birch-aspen, similar to that which exists in spruce forests. Many of the even-aged overstory trees may become overmature and die within a short time span, causing downed woody fuels to accumulate rapidly.

Inflammability is often increased by the presence of suppressed conifers in the understory. The fire hazard is, however, of shorter duration than in spruce stands, because of the more rapid decomposition of birch and aspen.

4) Red Oak Stands

Moderate fires can be beneficial to oak stands, contributing to their ability to perpetuate themselves and outcompete potential invading species, such as northern hardwoods. Mature oaks often survive moderate fires. Younger trees, on which foliage and branches are killed, may sprout prolifically from their bases. Intense fires, however, can change the composition of an oak stand dramatically. Destruction of litter often prevents germination of acorns while enhancing germination of pines, birches, aspen and spruce.

Oak stands present a more constant level of flammability than such forest types as spruce and birch-aspen. Rarely does an entire stand become overmature and die within a short time span. However, oak leaves produce litter that is highly inflammable, especially during the autumn months, when it is loose and well-aerated. The frequent presence of low shrubs in the understory increases flammability.

5) Northern Hardwood Stands

Northern hardwoods are not only less likely to burn than other forest types, but are also more susceptible to fire damage. Both ignition and spread of fire are unlikely except during the most severe droughts. Intense fires burning through adjacent stands may, however, ignite and spread through northern hardwoods, especially during the fall, when litter is most inflammable.

When fire does occur in this type, it may drastically change stand composition. Most of the common species are not well adapted to fire. The thin-barked trees that make up these stands are often severely damaged by fires of only moderate intensity. Post-fire regeneration is likely to include a low proportion of such typical northern hardwood species as sugar maple and yellow birch. Beech may be better represented because of its ability to sucker. Species that commonly invade the post-fire forest include paper and grey birch, aspen, red spruce and pines.

Fire may, as in the case of AC02, enhance the importance of beech in a northern hardwood stand. What was formerly a beech-sugar maple stand is now a beech stand with sugar maple, paper birch and aspen as minor components. Other possible results of fire are the initiation of a birch-aspen stand or a mixed conifer-hardwood stand where northern hardwoods once stood.

7.2. Soils

There are available several excellent review articles on the effects of fire on soil. These include Wells, et al. (1979), Ahlgren (1974), Brown and Davis (1973) and Viro (1974), and all should be available to NPS personnel responsible for the development of fire management plans. Fire can alter both the physical and chemical characteristics of soils and in so doing affect water regimes and vegetative regrowth. Where soils are shallow and on steep slopes, fire can remove the protective mantle of organic litter and subsequent erosion can expose substrates that are difficult for vegetation to recolonize. Soil texture influences the susceptibility of soils to post fire erosion. Coarse, highly permeable soils (sands and loamy sands) are less likely to erode than the finer-textured silts and clays. Soil moisture content often rises following a fire because of decreased evapotranspiration, and soils that have a higher moisture-holding capacity are able to absorb less rainfall than well drained soils. As soil moisture content rises, the likelihood of surface runoff and erosion increases.

Where slopes are less steep and soils are deeper, fire can release nutrients and stimulate seeds stored in the soil to germinate. This promotes rapid revegetation and increased productivity. The organic soil horizons of the forest floor contain a reservoir of nutrients, but these are often bound in unavailable forms. Fire rapidly decomposes litter and releases nutrients for plant uptake. The release of cations and formation of compounds such as potassium hydroxide help neutralize soil acidity, and this further improves the soil as a medium for plant growth.

Many plants produce seeds that can be stored in the soil for long periods and germinate when exposed to the warmer, more moist and higher nutrient content conditions that follow fire. Other species that have light seeds (e.g., aspen) or seeds that can be blown long distances across the snow (e.g., the birches) rapidly recolonize burned soils. Regrowth is important in retaining nutrients that are mobilized by fire and in providing a protective cover that reduces the risk of erosion.

Under some conditions the burning of litter produces organic compounds that reduce the wettability of soils. The creation of these hydrophobic soil conditions has been documented for brush and some conifer stands in the west (DeBano 1966, 1981; DeBano and Krammes 1966; DeBano, et al. 1977; Dyrness 1976; Savage 1974; and others). The impermeability of hydrophobic soils can lead to increased overland flow, and severe gullying may occur on moderate to steep slopes. The extent to which hydrophobic soils could be a problem in the Northeast is unknown.

Soil associations of Acadia National Park have been mapped as part of the Maine Coastal Inventory (MCI, 1977). General Soils Maps Nos. 4-1 (Mt. Desert), 4-3 (Schoodic), and 3-2 (Isle au Haut) show the distribution of approximately 35 soil associations in the Park. More detailed soil series maps are available for some towns (e.g., Southwest Harbor, Isle au Haut, Somesville and Winter Harbor). The following discussion is limited to those series and associations that would be most susceptible to damage by fire.

We have categorized the soils of Acadia with regard to their susceptibility to fire damage. Our analysis is based upon slope, drainage, permeability, depth to bedrock, surface texture and K value [a measure of erodibility, with values ranging from 0 (nonerodible) to 1.0 (extremely erodible)]. A list of associations that occur, at least in part, on slopes >8% is found in Table 7.1. We assume that erosion potential is much reduced on soils of <8% slope. Table 7.2 provides descriptions of individual series within the listed associations. We have interpreted the data in the tables and have subjectively rated the potential for fire damage for these soils. Our classes are a function of both the degree to which post-fire erosion would occur and the rapidity with which revegetation would take place. The latter criterion is related to soil depth and rockyness. Our field studies show that revegetation is slowest where shallow soils erode and leave only exposed bedrock at the surface.

The four susceptibility classes are defined as follows:

Class I - associations with slopes up to 15% but with low K values, coarse texture, good permeability and drainage, and >60 inches of soil above bedrock.

Class II - associations occurring on slopes of <15% but with some series that are either shallow to bedrock (<20 inches) or are finer textured with higher K values.

Class III - associations on slopes >15% but with soils that show good drainage and that are generally >60 inches deep. Erodibility is generally low.

Class IV - soils on slopes <15% with high K values or with <20 inches to bedrock. These soils often consist of little more than organic litter and moss. Fire consumes the soil and leaves exposed rock that revegetates very slowly.

We have excluded from the classification soil association 151 (Coulton-Duane) although it occurs on slopes >8%. Its soils have high permeability, are well drained and have low K values, and it occurs on a limited area within the Park. Classification of other associations is found in Table 7.1.

Table 7.1. Fire susceptibility classes of ANP soil associations that occur, at least in part, on slopes >8%.

Susceptibility Class	Assoc. No.	Name, Rockyness, Percent Slope
II	60	Lyman-Marlow, 3-15%
II	61	Lyman-Marlow, 3-15%
IV	62	Lyman-Marlow, rocky phase, 15-45%
II	63	Lyman-Berkshire, 3-15%
II	64	Lyman-Berkshire, rocky phase, 0-15%
IV	65	Lyman-Berkshire, rocky phase, 0-15%
II	67	Rockland-Lyman, rocky phase, 3-45%
III	76	Marlow-Lyman, stony phase, 15-45%
II	78	Peru-Marlow, stony phase, 8-15%
III	87	Berkshire-Lyman, stony phase, 15-25%
II	90	Herman-Lyman, 8-15%
II	92	Herman-Lyman, stony phase, 3-15%
III	93	Herman-Lyman, stony phase, 15-45%
I	95	Herman-Waumbek, 8-15%
I	96	Herman-Waumbek, stony phase, 3-15%
I	101	Waumbek-Herman, stony phase, 8-15%
IV	121	Buxton-Suffield, 15-25%
II	125	Buxton-Lyman, 3-15%
II	139	Elmwood-Swanton, 0-15%

Table 7.2. Summary of soil series descriptions for ANP.

Series	Slope (percent)	Depth to Bedrock (inches)	Drainage	Permeability	Surface Texture	Subsoil Texture [a]	K Value (Erodibility)
Berkshire	0-25	>60	Well	Moderate	fsl,l	fsl	0.20
Buxton	0-25	>60	Mod. well to some-what poor	Very low	sil	sicl	0.49
Colton	0-45	>60	Excessive	Very rapid	ls, lfs,sl	s	0.17
Elmwood	0-15	>60	Mod. well	Slow	sl,fsl	fs,sicl	0.32
Hermon	3-35	>60	Somewhat excessive	Rapid	sl	lcos	0.17
Lyman	3-35	<20	Somewhat excessive	Mod. rapid	l	l	0.20
Marlow	3-35	>60	Well	Mod. slow	fsl,l	fsl	0.24
Peru	3-15	>60	Mod. well	Slow	l	fsl	0.24
Rockland	8-35	<20	Excessive	Mod. rapid	ls,sl,fsl, sil	ls,sl,fsl,sil	--
Suffield	3-35	>60	Well	Very slow, slow	vfsl,sil	sicl	0.49
Waumbek	3-15	>60	Mod. well	Mod. rapid	sl	ls	0.17

[a] . Textural symbols are: f=fine, s= sand or sandy, l=loam or loamy, si=silt or silty, c=clay, co=coarse, v=very

7.3. Water

The effects of fire on water have been less-well studied than have those on soil. Tiedemann, et al. (1979) review the present state of knowledge. Most studies have been conducted in the western United States, and we know little about the effects of fire on watersheds in the Northeast.

Fire affects water regimes both on-site and downstream. In general fire reduces interception and infiltration and increases soil moisture storage, snow accumulation, overland flow and surface and mass erosion. Erosion effects are correlated with percent and length of slope, soil texture, and rainfall and snowmelt characteristics. The degree and duration of effects depend largely on the severity of burn and rate of revegetation. Where revegetation is rapid soil-water regimes may stabilize in a few years. Other areas may take much longer to stabilize. Acadia's exposed rocky mountains are excellent examples of sites where the effects of fire on water regimes would be evident for many years.

Downstream effects are directly related to those on-site -- a reflection of the fact that streams integrate both aquatic and terrestrial ecosystems. An important but poorly understood effect is increased sediment transport, which results from increased overland flow, channel scouring (due to increased discharges), dry ravel and creep into stream channels, and mass erosion. Increased sediment transport causes increased turbidity, and this plus shade removal increases stream temperatures. Again, effects depend upon rainfall and topographic factors.

Unlike streams, almost nothing is known about the effects of fire on lakes and other larger water bodies. Wright (1976) studied the 1971 Little Sioux fire in northeastern Minnesota and found that as a result of vegetation removal lake levels responded more rapidly to rainfall. Other effects were less clear, however. McColl and Grigal (1975) studied the same fire and found that concentrations of nitrogen and phosphorous in soil solution were increased, as were the concentrations of most cations. Although they found accelerated rates of transport of nutrients from uplands, neither Wright nor McColl and Grigal reported changes in lake-water concentrations. They conclude that dilution by lake water and filtering by stream periphyton prevent changes that they observed on upland sites from affecting water quality of lakes.

Aquatic organisms are most affected by changes in concentrations of soluble forms of elements. There is almost no information available on the effects of fire on aquatic productivity, but under most circumstances effects are probably minor and short-lived. Transport of elements bound in an insoluble form to larger mineral and organic particles probably increases with increased erosion following fire. It seems unlikely that this would alter aquatic productivity, but sedimentation rates may be accelerated. Paleolimnological studies by Swain (1973), Cwynar (1978) and Patterson (1978) all show evidence of postfire increases in lake sedimentation following fire.

7.4. Fuels

Few studies have examined the effects of fire on fuels in the Northeast. A recent monograph by Martin, et al. (1979) contains little information applicable to coastal Maine forests. Data presented for spruce-fir in the Lake States show that of a total average fuel loading of 32.7 tons/acre (72 metric tons/ha), 8% was classed as < ½ inch (.6 cm), 14% as ½ to 1 inch (1.3 to 2.5 cm), 20% as 1 to 3 inches (2.5 to 5.8 cm) and 58% as > 3 inches (5.8 cm) in diameter. An additonal 20 tons/acre (44 metric tons/ha) of larger material was removed from these recently harvested stands. Prescribed fires reduced loadings by 25% with reductions by size class as follows; 90% for foliage and < ½ inch (0.6 cm) diameter particles, 81% for ½ to 1 inch (1.3 to 2.5 cm), 27% for 1 to 3 inches (2.5 to 5.8 cm) and 3% for > 3 inches (5.8 cm).

Fires at Acadia may produce generally similar patterns of fuel reduction, but total fuel loadings are higher in Maine's more productive forests. In addition, fuel distributions are probably less uniform than in logged-over areas and burn patterns less predictable. Any attempts to manage fuels at Acadia, whether by prescribed fire or mechanical means, should carefully document the effects on fuel loadings and distribution. Resulting data would provide much needed information for the Northeast as a whole and be useful in planning future efforts at fuel modification in the Park.

The presence of a dense, inflammable shrub stratum presents unique problems in the open conifer stands at Acadia. The loading of particles < 3 inches (5.8 cm) in diameter (1, 10 and 100 hour time-lag fuels) is low in these Fuel Model Q stands (Figure 5.4), but fire history studies suggest frequent burning.

The inflammable nature of the ericaceous shrubs and extensive mats of lichens on the forest floor apparently combine to increase fire danger. We know little about the behavior of fires in these stands, and they represent areas where additional research is needed. Blueberry and huckleberry are important components of the shrub layer, and their presence may increase inflammability of the type. The persistence of these shrubs may in turn depend upon recurring fire.

7.5. Fauna

There is a lack of descriptions of long-term and short-term ecosystem response to burning, including site specific responses of food, cover, and animals, and differential response to season of burn and repeated burning. We lack knowledge of specific habitat requirements, life histories, and inter-species relationships of key faunal species or groups (Lyon, et al. 1978). There are virtually no data on how varying the properties of fire will affect wildlife (Bendell 1974).

Bendell (1974) in Fire and Ecosystems, helps us to make some generalizations concerning effects of fire on fauna. However, generalizations must be used with caution as fire effects on wildlife vary according to the faunal species involved, the site, characteristics of the fire itself, and other factors.

7.5.1. Birds and Mammals

Birds and mammals encounter many changes in their environment and easily cope with most of them. Many birds and mammals are adapted to living in environments created largely by fire. Some fauna may actually contribute to maintenance of forest conditions conducive to burning. There may be a tendency for larger sized animals and birds to inhabit fire forests; smaller animals and birds to inhabit fire resistant forests such as hemlock.

Effects of fire on fauna may be direct or indirect. Indirect effects may take considerable time to become apparent. Many birds and animals remain calm in the presence of fire and may move into a burn immediately after a fire. Other animals may panic and run into a fire where they are consummed (rats, rabbits). Death may result from suffocation, asphyxiation and heat. Some animals escape fire by taking refuge in burrows. Soil temperature may be tolerable four inches (10.2 cm) below the ground surface when surface temperatures are 1000°F (538°C). Some mammals may suffocate in burrows without adequate ventilation. Vapor pressure increases when soil is heated which can, in some cases, create untenable conditions for wildlife. Rats die when temperatures exceed 145°F (63°C).

Fire affects the climate and microclimate of an area. Fire produces smoke, blackens soil and results in changes in light, humidity, wind, and snow cover. Birds and mammals are sometimes affected by windchill, especially when they are wet.

Fire affects the structure of vegetation and in so doing alters wildlife habitat characteristics. Trees and large shrubs are destroyed and new vegetation emerges close to the ground. Obstructions created by fire control operations such as snag felling may impede movement of some species. Others seek these conditions. Waterfoul may be kept from wetlands when they become choked with dense emergent vegetation, shrubs, and trees. Burning creates open water (Bendell 1974). Nesting areas may be altered with resultant adverse reproductive impacts to some species. Pattern of cover changes after burning with varying effects on birds and mammals. Local distribution and density of species, competition between faunal species, predation, and parasites are affected by burning. Burns create edge effect which benefits some species. A number of small fires will create more edge and interspersion than one large fire. Fire affects food supplies to the benefit or detriment of different species. In many cases food conditions are improved for surface feeding mammals due to regeneration of vegetation at ground level. Nutrient release following fire often enhances the quality of feed, although some nutrients may increase while others decrease.

Burning may favorably affect water supply. Reduced use of water by plants may cause water levels in streams to rise following fires. Severe fires in some localities, however, may result in drying of the site to an intolerable degree for some wildlife.

Many wildlife do not change in density or abundance after their habitat is devastated by fire. Some increases and decreases are noted. Bendell (1974) in summarizing studies conducted by Boch and Lynch (1970) and Martin (1960) notes that 80% of animal and bird populations remained about the same with respect to population density and trend following fires.

Extrinsic factors of environment such as food supply, cover, parasites, and preditors may favor or retard the expansion of populations. Genetic quality of stock is a basic cause of population change. Many studies show a relationship between stage of forest growth and associated birds and mammals. Wildlife forms are present that are adapted to each kind of environment present in a wide area. There is a native fauna and it persists without extreme changes in abundance and destructive impact to places where it lives. Occasionally large disturbances may favor the establishment of exotic species or result in epidemic levels of native species.

Some birds and mammals apparently are not sensitive to fine details of habitat and tolerate a wide range of conditions of their environment. Such may be the case of species which live in fluctuating environments such as forests which frequently burn. Most species favor a broad group of vegetation such as grass, herbs or shrubs rather than specific species of vegetation.

Birds show little change in abundance after fire. In general, ground dwellers show the largest population increase following fire; tree/trunk dwellers the most decrease.

Many birds and mammals inhabit Acadia. We are unaware of any specific studies concerning the effects of fire on fauna at Acadia. Studies conducted elsewhere may permit us to generalize concerning the effects of fire on a few species found at Acadia.

Several species of woodpeckers inhabit Acadia: downey (Picoides pubescens), hairy (Picoides villosus), and pileated (Dryocopus pileatus). Woodpeckers are attracted to burns when fire creates new snags and when insects move into the fire-killed trees. On the other hand removal of snags during or following the fire can adversely affect woodpeckers.

There are at least 16 species of warblers (Parulidae) at Acadia (Butcher 1977). Warblers that live in the canopy of deciduous trees require shade (Brewer 1958, Kendeigh 1945). Removal of forests changes the input and reflectance of light (Bendell 1974). Warblers may be adversely affected. The ovenbird (Seiurus aurocapillus) nests in dry leaves of the forest floor (Butcher 1977), and fires may destroy nests.

Ruffed grouse (Bonasa umbellus) is generally favored by fire. Doerr (1970) found no dead grouse on a 640-acre (259 ha) burn in Alberta. However there was a reproductive failure on the burned area which was attributed to destruction of grouse nests. In summer when it is hot and dry ruffed grouse live in parts of burns that are wet and grow thick willow (Salix spp.) or alder. In winter when it is cold and wet, they may be found on open burned areas as well as in their summer habitat (Bendell 1974). Grouse plunge and burrow into snow to escape cold and preditors (Gullion 1967). Snow on burned areas is often deeper than it is in forests; therefore, grouse survival may be increased during winter on burns. Thick clumps of conifers conceal preditors of grouse (Gullion 1972). Burning may mitigate predation losses. Abundant and nutritious vegetation usually emerges on burns and fire increases the number of litter-dwelling insects (Gullion 1967). Grouse have been observed to feed upon old male aspen trees which have been injured by fire. It is believed that these trees were of higher nutritional value than others and therefore important to reproduction and winter survival (Gullion 1970, Svoboda and Gullion (1972).

Whitetail deer (Odocoileus virginianus) occurs in Acadia. Deer use the edge of a burn more frequently than open burn or forest (McCulloch 1969). Many small fires will create more edge effect and interspersion of plant species than a large fire. Deer may utilize open burns where food is nutritious for the first few years following fire. However, Kelsall and Prescott (1971) have observed that deer leave a burn when snow is deep and soft and live in surrounding forest where snow is shallow and has a firm crust. Gates (1968) indicates this practice occurs even when abundant and preferred food occurs on the burn. Deep snow with little crust can immobilize deer. This condition frequently occurs on burns. Cheatum (1949) has observed that deer in exposed areas may starve to death sooner than those in sheltered areas.

Black bear (Ursus americanus) and moose (Alces alces) are only occasional visitors to Acadia (Butcher 1977). Both are fire followers (Bendell 1974), but it is doubtful fire has any appreciable effect on these species at Acadia.

Red squirrel (Tamiasciurus hudsonicus), northern flying squirrel (Glaucomys sabrinus) and eastern gray squirrel (Sciurus carolinensis) all occur in Acadia (Butcher 1977). Udvardy (1969) has observed that squirrels may swim large rivers to escape fires in Siberia. Squirrels don't normally occupy burned areas because of lack of nesting sites (Terrill and Crawford 1946). Red squirrel decreases after fire. This species is dependent upon mature climax vegetation (Lyon, et al. 1978).

Snowshoe hare (Lepus americanus), beaver (Castor canadensis), and racoon (Procyon lotor) all inhabit Acadia (Butcher 1977). Hare and beaver usually increase after fire. Wynne-Edwards (1970) believes that aspen and birch are required by beaver and that they adjust their numbers to these species. Aspen and birch revegate burned areas in Acadia, so fires may favor beaver.

Hall (1971) indicates that beaver may persist without aspen and birch when they can feed upon a variety of aquatic plants. Sunquist (1967) observes that racoon merely move away from a fire and neither frequent or avoid a burn more than usual.

We doubt that fire has any long-term effect on most bird and mammal species that occur in Acadia. There may, however, be short term adjustments in distribution and populations of fauna.

7.5.2. Invertibrates

Effects of fire on invertibrate populations may be transitory or long lasting. In general invertibrates decrease because the species or its eggs are killed by heat and flames and their food supply and shelter are diminished (Lyon, et al. 1978). However, some flying insects are attracted by heat, smoke, or dead and damaged trees and may increase during and after fire. In general most soil fauna decrease markedly for short periods after fire. Many surface insects are also reduced in numbers after fire but these insects are not as susceptible as the soil species. They are protected by their ability to fly, to move quickly into tunnels in the soil and to insulate themselves from heat and smoke in the bark of trees.

7.5.3. Stream Fauna

Increased soil erosion, increased water flow, removal of streamside vegetation, and increased nutrient loading result from fire (Lyon, et al. 1978). Sediment loading may reduce the size of spawning gravels or deposit fine material that smothers eggs, prevents emergence of fry (Cordone, et al. 1961; Burns 1970; Cooper 1965; Phillips 1961), increases predation losses and reduces populations of preferred food species such as may, caddis, and stone flies (Bjorn, et al. 1977; Burns 1970). Eggs may be crushed due to increased streamflow.

Removal of streamside vegetation increases streambank erosion, reduces available habitat, and increases stream temperatures. Dissolved oxygen decreases, whereas faunal oxygen demand increases. Increased temperature results in higher incidence of fish disease. Nutrient loading seldom reaches toxic levels and effects on productivity may be beneficial (Fredriksen, et al. 1975). Increased algae production may sustain a greater biomass and a more diversified population of insect larvae.

CHAPTER 8. FIRE WEATHER AND FIRE DANGER RATING

8.1. Fire Weather

Weather has been defined in Chapter 3. Weather parameters of interest to fire managers are measured daily at a specified time at field weather stations during the fire season. Parameters measured include temperatures (minimum, maximum, and temperature at observation time), relative humidity, fuel moisture, cloud cover, 24-hour precipitation and wind velocity and direction.

Factors affecting fire behavior are topography (including slope), fuel conditions and weather. Of these, weather is the most variable. Topography, for practical purposes, is fixed. It changes only over long geologic time periods, or occasionally rather abruptly due to a catastrophic event such as the eruption of Mt. St. Helens, Washington. Forest fuels normally change rather slowly as vegetation changes in response to management activities and successional processes. Dead fuels generally accumulate gradually on the forest floor. Events such as logging, fire, insect epidemics and blowdown, however, may result in abrupt changes in fuel conditions. Weather changes daily and even hourly. Weather conditions usually are much different at night than during the day. These diurnal changes can affect the ease of ignition and control of wildfire and dictate when safe and successful prescribed burns can be conducted.

Field fire-weather stations have been installed in Acadia National Park. NPS has operated fire weather station number 170701 at McFarland Work Center for many years. All historical fire weather data used in fire weather studies for Acadia National Park were obtained from the McFarland weather station records, except for two parameters to be discussed later. The McFarland weather station was upgraded to 1978 (NFDRS) standards in 1980.

Two new manually operated fire-weather stations were installed in 1980; one adjacent to the Ranger Station on Schoodic Peninsula and another adjacent to the Ranger Station on Isle au Haut. The former station was subsequently dismantled because personnel trained to take measurements were unavailable on a regular basis. The latter was subsequently moved to the Isle au Haut fire station. Because no historical data are available at these locations, the new stations were not used in the current fire-weather studies. It is recommended that measurements be recorded for at least two more years at Isle au Haut to determine whether sufficient variability exists between the two stations to warrant continued operation of the Isle au Haut unit.

A Remote Automated Weather Station (RAWS) was installed in February, 1980 on Western Mountain near Seal Cove Pond. The unit was purchased with Forest Service-appropriated funds and remains in USDA ownership. This station automatically transmits hourly weather data to a satellite from which data are relayed to the National Environmental Satellite Service in Virginia. Parameters measured include precipitation, wind speed and direction, air temperature, fuel temperature, relative humidity and a test voltage. The unit is capable of measuring barometric pressure, but this is not an input to the NFDRS, and therefore this feature is not operational on the unit. Again, no historical data exist for this station, and data collected in 1980 are not utilized in our studies of historical fire weather. The unit was moved to Isle au Haut in late 1982 in order to obtain more reliable weather data for this remote area in the Park.

A remote computer terminal is necessary to access the data transmitted by the RAWS station. The unit may be accessed by:

1. The Administrative and Forest Fire Information Retrieval and Management System (AFFIRMS) computer program (AFFIRMS will be discussed later). This is the simplest means.

2. National Environmental Satellite Service (NOAA-NESS). This is a comparatively complex process as the received data must be decoded.

To derive full value from the RAWS station the Park should have access to a computer terminal. Procedures for accessing the data through NOAA-NESS or AFFIRMS may be obtained through the USDI-NPS Office of Fire Management at Boise Interagency Fire Center.

The USDA-Forest Service publication "Fire Weather Observer's Handbook", Agriculture Handbook #494, details installation and maintenance procedures for fire weather stations and discusses instruments used to measure fire weather parameters. It is very important to install and maintain fire weather stations as detailed in this publication, or erroneous readings will result.

8.2. National Fire Danger Rating

National Fire Danger Rating was developed to provide the fire manager with daily weather information and indices. NFDRS helps managers to evaluate the potential for fires to ignite and spread and the difficulty to be expected in controlling them.

Fire danger rating is a useful tool in developing step-up plans for varying the quantity and location of fire suppression resources according to expected fire activity and burning conditions. Fire danger rating is also used as a fire prevention tool to inform the public of relative fire danger. Adjective ratings (tied to numerical indices) ranging from low to extreme are often used for this purpose. Brown and Davis (1973) devote a chapter to fire danger rating and discuss various systems that have been employed.

For most federal fire-suppression agencies the Buildup Index system was replaced in 1972 by the NFDRS which utilizes numerous components and indices to provide the fire manager with indicators of fire occurrence, spread, and difficulty of control.

The 1972 - NFDRS was refined in 1978. The number of fuel models was increased from 9 to 20 nationwide; the number of slope classes increased from 3 to 5; and the 1000-hour timelag fuel moisture and live fuel moisture models were added to provide more reliable indicators of drought. Changes were also made in the methods of calculating lightning and man-caused fire occurrence indices.

A detailed description of the 1978-NFDRS can be found in Deeming, et al. (1977). The NFDRS utilizes field measurements of weather parameters and intermediate calculations to arrive at outputs that include; Spread Component, Energy Release Component, Burning Index, Ignition Component, Lightning Occurrence Index, Man-Caused Occurrence Index and Fire Load Index (Figure 8.1). The last index combines expected fire occurrence with the expected fire behavior of one fire to arrive at an indicator of the total fire suppression job on a given day. Deeming, et al. (1977) discuss the meaning of the above indices.

NFDRS Fuel Models E and R (hardwood) plus G, H, and Q (conifers and mixed conifer-hardwood types) are present within the Park. Because a given NFDRS station is generally applied to a large area (perhaps 100,000 acres = 40,000 ha) we feel that Fuel Model H is the most appropriate model for NFDRS purposes in Acadia National Park.

We recommend that Slope Class 2, Climate Class 3 and perennial vegetation continue to be used in calculations.

Outputs (components and indices) may be determined by three methods:

1. Nomograms. Components and indices are determined manually, a cumbersome process. This process is detailed in USDA-Forest Service General Technical Report INT-40, "Manually Calculating Fire-Danger Ratings - 1978 National Fire Danger Rating System" (Burgan, et al. 1977). Nomograms for individual fuel models can be ordered from the Boise Interagency Fire Center.

2. Texas Instruments TI-59 hand-held calculator. A Custom Read Only Memory (CROM) chip was developed for use in this hand-held calculator, which allows quick calculations of components and indices.

3. AFFIRMS (Administrative and Forest Fire Information Retrieval and Management System). Components and indices are calculated by computer. Computer Sharing Services of Denver, Colorado, currently has the AFFIRMS contract. Fire weather forecasters can also enter regional forecasts. The current day's outputs and predictions for the following day are, therefore, available to users.

AFFIRMS archives measurements for retrieval and use with fire related computer programs such as FIREFAMILY. The data are stored at the National Fire Weather Data Library (NFWDL), Ft. Collins, Colorado. Instructions on the use of AFFIRMS is found in Helfman, et al. (1980). Fire weather data for users not on AFFIRMS can be periodically archieved at the NFWDL by transmitting the data to Ft. Collins on punch cards or tape. The data can then be manipulated with computer programs. Instructions for data input to the NFWDL are contained in Furman and Brink (1975).

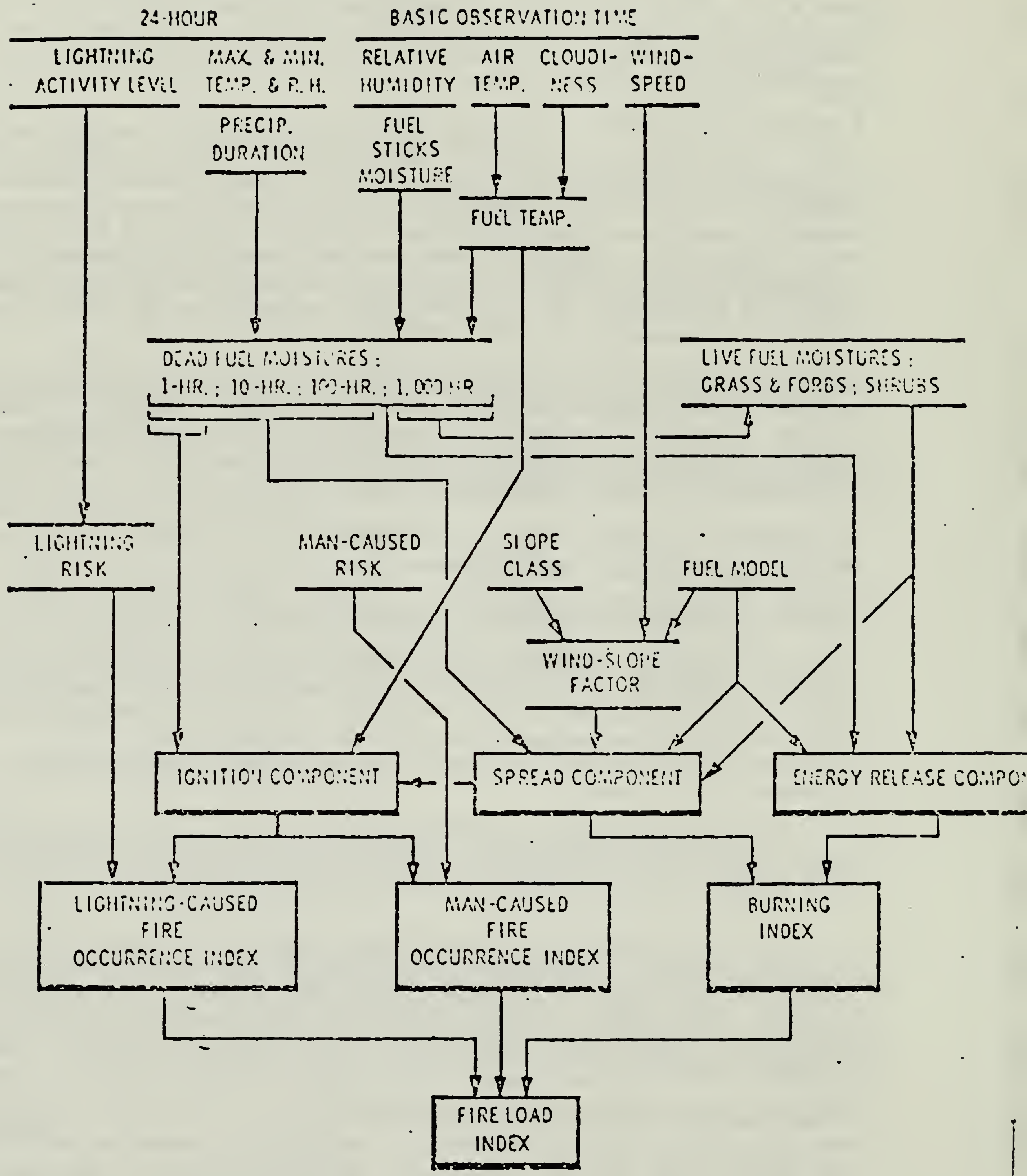

Figure 8.1 Structure of the 1978 National Fire-Danger Rating System (from Deeming, et al. 1977).

Chapter 9 of NPS-18 specifies that the 1978-NFDRS be used as the basis for NPS fire danger rating. Commencing in 1980 Acadia National Park implemented this system. Indices are computed using the TI-59 calculator with NFDRS/Fire Behavior CROM. Roger Rudolph of NPS, Acadia National Park, supervised implementation of the 1978 system. A training session on the 1978-NFDRS and use of the TI-59 calculator with NFDRS CROM was conducted by Rudolph and Jack Frost of the Forest Service's North Central Forest Experiment Station in June, 1980.

The McFarland weather records could not be located for the years 1974-1979 inclusive. Therefore, the years 1969 through July 1973 were utilized for analyzing fire weather for Acadia. Weather parameters were recorded daily (with some exceptions) over the nearly five-year period and should provide a reasonable indication of the frequency occurrence of NFDRS components and indices.

Use of the McFarland weather records is complicated by the fact that all parameters called for on the weather form were not recorded, especially maximum temperature, minimum temperature, and state of weather. To overcome the lack of maximum-minimum temperature data at McFarland, the data recorded at Hulls Cove were used. Hulls Cove is situated only 2.4 air miles (3.8 km) from McFarland and neither station is close to the water. It is doubtful that the Hulls Cove data differ substantially from data that would be measured at McFarland.

Unfortunately, "state of the weather" observations were generally not recorded at Hulls Cove. Therefore, this item was coded "scattered clouds" (less than 1/10 of sky covered with clouds) on days for which no precipitation occurred and "raining" when precipitation did occur. A few of the days were coded as "drizzle" when we could identify this condition from the records.

With implementation of the 1978-NFDRS at the Park, NPS weather observers began recording all inputs necessary for the system. We recommend continuation of this procedure. A windspeed counter should be installed at McFarland to improve reliability of wind measurements.

We recommend that the recording of weather data at McFarland begin no later than March 15 each year. This allows time for the NFDRS indices and components to adjust to the Park's fuel conditions. McFarland measurements should be continued through the fall until there is no doubt that the fire season has ended. Normally, November 30 would be a satisfactory cutoff date unless unusual fall drought conditions persist. The weather station at Isle au Haut should be operated from the time the nearby ranger station is activated to the time it is closed for the season. Weather measurements should be made at 1:00 p.m. Eastern Standard Time and 2:00 p.m. Eastern Daylight Time when at all possible.

Rangers at Isle au Haut should be provided training and the means to calculate the outputs of the NFDRS system (nomograms or TI-59 calculator). Outputs for the McFarland weather station are being calculated by TI-59.

ANP should consider subscribing to AFFIRMS. For manually operated weather stations the advantages of AFFIRMS are computer calculation of the outputs, automatic archiving of weather data in the National Fire Weather Data Library, and outputting of forecasts for the following day. A remote computer terminal must be utilized to input and output data. The terminal could also be used to output RAWS data. If ANP subscribes to AFFIRMS, data from all weather stations should be transmitted daily to the computer operator by telephone or radio. It should be noted that data transmitted by the RAWS station may be retrieved for the previous 24-hours. These data are not archived by AFFIRMS. NFDRS components and indices may be computed from RAWS weather data.

The computer program FIRDAT was executed to obtain tabulations and frequency curves of the NFDRS components and indices. Computer printouts obtained from execution of FIRDAT are submitted with this report. Instructions for executing FIRDAT can be obtained through USDI-NPS Office of Fire Management, Boise, Idaho. The following values were used for the indicated parameters: Slope Class -- 2 (26%-40% slope); Herbaceous Type -- P (Perennial); and Climate Class -- 3 (Humid).

Runs were executed for NFDRS Fuel Models G, H, and E/R using the historical fire weather data for McFarland weather station and the values for slope class, herbaceous, and climate class shown above. As noted earlier, we feel that Fuel Model H is the most appropriate fuel model for use in fire planning in Acadia National Park.

The computer runs for Fuel Model H yielded the 90th and 97th percentile values (measured along the cumulative frequency curves) shown below for the various NFDRS components and indices:

Component/Index	90%	97%
Ignition Component	19.9	28.1
Spread Component	1.9	3.5
Energy Release Component	13.5	15.9
Burning Index	13.1	18.0

Federal wildland fire management agencies generally use either the Fire Load Index or the Burning Index in developing step-up plans. We suggest that Acadia National Park use the Burning Index. Inputs for calculation of the Fire Load Index include man-caused and lightning-caused fire occurrence indices. The scaling factors for obtaining these indices cannot be accurately computed at this time, therefore the Fire Load Index cannot be accurately computed. Basing the step-up plan on Burning Index should be satisfactory as the Park experiences very few days for which more than one fire occurs. Lightning fires are rare enough in Acadia that they can be considered as miscellaneous fires.

Manning classes based on Burning Index may be established according to the following accepted procedure:

Fire Danger Manning Class	Burning Index Value Range
I	Zero to 1/4 of the Burning Index value occurring at the 90th percentile on the cumulative frequency curve.
II	The range of values between 1/4 and 1/2 of the Burning Index value occurring at the 90th percentile on the cumulative frequency curve.
III	The range between 1/2 of the 90th percentile Burning Index value and the 90th percentile value.
IV	The range between the 90th percentile Burning Index value and the 97th percentile value.
V	Burning Index Values above the 97th percentile.

The following Burning Index ranges are indicated for Acadia when using Fuel Model H:

Manning Class	BI Range
I	0-2
II	3-6
III	7-13
IV	14-17
V	18+

Calculating Ignition Component, Spread Component and Energy Release Component each day provides valuable indicators as to how easily fires will ignite on a given day, how fast they can be expected to spread, and the expected difficulty of fire control. The meaning of the values obtained for these components can be found on page 1 of Deeming, et al. (1977).

A study of the "Burning Index" column in the "Daily List" printouts shows a rather sporadic distribution of index values. However, higher indices generally occur more frequently in the spring than in summer or fall. High indices can also occur in fall beyond the dates of the normal fire season in drought years. "Daily List" and cumulative frequency tabluations and curves for the NFDRS components and indices are presented in the printouts for Fuel Models H, G, and E/R.

The following is a summary listing of the publications needed in order to utilize the 1978-National Fire Danger Rating System, AFFIRMS, the National Fire Weather Data Library, and FIREFAMILY:

Subject Matter	*Publication*
Installation and maintenance of fire weather stations and discussion of the weather instruments.	*Fire Weather Observers' Handbook, USDA-Forest Service, Agriculture Handbook #494; Fischer and Hardy (1976).*
Description of the 1978-National Fire Danger Rating System and its operation.	*The National Fire Danger Rating System-1978, USDA-Forest Service General Technical Report INT-39; Deeming, et al. (1977).*
Step by step procedures for manually calculating NFDRS outputs by means of nomograms.	*Manually Calculating Fire Danger Ratings - 1978 National Fire Danger Rating System, USDA-Forest Service General Technical Report INT-40; Burgan, et al. (1977).*
Use of AFFIRMS computer system	*Users Guide to AFFIRMS: Time Share Compterized processing for Fire Danger Rating, USDA-Forest Service General Technical Report INT-82; Helfman, et al. (1980).*
Entering weather data into the National Fire Weather Data Library at Fort Collins, Colorado, and the extraction of this data from the library when needed.	*The National Fire Weather Data Library: What it is and How to use it, USDA-Forest Service General Technical Report RM-19; Furman and Brink (1975).*
Instructions for running FIREFAMILY programs (FIRDAT, SEASON, FIRINF).	*Firefamily: Fire Planning with Historic Weather Data, General Technical Report NC-73; Main, et al. (1982).*

Chapter 9. FIRE PROTECTION

9.1. Introduction

The Park's fire reports were utilized in the evaluation of fire protection in the Park. Other NPS records and documentation from external sources were used as appropriate. The period 1937 through 1979 was studied, although fire reports for the periods 1956-1960 and 1969-1973 could not be located. This is unfortunate, because the weather records for the 1969-1973 period were used in the protection analysis. Due to low fire incidence at Acadia, there will probably be little difference in the end result of the analysis. Some data were also omitted from some fire reports. Therefore, some tables in this chapter total to less than the total number of fires for the 33 years for which fire reports are available. There were no reported fires some years.

9.2. Summary of the Fire Situation

NPS took action on 204 fires from 1937-1979 in those years for which fire reports are available (Table 9.1). Seventy-six percent of the fires occurred on lands in NPS ownership. The remainder occurred on private lands, mostly outside the Park boundary (Table 9.2). There were only 13 days on which two or more fires occurred (Table 9.3). Fifty-eight percent of the fires were Size Class "A" (0.25 acres or less); 39% were Size Class "B" (0.26 - 9 acres); 2% were Size Class "C" (10-99 acres). Only one fire, the 1947 Bar Harbor Fire, exceeded 100 acres (Table 9.4).

Fires were evenly distributed through the week, except for Sunday which experienced nearly twice as many fires as the other days of the week (Table 9.5). Smoking and incendiary fires account for 72% of the fires, although incendiarism does not appear to have been a problem in recent years. Only a small percentage of fires can be attributed to each of several other causes (Table 9.6). Specific causes of fires are shown in Table 9.7. Park visitors account for 43% of the fires followed by permanent residents at 29% (Table 9.8). The largest number of fires during the period occurred in 1940 when there were 24 fires. The Park experienced most of its fires during the tourist season (June through Labor Day). Vegetation is normally green throughout this period, however, and large fires are not as likely to occur as during the spring or fall.

We infer from the above summary that Acadia National Park seldom has a serious wildfire problem. Although the Park experiences some fires in most years, nearly all fires are controlled when small. The 1947 Bar Harbor Fire was the only disaster fire in more than three decades. Prolonged droughts rarely occur in Acadia, although short periods of critical fire weather occur nearly every year. When droughts do occur, conditions are favorable for the occurrence of disaster fires.

Table 9.1. Number of fires by year and month from NPS fire reports.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Remarks
1979													0	No fires
1978							1	3					4	
1977					1		1						2	
1976						2							2	
1975					1			2					3	
1974														Records missing thru 1969
1968					1		1	3					5	
1967													0	No fires
1966					2	2	2						6	
1965					1	6	5	5	3				20	
1964				6	2	1	1						10	
1963							4			1			5	
1962				1	4	1	2						8	
1961														Records missing thru 1956
1955			1	2	1	2	2	3	1				12	
1954							1	1					2	
1953					2	1	3						6	
1952				1		1	3	2			1		8	
1951			1										1	
1950					1		2	3					6	
1949				2	1			13	1				17	
1948													0	No fires
1947								3		2	1		6	
1946			1				2	1		1			5	
1945													0	No fires
1944								2					2	
1943													0	No fires
1942				4									4	
1941				8		1	3	2	1				15	
1940					6	4	4	10					24	
1939					2	2	1	8			2		15	
1938					2	2	2						6	
1937					1		4	5					10	
			3	24	26	29	40	68	6	4	4		204	
			1%	12%	13%	14%	20%	33%	3%	2%	2%			

Table 9.2. Number of fires by ownership (some years missing or no fires).

	Land Ownership		
Year	NPS	Private Inside	Private Outside
1978	3		
1977	2		
1976	2		
1975	3		
1968	3		2
1966	4		3
1965	12		8
1964	8		2
1963	5		
1962	7		1
1955	12		
1954	1		1
1953	5		1
1952	5		3
1951	1		
1950	4	2	
1949	12		5
1947	3		3
1946	4		1
1944	2		
1942	3		1
1941	8		7
1940	16		8
1939	15		
1938	6		
1937	10		
	156	2	46

Table 9.3. Multiple fire days from NPS fire reports.

Date	Number	Size
8/12/37	2	B(2)
6/2/38	2	B(2)
8/13/39	2	A(1) B(1)
8/16/39	2	A(1) B(1)
5/19/40	3	A(1) B(2)
6/16/40	2	A(1) B(1)
4/18/41	2	A(1) B(1)
4/3/42	3	B(3)
8/19/49	2	A(1) B(1)
8/25/49	2	A(2)
8/13/50	2	A(2)
7/7/55	2	A(1) B(1)
6/24/76	2	A(1) B(1)

Table 9.4. Number of fires by size class from NPS fire reports.

Year	A	B	C	D	E	F	G	Total	Remarks
1979								0	No fires
1978		4						4	
1977	2							2	
1976	1	1						2	
1975	3							3	
1974									Records missing 1974-69
1968	1	3						4	
1967								0	No fires
1966		1						1	
1965		3						3	
1964	1	1						2	
1963	2							2	
1962		2						2	
1961									Records missing thru 195
1955	9	3						12	
1954	2							2	
1953	6							6	
1952	7	1						8	
1951		1						1	
1950	6							6	
1949	14	3						17	
1948									No fires
1947	4		1				1	6	Bar Harbor Fire 17,188 a
1946	4	1						5	
1945									No fires
1944	1							1	
1943									No fires
1942		4						4	
1941	9	5	1					15	
1940	13	11						24	
1939	6	8	1					15	
1938	2	4						6	
1937	2	7	1					10	
	95	63	4				1	163	
	58%	39%	2%				1%	100%	

Table 9.5. Number of fires by day of week from NPS fire reports.

Year	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Remarks
1979								No fires
1978	2		1		1			
1977	1		1					
1976					2			
1975	1	1				1		
1974								Records missing thru 1969
1968		1	1		1		2	
1967								No fires
1966	2	2		1		1		
1965	4	4	2	2	1	4	3	
1964	2	1	2	1			4	
1963	2		1	2				
1962	2		1		1	2	2	
1961								Records missing 1961 thru 195
1955	1	1	2	3	4		1	
1954		2						
1953	1	2	1		1	1		
1952	2	1			2	1	2	
1951			1					
1950	2		1	2		1		
1949	4	2	4	2	2	3		
1948								No fires
1947		2		1	1	2		
1946	1		1	1		1	1	
1945		1		1				
1944								No fires
1943								No fires
1942					1	3		
1941	4	1	2	2	2	3	1	
1940	10	3	1	2	4	1	4	
1939	5	2	1	3		2	2	
1938	1			1	2	1	1	
1937	2	1	2	1	3		1	
	49	27	24	24	29	27	25	

Table 9.6. Number of fires by statistical cause from NPS fire reports (some years missing).

Year	Lightning	Campfire	Smoking	Debris Burning	Incendiary	Equipment Use	Children	Mis
1978		4						
1977			1					1
1976	2							
1975			3					
1968	1		3			1		
1966			5				1	
1965		1	15				3	1
1964			4		2		3	
1963	1		1	1			1	2
1962		2	5		1			
1955		1	4	1	4	1		1
1954			2					
1953			5					1
1952		1	5	1				1
1951					1			
1950			4					2
1949		3	11	2				1
1947			4	1	1			
1946			3	1		1		
1944			2					
1942			1		3			
1941		1	5	3	4			2
1940		1	18	1	3			1
1939	1	1	9	1	3			
1938			6					
1937			9					
	5	15	125	12	22	3	8	14
	2%	7%	61%	6%	11%	2%	4%	7

Table 9.7. Number of fires by specific cause from NPS fire reports (some years missing).

Year	Lightning	Burning Vehicle	Exhaust Other	Cooking Fire	Smoking	Burning Building	Power Line	Fireworks	Play w/ Matches	Othe
1978				4						
1977					1			1		
1976	2									
1975					3					3
1968	1				3					1
1966					5				1	
1965				1	15		1		3	
1964					4				3	3
1963	1				1				1	2
1962					5					3
1955		1			4					7
1954					2					
1953					5		1			
1952					5					3
1951										1
1950					4					2
1949					11					6
1947					4					2
1946			1		3					1
1944					2					
1942					1					3
1941					5					10
1940					18	1				5
1939	1				9					5
1938					6					
1937					9	1				
	5	1	1	5	125	2	2	1	8	57
	2%	0.5%	0.5%	2%	60%	1%	1%	0.5%	4%	28

Table 9.8. Number of fires by class of people from NPS fire reports (some years missing).

Year	Lightning or Unknown	Contracting	Public Employees	Permanent Residents	Seasonal Residents	Visitors, etc.	All Others	None Specified
1978						1	3	
1977						2		
1976	2							
1975						3		
1968	1			1		3		
1966				2		4		
1965	1			7		9		
1964				7		1		
1963	2			3		1		
1962				4		4		
1955		1	1	4		6		
1954				1		1		
1953	1			2		2	1	
1952				1		6	1	
1951				1				
1950				2		3	1	
1949		1	2	4	1	9		
1947				3		2	1	
1946				1		4		
1944						2		
1942				3	1			
1941				9		6		
1940				3		17	4	
1939	1							14
1938								6
1937								10
	8	2	3	58	2	86	11	30
	4%	1%	2%	29%	1%	43%	5%	15%

The fire situation in ANP does not justify maintenance of a large organization dedicated solely to fire protection. However, when prolonged droughts or short periods of critical fire weather occur within normal fire seasons, it is essential that these conditions be recognized so that emergency prevention and presuppression action may be taken.

9.3. Fire Season

Fire season may be defined as "the period or periods of the year during which fires are likely to occur, spread, and do significant damage to warrant organized fire control." (U. S. Forest Service, 1956). Table 9.1 indicates that 92% of the fires occur in the period April through August. The range of fire dates is March 22 (1946) through November 20 (1939) (Table 9.9). Nearly all fires burned less than ten acres.

The period September through November accounts for only 7% of the fires, but during droughts the most damaging fires are likely to occur during this period. Fire prevention measures and presuppression preparedness deserve special attention at such times.

Fire Management Guideline NPS-18 (Chapter 9) specifies that the fire season will be that period of the year during which 90% of the fires occur based upon total fire occurrence during the prior decade. However, due to the small number of fires occurring in Acadia, the 33 years for which reports are available may provide a better indication of fire season.

It is suggested that the period April 1 through Labor Day be established as the fire season. Tourism drops off markedly after Labor Day, thus resulting in less risk of fire. Risk and burning conditions are high enough during the proposed season to permit ignition, spread and resultant damage from fire. Prevention measures and presuppression readiness would be necessary outside this period during unusually dry preseason and post-season periods.

9.4. Step-up Plan

Firefighting agencies cannot finance organizations that can cope with all fires during the worst fire seasons or during peak fire danger of normal fire seasons. To provide for reasonable fire suppression capability, fire prevention and presuppression measures beyond those normally authorized can be taken during such periods of elevated fire danger. Emergency pre-suppression funding (PWE-343) is used to pay for these added measures. FIREPRO instructions specify the uses to which these funds may be put. Included are overtime for NPS employees, hiring of emergency firefighters, necessary transportation for firefighters, rental of standby equipment, etc. Authorization to expend PWE-343 funds is contingent upon approved step-up plans. It is recommended that this plan be prepared for Acadia National Park. The plan should be tied to the 1978-NFDRS.

Table 9.9. First and last fire dates by year.

Year	First Fire Date	Last Fire Date	Remarks
1979			No fires
1978	7/13	8/27	
1977	5/22	7/19	
1976	6/24	6/24	
1975	5/18	8/25	
1974			Records missing 1974-1969
1968	5/11	8/20	
1967			No fires
1966	6/13	8/29	
1965	5/1	9/9	
1964	4/19	7/18	
1963	6/2	6/30	
1962	5/11	7/8	
1961			Records missing 1961 thru 1956
1955	3/29	9/8	
1954	7/12	8/30	
1953	5/24	7/11	
1952	6/26	11/14	
1951	3/27	3/27	
1950	5/12	8/15	
1949	4/10	9/4	
1948			No fires
1947	8/1	11/6	
1946	3/22	10/8	
1945			No fires
1944	8/3	8/16	
1943			No fires
1942	4/3	9/2	
1941	4/5	9/28	
1940	5/6	8/29	
1939	5/13	11/20	
1938	5/19	7/9	
1937	5/30	8/25	

On-duty personnel are expected to control those fires occurring on days when fire danger is in Manning Class III and below without expenditure of emergency presuppression funding (PWE-343). For Acadia National Park this means that the regular on-duty Park personnel should be expected to handle the predicted fire workload at Burning Index 13 and below. When fire danger reaches Manning Class IV (BI 14-17 inclusive) personnel and standby equipment may be added in accordance with specifications in the approved step-up plan. If necessary, additional fire suppression resources may be authorized at Manning Class V (BI 17+).

Specific fire prevention or presuppression actions may be required at specific fire danger levels. These could include, for example:

> Requiring personnel to be in continuous radio contact at higher fire danger levels; intermittent or no contact at lower fire danger levels.
>
> Restricting normal activities of personnel at higher fire danger levels so they will be available for immediate dispatch to fires; limited or no restrictions at lower fire danger levels.
>
> Devoting more attention to fire prevention activities at higher fire danger levels.
>
> Manning the McFarland water tanker and fire truck with a specified number of people at specified fire danger levels.

The plan should specify manning and action to be implemented according to ranges of NFDRS indices during the defined fire season. The plan should also contain preseason and postseason sections to define the permitted manning and actions necessary outside the established fire season due to prolonged drought or short periods of elevated NFDRS indices.

9.5. Fire Protection

Responsibility for fire management in Acadia National Park rests with the Park Superintendent. Fire management includes all activities related to wildland fire protection and beneficial uses of fire: fire prevention, detection, presuppression, suppression, fuels management and prescribed burning. The Superintendent has delegated authority for presuppression activities to the Chief of Resource Management. The Chief of Visitor Protection has been delegated authority for fire suppression.

The Park uses personnel hired primarily for other purposes to perform fire prevention, detection, dispatch, and suppression work, except for two seasonal employees who maintain the fire cache at McFarland Work Center and perform other presuppression and suppression work.

Detection of fires is accomplished primarily by the public and NPS personnel on patrol. Beech Mountain Lookout is manned on a selective basis during critical fire weather.

Local fire departments and Maine Forest Service assist NPS with fire suppression work. NPS reciprocates. No formal cooperative agreements exist with Maine Forest Service or individual fire departments, but NPS does have a cooperative agreement with the Hancock County Firemen's Association (See Appendix I).

A basic fire suppression course was conducted in June, 1980 to satisfy training requirements for red carding personnel as firefighters. These people were required to pass the physical fitness test (Step Test or 1½-mile run) before being rated as firefighters. The Park currently has few people red carded above the level of firefighter.

NPS resources available for fire suppression are covered in the following section.

9.5.1. Fire Protection Resources (Existing)

9.5.1.1. Mt. Desert Island

Personnel - Two seasonal employees work out of the McFarland Work Center. Approximately 15-20 employees assigned other duties are available for fire suppression in the summer; 10 during spring and fall. Most personnel work out of the Bar Harbor area; a few work out of Seawall Ranger Station on western Mt. Desert Island. Seasonal hiring generally commences about May 1, and the Park is at full staffing by the tourist season. Personnel begin to leave after Labor Day.

Fire Cache - A fire cache located at McFarland Work Center is stocked to a level that will meet initial attack and first-follow-up needs, considering the need to use qualified firefighters. The cache contains such items as handtools, chain saws, hard hats, portable pumps, bladder bags, hose and limited quantities of nozzles and fittings, etc. Fire protective clothing is being acquired. A 20-man fire cache is located at Seawall Ranger Station and a five-man tool box is located at Blackwoods Campground.

The Park uses 1½-inch fire hose for wildland fires. Two different hose threads are in use; Iron Pipe and National Hose. These two threads cannot be coupled without use of an adapter. This problem has been mitigated by placing the hose with National Hose thread on Isle au Haut. Fire departments in Maine, unlike those in most States, use 1½-inch hose with couplings threaded to Iron Pipe.

Retaining the Iron Pipe threaded hose at McFarland Fire Cache enables this hose to be connected directly into hose lays of the numerous fire departments located on Mt. Desert Island without use of adapters.

Two 500 gallon-per-minute trailer mounted pumps are based at McFarland.

Motor Vehicles - *The following McFarland vehicles are available for fire suppression.*

- *Fire Truck (Engine). This unit is an all-wheel-drive rig with a 250 gallon-per-minute Darley Champion pump and a large booster tank. The unit, as equipped, is better suited for structural firefighting than wildland firefighting. Hose loads are composed of 2½-inch and 1½-inch hose. The only small diameter hose is on the booster reels. Some handtools are carried. The unit is manned by qualified operators; generally automotive shop personnel.*

  Tanker - This unit is a tractor-trailer unit with 5,000 gallon tank and an auxiliary pump. It is useful for refilling smaller NPS and local fire department units. The unit is manned by qualified operators; generally automotive shop personnel.

  All-Wheel-Drive Pickup - This unit carries no water, but is equipped with a portable pump and fire tools. It is assigned to fire cache personnel during the summer.

9.5.1.2. Isle au Haut

Personnel - Three seasonal personnel are stationed on Isle au Haut between the approximate dates of May 15 through October 15.

Fire Cache - A small fire cache suitable for initial attack is maintained at the Ranger Station. The cache includes portable pump, hose, and handtools.

Pickup Truck - This unit is a 4x4 vehicle without water and is operated by NPS seasonal personnel.

Trailer-Mounted Pump - This is a 500 gallon-per-minute pump. It is stored in the fire station at Isle au Haut.

Other - The community fire station at Isle au Haut is equipped with two fire trucks. The units are old, poorly equipped and appear to be in a poor state of repair.

9.5.1.3. Schoodic Peninsula

Personnel - One seasonal Ranger is stationed at the Schoodic Ranger Station during the period May 1 to October 31. The station is often unmanned two days per week.

Other - Two 10-man fire tool boxes are maintained on Schoodic by NPS. The seasonal Ranger uses a sedan for transportation. The U.S. Naval Base near Schoodic Point is equipped for firefighting and provides reliable assistance to NPS.

NPS-18 and NPS-20 provide guidelines for establishing cooperative agreements and discuss their contents. We suggest that NPS pursue negotiation of a cooperative agreement with Maine Forest Service (MFS) for use of MFS personnel, fire crews and perhaps aircraft. Maine Forest Service has three HU-1 helicopters and a Beaver float plane capable of dropping water. The helicopters can also be used for hauling firefighters, equipment and supplies to remote locations such as Isle au Haut or Schoodic. Agency policies will dictate whether aircraft and pilots will need to be carded.

9.5.2. Detection

Fire reports from the public and NPS personnel on patrol are generally adequate to meet fire detection needs. The Step-up Plan should provide for manning Beech Mountain Lookout when the fire danger reaches Manning Class IV (BI-14+) for several consecutive days.

9.5.3. Dispatch

Headquarters personnel handling dispatch activities should have a clear understanding of NPS, State and local fire department resources available and the procedures for dispatching them during normal work hours, at night, and during other off-duty periods.

Suppression resources and the means of procuring them should be documented in a mobilization plan. This plan should be updated periodically. Procedures for obtaining resources through North Atlantic Region and Boise Interagency Fire Center for problem fires should also be documented and understood by those who are assigned responsibilities for dispatching.

Local sources for obtaining fire suppression resources, supplies, and services should be listed in the mobilization plan. These items can include water tankers, tractors, crew transportation, lunches or restaurant meals, gasoline, diesel fuel, equipment repair, tree fallers, etc. These items or services should be prearranged and should be covered by rental agreements or blanket purchase orders as appropriate.

Persons to be assigned fire dispatch duties should receive initial training and periodic follow-up training using simulation exercises. Fire activity in Acadia is not sufficient to keep persons performing the dispatch role proficient for those occasions when problem fires occur. The Chief of Visitor Protection feels that hiring personnel to perform fire, rescue and law enforcement dispatch would provide a better level of expertise. We agree.

9.5.4. Initial Attack and First Follow-up

Most fires occurring in Acadia are readily controlled by NPS and mutual aid forces. Initial attack needs in the Park can best be met using qualified (red carded) supervisors and firefighters with handtools or small fire trucks and by prompt dispatch of local fire departments. Following is an evaluation of the adequacy of the existing initial attack organization and recommendations for strengthening it.

9.5.4.1. NPS Personnel - The number of personnel available for fire suppression is adequate. No new fire suppression positions are proposed. The capabilities of the existing organization to fight fire effectively and safely can be enhanced by:

1. Training at least two Crew Bosses to red card standards. This will provide qualified leadership on the fireline. Specific training, fire experience, and physical fitness requirements apply. These persons can also be used to train NPS "firefighters".

2. Training one Class III (Multiple Crew) Fire Boss. This would place qualified leadership in overall charge of fire suppression activities. A Class III Fire Boss can handle most fires in Acadia. The requirements for Class III Fire Boss are little more than for Crew Boss.

3. Provide key Acadia personnel to North Atlantic Region crews that are dispatched to other areas of the United States to fight specific fires. These assignments provide some of the best training opportunities available.

4. Continue the "firefighter" certification program started in 1980. This will probably require that a Basic Firefighter Course be conducted at least every two years. Continuation of this certification program will ensure that persons assigned to fight fires have had the basic training and meet basic physical fitness requirements. Minimum training should consist of Courses S-110 (Basic Fire Orientation), S-130 (Basic Firefighter), and S-190 (Basic Fire Behavior).

NPS-18 (Chapter 9) does in some cases permit the use of less than fully qualified "firefighters", but there are constraints on the use of these people. Initial attack forces must, in any case, be under the leadership of qualified supervisors. Due to remoteness of Acadia from other sources of qualified overhead and firefighters it is recommended that the Park maintain at least one qualified Class III Fire Boss, two Crew Bosses, and about 20 firefighters. It is probably not cost-effective to develop a red carded fire organization beyond this level in Acadia. If persons with higher red card qualifications are already available it will probably be worthwhile to maintain the experience and physical fitness currency of these people. Such people could also be used on firefighting assignments elsewhere in North Atlantic Region. Red card training courses above the level of "firefighter" could be handled most efficiently at the North Atlantic Region level.

9.5.4.2. Vehicles

1. *Small Fire Trucks - Fire slip-on pumper units mounted on four-wheel-drive pickup trucks offer a relatively inexpensive means of improving initial attack capability at Acadia. These rigs are fast, maneuverable, and have good off-highway performance. The slip-on pump unit can be removed during periods of low fire danger and the trucks used for other purposes. Slip-on pumpers are self-contained modules and are available from several sources. Tank capacity of 100 to 125 gallons should be used in order to provide sufficient water for initial attack on small fires and yet not exceed the gross vehicle weight of the truck chassis. Pump capacities of 30 to 50 g.p.m. at 150 psi are generally sufficient for small fire trucks. A hose reel or hose basket greatly facilitates initial attack by one or two people.*

   Four-wheel-drive pickups are assigned to the McFarland Fire Cache and Isle au Haut. Slip-on units for these vehicles would greatly increase initial attack capability, especially on Isle au Haut where there is considerable wildland fuel and few firefighting resources.

2. *Large Fire Truck - The large Darley-International fire truck at McFarland is equipped primarily for structural firefighting. The unit's primary value appears to be for the protection of the McFarland facility during the regular workweek when personnel are available at McFarland to operate the rig. For fires occurring during non-duty hours and at locations other than McFarland, local fire departments can generally provide faster service. This all-wheel-drive fire truck could better serve wildland fire protection needs by removing much of the 2½-inch fire hose, adding 1-inch hose in hose packs, stocking appropriate fittings for 1-inch and 1½-inch hose, and stocking enough well maintained handtools, hard hats, nomex, goggles, and headlamps to outfit 10 firefighters. The large amount of 2½-inch fire hose carried on the fire truck is useful primarily for supply lines between water sources (hydrants, lakes, ponds) and a fire and for applying large quantities of water to structural fires when there is an unlimited water supply.*

   Maintenance at Acadia of a large truck equipped for structural firefighting does not appear cost-effective. We recommend that this rig be outfitted for wildland firefighting. When the rig is replaced, consideration should be given to acquiring a smaller pumper on a pickup truck or 1½ ton chassis. A slip-on pumper based at Seawall would improve protection on western Mt. Desert Island.

3. *Patrol and Maintenance Vehicles - These vehicles should carry a shovel and cutting tools in good condition for attack on incipient fires.*

   Prompt dispatch of local fire departments should continue to be initiated whenever fires are capable of spreading. Fire departments may often provide the first attack because these departments are well distributed geographically.

9.5.4.3. Fire Caches - *Fire caches are maintained at McFarland and Isle au Haut and several other locations. Fire tools and equipment stored in these caches are generally adequate to meet initial attack and first follow-up needs, assuming qualified firefighters are utilized for fire suppression. The following should be considered:*

1. *Handtool Maintenance - Tools should be sharp with handles tight, straight and smooth.*

2. *Fire Resistive Clothing - This should be issued to key personnel and stored in fire caches for issuance to others during fires.*

3. *Fire Hose - Future hose orders should specify Iron Pipe Thread for compatibility with hose and fittings of local fire departments and most NPS hose and fittings. Hose with National Hose thread should remain at Isle au Haut and adequate adapters should be maintained for connecting this hose to Iron Pipe threaded couplings, nozzles, and pump discharge valves. Trading hose with National Hose couplings to other NPS field units in states where this thread is standard in exchange for Iron Pipe Threaded hose is being considered and would be a practical solution to the problem.*

   Hose should be periodically static tested to 250 pounds-per square-inch pressure.

   Consideration should be given to purchase of 1-inch forestry hose for the large McFarland fire truck and any slip-on pumpers that may be acquired. There is a need for both 1½-inch and 1-inch hose in wildland fire protection organizations. The larger hose size is normally used for long hose lines with tapoffs for 1-inch lines, initial attack on very hot fires, and lines attached to small portable pumps.

   The 1½-inch hose may be reduced to two or more 1-inch working lines at the fire. The smaller hose size is less expensive, lighter weight, easier to handle, requires less water, and yet provides ample water for most wildland fire situations. We do not recommend that Acadia purchase a large quantity of 1-inch fire hose at this time. However, as 1½-inch hose is replaced, consideration should be given to replacement to provide an appropriate mix of 1-inch and 1½-inch hose.

   A supply of hose fittings and accessories should be maintained in fire caches (nozzles, adapters, reducers, spanner wrenches, gated Y's, gizmos, foot valves, etc.).

9.5.4.4. Local Fire Departments - *Local fire departments, mostly volunteer, are well distributed on Mt. Desert Island and Schoodic Penninsula. Isle au Haut is poorly equipped.*

Local fire departments are often in a position to provide initial attack or first reinforcement to fires on NPS lands. Use of fire department resources can be made more effective by:

1. *Use of a common radio frequency in fire department and NPS vehicles.*

2. *Joint fire training sessions between NPS and local departments to increase the knowledge/skills of local firemen in coping with wildland fires.*

3. *Encouraging fire departments to apply for federal Rural Community Fire Protection funds and to participate in the Federal Excess Property program. These programs assist low budget fire departments in training their people and obtaining equipment. The Director of the Maine Forest Service coordinates these programs.*

9.5.5. Escaped Fires

The fire organization employed in Acadia National Park and resources available from State of Maine and local fire departments are inadequate to cope with those rare occasions when multiple large fires occur. In these cases it will be necessary to import fire crews and other fire suppression resources from elsewhere in the Northeast or nationally.

The need to import fire crews, overhead teams and aircraft should be recognized early in the progress of the fire(s). Procedures for obtaining resources from North Atlantic Region and Boise Interagency Fire Center should be well understood by responsible Acadia personnel.

The U. S. Forest Service has Cooperative Agreements with the States of Maine, Vermont, New Hampshire, New York, Connecticut, Rhode Island, and other northeastern states for fire crews. These crews, when available, can be requested through normal NPS channels to the Cooperative Forest Fire Management office in Broomall, PA. (Telephone 215-461-3160).

Resources such as crews, fire teams, radios, infra-red aircraft, helicopters, air tankers, fire tools and equipment are available nationally through Boise Interagency Fire Center.

Use of resources available to the State of Maine through the Northeastern Forest Fire Compact, whose membership includes the New England States and two Canadian Provinces, should be explored.

9.5.6. Fire Prevention

NPS people in the Headquarters Visitor Center and on patrol can normally handle fire prevention activities during the course of their normal duties. During periods of critical fire danger these activities should be augmented with more contacts of visitors and landowners, fire prevention releases to the news media and close coordination with other agencies. Occasional days of extreme fire danger don't usually warrant increased fire prevention activities. However, increased prevention is justified during droughts or when several successive days of critical fire weather occur during normal fire seasons. The Step-up Plan should provide for additional effort needed at Manning Classes IV and V.

9.5.7. Fuels Management

There are areas in the Park where fuel accumulations are heavy due to blowdown. These concentrations tend to occur in pockets intermixed with areas of lesser accumulations (e.g., in the vicinity of Otter Point, on Western Head, Isle au Haut and Western Mountain). Fuels management work may include slash reduction programs, type conversion projects, and fuelbreak construction. Fuels management can be accomplished through the use of manual labor, mechanical removal, prescribed burning and chemical herbicides or fire suppressants. The Fire Management Plan should specify the types of fuels management projects to be undertaken, if any, and give specific guidance on the methods that are acceptable from a management standpoint. A Park policy should be established.

9.6. Prescribed Fire

Prescribed fire is becoming an increasingly important management tool. Uses of management fires are discussed in NPS-18. Some species of vegetation are fire dependent and may not perpetuate in the absence of fire.

The decision to use or not to use fire is an important management decision. The policy with respect to use of fire and/or the conditions under which fire may be used should be stated in the Resource Management Plan for the Park. Qualifications of the people supervising such projects are contained in NPS-18.

Prescribed fire involving both planned and unplanned (natural) ignitions can be utilized. However, there appears to be little opportunity for use of natural fire in Acadia. Lightning storms are usually accompanied by considerable rain and few fires result. Land ownership patterns also make use of prescribed natural fire hazardous to private lands and structural improvements. It is doubtful that local public opposition to a proposal for prescribed natural fire could be stilled.

Use of prescribed fires by planned ignitions have merit in Acadia. The Bar Harbor fire is remembered by many local residents. Prescribed burning may be controversial at first, but uncontrolled fuels buildup could eventually favor Park fuel conditions favorable to another disaster fire. We feel that it is better to reduce fuel accumulations by prescribed fire under carefully controlled conditions than to wait for wildfires to accomplish this reduction during periods when conflagration fires will result.

If implementation of prescribed fire is considered for Acadia, the following steps should be taken:

1. *The objectives of burning should be documented in the Resource Management Plan.*

2. *Constraints on use of fire should be stated.*

3. *A thorough public information involvement program should be implemented.*

4. *Initial prescriptions should be formulated for fuel types in which burning is to be conducted.*

5. *The prescriptions should be tested in safe locations.*

   a. *Locations should be selected where test burns can be conducted with little risk to private property.*

   b. *Initial burns should be small; no more than one-half to two acres.*

   c. *A Prescribed Burning Plan should be prepared which sets forth the objectives of each burn, the prescription, the fire suppression resources, firelines and other protection measures to be employed, and assignment of responsibilities to named personnel. Mop-up, and patrol responsibilities should be spelled out.*

   d. *Weather reports and forecasts should be monitored for several days prior to and during the burn. On-site weather measurements using portable weather instrument shelters or belt-weather kits should be taken and on-site indices calculated prior to burning.*

   e. *Each burn should be conducted within prescription and otherwise according to plan.*

   f. *Burns should be evaluated with respect to accomplishment of intended management objectives and safety. Prescriptions should be modified as necessary.*

6. *After the development and testing of prescriptions, the program could be expanded into an operational prescribed burning program. Larger burns may be conducted. Each burn should follow the steps outlined above for prescription test fires. A small test fire should be started prior to igniting each prescribed management burn. It is essential that personnel involved in prescribed burns have extensive experience with prescribed burning techniques.*

7. *Weather, vegetation and fuel conditions prior to, during and following planned ignitions should be carefully monitored and documented so that knowledge gained in these exercises can be applied to subsequent burns.*

Implementation of prescribed burning in areas where burning projects have not been previously conducted requires the utmost attention to detail. This is particularly true where private property is subject to damage and where local sentiment may not favor prescribed burning. Burning outside of prescription, inadequate suppression resources, inadequate natural or man-constructed firelines, and use of unqualified personnel during burning are shortcuts to disaster and may lead to the demise of a useful management tool.

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APPENDIX

A. *Interchange Agreement Between National Park Service and Forest Service*

B. *USDI - National Park Service - Special Directive 77-4*

C. *Climatic Data for Bar Harbor, Maine - 1940-1980*

D. *Individual Relevé Descriptions*

E. *Vegetation Summaries Based Upon all Relevés Occurring in a Cover Type (Map Unit)*

F. *Cluster Analysis Dendrograms Based on Standardized and Absolute Distance and Associated Reordered Data Matrices*

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APPENDIX A

Interchange Agreement Between National Park Service and Forest Service

December 1, 1975

INTERCHANGE AGREEMENT BETWEEN NATIONAL [illegible] SERVICE AND FOREST SERVICE

The Forest Service, USDA and the National Park Service have over the past years, shared common boundaries, concerns, and problems with an informal and moderate exchange of assistance and methodology. As our concerns and association continues to dovetail with many common objectives, it is to the advantage of both organizations to develop a more formal method of communication and exchange.

We therefore enter this agreement to provide exchange of personnel on project details and training courses. Project details would involve assignments of 1 to 3 months of people with specific expertise who would assist directly in a project or task force. Exchange of personnel for training courses encompasses participation in formal courses of all types with participation based on individual or agency needs.

The agreement is to be effected through the following steps:

1. Representatives from the Regional Office level of both organizations will meet annually to [illegible] plans for accomplishing interchange of personnel on project details and training courses. Regional level representation in the National Park Service includes Regional Offices and Service Centers. [illegible] level representation in Forest Service is to include National Forest System, Research, and State and Private Forestry [illegible]. Regional representation should be based on units having common [illegible] jurisdiction, or nearly so.

2. Each Regional Office [illegible] written summary of activities under this agreement to their [illegible] every 6 months starting July 1, 1976, and every January [illegible] thereafter.

3. The cost of all travel [illegible] will be resolved by the involved parties.

This agreement is effective January 1, 1976.

APPROVED:

[signature]

Forest Service, USDA

APPROVED:

[signature]

Director, National Park Service

APPENDIX B

USDI - National Park Service - Special Directive 77-4

United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:
A23(230)

MAR 24 1977

Memorandum

March 1, 1978
(Review Date)

SPECIAL DIRECTIVE 77-4

To: Directorate and WASO Division Chiefs

From: Director

Subject: Interchange Agreement Between National Park Service and U. S. Forest Service

Special Directive 76-1, dated Jan[illegible] 8, [illegible], Subject: Interchange Agreement Between National Park Service and U. S. Forest Service, has been reviewed, and replaced by this Directive. Upon receipt of this Directive, all copies of Special Directive 76-1 should be removed from the files and destroyed. (The original agreement remains in effect. It should be kept and attached to this Directive.)

The National Park Service and the U. S. Forest Service have approved the subject agreement.

I am aware of the current and past working relationships with the Forest Service and strongly urge their continuation. In our meetings, however, we find a need for more formal relationships to be developed to strengthen the understanding and communication bridges between the two organizations.

Each organization has individuals with specialized skills and expertise which could be of considerable benefit to the other. There is simply no point in each of us "re-inventing the wheel" over and over at unnecessary expense.

Chief McGuire and I have, therefore, signed the Agreement directing you to make formal and documented contact with the U. S. Forest Service and arrange for appropriate exchange(s) of personnel. This exchange should be carefully planned for the fullest utilization of detail assignments and training experiences which represent quality development for the individual and the organization.

REVOLUTION BICENTENNIAL
MAY 17 1976

APPENDIX C

Climatic Data for Bar Harbor, Maine - 1940-1980

APPENDIX C

CLIMATIC DATA FOR BAR HARBOR, ME
1940-1980

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1980	Jan.	33.5	15.4	24.5	0.73	3.0
	Feb.	30.7	13.0	21.9	0.86	21.5
	Mar.	39.8	25.3	32.6	6.54	4.0
	Apr.	54.4	36.5	45.5	6.11	-
	May	67.9	45.5	56.7	0.91	-
	June	80.2	52.9	66.6	2.67	-
	July	85.7	65.9	75.8	3.22	-
	Aug.	86.3	57.9	72.1	0.49	-
	Sept.	69.2	48.7	59.0	4.94	-
	Oct.	54.7	40.0	47.4	5.60	-
	Nov.	45.6	29.4	37.5	5.47	9.3
	Dec.	36.0	14.3	25.2	5.46	-
		57.0	37.1	47.1	43.00	37.8
1979	Jan.	32.9	17.2	25.1	11.78	18.0
	Feb.	26.3	8.4	17.4	3.70	2.0
	Mar.	45.5	29.4	37.5	4.95	-
	Apr.	53.1	34.5	43.8	5.08	1.7
	May	63.7	46.2	55.0	8.72	-
	June	75.9	51.7	63.8	1.07	-
	July	80.9	56.9	68.9	3.23	-
	Aug.	74.6	55.8	65.2	4.38	-
	Sept.	68.2	46.8	57.5	3.42	-
	Oct.	58.5	41.3	49.9	7.06	-
	Nov.	50.3	36.8	43.6	5.07	0.3
	Dec.	37.7	21.5	29.6	3.59	4.0
		55.6	37.2	46.4	62.05	26.0
1978	Jan.	29.1	14.0	21.6	7.64	26.0
	Feb.	29.3	13.0	21.2	1.34	20.0
	Mar.	39.7	21.8	30.8	3.33	3.9
	Apr.	51.3	32.1	41.7	3.86	1.0
	May	68.2	41.8	55.0	2.84	-
	June	72.8	49.6	61.2	5.81	-
	July	80.4	55.0	67.7	1.20	-
	Aug.	81.2	56.0	68.6	0.73	-
	Sept.	67.2	45.7	56.5	1.50	-
	Oct.	56.6	38.9	47.8	6.51	-
	Nov.	44.3	25.3	34.8	1.98	4.0
	Dec.	36.1	18.7	27.4	3.94	17.5
		54.7	34.3	44.5	40.68	72.4

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1977	Jan.	27.5	8.8	18.2	3.83	25.5
	Feb.	32.8	14.7	23.8	3.85	10.5
	Mar.	44.9	30.2	37.6	6.78	10.0
	Apr.	53.6	33.2	43.4	3.00	2.0
	May	70.4	42.7	56.6	1.26	1.5
	June	69.3	51.6	60.5	6.25	-
	July	76.9	56.1	66.5	5.82	-
	Aug.	76.2	54.4	65.3	2.59	-
	Sept.	66.4	48.7	57.6	9.34	-
	Oct.	58.1	44.0	51.1	7.60	-
	Nov.	49.4	35.3	42.4	4.23	-
	Dec.	34.5	21.0	27.8	10.35	31.4
		55.0	36.7	45.9	64.90	80.9
1976	Jan.	29.6	10.9	20.3	7.59	10.2
	Feb.	38.6	20.7	29.7	4.54	13.1
	Mar.	43.0	24.8	33.9	1.83	19.4
	Apr.	55.0	34.2	44.6	4.71	2.0
	May	64.5	44.1	54.3	4.74	-
	June	78.8	54.4	66.6	4.94	-
	July	75.8	56.7	66.3	9.32	-
	Aug.	76.3	57.5	66.9	2.17	-
	Sept.	67.5	50.6	59.1	2.31	-
	Oct.	55.9	39.5	47.7	6.42	-
	Nov.	43.8	29.2	36.5	2.24	-
	Dec.	33.8	12.5	23.2	5.39	20.9
		55.2	36.3	45.8	55.20	65.6
1975	Jan.	34.3	17.4	25.9	5.19	19.0
	Feb.	31.4	17.0	24.2	1.82	10.7
	Mar.	40.2	24.8	32.5	4.46	15.0
	Apr.	51.7	31.8	41.8	3.54	5.0
	May	67.5	45.1	56.3	1.35	-
	June	74.9	52.2	63.6	6.42	-
	July	80.3	58.9	69.6	2.40	-
	Aug.	79.1	56.3	67.7	2.50	-
	Sept.	64.8	49.2	57.0	4.93	-
	Oct.	58.7	42.3	50.5	4.97	-
	Nov.	51.8	36.5	44.2	7.78	6.0
	Dec.	36.4	17.0	26.7	9.11	17.0
		55.9	37.4	46.7	54.47	72.7

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1974	Jan.	32.0	15.7	23.9	3.07	12.5
	Feb.	31.2	14.0	22.6	5.18	14.0
	Mar.	40.8	23.9	32.4	4.89	2.8
	Apr.	56.5	35.4	46.0	3.90	6.4
	May	60.2	40.3	50.3	4.04	-
	June	74.8	50.5	62.7	2.90	-
	July	78.0	54.8	66.4	2.04	-
	Aug.	81.3	56.1	68.7	2.02	-
	Sept.	66.8	49.9	58.4	8.70	-
	Oct.	54.0	36.7	45.4	1.22	-
	Nov.	46.7	32.9	39.8	4.50	7.0
	Dec.	37.9	24.0	31.0	2.72	5.0
		55.0	36.2	45.6	45.18	47.7
1973	Jan.	32.9	16.3	24.6	4.38	9.7
	Feb.	31.6	14.7	23.2	3.76	18.7
	Mar.	45.7	30.4	38.1	3.88	-
	Apr.	54.4	35.6	45.0	8.06	-
	May	60.1	42.8	51.5	5.82	-
	June	74.8	53.0	63.9	3.13	-
	July	80.5	59.7	70.1	4.05	-
	Aug.	80.1	58.7	69.4	2.41	-
	Sept.	68.9	49.3	59.1	3.80	-
	Oct.	57.6	42.4	50.0	4.65	-
	Nov.	45.0	31.9	38.5	3.18	-
	Dec.	42.4	26.0	34.2	8.56	1.5
		56.2	38.4	47.3	55.68	29.9
1972	Jan.	35.3	16.6	26.0	3.99	15.3
	Feb.	31.4	13.4	22.4	4.57	27.3
	Mar.	34.9	19.7	27.3	8.54	24.0
	Apr.	49.0	30.8	39.9	3.13	7.1
	May	67.2	41.8	54.5	4.15	-
	June	73.4	57.0	65.2	3.94	-
	July	76.1	55.7	65.9	2.73	-
	Aug.	77.8	55.6	66.7	1.02	-
	Sept.	71.4	50.4	60.9	6.53	-
	Oct.	53.5	38.5	46.0	3.85	-
	Nov.	41.0	29.0	35.0	6.36	3.5
	Dec.	33.9	17.1	25.5	5.75	20.6
		53.7	35.5	44.6	54.56	97.8

Year	Month	Mean Max. Temp (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1971	Jan.	25.7	7.0	16.4	8.95	18.3
	Feb.	32.1	16.5	24.3	9.39	32.6
	Mar.	41.2	24.2	32.7	4.07	12.1
	Apr.	50.0	32.5	41.3	1.77	6.0
	May.	64.9	43.4	54.2	3.66	-
	Jun.	77.3	49.7	63.5	1.69	-
	July	80.6	55.4	68.0	3.09	-
	Aug.	78.0	57.3	67.7	2.69	-
	Sept.	71.0	52.6	61.8	2.35	-
	Oct.	62.4	44.9	53.7	3.96	-
	Nov.	43.4	30.7	37.1	5.42	1.0
	Dec.	36.8	18.4	27.6	2.94	8.8
		55.3	36.1	45.7	49.98	78.8
1970	Jan.	23.3	7.8	15.6	1.45	5.3
	Feb.	33.9	14.7	24.3	7.39	10.5
	Mar.	40.6	23.7	32.2	2.11	10.0
	Apr.	52.3	32.9	42.6	5.48	2.0
	May	65.9	44.4	55.2	2.40	-
	June	74.5	51.3	62.9	2.82	-
	July	80.8	57.7	69.3	1.60	-
	Aug.	79.3	55.8	67.6	4.20	-
	Sept.	68.0	50.2	59.1	1.58	-
	Oct.	60.0	43.3	51.7	4.80	-
	Nov.	47.0	33.0	40.0	2.98	-
	Dec.	28.2	12.0	20.1	6.30	-
		54.5	35.6	45.1	43.11	27.8
1969	Jan.	31.8	17.2	24.5	4.32	4.5
	Feb.	33.3	19.7	26.5	4.08	36.3
	Mar.	40.5	24.2	32.4	3.00	12.4
	Apr.	50.8	33.5	42.2	4.71	2.5
	May	65.1	43.3	54.2	3.69	-
	June	76.0	53.6	64.8	1.24	-
	July	77.4	56.4	66.9	4.22	-
	Aug.	79.5	58.0	68.8	2.75	-
	Sept.	67.8	48.9	58.4	5.11	-
	Oct.	57.6	39.0	48.3	2.50	3.4
	Nov.	47.4	36.1	41.8	8.16	-
	Dec.	37.2	21.1	29.2	5.64	6.6
		55.4	37.6	46.5	49.42	65.7

Year	Month	Mean Max. Temp (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1968	Jan.	28.5	9.8	19.2	3.26	28.5
	Feb.	28.9	10.9	19.9	1.77	4.0
	Mar.	41.9	27.4	34.7	3.92	9.1
	Apr.	52.5	33.8	43.2	2.62	-
	May	61.2	41.1	51.2	4.44	-
	June	67.8	50.7	59.3	4.75	-
	July	79.2	57.4	68.3	0.22	-
	Aug.	74.3	54.3	64.3	1.46	-
	Sept.	69.0	50.8	59.9	1.79	-
	Oct.	61.0	44.3	52.7	3.87	-
	Nov.	43.3	29.8	36.6	7.85	4.0
	Dec.	33.9	20.2	27.1	7.92	9.5
		53.5	35.9	44.7	43.87	55.1
1967	Jan.	35.5	19.9	27.7	3.13	8.5
	Feb.	30.5	8.3	19.4	4.34	43.0
	Mar.	35.6	18.5	27.1	1.96	12.7
	Apr.	49.3	29.5	39.4	2.13	3.0
	May	57.5	37.1	47.3	5.17	-
	June	73.0	48.8	60.9	2.40	-
	July	73.7	52.7	63.2	3.97	-
	Aug.	74.4	55.3	64.9	3.07	-
	Sept.	66.8	50.1	58.5	5.15	-
	Oct.	57.5	43.3	50.4	3.05	-
	Nov.	44.2	30.5	37.4	5.16	-
	Dec.	37.0	20.5	28.8	10.32	-
		52.9	34.5	43.8	49.85	67.2
1966	Jan.	33.8	17.8	25.8	4.46	43.0
	Feb.	34.7	16.6	25.7	4.24	19.5
	Mar.	41.6	26.7	34.2	4.03	2.0
	Apr.	50.0	31.9	41.0	0.82	2.0
	May	62.7	40.4	51.6	3.58	-
	June	72.1	51.3	61.7	2.66	-
	July	76.6	56.1	66.4	2.06	-
	Aug.	76.4	55.9	66.2	2.28	-
	Sept.	66.1	47.9	57.0	7.43	-
	Oct.	58.9	40.7	49.8	4.16	-
	Nov.	49.5	38.9	44.2	5.32	-
	Dec.	38.5	25.9	32.2	3.13	9.0
		55.1	37.5	46.3	44.17	75.5

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1965	Jan.	28.8	11.5	20.2	2.00	26.0
	Feb.	31.3	12.5	21.9	4.28	16.4
	Mar.	39.6	25.2	32.4	0.77	2.6
	Apr.	50.1	32.4	41.3	3.55	0.5
	May	64.2	43.0	53.6	1.52	-
	June	74.7	51.8	63.3	0.44	-
	July	76.4	54.2	65.3	1.88	-
	Aug.	75.5	57.3	66.4	1.01	-
	Sept.	67.4	47.6	57.5	3.00	-
	Oct.	55.8	39.9	47.9	4.83	3.0
	Nov.	44.4	29.9	37.2	8.43	-
	Dec.	36.7	21.2	29.0	3.55	9.0
		53.7	35.5	44.7	35.26	57.5
1964	Jan.	35.3	19.2	27.3	5.43	
	Feb.	34.1	16.6	25.4	3.54	19.9
	Mar.	40.2	25.5	32.9	3.81	18.0
	Apr.	52.3	32.2	42.3	3.73	3.0
	May	64.6	43.0	53.8	1.62	-
	June	71.9	50.5	61.2	1.53	-
	July	73.5	56.1	64.8	1.27	-
	Aug.	73.7	54.7	64.2	3.61	-
	Sept.	64.7	46.1	55.4	2.34	-
	Oct.	57.5	38.7	48.1	3.55	-
	Nov.	46.7	31.4	39.1	3.09	-
	Dec.	34.3	20.6	27.5	6.85	35.7
		54.1	36.2	45.2	40.37	76.6
1963	Jan.	35.0	15.8	25.4	5.19	22.8
	Feb.	29.5	11.6	20.6	5.64	27.4
	Mar.	39.9	24.8	32.4	4.82	19.3
	Apr.	51.4	34.3	42.9	1.90	-
	May	63.2	41.4	52.3	6.96	-
	June	74.1	52.0	63.1	0.98	-
	July	77.4	57.7	67.6	2.46	-
	Aug.	71.0	54.0	62.5	3.40	-
	Sept.	63.4	47.3	55.4	5.96	-
	Oct.	64.5	43.9	54.2	4.49	-
	Nov.	48.9	35.1	42.0	8.89	-
	Dec.	27.9	11.0	19.5	2.16	19.0
		53.9	35.7	44.8	52.85	88.5

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1962	Jan.	34.3	13.8	24.1	4.22	2.5
	Feb.	30.0	10.8	20.4	2.62	25.7
	Mar.	43.3	26.0	34.7	1.51	12.0
	Apr.	50.1	34.9	42.5	6.35	4.0
	May	61.3	42.6	52.0	2.11	-
	June	71.6	51.0	61.3	2.47	-
	July	71.4	53.9	62.7	2.77	-
	Aug.	71.4	56.4	63.9	3.24	-
	Sept.	64.2	48.5	56.4	6.27	-
	Oct.	57.4	42.4	49.9	4.75	-
	Nov.	44.0	29.9	37.0	8.66	15.8
	Dec.	35.7	17.0	26.4	7.30	49.6
		52.9	35.6	44.3	52.27	109.6
1961	Jan.	26.2	8.7	17.5	4.44	18.0
	Feb.	34.0	16.0	25.0	3.78	8.0
	Mar.	40.1	22.9	31.5	3.20	14.8
	Apr.	47.9	33.0	40.5	6.16	-
	May	61.3	41.4	51.4	10.61	-
	June	72.3	51.4	61.9	3.53	-
	July	72.6	54.4	63.5	3.39	-
	Aug.	75.8	55.5	65.7	0.42	-
	Sept.	72.4	55.2	63.8	3.70	-
	Oct.	59.7	44.7	52.2	5.56	-
	Nov.	47.7	36.3	42.0	8.00	1.0
	Dec.	35.4	23.6	29.5	6.54	23.5
		53.8	36.9	45.4	59.33	65.3
1960	Jan.	32.8	17.0	24.9	4.76	22.7
	Feb.	38.0	24.1	31.1	9.87	16.0
	Mar.	36.5	22.7	29.6	3.56	15.5
	Apr.	51.7	34.1	42.9	4.08	-
	May	65.8	44.8	55.3	7.08	-
	June	71.7	52.1	61.9	2.26	-
	July	76.7	57.5	67.1	2.40	-
	Aug.	76.8	55.7	66.3	0.79	-
	Sept.	69.4	49.1	59.3	3.17	-
	Oct.	56.2	38.9	47.6	4.88	-
	Nov.	49.9	35.7	42.8	6.50	-
	Dec.	35.2	18.3	26.8	5.52	1.5
		55.1	37.5	46.3	54.87	55.7

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1959	Jan.	32.7	13.5	23.1	4.01	10.0
	Feb.	29.2	10.0	19.6	3.91	19.0
	Mar.	40.0	23.1	31.6	5.28	21.0
	Apr.	51.5	35.1	43.3	2.63	-
	May	67.7	44.3	56.0	1.19	-
	June	64.9	48.6	56.8	7.35	-
	July	78.8	57.0	67.9	2.82	-
	Aug.	77.4	57.1	67.3	2.82	-
	Sept.	69.0	51.9	60.5	3.62	-
	Oct.	55.7	41.0	48.4	9.18	-
	Nov.	47.7	33.4	40.6	7.69	8.0
	Dec.	36.9	25.1	31.0	6.50	12.5
		54.3	36.7	45.5	57.00	70.5
1958	Jan.	35.2	22.8	29.0	10.63	13.7
	Feb.	30.2	13.2	21.7	3.70	23.0
	Mar.	42.1	29.5	35.8	3.97	30.0
	Apr.	53.6	35.3	44.5	7.20	6.0
	May	59.7	41.9	50.8	5.07	-
	June	67.3	48.6	58.0	2.02	-
	July	72.8	57.0	64.9	7.21	-
	Aug.	73.9	57.2	65.6	3.34	-
	Sept.	67.1	52.2	59.7	3.28	-
	Oct.	54.9	40.4	47.7	6.07	-
	Nov.	48.1	32.0	40.1	6.46	-
	Dec.	28.5	11.5	20.0	3.32	17.8
		52.8	36.8	44.8	62.27	90.5
1957	Jan.	27.1	6.5	16.8	3.13	23.9
	Feb.	37.1	21.3	29.2	2.25	-
	Mar.	41.1	25.2	33.2	3.49	7.8
	Apr.	53.4	33.4	43.3	3.88	9.5
	May	64.9	41.4	53.2	2.03	-
	June	71.7	51.6	61.7	1.74	-
	July	75.1	56.7	65.9	2.57	-
	Aug.	73.0	54.6	63.8	2.67	-
	Sept.	69.3	49.1	59.2	1.37	-
	Oct.	58.4	41.1	49.8	1.68	-
	Nov.	49.3	35.9	42.6	5.68	-
	Dec.	58.8	26.0	42.4	6.24	-
		56.6	36.9	46.8	36.73	41.2

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1956	Jan.	35.2	26.0	30.6	8.26	7.3
	Feb.	34.4	16.5	25.5	3.61	24.7
	Mar.	36.5	18.4	27.5	5.88	30.5
	Apr.	49.5	32.2	40.9	4.20	3.0
	May	58.4	37.9	48.2	4.89	-
	June	69.5	50.1	59.8	2.49	-
	July	73.9	54.7	64.3	4.07	-
	Aug.	73.2	52.7	63.0	2.54	-
	Sept.	63.8	47.4	55.6	5.18	-
	Oct.	58.7	40.3	49.5	4.23	-
	Nov.	51.3	31.8	41.6	4.42	4.0
	Dec.	40.0	20.9	30.5	5.39	8.7
		53.7	35.7	44.8	55.16	78.2
1955	Jan.	30.3	13.8	22.1	1.73	8.5
	Feb.	34.9	17.3	26.1	5.09	15.0
	Mar.	39.3	22.5	30.9	6.77	5.0
	Apr.	52.1	34.5	43.3	2.71	-
	May	67.4	46.5	57.0	1.24	-
	June	70.0	50.6	60.3	5.38	-
	July	80.3	56.5	68.4	0.95	-
	Aug.	76.8	56.0	66.4	4.70	-
	Sept.	67.2	49.0	58.1	3.95	-
	Oct.	58.7	41.8	50.3	2.86	-
	Nov.	46.3	31.8	39.1	6.52	-
	Dec.	28.3	13.7	21.0	1.25	4.3
		54.3	36.2	45.3	43.15	32.8
1954	Jan.	31.6	12.9	22.3	4.20	22.6
	Feb.	38.6	22.0	30.3	5.97	8.7
	Mar.	41.6	25.0	33.3	3.63	9.5
	Apr.	53.4	32.0	42.7	5.15	-
	May	60.2	44.0	52.1	7.02	-
	June	69.6	52.1	60.9	2.93	-
	July	73.3	56.3	64.8	2.31	-
	Aug.	74.0	55.8	64.9	4.84	-
	Sept.	65.5	49.7	57.6	6.56	-
	Oct.	60.5	45.2	52.9	6.08	-
	Nov.	48.5	32.6	40.6	4.61	-
	Dec.	38.6	22.5	30.6	4.21	7.0
		54.6	37.5	46.1	57.51	47.8

h	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
	39.0	21.2	30.1	4.84	4.7
	37.1	20.1	28.6	5.18	9.2
	42.4	26.2	34.3	10.67	-
	53.8	37.6	45.7	4.91	-
	61.1	42.4	51.8	3.41	-
	72.7	50.0	61.4	1.63	-
	75.1	57.6	66.4	3.04	-
	75.1	56.5	65.8	3.15	-
	68.6	52.3	60.5	7.91	-
	60.2	43.8	52.0	5.93	-
	53.7	36.7	45.2	5.93	-
	45.1	27.8	36.5	6.31	-
	57.0	39.4	48.2	62.91	13.9
	36.3	16.1	26.2	8.36	31.5
	34.9	18.1	26.5	3.87	18.0
	41.2	26.1	33.7	1.52	2.7
	53.9	36.4	45.2	3.70	-
	62.0	42.9	52.5	4.68	-
	73.8	51.2	62.5	4.67	-
	82.0	59.7	70.9	0.21	-
	76.6	58.1	67.4	4.88	-
	69.3	51.6	60.5	3.87	-
	57.9	41.7	49.8	2.34	-
	48.2	33.2	40.7	3.98	2.3
	37.7	24.9	31.3	5.33	4.8
	56.2	38.3	47.3	47.41	59.3
	37.6	20.3	29.0	4.41	8.0
	37.5	19.7	28.6	4.41	20.0
	40.3	28.7	34.5	2.57	4.5
	53.2	39.7	46.5	4.97	-
	65.8	43.0	54.4	5.56	-
	69.0	51.2	60.1	2.38	-
	77.5	58.8	68.2	5.47	-
	72.8	57.5	65.2	3.85	-
	9.4	52.0	60.7	3.77	-
	8.5	-	-	5.18	-
	3.3	30.5	39.4	9.62	0.5
	.9	18.8	28.9	5.58	10.6
	.7	38.2	46.9	57.77	43.6

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1950	Jan.	40.0	17.8	28.9	5.62	18.6
	Feb.	31.5	12.0	21.8	2.86	16.0
	Mar.	39.1	19.9	29.5	2.55	14.9
	Apr.	51.7	32.8	42.3	3.27	3.0
	May	64.6	42.7	53.7	0.95	-
	June	71.7	50.7	61.2	3.52	-
	July	75.6	57.0	66.3	2.89	-
	Aug.	72.9	55.7	64.3	3.42	-
	Sept.	64.1	47.9	56.0	2.28	-
	Oct.	58.0	42.2	50.1	1.55	-
	Nov.	51.9	36.3	44.1	9.37	0.8
	Dec.	36.4	23.8	30.1	6.69	6.8
		54.8	36.6	45.7	44.97	60.1
1949	Jan.	37.8	19.9	28.9	4.62	9.7
	Feb.	36.1	19.0	27.6	4.95	12.5
	Mar.	42.1	25.4	33.8	2.20	11.7
	Apr.	55.5	36.7	46.1	2.94	-
	May	65.4	44.8	55.1	3.16	-
	June	74.9	53.4	64.2	2.89	-
	July	80.0	58.5	69.3	1.01	-
	Aug.	78.6	56.1	67.4	0.53	-
	Sept.	66.4	50.8	58.6	4.46	-
	Oct.	61.8	42.9	52.4	3.18	-
	Nov.	47.5	29.0	38.3	4.95	0.8
	Dec.	40.6	24.3	32.5	2.81	3.5
		57.2	38.4	47.9	37.70	38.2
1948	Jan.	28.8	10.5	19.7	4.22	31.0
	Feb.	31.4	9.8	20.6	1.72	11.2
	Mar.	40.4	23.1	31.8	3.33	16.6
	Apr.	49.6	32.5	41.1	2.83	2.0
	May	57.7	40.9	49.3	7.81	-
	June	68.8	48.5	58.7	3.20	-
	July	78.3	54.4	66.4	3.61	-
	Aug.	79.4	55.2	67.3	0.95	-
	Sept.	70.8	48.6	59.7	1.07	-
	Oct.	57.4	40.6	49.0	4.25	-
	Nov.	50.3	37.4	43.9	6.77	-
	Dec.	39.0	24.6	31.8	4.26	-
		54.3	35.5	44.9	44.02	60.8

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1947	Jan.	33.9	14.6	24.3	3.73	11.5
	Feb.	35.0	19.7	27.4	3.90	12.4
	Mar.	41.8	27.0	34.4	3.89	9.1
	Apr.	49.3	31.8	40.6	1.62	3.2
	May	61.2	42.9	52.1	7.58	-
	June	69.7	49.7	59.7	4.03	-
	July	76.0	60.0	68.0	4.42	-
	Aug.	77.9	56.6	67.3	0.56	-
	Sept.	69.6	50.0	59.8	2.38	-
	Oct.	67.8	44.9	56.4	0.08	-
	Nov.	47.1	29.7	38.4	5.56	0.2
	Dec.	32.8	16.8	24.8	2.73	19.3
		55.2	37.0	46.1	40.48	55.7
1946	Jan.	33.6	10.8	22.2	2.91	30.0
	Feb.	31.0	7.5	19.3	4.84	28.0
	Mar.	50.7	25.3	38.0	1.66	-
	Apr.	49.1	30.3	39.7	3.00	3.5
	May	63.5	39.6	51.6	3.37	-
	June	71.2	48.8	60.0	1.16	-
	July	75.2	53.9	64.6	1.62	-
	Aug.	71.0	55.3	63.2	5.34	-
	Sept.	69.3	49.9	59.6	0.90	-
	Oct.	62.4	41.1	51.8	2.57	-
	Nov.	49.9	33.5	41.7	3.31	-
	Dec.	37.9	20.4	29.2	6.02	18.2
		55.4	34.7	45.1	36.70	79.7
1945	Jan.	30.2	9.0	19.6	3.06	20.0
	Feb.	34.7	12.4	23.6	3.97	22.0
	Mar.	49.0	27.6	38.3	2.42	4.5
	Apr.	57.2	34.0	45.6	4.70	-
	May	59.6	38.3	49.0	9.51	2.0
	June	69.0	47.7	58.4	4.79	-
	July	75.6	58.7	67.2	2.91	-
	Aug.	76.7	53.7	65.2	1.66	-
	Sept.	71.9	48.1	60.0	2.15	-
	Oct.	55.0	36.0	45.5	5.56	-
	Nov.	48.2	31.0	39.6	6.03	8.0
	Dec.	32.0	14.0	23.0	4.54	12.0
		54.9	34.2	44.6	51.30	68.5

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1944	Jan.	34.3	16.3	25.3	0.53	-
	Feb.	33.1	13.2	23.2	3.69	20.0
	Mar.	41.4	20.8	31.1	5.37	4.0
	Apr.	50.5	29.1	39.8	3.14	-
	May	68.5	43.1	55.8	0.43	-
	June	70.8	49.2	60.0	2.72	-
	July	77.7	54.8	66.3	1.97	-
	Aug.	81.4	56.4	68.9	0.74	-
	Sept.	68.3	49.0	58.7	5.78	-
	Oct.	57.0	38.7	47.9	3.79	2.0
	Nov.	47.5	31.7	39.6	5.57	1.0
	Dec.	36.7	15.7	26.2	4.21	14.0
		55.6	34.8	45.2	37.94	41.0
1943	Jan.	27.1	10.1	18.6	1.42	10.1
	Feb.	36.1	16.1	26.1	2.50	10.5
	Mar.	40.0	22.3	31.2	3.72	14.4
	Apr.	48.0	29.0	38.5	3.12	-
	May	63.4	42.6	53.0	5.70	-
	June	71.6	50.7	61.2	2.48	-
	July	78.2	56.4	67.3	5.28	-
	Aug.	73.3	55.8	64.6	9.25	-
	Sept.	66.2	46.0	56.1	2.61	-
	Oct.	58.5	40.6	49.6	8.54	-
	Nov.	45.8	29.9	37.9	7.18	6.0
	Dec.	31.7	11.2	21.5	1.01	5.5
		53.3	34.2	43.8	52.81	46.5
1942	Jan.	33.0	14.0	23.5	5.06	15.4
	Feb.	31.5	15.0	23.3	3.63	14.8
	Mar.	45.9	30.6	38.3	7.04	6.0
	Apr.	55.2	33.8	44.5	3.67	12.4
	May	66.2	43.7	55.0	2.77	-
	June	71.7	51.2	61.5	7.65	-
	July	72.8	55.7	64.3	5.00	-
	Aug.	73.6	54.8	64.2	2.19	-
	Sept.	67.2	49.3	58.3	3.87	-
	Oct.	57.8	41.2	49.5	3.72	-
	Nov.	46.1	29.1	37.6	4.45	3.0
	Dec.	31.2	14.7	23.0	3.77	13.9
		54.4	36.1	45.3	52.82	65.5

Year	Month	Mean Max. Temp. (°F.)	Mean Min. Temp. (°F.)	Mean Temp. (°F.)	Total Rain (Inches)	Total Snow (Inches)
1941	Jan.	29.0	7.6	18.3	3.45	21.8
	Feb.	36.7	11.6	24.2	2.97	3.5
	Mar.	40.6	15.7	28.2	5.62	12.8
	Apr.	57.0	32.0	44.5	0.90	-
	May	66.9	37.5	52.2	3.00	-
	June	76.2	47.1	61.7	1.08	-
	July	80.2	56.6	68.4	1.98	-
	Aug.	74.6	54.1	64.4	4.75	-
	Sept.	71.3	48.2	59.8	1.54	-
	Oct.	59.0	40.1	49.6	4.18	-
	Nov.	50.1	32.8	41.5	4.21	-
	Dec.	37.5	22.4	30.0	3.63	4.7
		56.6	33.8	45.2	37.31	42.8
1940	Jan.	28.3	9.3	18.8	2.55	7.4
	Feb.	34.1	12.2	23.2	2.79	12.7
	Mar.	38.1	18.1	28.1	3.96	17.3
	Apr.	49.1	28.7	38.9	5.39	11.7
	May	64.4	39.7	52.1	4.38	-
	June	69.7	46.6	58.2	4.67	-
	July	78.8	50.8	64.8	3.26	-
	Aug.	77.2	52.0	64.6	1.15	-
	Sept.	69.8	47.0	58.4	4.80	-
	Oct.	56.7	32.6	44.7	0.57	-
	Nov.	49.6	28.7	39.2	2.90	8.0
	Dec.	43.3	15.1	29.2	5.05	8.1
		54.9	31.7	43.4	41.47	65.2

APPENDIX D

Individual Releve Descriptions

REF. NO.: 1RA MAP-UNIT-NO.: 01 DATE(DA.MO.YR)--16-05-80
LOCATION: EAGLELK. MOI. MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC01 OLD-GROWTH SPRUCE FOREST. DENSE UNDERSTORY (< 1 M HEIGHT) OF RED SPRUCE. MANY MOSS-COVERED BOULDERS ON SURFACE, BUT NO EXPOSED BED ROCK. FAIRLY COARSE-TEXTURED SOIL. 3-5 CM A2 OVER WELL DEVELOPED HORIZON. NEAR SAMPLE POINT AC01-FI, NORTHWEST CORNER OF EAGLE LAKE. NFORS H: NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 7C		
4.5	134	PICEA RUBENS	
1.1	28	BETULA PAPYRIFERA	
1.1	138	PINUS STROBUS	
1.1	199	TSUGA CANADENSIS	
	E 5A		
R.1	134	PICEA RUBENS	
	E 3A		
+.1	134	PICEA RUBENS	
	H1-2B		
+.2	112	MAIANTHEMUM CANADENSE	
+.2	153	PTERIDIUM AQUILINUM	
	E1-2I		
4.4	134	PICEA RUBENS	
1.2	199	TSUGA CANADENSIS	
+.1	1	ABIES BALSAMEA	
+.1	138	PINUS STROBUS	
R.1	158	QUERCUS RUBRA	
	L 1P		
3.4	120	MOSS	
1.2	97	LICHENS	

TOTAL SPECIES = 10

REF. NO.: 1RB MAP-UNIT-NO.: 01 DATE (DA.MO.YR)--16-06-80
LOCATION: EAGLE LAKE, MOI. MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

1RB OLD GROWTH SPRUCE FOREST WITH FAIRLY SPARCE UNDERSTORY OF SPRUCE MOSTLY LESS THAN ONE METER. SMALL PATCHES OF TWO METER TALL SPRUCE. BOULDERS EVIDENT BUT NOT FREQUENT. SOME MOSS COVERED. NO EXPOSED BEDROCK. SEVERAL VERY OLD CUT STUMPS AND MORE RECENT BLOWDOWNS. SOIL: A2 IS .5-2 CM COARSE TEXTURE. GRADING INTO WELL-DEVELOPED B. NFORS=H, NFFL=8. NEAR SAMPLE POINT AC01-FQ.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 7I		
4.5	134	PICEA RUBENS	
1.1	138	PINUS STROBUS	
	D 6A		
R.1	9	AMELANCHIER SPP.	
	E 4B		
+.1	134	PICEA RUBENS	
	E1-3R		
2.4	134	PICEA RUBENS	
1.1	1	ABIES BALSAMEA	
1.1	204	VACCINIUM SPP.	
+.1	28	BETULA PAPYRIFERA	
+.1	138	PINUS STROBUS	
R.1	3	ACER RUBRUM	
R.1	158	QUERCUS RUBRA	
	L 1R		
2.4	120	MOSS	
+.2	97	LICHENS	
	H 1A		
+.2	112	MAIANTHEMUM-CANADENSE	
+.2	196	TRIENTALIS BOREALIS	
	G 1B		
1.4	78	GRAMINEAE	

TOTAL SPECIES = 13

REF. NO.: 226 MAP-UNIT-NO.: 11 DATE(DA.MO.YR)--19-06-80
LOCATION: CONNERS NUBBLE,MDI,MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS

ACC2 47 BURN AREA, PIT AND MOUND TOPOGRAPHY, OLD CUT STUMPS SOME BEECH-BARK DISEASE. MAIN CANOPY 25-35 FEET HIGH, WITH SCATTERED EMERGENTS, MOSTLY MAPLE AND ASPEN, 40-60 FEET TALL. BOULDERS SCATTERED AND SOMEWHAT INFREQUENT AT SURFACE. SOIL: DEEP ORGANIC LAYER OVER ASHY A2 5-6 CM COARSE, WELL-DEVELOPED B SANDY LOAM. NFORS R,NFFL 9.
NEAR SAMPLE POINT ACC2-FQ

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D 6C		
5.5	66	FAGUS GRANDIFOLIA	
2.2	3	ACER RUBRUM	
2.2	28	BETULA PAPYRIFERA	
2.2	146	POPULUS GRANDIDENTATA	
1.2	2	ACER PENSYLVANICUM	
+.1	29	BETULA POPULIFOLIA	
R.1	4	ACER SACCHARUM	
	M4-5R		
1.2	2	ACER PENSYLVANICUM	
1.1	66	FAGUS GRANDIFOLIA	
+.2	134	PICEA RUBENS	
+.1	28	BETULA PAPYRIFERA	
R.1	26	BETULA ALLEGHENIENSIS	OR BE
	E 39		
1.1	134	PICEA RUBENS	
	L1-2R		
2.3	120	MOSS	
+.3	97	LICHENS	
	H1-2B		
+.2	46	COMPOSITAE	
+.2	112	MAIANTHEMUM CANADENSE	
+.2	195	TRIENTALIS BOREALIS	
R.1	49	COPALLORHIZA SPP.	
R.1	153	PTERIDIUM AQUILINUM	
	G1-2A		
+.2	33	CAREX SPP.	
+.2	78	GRAMINEAE	
	M1-2B		
+.1	2	ACER PENSYLVANICUM	
+.1	3	ACER RUBRUM	
+.1	66	FAGUS GRANDIFOLIA	
+.1	134	PICEA RUBENS	
+.1	146	POPULUS GRANDIDENTATA	
+.1	204	VACCINIUM SPP.	

TOTAL SPECIES = 19

3

REF. NO.: 298 MAP-UNIT-NO.: 11 DATE(DA.MO.YR)--20-06-80
LOCATION: CONNORS NUBBLE, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

--REMARKS----

A302 47 BURN AREA PIT AND MOUND TOPOGRAPHY. MAIN CANOPY 30-35 FEET TALL WITH SCATTERED EMERGENTS. BOULDERS SCATTERED AND INFREQUENT AT SURFACE. PITS AND MOUNDS, HERE AND AT LAST RELEVE, HAVE SHARP CONTOURS. SOIL: MULL. A2 MOSTLY WEAK OR UNDEVELOPED, B MODERATELY WELL-DEVELOPED SANDY LOAM. NFCRS R. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D 6C		
5.5	66	FAGUS GRANDIFOLIA	
R.1	3	ACER RUBRUM	
R.1	4	ACER SACCHARUM	
R.1	28	BETULA PAPYRIFERA	
	D4-5R		
2.1	66	FAGUS GRANDIFOLIA	
1.2	2	ACER PENSYLVANICUM	
	M2-3R		
1.2	134	PICEA RUBENS	
+.2	2	ACER PENSYLVANICUM	
+.2	66	FAGUS GRANDIFOLIA	
+.2	146	POPULUS GRANDIDENTATA	
+.1	9	AMELANCHIER SPP.	
R.1	4	ACER SACCHARUM	
R.1	69	FRAXINUS AMERICANA	
	M1-2A		
+.2	119	MONOTROPA UNIFLORA	
+.2	193	THELYPTERIS NOVEBORACENSIS	
+.2	195	TRIENTALIS BOREALIS	
+.1	112	MAIANTHEMUM CANADENSE	
+.1	186	SOLIDAGO SPP.	
	G1-2A		
+.3	78	GRAMINEAE	
+.2	33	CAREX SPP.	
	L 1R		
2.3	120	MOSS	
1.2	97	LICHENS	
	D 1A		
+.2	3	ACER RUBRUM	
+.2	66	FAGUS GRANDIFOLIA	
+.2	146	POPULUS GRANDIDENTATA	
+.1	2	ACER PENSYLVANICUM	
+.1	29	BETULA PAPYRIFERA	
+.1	204	VACCINIUM SPP.	

TOTAL SPECIES = 19

REF. NO.: 2RC MAP-UNIT-NO.: 11 DATE(DA.MO.YR)--02-07-80
LOCATION: CONNORS NUBBLE, MDI, MAINE
SURVEYOR--KAREN-SAUNDERS AREA-COVERED--0.025-HA.

REMARKS----

AC02 47 BURN AREA, MAIN CANOPY ABOUT 30-35 FEET AND 30ISH YEARS. EMERGENTS 70 TO 110 YEARS WITH SCARS FROM 47 FIRE. SHARPLY DEFINED PIT AND MOUND TOPOGRAPHY. SOIL:-WELL-DEVELOPED-ORGANIC-LAYER, SLIGHTLY-MULLISH A2 WELL-DEFINED, ASHY, 3-6CM OVER SANDY LOAM B. NFDRS R, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D6-7I		
3.3	66	FAGUS	GRANDIFOLIA
3.1	4	ACER	SACCHARUM
2.2	2	ACER	PENSYLVANICUM
2.2	28	BETULA	PAPYRIFERA
2.1	26	BETULA	ALLEGHENIENSIS OR BE
1.1	146	POPULUS	GRANDIDENTATA
	D 5I		
4.4	66	FAGUS	GRANDIFOLIA
2.2	2	ACER	PENSYLVANICUM
1.2	29	BETULA	POPULIFOLIA
	D 4B		
1.1	66	FAGUS	GRANDIFOLIA
	G1-2A		
+.2	33	CAREX	SPP.
	D1-2B		
1.2	2	ACER	PENSYLVANICUM
+.2	66	FAGUS	GRANDIFOLIA
+.2	146	POPULUS	GRANDIDENTATA
+.1	3	ACER	RUBRUM
+.1	134	PICEA	RUBENS
R.1	1	ABIES	BALSAMEA
	L 1B		
+.3	97	LICHENS	
+.3	120	MOSS	
	H 1A		
+.2	196	TRIENTALIS	BOREALIS
R.1	112	MAIANTHEMUM	CANADENSE

TOTAL SPECIES = 15

REF. NO.: 32A MAP-UNIT-NO.: 11 DATE(DA.MO.YR)--23-06
LOCATION: BUBBLE POND. MDI. MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS---

AC03 NORTHERN HARDWOOD STAND. PREDOMINANTLY BEECH AND SUGAR MAPLE, PRE-FIRE. PIT AND MOUND TOPOGRAPHY BUT NOT SO EXAGGERATED AS IN [illegible]. STON AND BOULDERS SCATTERED. MANY MOUNDS AND SOME BOULDERS MOSS-COVERED. LITTER VERY SHALLOW, OFTEN NONEXISTENT ON MOUNDS. THUS MANY TINY BIRCH SEEDLINGS. CHARCOAL IN DUFF. LOTS OF DOWNED GREY BIRCH, SEEMS TO BE DROPPI OUT OF THE STAND. STAND EXTENSIVE.
SOIL: NO2 PRESENT. MULL HUMUS GRADES THROUGH LOOSE, HIGHLY ORGANIC SOIL TO A YELLOW-BROWN SANDY LOAM B. NFURS R. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS SPECIES
	D 5C	
3.3	4	ACER SACCHARUM
3.3	66	FAGUS GRANDIFOLIA
2.2	2	ACER PENSYLVANICUM
2.2	28	BETULA PAPYRIFERA
1.1	69	FRAXINUS AMERICANA
1.1	129	OSTRYA VIRGINIANA
	D4-5P	
2.3	2	ACER PENSYLVANICUM
2.2	66	FAGUS GRANDIFOLIA
1.1	4	ACER SACCHARUM
	D 3B	
1.2	2	ACER PENSYLVANICUM
1.1	66	FAGUS GRANDIFOLIA
+.1	134	PICEA RUBENS
R.1	9	AMELANCHIER SPP.
	H1-2R	
2.3	144	POLYSTICHUM ACROSTICHOIDES
1.2	62	DRYOPTERIS SPP.
+.2	49	CORALLORHIZA SPP.
+.2	196	TRIENTALIS BOREALIS
+.2	206	VERONICA OFFICINALIS
+.1	186	SOLIDAGO SPP.
R.1	31	BOTRYCHIUM LANCEOLATUM
R.1	86	HIERACIUM VULGATUM
	G1-2B	
1.3	78	GRAMINEAE
+.2	33	CAREX SPP.
	D1-2B	
+.2	4	ACER SACCHARUM
+.2	28	BETULA PAPYRIFERA
+.2	66	FAGUS GRANDIFOLIA
+.2	69	FRAXINUS AMERICANA
+.1	2	ACER PENSYLVANICUM
R.1	132	PICEA GLAUCA
	L 1R	
2.3	120	MOSS
+.2	97	LICHENS

TOTAL SPECIES = 21

REF. NO.: 3RB MAP-UNIT-NO.: 11 DATE(DA.MO.YR)--24-06-80
LOCATION: BUBBLE POND, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA-COVERED--0.025 HA.

REMARKS

AC03 PRE-FIRE NORTHERN HARDWOOD WITH TREMBLING ASPEN . PIT AND MOUND LIKE 3RA. BOULDERS SCATTERED THROUGHOUT, FREQUENT IN SE CORNER, LESS SO IN REST. LITTER NOT SO DEEP AS IN AC02, BUT DOES COVER MOST OF AREA. SOIL: MULL, A2 WEAKLY TO STRONGLY DEVELOPED, 1-3.5 CM. B - YELLOW-ORANGE BROWN SANDY LOAM. NFDRS R, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D6-7I		
3.2	66	FAGUS GRANDIFOLIA	
2.2	4	ACER SACCHARUM	
1.2	28	BETULA PAPYRIFERA	
1.2	147	POPULUS TREMULOIDES	
R.1	134	PICEA RUBENS	
	D4-5I		
3.2	66	FAGUS GRANDIFOLIA	
+.1	2	ACER PENSYLVANICUM	
+.1	4	ACER SACCHARUM	
R.1	134	PICEA RUBENS	
	H1-2B		
+.2	62	DRYOPTERIS SPP.	
+.2	112	MAIANTHEMUM CANADENSE	
+.2	144	POLYSTICHUM ACROSTICHOIDES	
+.2	194	THELYPTERIS PHEGOPTERIS	
+.2	196	TRIENTALIS BOREALIS	
R.1	49	CORALLORHIZA SPP.	
	G1-2A		
+.2	33	CAREX SPP.	
	D1-2B		
1.2	66	FAGUS GRANDIFOLIA	
+.2	2	ACER PENSYLVANICUM	
+.2	3	ACER RUBRUM	
+.2	9	AMELANCHIER SPP.	
+.2	30	BETULA SPP	
+.2	134	PICEA RUBENS	
+.2	147	POPULUS TREMULOIDES	
+.1	4	ACER SACCHARUM	
+.1	71	FRAXINUS SPP.	
	M 12		
2.3	120	MOSS	
+.2	97	LICHENS	

TOTAL SPECIES = 19

REF. NO.: 4RA MAP-UNIT-NO.: 01 DATE(DA.MO.YR)--27-06-80
LOCATION: SEAL HARBOR, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC04 OLD SPRUCE STAND WITH OPEN UNDERSTORY AND PATCHES OF REGENERATION COMIN IN. DAMP RAVINE ON ONE SIDE OF RELEVE GOING DOWN TO A STREAM FLOWING FROM A SPRING A CHAIN UP HILL. LOTS OF DOWNED POLE-SIZED TREES AND MOSS-COVERED STUMP NO BOULDERS SEEN ON SURFACE. PIT AND MOUND TOPOGRAPHY. SOIL: MOR HUMUS, WELL-DEFINED, DEEP A2 ABOVE WELL-DEFINED B, FINE, SANDY. DAMP SOIL. NFORS H, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS SPECIES
	E6-7C	
5.5	134	PICEA RUBENS
2.2	138	PINUS STROBUS
1.1	3	ACER RUBRUM
+.1	1	ABIES BALSAMEA
R.1	28	BETULA PAPYRIFERA
	D4-5B	
+.1	2	ACER PENSYLVANICUM
R.1	9	AMELANCHIER SPP.
	M 3A	
+.2	2	ACER PENSYLVANICUM
R.1	134	PICEA RUBENS
	H1-2B	
1.2	196	TRIENTALIS BOREALIS
+.2	130	OXALIS MONTANA
R.1	84	HERB
R.1	153	PTERIDIUM AQUILINUM
	G1-2A	
+.2	33	CAREX SPP.
	E1-2R	
2.4	134	PICEA RUBENS
1.2	1	ABIES BALSAMEA
+.2	2	ACER PENSYLVANICUM
+.2	3	ACER RUBRUM
+.2	30	BETULA SPP
+.2	204	VACCINIUM SPP.
+.2	209	VIBURNUM CASSINOIDES
+.1	9	AMELANCHIER SPP.
+.1	138	PINUS STROBUS
R.1	158	QUERCUS RUBRA
	L 1P	
3.4	120	MOSS
+.2	97	LICHENS

TOTAL SPECIES = 18

REF. NO.: 4RB MAP-UNIT-NO.: 01 DATE (DA.MO.YR) --27-05-80
LOCATION: SEAL HARBOR, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC04 MATURE STAND OF MIXED CONIFEROUS AND DECIDUOUS TREES. SPRUCE MOST ABUNDANT. LOTS OF REGENERATION IN VARIOUS HEIGHT CLASSES. MOST VIABLE REGENERATION SPRUCE OR FIR. WHITE PINE REGENERATION NOT HEALTHY (BUT THIS SEEMS TO BE THE CASE IN ALMOST ALL PLACES. BUT THERE ARE HEALTHY MATURE PINES, SO HOW DO THEY GET THERE?). FEW BOULDERS ON SOIL SURFACE BUT MANY UNDER IT. SLIGHT PIT AND MOUND TOPOGRAPHY. CHARCOAL IN DUFF. SOIL: A2 1.5-3.0 CM DEEP OVER STRONG B. REDDISH BROWN. FINE DAMP SOIL. RELEVE JUST OUTSIDE PARK BOUNDARIES. NFORS H, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M6-7I		
3.4	134	PICEA RUBENS	
2.2	3	ACER RUBRUM	
1.1	26	BETULA ALLEGHENIENSIS OR BE	
	E 4R		
1.3	1	ABIES BALSAMEA	
1.2	134	PICEA RUBENS	
+.2	2	ACER PENSYLVANICUM	
	E1-3P		
3.4	134	PICEA RUBENS	
1.2	1	ABIES BALSAMEA	
+.2	3	ACER RUBRUM	
+.2	9	AMELANCHIER SPP.	
+.2	30	BETULA SPP	
+.2	204	VACCINIUM SPP.	
R.1	158	QUERCUS RUBRA	
R.1	209	VIBURNUM CASSINOIDES	
	H1-2B		
1.2	196	TRIENTALIS BOREALIS	
+.2	51	CORNUS CANADENSIS	
+.2	112	MAIANTHEMUM CANADENSE	
	G1-2A		
+.2	78	GRAMINEAE	
	L 1I		
4.4	120	MOSS	
+.2	97	LICHENS	

TOTAL SPECIES = 16

REF. NO.: 4RC MAP-UNIT-NO.: 01 DATE (DA.MO.YR)--08-07
LOCATION: SEAL HARBOR, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

----REMARKS----

AC04 OLD-GROWTH SPRUCE, VERY PATCHY OVERSTORY, TALLEST ARE SOME BIG OLD RED SPRUCE AND WHITE PINE, THEN SOME RED SPRUCE AND THUJA ABOUT [illegible]0 FEET. SLIGHT PIT AND MOUND OVER PART, LOTS OF BLOWNDOWN SPRUCE, SOME STUMPS. LOTS OF 3-30 FOOT REGENERATION, TALLEST (20-30 FEET) MOSTLY BALSAM FIR. REST MOSTLY RED SPRUCE. SOIL: A2 VARIABLE, 0-6CM WHERE PRESENT, SHARPLY DEFINED. A YELLOW BROWN LOAMY SAND WITH LOTS OF STONES.
HFORS M, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS SPECIES
	E 7R	
2.1	134	PICEA RUBENS
2.1	138	PINUS STROBUS
1.1	195	THUJA OCCIDENTALIS
	M 6P	
2.1	3	ACER RUBRUM
2.1	26	BETULA ALLEGHENIENSIS OR BE
2.1	134	PICEA RUBENS
1.1	195	THUJA OCCIDENTALIS
	E3-5S	
4.4	134	PICEA RUBENS
3.2	1	ABIES BALSAMEA
2.2	2	ACER PENSYLVANICUM
1.2	3	ACER RUBRUM
1.2	26	BETULA ALLEGHENIENSIS OR BE
+.1	138	PINUS STROBUS
R.1	146	POPULUS GRANDIDENTATA
	H1-2S	
+.2	48	COPTIS GROENLANDICA
+.2	39	LINNAEA BOREALIS
+.2	112	MAIANTHEMUM CANADENSE
+.2	115	MITCHELLA REPENS
+.2	196	TRIENTALIS BOREALIS
+.2	203	VACCINIUM VITIS-IDAEA
+.1	14	ARALIA NUDICAULIS
	M1-2R	
2.3	134	PICEA RUBENS
+.2	2	ACER PENSYLVANICUM
+.2	209	VIBURNUM CASSINOIDES
+.1	1	ABIES BALSAMEA
+.1	3	ACER RUBRUM
+.1	9	AMELANCHIER SPP.
+.1	26	BETULA ALLEGHENIENSIS OR BE
+.1	159	QUERCUS RUBRA
+.1	209	VIBURNUM CASSINOIDES
R.1	102	LONICERA SPP.
R.1	187	SORBUS AMERICANA
	L 1R	
2.4	120	MOSS
+.2	97	LICHENS

TOTAL SPECIES = 22

REF. NO.: 52A MAP-UNIT-NO.: 04 DATE(DA.MO.YR)--14-07-
LOCATION: PEMETIC MOUNTAIN, MDI, MAINE
SURVEYOR--KAREN SAUNDERS - AREA COVERED--0.025 HA.

REMARKS----

AC05 OPEN STAND OF THUJA MIXED WITH PAPER BIRCH, STRIPED MAPLE AND OTHER HARDWOODS. SPRUCES IN ONE CORNER. MANY OLD GNARLED TREES, OFTEN CHARRED AND HOLLOW. ALSO LOTS OF DOWNED LIMBS AND SMALL DEAD BIRCH TREES. GROUND IS BEDROCK LEDGES AND HUGE BOULDER SCREE. THIN LAYER OF SOIL FILLS CRACKS IN ROCKS AND POCKETS BETWEEN THEM. SOIL IN DEPRESSIONS ORGANIC MATTER MIXED WITH BITS OF ROCK. BLACK, FRIABLE, DAMP SOIL WITH NO APPARENT HORIZONS. SOMETIMES HELD TOGETHER WITH ROOTS ABOVE EMPTY POCKET BETWEEN ROCKS. ON TOP OF ROCKS, JUST BLACK ORGANIC SOIL.
NFORS M, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS SPECIES
	M5-61	
3.3	195	THUJA OCCIDENTALIS
2.2	28	BETULA PAPYRIFERA
2.1	134	PICEA RUBENS
+.2	3	ACER RUBRUM
+.2	9	AMELANCHIER SPP.
+.2	26	BETULA ALLEGHENIENSIS OR BE
R.1	4	ACER SACCHARUM
R.1	146	POPULUS GRANDIDENTATA
	M 42	
1.2	2	ACER PENSYLVANICUM
1.2	28	BETULA PAPYRIFERA
1.1	195	THUJA OCCIDENTALIS
+.2	5	ACER SPICATUM
+.1	134	PICEA RUBENS
R.1	187	SORBUS AMERICANA
	M2-38	
1.2	5	ACER SPICATUM
+.2	2	ACER PENSYLVANICUM
+.1	134	PICEA RUBENS
+.1	195	THUJA OCCIDENTALIS
	M1-28	
+.2	20	ASTER MACROPHYLLUS
+.2	46	COMPOSITAE
+.2	67	FILICALES
+.2	142	POLYPODIUM VULGARE
+.2	150	PRENANTHES SPP.
+.2	212	VIOLA SPP.
+.1	14	ARALIA NUDICAULIS
+.1	112	MAIANTHEMUM CANADENSE
+.1	168	RUBUS SPP.
+.1	168	RUBUS SPP.
+.1	196	TRIENTALIS BOREALIS
	G1-28	
1.2	78	GRAMINEAE
+.2	33	CAREX SPP.
	L 18	
+.3	97	LICHENS
+.3	120	MOSS
	M 1A	
+.2	2	ACER PENSYLVANICUM
+.2	5	ACER SPICATUM
+.2	146	POPULUS GRANDIDENTATA
+.2	195	THUJA OCCIDENTALIS
+.1	9	AMELANCHIER SPP.
+.1	30	BETULA SPP
+.1	134	PICEA RUBENS
+.1	187	SORBUS AMERICANA

TOTAL SPECIES = 26

REF. NO.: 5X8 MAP-UNIT-NO.: 04 DATE(DA.MO.YR)--15-07-80
LOCATION: PEMETIC MOUNTAIN, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

ACO5 SMALL ALMOST PURE THUJA STAND PARTLY ON BEDROCK LEDGE, PARTLY ON BOULDER SCREE. STAND APPEARS TO BE YOUNGER THAN FIRE, POSSIBLY A ROCK-SLIDE CAME THROUGH AFTER FIRE. NOT ALOT OF CHARCOAL PRESENT HERE. FALLEN TREES IN RELEVE AREA AND SOME RAGGED STUMPS. SUPPRESSED TREES IN UNDERSTORY. SOIL: ORGANIC,DAMP, MOSTLY SHALLOW, BUT 6 INCHES DEEP FOUND IN A HOLLOW.NFORS H, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E5-6D		
5.5	195	THUJA	OCCIDENTALIS
+.2	26	BETULA	PAPYRIFERA
	M3-43		
1.2	195	THUJA	OCCIDENTALIS
+.2	7	ALNUS	CRISPA
+.2	30	BETULA	SPP
	H1-28		
+.2	20	ASTER	MACROPHYLLUS
+.2	46	COMPOSITAE	
+.2	150	PRENANTHES	SPP.
+.1	14	ARALIA	NUDICAULIS
+.1	67	FILICALES	
+.1	112	MAIANTHEMUM	CANADENSE
+.1	186	SOLIDAGO	SPP.
+.1	196	TRIENTALIS	BOREALIS
R.1	68	FRAGARIA	SPP.
R.1	84	HERB	
R.1	139	POLYGONATUM	PUBESCENS
	G1-28		
+.3	78	GRAMINEAE	
+.2	33	CAREX	SPP.
	M1-29		
+.2	7	ALNUS	CRISPA
+.2	28	BETULA	PAPYRIFERA
+.2	188	SPIRAEA	LATIFOLIA
+.2	195	THUJA	OCCIDENTALIS
+.1	5	ACER	SPICATUM
+.1	16	ARONIA	MELANOCARPA
+.1	165	ROSA	SPP.
R.1	134	PICEA	RUBENS
R.1	151	PRUNUS	PENSYLVANICA
	L 1R		
2.3	97	LICHENS	
1.3	120	MOSS	

TOTAL SPECIES = 25

REF. NO.: 6RA MAP-UNIT-NO.: 04 DATE (DA.MO.YR)--11-07-80
LOCATION: WEST OF SARGENT MOUNTAIN, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS--

AC06 OVERSTORY MOSTLY MATURE THUJA WITH SOME RED MAPLE PRESENT AND WHITE PINE (VERY LARGE) SCATTERED THROUGH STAND. A LITTLE BIT OF 2-6 FOOT REGENERATION BUT MOSTLY OPEN BETWEEN CANOPY AND CINNAMON FERNS. DRY INTERMITTENT STREAMBEDS THROUGHOUT.
LOGGING STUMPS PRESENT. VERY FEW BOULDERS ON SURFACE. SLIGHT PIT AND MOUND TOPOGRAPHY. SOIL: QUITE VARIABLE: NEAR STREAM AND IN HOLLOWS 4-6INCH DEEP ORGANIC PEATY LAYER ABOVE BLACK A AND GREY-BROWN LOAMY B. SOMETIMES B IS COARSE SAND INSTEAD. ON HUMMOCKS, 2-5INCH DEEP PODZOLIZED A2 WITH WELL-DEFINED ORANGE-BROWN LOAMY SAND B. SOIL DAMP EVERYWHERE.
NFORS H, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M6-7C		
4.2	195	THUJA OCCIDENTALIS	
3.2	3	ACER RUBRUM	
1.1	26	BETULA ALLEGHENIENSIS OR BE	
1.1	134	PICEA RUBENS	
1.1	138	PINUS STROBUS	
1.1	199	TSUGA CANADENSIS	
R.1	78	FRAXINUS NIGRA	
	E3-4B		
1.2	134	PICEA RUBENS	
+.1	2	ACER PENSYLVANICUM	
+.1	138	PINUS STROBUS	
R.1	1	ABIES BALSAMEA	
	H1-3P		
1.4	128	OSMUNDA CINNAMOMEA	
1.4	212	VIOLA SPP.	
+.2	21	ASTER NEMORALIS	
+.2	23	ASTER SPP.	
+.2	112	MAIANTHEMUM CANADENSE	
+.2	113	MEDEOLA VIRGINIANA	
+.2	193	THELYPTERIS NOVEBORACENSIS	
+.2	194	THELYPTERIS PHEGOPTERIS	
+.2	196	TRIENTALIS BOREALIS	
+.1	168	RUBUS SPP.	
	G1-2B		
1.3	78	GRAMINEAE	
+.2	33	CAREX SPP.	
	M1-2B		
+.2	26	BETULA ALLEGHENIENSIS OR BE	
+.2	195	THUJA OCCIDENTALIS	
+.1	1	ABIES BALSAMEA	
+.1	2	ACER PENSYLVANICUM	
+.1	3	ACER RUBRUM	
+.1	9	AMELANCHIER SPP.	
+.1	78	FRAXINUS NIGRA	
+.1	134	PICEA RUBENS	
+.1	138	PINUS STROBUS	
+.1	199	TSUGA CANADENSIS	
+.1	204	VACCINIUM SPP.	
R.1	158	QUERCUS RUBRA	
	L 1R		
2.3	120	MOSS	

TOTAL SPECIES = 25

REF. NO.: 428   MAP-UNIT-NO.: C4   DATE(DA.MO.YR)--11-07-80
LOCATION: WEST OF SARGENT MOUNTAIN, MDI, MAINE
SURVEYOR--KAREN SAUNDERS   AREA COVERED--0.025 HA.

REMARKS----

A236 MATURE THUJA STAND ON DAMP SOIL, MARSHY IN PLACES. SMALL SUPPRESSED THUJA AND RED SPRUCE UNDER MAIN CANOPY. SOME VISIBLE REGENERATION SCATTERED THROUGHOUT AREA. LOGGING STUMPS PRESENT. BOULDERS SCATTERED ON SURFACE. ROCK UNDERLYING SOIL AT ABOUT ONE FOOT. SLIGHT PIT AND MOUND TOPOGRAPHY IN PART. SOIL: QUITE VARIABLE. IN MARSHY AREA, VERY DEEP ORGANIC MATTER ON TOP OF ROCK - VERY WET. BY STREAM (RUNNING) ORGANIC PEATY LAYER ON TOP OF SAND WITH ORGANIC MATTER MIXED IN BETWEEN THE TWO. AWAY FROM MARSH AND STREAM, HUMPFATT ORGANIC LAYER ABOVE WEAKLY PODZOLIZED A2 1-3MM. YELLOW TO ORANGE BROWN LOAMY CLAY BENEATH IN HUMMOCKS. ROCK BENEATH IN HOLLOWS. NFORS H. NEFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M6-7I		
4.4	195	THUJA OCCIDENTALIS	
2.2	3	ACER RUBRUM	
1.2	26	BETULA ALLEGHENIENSIS OR BE	
1.1	134	PICEA RUBENS	
+.1	70	FRAXINUS NIGRA	
R.1	138	PINUS STROBUS	
	M4-58		
+.2	81	HAMAMELIS VIRGINIANA	
+.1	134	PICEA RUBENS	
+.1	195	THUJA OCCIDENTALIS	
R.1	66	FAGUS GRANDIFOLIA	
	E 38		
1.2	134	PICEA RUBENS	
+.2	81	HAMAMELIS VIRGINIANA	
+.1	1	ABIES BALSAMEA	
+.1	138	PINUS STROBUS	
	M1-3R		
1.4	212	VIOLA SPP.	
1.3	127	ONOCLEA SENSIBILIS	
1.3	125	OSMUNDA CINNAMOMEA	
+.3	48	COPTIS GROENLANDICA	
+.3	73	GALIUM PALUSTRE	
+.3	115	MITCHELLA REPENS	
+.2	18	ASTER ACUMINATUS	
+.2	24	ATHYRIUM FILIX-FEMINA	
+.2	64	EQUISETUM SYLVATICUM	
+.2	110	LYCOPODIUM SPP.	
+.2	112	MAIANTHEMUM CANADENSE	
+.2	119	MONOTROPA UNIFLORA	
+.2	192	THALICTRUM POLYGAMUM	
+.2	193	THELYPTERIS NOVEBORACENSIS	
+.2	194	THELYPTERIS PHEGOPTERIS	
+.2	196	TRIENTALIS BOREALIS	
+.1	21	ASTER NEMORALIS	
+.1	23	ASTER SPP.	
+.1	150	PRENANTHES SPP.	
+.1	200	UVULARIA SESSILIFOLIA	
R.1	14	ARALIA NUDICAULIS	
R.1	111	LYSIMACHIA QUADRIFOLIA	
R.1	113	MEDEOLA VIRGINIANA	
	G1-3R		
1.4	33	CAREX SPP.	
1.4	78	GRAMINEAE	
	M1-2R		
1.4	204	VACCINIUM SPP.	
+.2	30	BETULA SPP	
+.2	81	HAMAMELIS VIRGINIANA	
+.2	146	POPULUS GRANDIDENTATA	
+.2	195	THUJA OCCIDENTALIS	
+.1	1	ABIES BALSAMEA	
+.1	2	ACER PENSYLVANICUM	
+.1	3	ACER RUBRUM	
+.1	9	AMELANCHIER SPP.	
+.1	26	BETULA ALLEGHENIENSIS OR BE	
+.1	28	BETULA PAPYRIFERA	
+.1	66	FAGUS GRANDIFOLIA	
+.1	70	FRAXINUS NIGRA	
+.1	90	ILEX VERTICILLATA	
+.1	132	PICEA GLAUCA	
+.1	134	PICEA RUBENS	
+.1	138	PINUS STROBUS	
+.1	158	QUERCUS RUBRA	
+.1	209	VIBURNUM CASSINOIDES	
R.1	93	KALMIA ANGUSTIFOLIA	
R.1	187	SORBUS AMERICANA	
	L 1R		
2.4	120	MOSS	
+.3	97	LICHENS	

REF. NO.: 784 MAP-UNIT-NO.: 12 DATE(DA.MO.YR)--16-07-8
LOCATION: ACROSS FROM GILMORE MEADOW, MDI, MAINE
SURVEYOR--KAREN-SAUNDERS AREA-COVERED--0.025 HA.

REMARKS--

AC07 OAK STAND WITH RED MAPLE AND ASPEN MIXED IN. MOST TREES APPEAR TO BE OF SPROUT ORIGIN - 1947 FIRE. SCATTERED OLDER OAKS EMERGE FROM THE CANOPY AND HAVE FIRE SCARS. THESE TREES SEEM TO BE LESS THAN 80 YEARS OLD, SUGGESTING THAT THE 1901 FIRE FROM AUNT BETTY'S POND TO THE BUBBLES SWEPT THROUGH THIS AREA. LOTS OF BOULDERS ON SURFACE. CHARCOAL AT BOTTOM OF DUFF. MOSTLY LEVEL WITH VERY LITTLE PIT AND MOUND.
SOIL: MULL HUMUS OVER ASHY GREY A2 1-6CM, B YELLOW BROWN LOAMY SAND.
NFORS R, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	0 6C		
4.4	158	QUERCUS	RUBRA
2.2	3	ACER	RUBRUM
1.1	146	POPULUS	GRANDIDENTATA
	0 5P		
2.2	2	ACER	PENSYLVANICUM
1.2	3	ACER	RUBRUM
1.2	158	QUERCUS	RUBRA
+.1	146	POPULUS	GRANDIDENTATA
	03-48		
1.2	2	ACER	PENSYLVANICUM
+.2	29	BETULA	POPULIFOLIA
+.1	134	PICEA	RUBENS
R.1	132	PICEA	GLAUCA
	H1-2R		
1.2	153	PTERIDIUM	AQUILINUM
+.2	75	GAULTHERIA	PROCUMBENS
+.2	115	MITCHELLA	REPENS
+.2	196	TRIENTALIS	BOREALIS
+.2	206	VERONICA	OFFICINALIS
+.1	112	MAIANTHEMUM	CANADENSE
R.1	46	COMPOSITAE	
	G1-2A		
+.2	78	GRAMINEAE	
	M1-2A		
1.3	204	VACCINIUM	SPP.
+.2	2	ACER	PENSYLVANICUM
+.2	29	BETULA	POPULIFOLIA
+.2	93	KALMIA	ANGUSTIFOLIA
+.1	3	ACER	RUBRUM
+.1	47	COMPTONIA	PEREGRINA
+.1	134	PICEA	RUBENS
+.1	138	PINUS	STROBUS
+.1	158	QUERCUS	RUBRA
R.1	132	PICEA	GLAUCA
R.1	146	POPULUS	GRANDIDENTATA
	L 1B		
1.3	120	MOSS	
+.2	97	LICHENS	

TOTAL SPECIES = 21

REF. NO.: 7RB MAP-UNIT-NO.: 12 DATE(DA.MO.YR)--16-07-80
LOCATION: ACROSS FROM GILMORE MEADOW, MOI, MAINE
SURVEYOR--KAREN SAUNDERS AREA-COVERED--0.025 HA.

REMARKS

AC07 SIMILAR TO 7RA SOIL AND TOPOGRAPHY SIMILAR. TREES SIMILAR BUT LESS ASPEN IN OVERSTORY, FEWER EMERGENT TREES AND A STRONGER COMPONENT OF MID-STORY TREES. A FAIR AMOUNT OF GREY BIRCH IN ONE CORNER OF THE RELEVE THAT APPEARS TO BE DYING OUT.NFORS R. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D 5C		
4.4	158	QUERCUS RUBRA	
2.2	3	ACER RUBRUM	
1.2	146	POPULUS GRANDIDENTATA	
R.1	26	BETULA PAPYRIFERA	
	D4-5P		
2.4	29	BETULA POPULIFOLIA	
2.2	2	ACER PENSYLVANICUM	
2.2	3	ACER RUBRUM	
R.1	138	PINUS STROBUS	
	H1-2P		
2.4	153	PTERIDIUM AQUILINUM	
+.1	112	MAIANTHEMUM CANADENSE	
+.1	196	TRIENTALIS BOREALIS	
R.1	186	SOLIDAGO SPP.	
	G1-2A		
+.2	78	GRAMINEAE	
	D1-2R		
2.2	204	VACCINIUM SPP.	
1.3	76	GAYLUSSACIA BACCATA	
+.3	75	GAULTHERIA PROCUMBENS	
+.2	2	ACER PENSYLVANICUM	
+.2	3	ACER RUBRUM	
+.2	29	BETULA POPULIFOLIA	
+.2	47	COMPTONIA PEREGRINA	
+.2	132	PICEA GLAUCA	
+.1	9	AMELANCHIER SPP.	
+.1	158	QUERCUS RUBRA	
	L 1R		
2.3	120	MOSS	
+.3	97	LICHENS	

TOTAL SPECIES = 20

LOCATION: SAND BEACH, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC08 POST-FIRE PITCH PINE STAND, WITH RED SPRUCE. CLOSE TO ROAD PINE PREDOMINATES, BUT AS GET FURTHER FROM ROAD, AMOUNT OF SPRUCE INCREASES, TILL AT SOME DISTANCE IT PREDOMINATES (WHOLE STAND, NOT RELEVE). STAND IS OPEN WITH OCCASIONAL PATCHES OF TREES SURROUNDED BY LARGE AREAS IN WHICH SHRUBS OR MOSS PREDOMINATE. MANY STUMPS OF TREES BURNED IN 47 FIRE. SOME STUMPS ARE CHARRED ON TOP AND SOME HAVE OLDER FIRE SCARS SUGGESTING THAT AT LEAST ONE PREVIOUS FIRE OCCURRED. SOME BOULDERS ON SURFACE, MOSTLY BEDROCK LEDGES. MOST SMALL TREES OF SPROUT ORIGIN. LOTS OF DEAD TREES IN ADDITION TO STUMPS. SOIL: THIN ORGANIC SOIL IN CRACKS AND DEPRESSIONS IN ROCKS. NFORS Q, NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
		M3-4R	
1.2	29	BETULA	POPULIFOLIA
1.1	134	PICEA	RUBENS
1.1	137	PINUS	RIGIDA
+.3	76	GAYLUSSACIA	BACCATA
+.2	93	KALMIA	ANGUSTIFOLIA
+.2	147	POPULUS	TREMULOIDES
+.1	9	AMELANCHIER	SPP.
+.1	26	BETULA	PAPYRIFERA
+.1	209	VIBURNUM	CASSINOIDES
R.1	7	ALNUS	CRISPA
R.1	138	PINUS	STROBUS
		S1-2P	
2.4	93	KALMIA	ANGUSTIFOLIA
2.4	204	VACCINIUM	SPP.
2.3	76	GAYLUSSACIA	BACCATA
+.2	3	ACER	RUBRUM
+.2	26	BETULA	PAPYRIFERA
+.2	29	BETULA	POPULIFOLIA
+.2	147	POPULUS	TREMULOIDES
+.1	9	AMELANCHIER	SPP.
+.1	16	ARONIA	MELANOCARPA
+.1	47	COMPTONIA	PEREGRINA
+.1	209	VIBURNUM	CASSINOIDES
R.1	58	DIERVILLA	LONICERA
		H1-2B	
1.5	58	HYPERICUM	GENTIANOIDES
1.2	149	POTENTILLA	TRIDENTATA
+.2	20	ASTER	MICROPHYLLUS
+.2	153	PTERIDIUM	AQUILINUM
+.1	23	ASTER	SPP.
+.1	114	MELAMPYRUM	LINEARE
+.1	186	SOLIDAGO	SPP.
R.1	196	TRIENTALIS	BOREALIS
		G1-2A	
1.2	33	CAREX	SPP.
1.2	78	GRAMINEAE	
		L 1P	
2.4	97	LICHENS	
2.4	120	MOSS	

TOTAL SPECIES = 28

REF. NO.: 8RB MAP-UNIT-NO.: 23 DATE(DA.MO.YR)--18-07-80
LOCATION: SAND BEACH, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS

AC08 OPEN POST-FIRE PITCH STAND. A FAIR AMOUNT OF SEEDLING (SEVERAL YEARS OLD) PITCH PINE. IN GENERAL, SMALL TREES ABOUT EQUALLY OF SEEDLING, SPROUT ORIGIN. SOME OLD STUMPS AND LOGS BUT NOT ALOT. BARE LEDGES AND LARGE BOULDERS. CHARCOAL. SOIL: THIN ORGANIC SOIL IN CRACKS AND DEPRESSIONS IN ROCKS. DEEPER IN SOME LARGE DEPRESSIONS, FORMING SMALL BOGGY OR MESIC AREAS. NFORS 0, NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
		M3-4P	
2.2	137	PINUS	RIGIDA
1.2	29	BETULA	POPULIFOLIA
1.2	134	PICEA	RUBENS
1.2	209	VIBURNUM	CASSINOIDES
+.2	7	ALNUS	CRISPA
+.2	147	POPULUS	TREMULOIDES
+.1	3	ACER	RUBRUM
+.1	28	BETULA	PAPYRIFERA
+.1	132	PICEA	GLAUCA
+.1	151	PRUNUS	PENSYLVANICA
R.1	171	SALIX	SP.
		H1-2A	
+.2	14	ARALIA	NUDICAULIS
+.2	149	POTENTILLA	TRIDENTATA
R.1	23	ASTER	SPP.
R.1	112	MAIANTHEMUM	CANADENSE
		G1-2A	
+.2	33	CAREX	SPP.
+.2	78	GRAMINEAE	
		D1-2P	
2.3	76	GAYLUSSACIA	BACCATA
2.3	204	VACCINIUM	SPP.
1.2	93	KALMIA	ANGUSTIFOLIA
+.2	3	ACER	RUBRUM
+.2	7	ALNUS	CRISPA
+.2	28	BETULA	PAPYRIFERA
+.2	29	BETULA	POPULIFOLIA
+.2	47	COMPTONIA	PEREGRINA
+.2	147	POPULUS	TREMULOIDES
+.2	188	SPIRAEA	LATIFOLIA
+.2	209	VIBURNUM	CASSINOIDES
+.1	9	AMELANCHIER	SPP.
+.1	137	PINUS	RIGIDA
R.1	158	QUERCUS	RUBRA
		L 1R	
2.3	120	MOSS	
1.2	97	LICHENS	

TOTAL SPECIES = 26

REF. NO.: 9RA MAP-UNIT-NO.: 09 DATE(DA.MO.YR)--19-07-80
LOCATION: ROUTE 3, DORR MTN, MDI, MAINE
SURVEYOR--KAREN-SAUNDERS AREA COVERED--0.025 HA.

REMARKS

AC09 BIRCH-ASPEN STAND, POST-FIRE, BIRCH APPEARS MOSTLY SEEDLING ORIGIN. APPEARS TO HAVE BEEN PREDOMINATELY WHITE PINE BEFORE FIRE. CHARCOAL ON SURFAC LOTS OF SMALL BOULDERS AND LITTLE ROCKS ON SURFACE. SOILS MULL HUMUS GRADING INTO HIGHLY ORGANIC A. A2 NOT ALWAYS PRESENT AND DEPTH WHEN PRESENT I VARIABLE. B- YELLOW TO ORANGE BROWN LOAMY SAND.
NFDRS R, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	05-60		
3.3	28	BETULA PAPYRIFERA	
3.3	146	POPULUS GRANDIDENTATA	
2.2	2	ACER PENSYLVANICUM	
1.2	3	ACER RUBRUM	
	M3-4R		
1.2	2	ACER PENSYLVANICUM	
1.1	28	BETULA PAPYRIFERA	
+.2	3	ACER RUBRUM	
+.1	134	PICEA RUBENS	
R.1	138	PINUS STROBUS	
	H1-28		
+.3	51	CORNUS CANADENSIS	
+.2	111	LYSIMACHIA QUADRIFOLIA	
+.2	112	MAIANTHEMUM CANADENSE	
+.1	12	APOCYNUM ANDROSAEMIFOLIUM	
+.1	14	ARALIA NUDICAULIS	
+.1	18	ASTER ACUMINATUS	
+.1	20	ASTER MACROPHYLLUS	
+.1	23	ASTER SPP.	
+.1	85	HIERACIUM PRATENSE	
+.1	153	PTERIDIUM AQUILINUM	
+.1	196	TRIENTALIS BOREALIS	
	G1-2A		
+.2	33	CAREX SPP.	
+.2	76	GRAMINEAE	
	M1-28		
1.2	134	PICEA RUBENS	
+.2	146	POPULUS GRANDIDENTATA	
+.2	147	POPULUS TREMULOIDES	
+.1	1	ABIES BALSAMEA	
+.1	9	AMELANCHIER SPP.	
+.1	28	BETULA PAPYRIFERA	
+.1	47	COMPTONIA PEREGRINA	
+.1	66	FAGUS GRANDIFOLIA	
+.1	69	FRAXINUS AMERICANA	
+.1	138	PINUS STROBUS	
+.1	158	QUERCUS RUBRA	
+.1	204	VACCINIUM SPP.	
+.1	209	VIBURNUM CASSINOIDES	
R.1	188	SPIRAEA LATIFOLIA	
R.1	195	THUJA OCCIDENTALIS	
	L 18		
1.4	120	MOSS	
1.2	97	LICHENS	

TOTAL SPECIES = 32

REF. NO.: 9R8 MAP-UNIT-NO.: 09 DATE(DA.MO.YR)--19-07-8
LOCATION: ROUTE 3, DORR MTN, MDI, MAINE
SURVEYOR--KAREN-SAUNDERS AREA-COVERED--0.025-HA.

REMARKS

AC39 POST-FIRE BIRCH-ASPEN STAND. PREVIOUS STAND APPEARS TO HAVE BEEN MAIN
PAPER BIRCH WITH A GOOD AMOUNT OF SPRUCE AND SOME OAK. CHARCOAL PRESENT
AND CHARRED STUMPS. SOIL:-DISTURBED IN MOST PLACES, WHERE NOT: MULL HUMUS.
A2 1-2CM ABOVE YEELOW-BROWN LOAMY SAND B.
NFORS R. NFFLB.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
		D SP	
3.3	146	POPULUS GRANDIDENTATA	
3.2	2	ACER PENSYLVANICUM	
1.2	3	ACER RUBRUM	
1.2	158	QUERCUS RUBRA	
1.1	28	BETULA PAPYRIFERA	
1.1	28	BETULA PAPYRIFERA	
1.1	146	POPULUS GRANDIDENTATA	
+.2	158	QUERCUS RUBRA	
+.1	29	BETULA POPULIFOLIA	
+.1	147	POPULUS TREMULOIDES	
		D3-4R	
2.2	2	ACER PENSYLVANICUM	
1.2	134	PICEA RUBENS	
+.1	28	BETULA PAPYRIFERA	
+.1	29	BETULA POPULIFOLIA	
		H1-2R	
+.3	20	ASTER MACROPHYLLUS	
+.3	85	HIERACIUM PRATENSE	
+.3	206	VERONICA OFFICINALIS	
+.2	14	ARALIA NUDICAULIS	
+.2	112	MAIANTHEMUM CANADENSE	
+.2	118	MONOTROPA HYPOPITHYS	
+.2	186	SOLIDAGO SPP.	
+.1	18	ASTER ACUMINATUS	
+.1	111	LYSIMACHIA QUADRIFOLIA	
+.1	114	MELAMPYRUM LINEARE	
+.1	153	PTERIDIUM AQUILINUM	
+.1	196	TRIENTALIS BOREALIS	
R.1	86	HIERACIUM VULGATUM	
R.1	182	SOLIDAGO GIGANTEA	
		G1-2B	
1.2	78	GRAMINEAE	
+.2	33	CAREX SPP.	
		D1-2B	
+.3	75	GAULTHERIA PROCUMBENS	
+.2	204	VACCINIUM SPP.	
+.2	209	VIBURNUM CASSINOIDES	
+.1	134	PICEA RUBENS	
R.1	66	FAGUS GRANDIFOLIA	
R.1	173	SAMBUCUS PUBENS	
R.1	187	SORBUS AMERICANA	
R.1	195	THUJA OCCIDENTALIS	
R.1	207	VIBURNUM ACERIFOLIUM	
		L 1A	
+.2	97	LICHENS	
+.2	120	MOSS	

TOTAL SPECIES = 34

REF. NO.: 10RA MAP-UNIT-NO.: 01 DATE(DA.MO.YR)---23-07-8
LOCATION: NORUMBEGA, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC10 OLD GROWTH SPRUCE WITH THUJA IN SPOTS. WHITE PINE, OAK AND BIRCH SCATTERED THROUGHOUT. RED MAPLE SPOTTY, LIKE THUJA. SOME SUPPRESSED TREES IN UNDERSTORY AND A SMALL AMOUNT OF SLOW-GROWING REGENERATION. VERY FEW HERBS AND SHRUBS. A FAIR AMOUNT OF TREE SEEDLINGS (1-2 YEARS) STAND AS A WHOLE APPEARS TO BE SPRUCE-THUJA , WITH RED AND WHITE PINE, RED OAK, RED MAPLE, WHITE AND YELLOW BIRCH SCATTERED. DRYISH - MOSTLY SPRUCE WITH SOME RED PINE: LOW AND DAMPISH - MOSTLY THUJA WITH RED MAPLE. PREVIOUS STAND MAY HAVE BEEN MOSTLY THUJA AND THEN A FIRE ABOUT 1350. SCATTERED BOULDERS, MOSTLY MOSS-COVERED. SOIL: MORR HUMUS ABOVE YELLOW-BROWN LOAMY S. A2 MOSTLY NOT PRESENT, WHERE IS, ABOUT 1 CM, NOT WELL-DEFINED. NFORS H, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E6-7C		
4.4	134	PICEA	RUBENS
1.2	28	BETULA	PAPYRIFERA
1.1	138	PINUS	STROBUS
1.1	158	QUERCUS	RUBRA
+.2	195	THUJA	OCCIDENTALIS
R.1	3	ACER	RUBRUM
	E4-5B		
1.1	134	PICEA	RUBENS
	E3-4B		
1.2	134	PICEA	RUBENS
+.1	1	ABIES	BALSAMEA
	H1-2A		
+.2	196	TRIENTALIS	BOREALIS
R.1	112	MAIANTHEMUM	CANADENSE
	H1-2B		
+.2	1	ABIES	BALSAMEA
+.2	30	BETULA	SPP
+.2	115	MITCHELLA	REPENS
+.2	134	PICEA	RUBENS
+.2	204	VACCINIUM	SPP.
+.1	2	ACER	PENSYLVANICUM
+.1	3	ACER	RUBRUM
+.1	9	AMELANCHIER	SPP.
+.1	138	PINUS	STROBUS
+.1	158	QUERCUS	RUBRA
+.1	209	VIBURNUM	CASSINOIDES
	D1-2B		
+.2	2	ACER	PENSYLVANICUM
+.2	3	ACER	RUBRUM
+.2	28	BETULA	PAPYRIFERA
+.2	146	POPULUS	GRANDIDENTATA
+.1	69	FRAXINUS	AMERICANA
+.1	158	QUERCUS	RUBRA
	L 1R		
2.3	120	MOSS	
+.2	97	LICHENS	

TOTAL SPECIES = 19

REF. NO.: 10RB MAP-UNIT-NO.: 01 DATE (DA.MO.YR)---23-07-
LOCATION: NORUMBEGA, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC10 OLD GROWTH SPRUCE IN BOTH RA AND RB SHOW GOOD STEADY GROWTH WHEN YOUNG. SMALL SPRUCE AND THUJA, BFIR IN BOTH HAVE GROWN VERY SLOWLY, SUGGESTING THAT THEY BEGAN GROWTH WHEN THE CANOPY WAS CLOSED AND DENSE. BUT BIGGER TREES APPEAR TO HAVE BEGUN GROWTH UNDER AN OPEN CANOPY. TWO BLOWNDOWN THUJAS AND A STANDING DEAD SPRUCE HAVE LEFT A LARGE OPENING IN THE CANOPY AT THE CENTER OF THE RELEVE. FORMERLY SUPPRESSED TREES THERE N GROWING WELL. SPHAGNUM MAT COVERS TOP HALF. BEDROCK THERE. SPHAGNUM UNDER BLOWDOWN HAS LOTS OF HEALTHY SEEDLINGS. LOWER HALF SCATTERED MOSSY BOULDERS. SOIL: UPPER 1/2 OF PLOT: SHALLOW, MOIST, ORGANIC MIXED WITH CRUMBLING BEDROCK: LOWER HALF: DEEP , A2 ABOUT 4-5 CM BUT WEAKLY PODZOLIZED AND NOT SHARPLY DEFINED, B SANDY LOAM.
NFORS M, NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 7I		
3.3	195	THUJA	OCCIDENTALIS
3.1	134	PICEA	RUBENS
1.1	138	PINUS	STROBUS
	M5-6P		
2.1	134	PICEA	RUBENS
2.1	195	THUJA	OCCIDENTALIS
1.2	3	ACER	RUBRUM
1.2	26	BETULA	ALLEGHENIENSIS OR BE
	E3-4R		
1.2	195	THUJA	OCCIDENTALIS
1.1	134	PICEA	RUBENS
+.3	76	GAYLUSSACIA	BACCATA
+.1	1	ABIES	BALSAMEA
	H1-2S		
+.2	51	CORNUS	CANADENSIS
+.2	153	PTERIDIUM	AQUILINUM
+.2	196	TRIENTALIS	BOREALIS
+.1	14	ARALIA	NUDICAULIS
+.1	112	MAIANTHEMUM	CANADENSE
	M1-2R		
1.3	76	GAYLUSSACIA	BACCATA
+.3	204	VACCINIUM	SPP.
+.1	1	ABIES	BALSAMEA
+.1	2	ACER	PENSYLVANICUM
+.1	3	ACER	RUBRUM
+.1	9	AMELANCHIER	SPP.
+.1	26	BETULA	ALLEGHENIENSIS OR BE
+.1	134	PICEA	RUBENS
+.1	138	PINUS	STROBUS
+.1	195	THUJA	OCCIDENTALIS
	L 1I		
4.5	120	MOSS	
+.3	97	LICHENS	
	G 1A		
+.2	33	CAREX	SPP.

REF. NO.: 11RA MAP-UNIT-NO.: 08 DATE(DA.MO.YR)---25-07-80
LOCATION: NORUMBEGA, MOI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS

AC11 UPSLOPE FROM AC10. OLDER STAND THAT APPEARS TO HAVE BEEN LESS SEVERELY AFFECTED BY FIRE SOMETIME AROUND 1850. SEVERAL TREES IN RELEVE DEFINATELY ANTEDATE FIRE AND MANY CEDARS PROBABLY DO BUT CANNOT TELL BECAUSE MOST CEDARS EXAMINED WERE ROTTEN IN MIDDLE, MAKING AGING IMPOSSIBLE . CANOPY FAIRLY OPEN BECAUSE OF MANY STANDING DEAD TREES AND HOLES FROM BLOWDOWNS ALSO LOTS OF DOWNED DEAD TREES. MANY SUPPRESSED BARELY LIVE TREES. MAJORITY OF TREES POLESIZED WITH EVERY SO OFTEN A LARGE SPRUCE OR PINE. NOTHING LIVE BETWEEN 1 AND 18 FEET TALL. SOIL: MORR HUMUS OVER 2-4 CM STRONG A2, SHARP DEMARCATION BETWEEN A2 AND B. B IS SANDY LOAM.
NFDRS 3. NFFL 10. SOME SCATTERED BOULDERS.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
		E 7I	
3.4	134	PICEA	RUBENS
1.1	136	PINUS	RESINOSA
1.1	138	PINUS	STROBUS
1.1	195	THUJA	OCCIDENTALIS
+.1	3	ACER	RUBRUM
+.1	28	BETULA	PAPYRIFERA
		E5-6B	
1.1	134	PICEA	RUBENS
+.1	195	THUJA	OCCIDENTALIS
		H1-2A	
+.1	112	MAIANTHEMUM	CANADENSE
+.1	196	TRIENTALIS	BOREALIS
R.1	56	CYPRIPEDIUM	ACAULE
		E1-2B	
1.2	134	PICEA	RUBENS
+.2	3	ACER	RUBRUM
+.2	93	KALMIA	ANGUSTIFOLIA
+.2	195	THUJA	OCCIDENTALIS
+.2	204	VACCINIUM	SPP.
+.1	1	ABIES	BALSAMEA
+.1	9	AMELANCHIER	SPP.
+.1	28	BETULA	PAPYRIFERA
+.1	136	PINUS	RESINOSA
+.1	138	PINUS	STROBUS
		L 1R	
2.4	120	MOSS	
+.2	97	LICHENS	

TOTAL SPECIES = 15

REF. NO.: 112[illegible] MAP-UNIT-NO.: C[illegible] DATE(DA.MO.YR)---25-07-80
LOCATION: NOFUMBEGA, MOI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS

AC11 UPSLOPE FROM AC10. LARGE SPRUCES AND PINES, A BIT OF THUJA, NOT MANY SUPPRESSED TREES. SOME DOWNED AND A FEW STANDING DEAD TREES. SCATTERED BOULDER AND 4-5" LEDGE MOSTLY COVERED BY MOSS AND NEEDLES.-SOIL:--NO-A2 APPARENT. MORR HUMUS OVER B DARK BROWN LOAM. NFORS H. NFFL B.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 7I		
3.1	134	PICEA	RUBENS
2.2	136	PINUS	RESINOSA
1.1	138	PINUS	STROBUS
1.1	195	THUJA	OCCIDENTALIS
	M 6R		
2.1	3	ACER	RUBRUM
+.1	134	PICEA	RUBENS
	E3-5P		
2.2	1	ABIES	BALSAMEA
2.1	134	PICEA	RUBENS
	H1-2A		
+.2	153	PTERIDIUM	AQUILINUM
+.1	112	MAIANTHEMUM	CANADENSE
+.1	196	TRIENTALIS	BOREALIS
R.1	14	ARALIA	NUDICAULIS
R.1	84	HERB	
	G1-2A		
+.2	78	GRAMINEAE	
	M1-2B		
+.2	93	KALMIA	ANGUSTIFOLIA
+.2	204	VACCINIUM	SPP.
+.1	1	ABIES	BALSAMEA
+.1	3	ACER	RUBRUM
+.1	9	AMELANCHIER	SPP.
+.1	30	BETULA	SPP.
+.1	136	PINUS	RESINOSA
+.1	138	PINUS	STROBUS
+.1	157	SORBUS	AMERICANA
+.1	195	THUJA	OCCIDENTALIS
+.1	209	VIBURNUM	CASSINOIDES
R.1	2	ACER	PENSYLVANICUM
R.1	90	ILEX	VERTICILLATA
	L 13		
1.3	120	MOSS	
+.2	97	LICHENS	

TOTAL SPECIES = 22

REF. NO.: 12RA MAP-UNIT-NO.: 01 DATE (DA.MO.YR)---28-07-80
LOCATION: DUCK HARBOR PATH, IAH, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC12 OLD SPRUCE STAND WITH MANY OPENINGS FROM DEAD DOWNED TREES. DEAD STANDING TREES SCATTERED THROUGHOUT STAND. SOME OPENINGS HAVE MIXED ERICACEAE, MOSSES, & BITS OF REGENERATION. OTHER OPENINGS NO REGENERATION AT ALL. MOST OF SMALL TREES ARE PARTIALLY SHADED. SOME BIG TREES ARE WOLFY WITH BRANCHES ALMOST DOWN TO THE GROUND. OTHERS HAVE SMALL LOPSIDED LIVE CROWNS. FEW, SCATTERED SMALL BOULDERS. CHARCOAL AT BOTTOM OF DUFF. SOIL: DEEP PEATY ORGANIC HORIZON OVERLYING 1 CM DEEP A2 OR WEATHERED ROCK. THEN SOLID ROCK . NO B APPARENT. NFORS H. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 6P		
3.1	134	PICEA	RUBENS
	E4-5R		
2.2	134	PICEA	RUBENS
+.1	9	AMELANCHIER	SPP.
R.1	28	BETULA	PAPYRIFERA
	M 3R		
2.4	76	GAYLUSSACIA	BACCATA
1.2	134	PICEA	RUBENS
	H1-23		
+.2	112	MAIANTHEMUM	CANADENSE
+.2	153	PTERIDIUM	AQUILINUM
+.2	203	VACCINIUM	VITIS-IDAEA
+.1	51	CORNUS	CANADENSIS
+.1	114	MELAMPYRUM	LINEARE
+.1	196	TRIENTALIS	BOREALIS
R.1	191	SYMPLOCARPUS	FOETIDUS
	G1-28		
+.2	33	CAREX	SPP.
+.2	78	GRAMINEAE	
	D1-2R		
2.4	76	GAYLUSSACIA	BACCATA
1.3	204	VACCINIUM	SPP.
+.2	93	KALMIA	ANGUSTIFOLIA
+.1	9	AMELANCHIER	SPP.
+.1	28	BETULA	PAPYRIFERA
+.1	75	GAULTHERIA	PROCUMBENS
+.1	134	PICEA	RUBENS
	L 1C		
5.5	120	MOSS	
1.2	97	LICHENS	

TOTAL SPECIES = 18

REF. NO.: 1298 MAP-UNIT-NO.: 31 DATE(DA.MO.YR)---28-07-
LOCATION: DUCK HARBOR PATH, IAH, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC12 STAND OF POLE TO SAWLOG SIZE SPRUCE, DENSE EXCEPT FOR ONE EDGE OF REL
THAT IS ON EDGE OF A BLOWDOWN WITH SPRUCE REGENERATION AND HAY-SCENTED FERN.
FIR APPEARS TO HAVE DROPPED OUT 40-60 YEARS AGO, COMPOSING SLIGHTLY MORE THA
HALF OF DOWNED FUEL. FEW BOULDERS ON SURFACE BUT LOTS OF ROCKS BENEATH.
SOIL: ORGANIC (SOME PLACES PEATY) HORIZON ABOVE GROUND ROCK OR A BIT (1 CM)
OF FINE ORGANIC SOIL.
NFORS G. NFFL-10.

COVER/ABUNDANCE	REF.NO.	GENUS SPECIES
	E6-7C	
5.5	134	PICEA RUBENS
+.2	28	BETULA PAPYRIFERA
+.1	3	ACER RUBRUM
	E3-5B	
1.1	134	PICEA RUBENS
	H1-2A	
+.2	57	DENNSTAEDTIA PUNCTILOBULA
+.1	112	MAIANTHEMUM CANADENSE
	E1-2B	
1.2	134	PICEA RUBENS
+.1	1	ABIES BALSAMEA
+.1	3	ACER RUBRUM
+.1	9	AMELANCHIER SPP.
+.1	26	BETULA PAPYRIFERA
R.1	2	ACER PENSYLVANICUM
R.1	187	SORBUS AMERICANA
	L 1P	
3.3	120	MOSS
+.2	97	LICHENS

TOTAL SPECIES = 11

REF. NO.: 13RA MAP-UNIT-NO.: 01 DATE (DA.MO.YR)---29-07-80
LOCATION: WEST HEAD, IAH, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS---

AC13 SPRUCE-FIR STAND WITH PATCHY AGE AND SIZE DISTRIBUTION. MANY DOWNED AND STANDING DEAD TREES. ONE CORNER OF RELEVE GOES INTO AN AREA OF DENSE REGENERATION. OTHERWISE EXTREMELY FEW SMALL (6"-6') TREES. FIR IS DROPPING OUT OF THE STAND. SOIL: PEATY WITH CHARCOAL , UP TO 9" DEEP.
NFORS G. NFFL 10.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 6I		
3.1	134	PICEA	RUBENS
2.1	1	ABIES	BALSAMEA
2.1	132	PICEA	GLAUCA
	M 4P		
2.2	187	SORBUS	AMERICANA
2.1	134	PICEA	RUBENS
1.2	28	BETULA	PAPYRIFERA
1.1	1	ABIES	BALSAMEA
	E3-4B		
1.1	134	PICEA	RUBENS
+.1	132	PICEA	GLAUCA
	H1-2R		
1.4	212	VIOLA	SPP.
1.2	42	CIRCAEA	ALPINA
1.2	112	MAIANTHEMUM	CANADENSE
+.3	48	COPTIS	GROENLANDICA
+.2	62	DRYOPTERIS	SPP.
+.2	77	GOODYERA	TESSELATA
+.2	196	TRIENTALIS	BOREALIS
+.1	84	HERB	
R.1	118	MONOTROPA	HYPOPITHYS
R.1	150	PRENANTHES	SPP.
	G1-2A		
+.2	78	GRAMINEAE	
	L 1P		
3.4	120	MOSS	
1.3	97	LICHENS	
	M 1B		
1.1	187	SORBUS	AMERICANA
+.1	1	ABIES	BALSAMEA
+.1	28	BETULA	PAPYRIFERA
+.1	132	PICEA	GLAUCA
+.1	134	PICEA	RUBENS
+.1	203	VACCINIUM	VITIS-IDAEA

TOTAL-SPECIES = 19

REF. NO.: 13RB MAP-UNIT-NO.: 01 DATE(DA.MO.YR)---30-07
LOCATION: WEST HEAD, IAH, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC13 RED SPRUCE-FIR-PAPER BIRCH STAND. DENSE, MAINLY POLE-SIZED TREES. A GAP IN ONE CORNER OF THE RELEVE CAUSED BY BLOWDOWN OF DOMINANT TREES AND DEATH OF INTERMEDIATE TREES. FIR IS DROPPING OUT OF THE STAND, PROVIDING THE MAJORITY OF THE DOWNED FUEL LOAD. SOME SPRUCE REGENERATION IN THE GAP BUT OTHERWISE ALMOST NOTHING BELOW THE MAIN CANOPY. SOME BIRCH DROPPING OUT. AC13 IS VERY CLOSE TO OCEAN AND SEEMS TO HAVE SHORTER-LIVED TREES THAN OTHER STANDS SEEN THUS FAR. THIS RELEVE TYPICAL OF PLOTS FROM FL ON. SOIL: SHALLOW PEATY SOIL WITH ROCK NOT FAR BELOW SURFACE, NO MINERAL SOIL. NFORS H. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E6-7I		
4.3	134	PICEA RUBENS	
1.1	1	ABIES BALSAMEA	
1.1	28	BETULA PAPYRIFERA	
	E4-5A		
+.1	134	PICEA RUBENS	
	G1-2A		
+.2	33	CAREX SPP.	
	E1-2B		
1.3	134	PICEA RUBENS	
+.2	204	VACCINIUM SPP.	
+.1	28	BETULA PAPYRIFERA	
R.1	1	ABIES BALSAMEA	
	L 1C		
5.5	120	MOSS	
1.2	97	LICHENS	
	H 1A		
+.4	112	MAIANTHEMUM CANADENSE	

TOTAL SPECIES = 8

REF. NO.: 14RA MAP-UNIT-NO.: CI DATE(DA.MO.YR)---30-07
LOCATION: PAT'S BROOK, IAH, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--C.025 HA.

REMARKS----

AC14 SELECTIVE CUT 1975. REMAINING TREES PREDOMINATELY RED SPRUCE. OLD SK
ROAD GOES THROUGH RELEVE. IT'S MOSTLY GRASS-COVERED. HAY-SCENTED FERN IN LA
STANDS. PILES OF SLASH. CHARCOAL. SCATTERED BOULDERS ON SURFACE. LOTS OF RC
ABOUT 1' BENEATH. SOIL: MORR HUMUS. NO A2 APPARENT. DEEP ORGANIC HORIZON
ABOVE B - DARK BROWN SANDY LOAM TO GREY-BROWN LOAMY SAND.
NFORS K. NFFL 11.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E6-7P		
3.1	134	PICEA	RUBENS
1.1	132	PICEA	GLAUCA
R.1	28	BETULA	PAPYRIFERA
R.1	195	THUJA	OCCIDENTALIS
	E3-5B		
1.1	134	PICEA	RUBENS
+.1	132	PICEA	GLAUCA
	H1-2P		
3.5	57	DENNSTAEDTIA	PUNCTILOBULA
1.4	169	RUMEX	ACETOSELLA
+.3	111	LYSIMACHIA	QUADRIFOLIA
+.3	212	VIOLA	SPP.
+.2	46	COMPOSITAE	
+.2	112	MAIANTHEMUM	CANADENSE
+.2	153	PTERIDIUM	AQUILINUM
+.2	179	SENECIO	VULGARIS
+.2	196	TRIENTALIS	BOREALIS
R.1	62	DRYOPTERIS	SPP.
	G1-2R		
2.4	78	GRAMINEAE	
+.2	33	CAREX	SPP.
	M1-2B		
1.4	28	BETULA	PAPYRIFERA
+.3	168	RUBUS	SPP.
+.2	204	VACCINIUM	SPP.
+.1	132	PICEA	GLAUCA
+.1	134	PICEA	RUBENS
+.1	195	THUJA	OCCIDENTALIS

TOTAL SPECIES = 18

SURVEYOR--KAREN SAUNDERS — AREA COVERED--0.025 HA.

REMARKS----

AC15 RED SPRUCE-YELLOW BIRCH FOREST. LOTS OF FALLEN PAPER BIRCH. MOSTLY ROTTEN. SOME DOWNED RED SPRUCE. THUJA & FIR. STREAM RUNS THROUGH ONE CORNER OF RELEVE. BELT OF SPRUCE REGENERATION (1-11') AND LYCOPODS ALONG A SMALL SLOPE. SOIL: VERY SHALLOW. A2 SELDOM PRESENT, WHERE IS , 1CM , OFTEN ONLY AN ORGANIC HORIZON ABOVE ROCK. NFORS H. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 7B		
1.1	138	PINUS STROBUS	
	M 5I		
3.1	134	PICEA RUBENS	
2.1	26	BETULA ALLEGHENIENSIS	OR BE
2.1	195	THUJA OCCIDENTALIS	
1.2	3	ACER RUBRUM	
1.1	2	ACER PENSYLVANICUM	
	E4-5B		
1.1	134	PICEA RUBENS	
+.1	1	ABIES BALSAMEA	
+.1	195	THUJA OCCIDENTALIS	
	E2-3R		
2.3	134	PICEA RUBENS	
	H1-2R		
2.4	104	LYCOPODIUM ANNOTINUM	
+.3	130	OXALIS MONTANA	
+.2	62	DRYOPTERIS SPP.	
+.2	119	MONOTROPA UNIFLORA	
+.2	153	PTERIDIUM AQUILINUM	
+.1	112	MAIANTHEMUM CANADENSE	
+.1	196	TRIENTALIS BOREALIS	
	G1-2A		
+.2	33	CAREX SPP.	
	L 1B		
1.3	120	MOSS	
+.3	97	LICHENS	
	M 1B		
+.2	26	BETULA ALLEGHENIENSIS	OR BE
+.1	2	ACER PENSYLVANICUM	
+.1	3	ACER RUBRUM	
+.1	134	PICEA RUBENS	
+.1	138	PINUS STROBUS	
+.1	195	THUJA OCCIDENTALIS	

REF. NO.: 16RA MAP-UNIT-NO.: 14 DATE(DA.MO.YR)---07-08-
LOCATION: LONG POND, MDI, MAINE
SURVEYOR--KAREN-SAUNDERS AREA-COVERED--0.025-HA.

REMARKS----

AC16 HARDWOOD STAND, MOSTLY PAPER BIRCH. TALL UNDERSTORY OF RED SPRUCE (REACHING TO BOTTOM OF MAIN CANOPY). VERY LITTLE HERBACEOUS GROUND COVER. SEEDLINGS MAINLY FIRST OR SECOND YEAR RED AND STRIPED MAPLE. PIT AND MOUND BOULDERS INFREQUENTLY SCATTERED, SOMETIMES MOSS-COVERED. CHARCOAL IN DUFF. SOIL: MOSTLY MULL HUMUS BUT MORRISH IN PLACES. A2 1/2-1 CM DEEP WEAKLY PODZOLIZED, OVER YELLOW-BROWN LOAMY SAND B. NFORS R. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D 6P		
3.2	28	BETULA PAPYRIFERA	
1.2	2	ACER PENSYLVANICUM	
1.2	3	ACER RUBRUM	
1.2	26	BETULA ALLEGHENIENSIS OR BE	
1.1	136	PINUS RESINOSA	
	E3-6I		
4.4	134	PICEA RUBENS	
+.1	1	ABIES BALSAMEA	
	D 2A		
+.2	2	ACER PENSYLVANICUM	
+.2	9	AMELANCHIER SPP.	
+.2	26	BETULA ALLEGHENIENSIS OR BE	
+.2	28	BETULA PAPYRIFERA	
	H1-2A		
+.1	196	TRIENTALIS BOREALIS	
	L 1B		
1.3	120	MOSS	
	D 1A		
+.2	204	VACCINIUM SPP.	
+.1	2	ACER PENSYLVANICUM	
+.1	3	ACER RUBRUM	
+.1	30	BETULA SPP	
+.1	134	PICEA RUBENS	
+.1	138	PINUS STROBUS	

TOTAL SPECIES = 13

REF. NO.: 16RB MAP-UNIT-NO.: 14 DATE(DA.MO.YR)---07-08-80
LOCATION: LONG POND, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC16 MIXED HARDWOODS MOSTLY BIRCH AND MAPLE, WITH AN UNDERSTORY OF SPRUCE FRO 6" TO 30' TALL. RELEVE AREA IS PARTLY A DAMPISH DRAINAGE AREA WITH CLAY SOIL. THE REST OF IT IS SANDY LOAM WITH SLIGHTLY PODZOLIZED A2. NO CHARCOAL SEEN, BUT ANY PRESENT WOULD PROBABLY HAVE WASHED OUT. SCATTERED BOULDERS ON SURFACE, MOSTLY MOSS-COVERED. NFORS 3. NFF. 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D6-7I		
2.2	3	ACER RUBRUM	
2.2	26	BETULA ALLEGHENIENSIS	OR BE
2.2	28	BETULA PAPYRIFERA	
2.1	70	FRAXINUS NIGRA	
1.2	2	ACER PENSYLVANICUM	
1.2	66	FAGUS GRANDIFOLIA	
1.1	4	ACER SACCHARUM	
+.2	9	AMELANCHIER SPP.	
+.1	134	PICEA RUBENS	
	E3-5P		
3.3	134	PICEA RUBENS	
1.1	1	ABIES BALSAMEA	
+.2	2	ACER PENSYLVANICUM	
+.2	26	BETULA ALLEGHENIENSIS	OR BE
	H1-2R		
2.3	104	LYCOPODIUM ANNOTINUM	
+.2	48	COPTIS GROENLANDICA	
+.2	57	DENNSTAEDTIA PUNCTILOBULA	
+.2	196	TRIENTALIS BOREALIS	
+.2	212	VIOLA SPP.	
+.1	112	MAIANTHEMUM CANADENSE	
R.1	84	HERB	
	G1-2A		
+.2	33	CAREX SPP.	
+.2	78	GRAMINEAE	
	H1-2B		
1.1	134	PICEA RUBENS	
+.2	30	BETULA SPP	
+.2	204	VACCINIUM SPP.	
+.1	2	ACER PENSYLVANICUM	
+.1	3	ACER RUBRUM	
+.1	4	ACER SACCHARUM	
+.1	70	FRAXINUS NIGRA	
+.1	138	PINUS STROBUS	
	L 1R		
2.3	120	MOSS	

TOTAL SPECIES = 23

REF. NO.: 178A MAP-UNIT-NO.: 01 DATE(DA.MO.YR)---06-08-8
LOCATION: SCHOODIC PENNINSULA, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC17 SPRUCE STAND ON ROCKS OVERLAIN BY MOSS AND PEAT. TWO AGE BRACKETS SEEM TO BE PRESENT IN OVERSTORY - OLDER, BRANCHY TREES THAT ARE SCARRED AND MIS-SHAPPEN, AND YOUNGER, WELL-PRUNED TREES DATING TO AGE OF A SCAR ON AN OLDER TREE. TWO OPEN AREAS IN RELEVE - ONE ON A ROCKY PLACE COVERED WITH SHRUBS, THE OTHER IN A DEPRESSION, WITH SPRUCE AND FIR REGENERATION. MINERAL SOIL NONEXISTENT OVER MUCH OF THE SITE - WHERE PRESENT IT'S FINE-TEXTURED. CHARCOAL. NFORS-H. NFFL-8.

COVER/ABUNDANCE	REF.NO.	GENUS ----- SPECIES
	E - 6I	
4.5	134	PICEA RUBENS
+.2	3	ACER RUBRUM
R.1	195	THUJA OCCIDENTALIS
	E4-5B	
1.1	1	ABIES BALSAMEA
1.1	134	PICEA RUBENS
	S2-3R	
2.4	93	KALMIA ANGUSTIFOLIA
1.2	76	GAYLUSSACIA BACCATA
+.2	204	VACCINIUM SPP.
R.1	9	AMELANCHIER SPP.
	H1-2A	
+.2	51	CORNUS CANADENSIS
+.1	153	PTERIDIUM AQUILINUM
+.1	196	TRIENTALIS BOREALIS
	L 1C	
4.5	120	MOSS
2.3	97	LICHENS
	M 1B	
1.2	93	KALMIA ANGUSTIFOLIA
1.2	203	VACCINIUM VITIS-IDAEA
+.2	204	VACCINIUM SPP.
+.1	1	ABIES BALSAMEA
+.1	3	ACER RUBRUM
+.1	76	GAYLUSSACIA BACCATA
+.1	134	PICEA RUBENS
+.1	187	SORBUS AMERICANA
R.1	209	VIBURNUM CASSINOIDES

TOTAL SPECIES = 16 56

REF. NO.: 18RA MAP-UNIT-NO.: 01 DATE(DA.MO.YR)---08-06-
LOCATION: WEST MOUNTAIN, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC18 SPRUCE STAND WITH POCKETS OF REGENERATION UP TO 2-4' TALL, APPARENTLY WHERE POCKETS OF FIR FORMERLY STOOD. BUT VERY LITTLE FIR REGENERATION. LOTS SCATTERED. LONG-DEAD FUEL ON GROUND,MOSTLY FIR. SOME PIT & MOUND TOPOGRAPHY. FEW BOULDERS ON SURFACE. CHARCOAL. SOIL: MORR HUMUS, NO A2 SEEN, SANDY B. NFDRS H. NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E6-7C		
4.4	134	PICEA RUBENS	
1.2	25	BETULA PAPYRIFERA	
1.1	3	ACER RUBRUM	
1.1	9	AMELANCHIER SPP.	
1.1	195	THUJA OCCIDENTALIS	
+.1	1	ABIES BALSAMEA	
	E4-5A		
+.1	134	PICEA RUBENS	
	E2-3R		
+.1	1	ABIES BALSAMEA	
+.1	9	AMELANCHIER SPP.	
+.1	134	PICEA RUBENS	
	H1-2A		
+.2	153	PTERIDIUM AQUILINUM	
+.1	112	MAIANTHEMUM CANADENSE	
+.1	196	TRIENTALIS BOREALIS	
	G1-2A		
+.2	33	CAREX SPP.	
+.2	78	GRAMINEAE	
	M 1B		
1.2	134	PICEA RUBENS	
+.2	204	VACCINIUM SPP.	
+.1	1	ABIES BALSAMEA	
+.1	3	ACER RUBRUM	
+.1	9	AMELANCHIER SPP.	
+.1	138	PINUS STROBUS	
+.1	187	SORBUS AMERICANA	
+.1	209	VIBURNUM CASSINOIDES	

TOTAL SPECIES = 15

REF. NO.: 19RB MAP-UNIT-NO.: 14 DATE(DA.MO.YR) ---13-08-80
LOCATION: WEST MOUNTAIN, MOI, MAINE
SURVEYOR--KAREN-SAUNDERS AREA COVERED--0.025 HA.

REMARKS

AC19 OVERSTORY HAS LARGE SPRUCE AND ASPEN. SMALL BIRCH AND MAPLE. THERE APPEARS TO HAVE BEEN A MAJOR DISTURBANCE ABOUT 100 YEARS AGO, A MINOR ONE ABOUT 60-70 YEARS AGO. CHARCOAL. SOIL: MOSTLY NO A2 (IN SMALL PLACES A2 WELL-PODZOLIZED 2-3 CM) MULL HORIZON GRADING INTO SANDY LOAM. NFORS R. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M6-7C		
3.2	3	ACER	RUBRUM
3.1	134	PICEA	RUBENS
1.2	28	BETULA	PAPYRIFERA
1.1	146	POPULUS	GRANDIDENTATA
1.1	195	THUJA	OCCIDENTALIS
R.1	4	ACER	SACCHARUM
R.1	136	PINUS	RESINOSA
	M4-5B		
1.1	1	ABIES	BALSAMEA
1.1	134	PICEA	RUBENS
+.1	2	ACER	PENSYLVANICUM
+.1	3	ACER	RUBRUM
	E3-4P		
3.3	134	PICEA	RUBENS
1.1	1	ABIES	BALSAMEA
+.2	2	ACER	PENSYLVANICUM
	H1-2B		
1.2	153	PTERIDIUM	AQUILINUM
+.2	48	COPTIS	GROENLANDICA
+.1	112	MAIANTHEMUM	CANADENSE
+.1	196	TRIENTALIS	BOREALIS
R.1	186	SOLIDAGO	SPP.
	G1-2A		
+.2	33	CAREX	SPP.
+.2	78	GRAMINEAE	
	L 1B		
1.3	120	MOSS	
+.2	97	LICHENS	
	M 1A		
+.2	1	ABIES	BALSAMEA
+.2	204	VACCINIUM	SPP.
+.1	2	ACER	PENSYLVANICUM
+.1	3	ACER	RUBRUM
+.1	9	AMELANCHIER	SPP.
+.1	134	PICEA	RUBENS

TOTAL SPECIES = 20

REF. NO.: 20RA MAP-UNIT-NO.: 14 DATE(DA.MO.YR)---14-08-8
LOCATION: HOGDON POND, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS---

AC20 SPRUCEII - PARKLIKE, WITH LARGE PATCHES OF BARE ROCK (LICHENS OFTEN PRESENT) COVERING MUCH OF THE RELEVE. AN OLD STUMP HAS AT LEAST TWO SETS OF FIRE SCARS, SUGGESTING REPEATED BURNING, PROBABLY AT LEAST ONE FIRE SEVERE. TREES ARE COMING IN GRADUALLY AS LICHENS AND SHRUBS PREPARE THE WAY. UPSLOPE OF HERE - MORE BARE ROCK, PITCH PINE AND RED PINE; DOWNSLOPE - THE MIXED HARDWOODS OF AC16. CHARCOAL. SOIL: OVER MUCH OF RELEVE EITHER BARE ROCK OR MOSS AND LICHENS OVER 1-3 CM ORGANIC MATTER OVER ROCK. LESS OFTEN, ORGANIC MATTER, MOSTLY FROM ERICACEOUS SHRUBS OVER POWDERED AND CRUMBLY ROCK, SOMETIMES MIXED WITH BLACK ORGANIC SOIL. NFOPS Q. NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
		E 6A	
+.1	134	PICEA	RUBENS
		E3-5R	
2.1	134	PICEA	RUBENS
1.2	3	ACER	RUBRUM
1.2	29	BETULA	POPULIFOLIA
1.1	137	PINUS	RIGIDA
1.1	138	PINUS	STROBUS
+.1	1	ABIES	BALSAMEA
		S1-3P	
2.4	76	GAYLUSSACIA	BACCATA
2.3	93	KALMIA	ANGUSTIFOLIA
2.2	204	VACCINIUM	SPP.
1.2	75	GAULTHERIA	PROCUMBENS
1.2	122	MYRICA	PENSYLVANICA
1.1	16	ARONIA	MELANOCARPA
+.2	201	VACCINIUM	CORYMBOSUM
		H1-2A	
+.2	149	POTENTILLA	TRIDENTATA
+.2	153	PTERIDIUM	AQUILINUM
+.1	112	MAIANTHEMUM	CANADENSE
+.1	114	MELAMPYRUM	LINEARE
		G1-2A	
+.2	78	GRAMINEAE	
		M1-2A	
+.3	91	JUNIPERUS	COMMUNIS
+.1	3	ACER	RUBRUM
+.1	9	AMELANCHIER	SPP.
+.1	134	PICEA	RUBENS
+.1	138	PINUS	STROBUS
		L 1P	
3.4	97	LICHENS	
1.3	120	MOSS	

REF. NO.: 20RB MAP-UNIT-NO.: 01 DATE (DA.MO.YR)---14-08-80
LOCATION: HOGDON POND, MDI, MAINE
SURVEYOR--KAREN SAUNDERS - AREA COVERED--0.025 HA.

REMARKS----

AC20 SPRUCE II. DAMP, SLIGHT DEPRESSION, APPEARS TO HAVE BEEN BURNED LESS SEVERELY THAN SURROUND. AREAS. DEEPER SOIL. PART WITH LITTLE ERICACEOUS COVER. OTHER PARTS WITH MORE ERICADS, LESS TREES, BALD IN SPOTS. SCATTERED AREAS LIKE THIS THROUGHOUT STAND APPEAR TO HAVE SURVIVED FIRES, PROVIDING SEED SOURCE FOR REST STAND. MOST OLDER TREES ON RELEVE-EDGES HAVE FIRE SCARS. PROBABLY A FIRE 110-120 YEARS AGO. SOIL: UNDER SPRUCES: DEEP MORR HUMUS (AS MUCH AS 25 CM) OVER BLACK A. 1-2 CM. RED-BROWN B. UP TO 10 CM. OR CRUSHED STONE. OTHERWISE ORGANIC MATTER 1-6 CM OVER CRUSHED STONE. IN SOME PLACES (LESS THAN 25 %) BARE ROCK. NFDRS 0. NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 5P		
2.1	134	PICEA	RUBENS
1.2	3	ACER	RUBRUM
1.1	133	PICEA	MARIANA
1.1	195	THUJA	OCCIDENTALIS
+.1	95	LARIX	LARICINA
	D 4B		
1.2	201	VACCINIUM	CORYMBOSUM
+.2	90	ILEX	VERTICILLATA
+.2	209	VIBURNUM	CASSINOIDES
	H3-5R		
1.2	3	ACER	RUBRUM
1.1	133	PICEA	MARIANA
1.1	134	PICEA	RUBENS
1.1	138	PINUS	STROBUS
+.1	1	ABIES	BALSAMEA
+.1	195	THUJA	OCCIDENTALIS
	S1-3P		
2.3	76	GAYLUSSACIA	BACCATA
1.2	93	KALMIA	ANGUSTIFOLIA
1.2	204	VACCINIUM	SPP.
+.2	16	ARONIA	MELANOCARPA
+.2	75	GAULTHERIA	PROCUMBENS
+.2	201	VACCINIUM	CORYMBOSUM
+.1	90	ILEX	VERTICILLATA
+.1	209	VIBURNUM	CASSINOIDES
	H1-2B		
1.2	153	PTERIDIUM	AQUILINUM
+.2	51	CORNUS	CANADENSIS
+.1	112	MAIANTHEMUM	CANADENSE
+.1	196	TRIENTALIS	BOREALIS
	G1-2A		
+.2	78	GRAMINEAE	
	M1-2B		
1.1	134	PICEA	RUBENS
+.1	3	ACER	RUBRUM
+.1	9	AMELANCHIER	SPP.
+.1	133	PICEA	MARIANA
+.1	138	PINUS	STROBUS
+.1	195	THUJA	OCCIDENTALIS
	L 1B		
1.3	97	LICHENS	
1.3	120	MOSS	

TOTAL SPECIES = 23

REF. NO.: 219A MAP-UNIT-NO.: 01 DATE(DA.MO.YR)---28-08-80
LOCATION: SCHOODIC PENNINSULA, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC21 JACK PINE STAND ALONG LOOP ROUTE ACROSS FROM OCEAN. NO FIRE-SCARRED TREES. LOTS OF BARE BEDROCK. SMALL AND LARGE BOULDERS. SEVERAL JACK PINE SEEDLINGS FOUND CHARCOAL. SOIL: SHALLOW TO NONEXISTENT. O.M. MOSTLY - SOMETIMES OVER GREY SAND AND CRUSHED ROCK. NFORS 0. NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E4-5P		
2.1	134	PICEA	RUBENS
2.1	135	PINUS	BANKSIANA
1.1	132	PICEA	GLAUCA
	M 3R		
2.1	134	PICEA	RUBENS
1.1	132	PICEA	GLAUCA
1.1	135	PINUS	BANKSIANA
+.1	1	ABIES	BALSAMEA
+.1	9	AMELANCHIER	SPP.
R.1	28	BETULA	PAPYRIFERA
R.1	151	PRUNUS	PENSYLVANICA
	S1-3I		
3.4	76	GAYLUSSACIA	BACCATA
2.4	93	KALMIA	ANGUSTIFOLIA
1.3	63	EMPETRUM	NIGRUM
1.3	203	VACCINIUM	VITIS-IDAEA
1.3	204	VACCINIUM	SPP.
+.2	7	ALNUS	CRISPA
+.2	16	ARONIA	MELANOCARPA
+.2	123	NEMOPANTHUS	MUCRONATA
+.2	158	SPIRAEA	LATIFOLIA
+.1	209	VIBURNUM	CASSINOIDES
R.1	165	ROSA	SPP.
	H1-2A		
+.1	14	ARALIA	NUDICAULIS
+.1	51	CORNUS	CANADENSIS
+.1	112	MAIANTHEMUM	CANADENSE
+.1	149	POTENTILLA	TRIDENTATA
+.1	196	TRIENTALIS	BOREALIS
	E1-2B		
1.1	134	PICEA	RUBENS
1.1	135	PINUS	BANKSIANA
+.1	132	PICEA	GLAUCA
	L 1P		
2.3	97	LICHENS	
2.3	120	MOSS	
	G 1A		
2.3	78	GRAMINEAE	

TOTAL SPECIES = 26

REF. NO.: 223A MAP-UNIT-NO.: 01 DATE(DA.MO.YR)---19-08-
LOCATION: OTTER POINT, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

AC22 LARGE BLOWDOWN WITH FEW STANDING SPRUCES, LARGE PATCHES OF REGENERATI CHARCOAL. ALTHOUGH NO REALLY OLD TREES WITHIN RELEVE, PROBABLY STILL SOME STANDING IN OTHER PARTS OF THE BLOWDOWN. SOIL: O.M. OVER POWDERED PINKISH RO NFDRS G. NFFL 10.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M 6B		
1.1	26	BETULA ALLEGHENIENSIS-- OR- BE	
1.1	134	PICEA RUBENS	
	M3-5P		
3.3	1	ABIES BALSAMEA	
1.2	151	PRUNUS PENSYLVANICA	
1.1	28	BETULA PAPYRIFERA	
1.1	134	PICEA RUBENS	
	H1-3R		
2.4	112	MAIANTHEMUM CANADENSE	
2.3	62	DRYOPTERIS SPP.	
+.2	18	ASTER ACUMINATUS	
+.2	22	ASTER UMBELLATUS	
+.2	51	CORNUS CANADENSIS	
+.1	14	ARALIA NUDICAULIS	
+.1	111	LYSIMACHIA QUADRIFOLIA	
+.1	165	SOLIDAGO RUGOSA	
+.1	196	TRIENTALIS BOREALIS	
	G1-2R		
2.4	76	GRAMINEAE	
	M1-2R		
1.3	167	RUBUS IDAEUS	
1.2	151	PRUNUS PENSYLVANICA	
+.3	204	VACCINIUM SPP.	
+.2	28	BETULA PAPYRIFERA	
+.2	123	NEMOPANTHUS MUCRONATA	
+.2	164	RIBES GLANDULOSUM	
+.2	187	SORBUS AMERICANA	
+.1	1	ABIES BALSAMEA	
+.1	134	PICEA RUBENS	
	L 1A		
+.3	120	MOSS	

TOTAL SPECIES = 21

REF. NO.: 23PA MAP-UNIT-NO.: 09 DATE(DA.MO.YR)---21-08-80
LOCATION: DAY MOUNTAIN, MOI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS

4023 MIXED HARDWOODS AND CONIFERS. ASPEN SCATTERED THROUGHOUT AND PREDOMINATING IN SOME AREAS. PROBABLY A FIRE ABOUT 90 YEARS AGO. INFREQUENT BOULDERS ON SURFACE. SOIL: MULL HUMUS, NO A2 APPARENT, B FINE YELLOW SANDY LOAM SOIL ABOUT 1' DEEP. NFORS R. NFFL 3.
A FAIR AMOUNT OF DOWNED TREES, MOSTLY ASPEN AND SOME SPRUCE. SHALLOW GULLY RUNS THROUGH RELEVE.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
		M5-70	
3.1	146	POPULUS	GRANDIDENTATA
2.2	70	FRAXINUS	NIGRA
1.2	3	ACER	RUBRUM
1.2	4	ACER	SACCHARUM
1.1	26	BETULA	ALLEGHENIENSIS OR BE
1.1	28	BETULA	PAPYRIFERA
1.1	134	PICEA	RUBENS
1.1	138	PINUS	STROBUS
		M 5P	
2.2	2	ACER	PENSYLVANICUM
2.1	2	ACER	PENSYLVANICUM
2.1	134	PICEA	RUBENS
1.1	26	BETULA	ALLEGHENIENSIS OR BE
+.2	3	ACER	RUBRUM
		M3-42	
2.2	1	ABIES	BALSAMEA
2.2	2	ACER	PENSYLVANICUM
2.1	134	PICEA	RUBENS
		M1-29	
1.+	57	DENNSTAEDTIA	PUNCTILOBULA
+.2	144	POLYSTICHUM	ACROSTICHOIDES
+.1	14	ARALIA	NUDICAULIS
+.1	94	HERB	
+.1	112	MAIANTHEMUM	CANADENSE
+.1	196	TRIENTALIS	BOREALIS
R.1	127	ONOCLEA	SENSIBILIS
		G1-24	
+.3	78	GRAMINEAE	
+.2	33	CAREX	SPP.
		M1-22	
1.2	1	ABIES	BALSAMEA
1.2	2	ACER	PENSYLVANICUM
1.1	146	POPULUS	GRANDIDENTATA
+.2	209	VIBURNUM	CASSINOIDES
+.1	3	ACER	RUBRUM
+.1	5	AMELANCHIER	SPP.
+.1	30	BETULA	SPP
+.1	70	FRAXINUS	NIGRA
+.1	134	PICEA	RUBENS
+.1	138	PINUS	STROBUS
		L 11	
+.3	120	MOSS	

TOTAL SPECIES = 23

REF. NO.: 23RB   MAP-UNIT-NO.: G9   DATE (DA.MO.YR)---21-08-60
LOCATION: DAY MOUNTAIN, NOI, MAINE
SURVEYOR---KAREN SAUNDERS   AREA COVERED---0.025 HA.

REMARKS

AC23 MIXED HARDWOODS AND CONIFERS. FEW DOWNED TREES. FIRE UPSLOPE HAD PROBABLY PETERED OUT AND EITHER BURNED LIGHTLY OR NOT AT ALL HERE. SOIL: MULL-MOR HUMUS ABOVE VERY DEEP FINE CLAY-LOAM. NO CHARCOAL AT BOTTOM OF DUFF, BUT THREE SEPARATE LAYERS IN MINERAL SOIL. PROBABLY WASHED DOWNSLOPE IN THREE SUCCESSIVE STORMS AFTER FIRE UPSLOPE. THIS RELEVE IS AT BOTTOM PART OF SLOPE WITH ONE EDGE OF RELEVE FLAT. FEW DOWNED TREES ARE PAPER BIRCH, ASPEN AND SPRUCE.
NFORS R. NFFL-8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M6-7C		
2.2	4	ACER	SACCHARUM
2.1	26	BETULA	ALLEGHENIENSIS OR SE
2.1	134	PICEA	RUBENS
1.2	3	ACER	RUBRUM
1.2	28	BETULA	PAPYRIFERA
1.1	146	POPULUS	GRANDIDENTATA
1.1	199	TSUGA	CANADENSIS
	M3-5P		
2.3	1	ABIES	BALSAMEA
2.3	134	PICEA	RUBENS
1.2	2	ACER	PENSYLVANICUM
+.1	26	BETULA	ALLEGHENIENSIS OR SE
	H1-2A		
+.2	62	DRYOPTERIS	SPP.
+.2	79	GYMNOCARPIUM	DRYOPTERIS
+.2	133	OXALIS	MONTANA
+.2	200	UVULARIA	SESSILIFOLIA
+.1	14	ARALIA	NUDICAULIS
+.1	23	ASTER	SPP.
+.1	112	MAIANTHEMUM	CANADENSE
+.1	196	TRIENTALIS	BOREALIS
	G1-2A		
+.2	33	CAREX	SPP.
+.2	78	GRAMINEAE	
	X1-2B		
1.2	1	ABIES	BALSAMEA
1.1	134	PICEA	RUBENS
+.2	2	ACER	PENSYLVANICUM
+.2	26	BETULA	ALLEGHENIENSIS OR SE
+.2	28	BETULA	PAPYRIFERA
+.1	3	ACER	RUBRUM
+.1	4	ACER	SACCHARUM
+.1	9	AMELANCHIER	SPP.
+.1	138	PINUS	STROBUS
	L 1B		
1.3	120	MOSS	

TOTAL SPECIES = 22

REF. NO.: 23FA MAP-UNIT-NO.: C9 DATE(DA.MO.YR)---21-08-6
LOCATION: DAY MOUNTAIN, MDI, MAINE
SURVEYOR--KAREN SAUNDERS- AREA-COVERED--0.025 HA.-

REMARKS----

AC23 MIXED HARDWOODS AND CONIFERS. ASPEN SCATTERED THROUGHOUT AND PREDOM-INATING IN SOME AREAS. PROBABLY A FIRE ABOUT 90 YEARS AGO. INFREQUENT BOULDERS ON SURFACE. SOIL: MULL HUMUS, NO A2 APPARENT. B-FINE YELLOW SANDY LO SOIL ABOUT 1' DEEP. NFURS R. NFFL 8. A FAIR AMOUNT OF DOWNED TREES. MOSTLY ASPEN AND SOME SPRUCE. SHALLOW GULLY RUNS THROUGH RELEVE.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
		M5-7C	
3.1	146	POPULUS GRANDIDENTATA	
2.2	70	FRAXINUS NIGRA	
1.2	3	ACER RUBRUM	
1.2	4	ACER SACCHARUM	
1.1	26	BETULA ALLEGHENIENSIS OR BE	
1.1	28	BETULA PAPYRIFERA	
1.1	134	PICEA RUBENS	
1.1	138	PINUS STROBUS	
		M 5P	
2.2	2	ACER PENSYLVANICUM	
2.1	2	ACER PENSYLVANICUM	
2.1	134	PICEA RUBENS	
1.1	26	BETULA ALLEGHENIENSIS OR BE	
+.2	3	ACER RUBRUM	
		M3-4R	
2.2	1	ABIES BALSAMEA	
2.2	2	ACER PENSYLVANICUM	
2.1	134	PICEA RUBENS	
		H1-2B	
1.4	57	DENNSTAEDTIA PUNCTILOBULA	
+.2	144	POLYSTICHUM ACROSTICHOIDES	
+.1	14	ARALIA NUDICAULIS	
		HERB	
+.1	84	MAIANTHEMUM CANADENSE	
+.1	112		
+.1	196	TRIENTALIS BOREALIS	
R.1	127	ONOCLEA SENSIBILIS	
		G1-2A	
+.3	78	GRAMINEAE	
+.2	33	CAREX SPP.	
		M1-2R	
1.2	1	ABIES BALSAMEA	
1.2	2	ACER PENSYLVANICUM	
1.1	146	POPULUS GRANDIDENTATA	
+.2	209	VIBURNUM CASSINOIDES	
+.1	3	ACER RUBRUM	
+.1	9	AMELANCHIER SPP.	
+.1	30	BETULA SPP	
+.1	70	FRAXINUS NIGRA	
+.1	134	PICEA RUBENS	
+.1	138	PINUS STROBUS	
		L 1A	
+.3	120	MOSS	

REF. NO.: 23RB MAP-UNIT-NO.: C9 DATE (DA.MO.YR)---21-08-80
LOCATION: DAY MOUNTAIN, MOI, MAINE
SURVEYOR—KAREN SAUNDERS—AREA-COVERED—0.025-HA.

REMARKS

AC23 MIXED HARDWOODS AND CONIFERS. FEW DOWNED TREES. FIRE UPSLOPE HAD PROBABLY PETERED OUT AND EITHER BURNED LIGHTLY OR NOT AT ALL HERE. SOIL: MULL-MOR HUMUS ABOVE VERY DEEP FINE CLAY-LOAM. NO CHARCOAL AT BOTTOM OF DUFF, BUT THREE SEPARATE LAYERS IN MINERAL SOIL. PROBABLY WASHED DOWNSLOPE IN THREE SUCCESSIVE STORMS AFTER FIRE UPSLOPE. THIS RELEVE IS AT BOTTOM PART OF SLOPE WITH ONE EDGE OF RELEVE FLAT. FEW DOWNED TREES ARE PAPER BIRCH, ASPEN AND SPRUCE.
NFORS R.-NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M6-7C		
2.2	4	ACER	SACCHARUM
2.1	26	BETULA	ALLEGHENIENSIS OR BE
2.1	134	PICEA	RUBENS
1.2	3	ACER	RUBRUM
1.2	28	BETULA	PAPYRIFERA
1.1	146	POPULUS	GRANDIDENTATA
1.1	199	TSUGA	CANADENSIS
	M3-5P		
2.3	1	ABIES	BALSAMEA
2.3	134	PICEA	RUBENS
1.2	2	ACER	PENSYLVANICUM
+.1	26	BETULA	ALLEGHENIENSIS OR BE
	H1-2A		
+.2	62	DRYOPTERIS	SPP.
+.2	79	GYMNOCARPIUM	DRYOPTERIS
+.2	133	OXALIS	MONTANA
+.2	200	UVULARIA	SESSILIFOLIA
+.1	14	ARALIA	NUDICAULIS
+.1	23	ASTER	SPP.
+.1	112	MAIANTHEMUM	CANADENSE
+.1	196	TRIENTALIS	BOREALIS
	G1-2A		
+.2	33	CAREX	SPP.
+.2	78	GRAMINEAE	
	M1-2B		
1.2	1	ABIES	BALSAMEA
1.1	134	PICEA	RUBENS
+.2	2	ACER	PENSYLVANICUM
+.2	26	BETULA	ALLEGHENIENSIS OR BE
+.2	28	BETULA	PAPYRIFERA
+.1	3	ACER	RUBRUM
+.1	4	ACER	SACCHARUM
+.1	9	AMELANCHIER	SPP.
+.1	138	PINUS	STROBUS
	L 1B		
1.3	120	MOSS	

TOTAL SPECIES = 22

REF. NO.: 24EA MAP-UNIT-NO.: 23 DATE(DA.MO.YR)---22-08
LOCATION: CHAMPLAIN MOUNTAIN, IAH, MAINE
SURVEYOR--KAREN SAUNDERS AREA-COVERED--0.025-HA.

REMARKS----

AC24 PITCH PINE STAND WITH RED SPRUCE. SMALL PATCHES OF NEEDLE- NO LICHE
COVERED ROCK SPRINKLED THROUGHOUT. VERY LITTLE REGENERATION. PROBABLY A FIR
ABOUT 97 YEARS AGO, AND ANOTHER, LESS SERIOUS FIRE, ABOUT 121 YEARS AGO.
SOIL: ERICACEOUS, PEATY O.M. OVER CRUSHED ROCK.
NFORS Q. NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M3-5P		
3.1	137	PINUS RIGIDA	
1.1	134	PICEA RUBENS	
+.2	29	BETULA POPULIFOLIA	
	S2-3C		
3.4	76	GAYLUSSACIA BACCATA	
2.4	93	KALMIA ANGUSTIFOLIA	
1.2	122	MYRICA PENSYLVANICA	
+.2	91	JUNIPERUS COMMUNIS	
	H1-2A		
+.1	112	MAIANTHEMUM CANADENSE	
+.1	114	MELAMPYRUM LINEARE	
	M1-2A		
+.1	3	ACER RUBRUM	
+.1	16	ARONIA MELANOCARPA	
+.1	134	PICEA RUBENS	
R.1	9	AMELANCHIER SPP.	
R.1	137	PINUS RIGIDA	
R.1	187	SORBUS AMERICANA	
	S 1P		
3.3	204	VACCINIUM SPP.	
1.2	75	GAULTHERIA PROCUMBENS	
	L 1B		
1.3	97	LICHENS	
+.2	120	MOSS	

TOTAL SPECIES = 17

137

REF. NO.: 25RA MAP-UNIT-NO.: 09 DATE(DA.MO.YR)---26-08-80
LOCATION: CADILLAC MOUNTAIN, MDI, MAINE
SURVEYOR--KAREN SAUNDERS---AREA COVERED--0.025-HA.

REMARKS----

AC25 BIRCH SCRUB FOREST WITH BARE ROCK PATCHES SPRINKLED THROUGHOUT. SCATTERED BOULDERS. STUMPS FROM SALVAGE AND CLEANUP AFTER 1947 FIRE. SPRUCE AND SEED-ORIGIN OAK STUMPS FOUND.-SOIL: A2 WEAKLY PODZOLIZED,-LESS THAN 1-CM, OVER YELLOW-BROWN FINE SANDY LOAM B. NFORS 2. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M3-4C		
3.3	29	BETULA	POPULIFOLIA
2.2	23	ASTER	SPP.
1.2	158	QUERCUS	RUBRA
1.1	1	ABIES	BALSAMEA
1.1	134	PICEA	RUBENS
1.1	151	PRUNUS	PENSYLVANICA
+.2	2	ACER	PENSYLVANICUM
+.2	7	ALNUS	CRISPA
+.2	9	AMELANCHIER	SPP.
+.2	171	SALIX	SP..
+.1	132	PICEA	GLAUCA
+.1	146	POPULUS	GRANDIDENTATA
	H1-2R		
1.3	51	CORNUS	CANADENSIS
1.3	111	LYSIMACHIA	QUADRIFOLIA
1.2	153	PTERIDIUM	AQUILINUM
+.2	112	MAIANTHEMUM	CANADENSE
+.1	12	APOCYNUM	ANDROSAEMIFOLIUM
+.1	14	ARALIA	NUDICAULIS
+.1	22	ASTER	UMBELLATUS
+.1	184	SOLIDAGO	PUBERULA
+.1	196	TRIENTALIS	BOREALIS
	G1-2D		
1.4	78	GRAMINEAE	
	H1-2P		
2.3	204	VACCINIUM	SPP.
1.2	47	COMPTONIA	PEREGRINA
1.2	209	VIBURNUM	CASSINOIDES
1.1	134	PICEA	RUBENS
1.1	146	POPULUS	GRANDIDENTATA
+.2	2	ACER	PENSYLVANICUM
+.2	7	ALNUS	CRISPA
+.2	28	BETULA	PAPYRIFERA
+.2	58	DIERVILLA	LONICERA
+.2	75	GAULTHERIA	PROCUMBENS
+.2	138	PINUS	STROBUS
+.2	171	SALIX	SP..
+.1	9	AMELANCHIER	SPP.
+.1	93	KALMIA	ANGUSTIFOLIA
+.1	151	PRUNUS	PENSYLVANICA
+.1	158	QUERCUS	RUBRA
+.1	166	RUBUS	ALLEGHENIENSIS
+.1	188	SPIRAEA	LATIFOLIA
	L 1B		
1.3	120	MOSS	

TOTAL SPECIES = 33

REF. NO.: R31 MAP-UNIT-NO.: 23 DATE(DA.MO.YR)--06-08-80
LOCATION: SCHOODIC PENNINSULA, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

OPEN JACK PINE STAND BY LOOP AT TOP OF SCHOODIC HEAD ROAD. ABOUT 20% BARE ROCK LEDGE, MOSTLY IN UPPER HALF OF RELEVE. ABUNDANT CHARCOAL. BENEATH THREE RECENTLY BLOWN DOWN SPRUCES. SOIL: MOSTLY PEATY ORGANIC HORIZON OVER ROCK. WHERE MINERAL SOIL IS PRESENT, IT'S FINE-TEXTURED. NO A2. NECPS 0. NEFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E5-6P		
3.2	135	PINUS	BANKSIANA
2.1	134	PICEA	RUBENS
1.2	28	BETULA	PAPYRIFERA
1.1	195	THUJA	OCCIDENTALIS
+.2	3	ACER	RUBRUM
	M3-4C		
1.2	7	ALNUS	CRISPA
1.2	123	NEMOPANTHUS	MUCRONATA
1.1	134	PICEA	RUBENS
1.1	135	PINUS	BANKSIANA
+.2	26	BETULA	PAPYRIFERA
+.2	209	VIBURNUM	CASSINOIDES
+.1	187	SORBUS	AMERICANA
R.1	195	THUJA	OCCIDENTALIS
	S2-3P		
2.4	76	GAYLUSSACIA	BACCATA
2.4	93	KALMIA	ANGUSTIFOLIA
1.3	160	RHODODENDRON	CANADENSE
	H1-2B		
+.2	18	ASTER	ACUMINATUS
+.2	51	CORNUS	CANADENSIS
+.1	14	ARALIA	NUDICAULIS
+.1	112	MAIANTHEMUM	CANADENSE
+.1	153	PTERIDIUM	AQUILINUM
+.1	196	TRIENTALIS	BOREALIS
	G1-2A		
+.3	78	GRAMINEAE	
	D1-2R		
+.2	7	ALNUS	CRISPA
+.2	123	NEMOPANTHUS	MUCRONATA
+.2	209	VIBURNUM	CASSINOIDES
+.1	3	ACER	RUBRUM
+.1	9	AMELANCHIER	SPP.
+.1	28	BETULA	PAPYRIFERA
+.1	134	PICEA	RUBENS
+.1	187	SORBUS	AMERICANA
R.1	135	PINUS	BANKSIANA
	S 1R		
2.4	204	VACCINIUM	SPP.
1.3	203	VACCINIUM	VITIS-IDAEA
+.3	63	EMPETRUM	NIGRUM
+.1	76	GAYLUSSACIA	BACCATA
+.1	93	KALMIA	ANGUSTIFOLIA
+.1	160	RHODODENDRON	CANADENSE
	L 1R		
2.4	120	MOSS	
1.3	97	LICHENS	

TOTAL SPECIES = 25 / 9

REF. NO.: RC2 MAP-UNIT-NO.: 23 DATE (DA.MO.YR)--01-08-8G
LOCATION: CHAMPLAIN MTN. IAH. MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025-HA.

REMARKS

NORTHWEST OF SUMMIT. RELEVE IN OPEN PITCH PINE-RED SPRUCE STAND. ONLY ONE TREE WITHIN RELEVE IS MORE THAN 30' NO PITCH PINES LESS THAN 15 FEET TALL. EXTREMELY FEW RED SPRUCE SEEDLINGS. NONE GROWING WELL. SCATTERED BOULDER FUELS: INFREQUENT SCATTERED DOHNED PITCH PINE AND RED SPRUCE, SOME STANDING DEAD TREES. SOIL: PEATY ORGANIC HORIZON , 1-6CM, SOMETIMES OVER CRUSHED ROCK C HORIZON, 1-5 CM. NFDRS Q. NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 6A		
R.1	134	PICEA	RUBENS
	E 5P		
2.1	134	PICEA	RUBENS
2.1	137	PINUS	RIGIDA
	M3-48		
1.1	134	PICEA	RUBENS
+.2	90	ILEX	VERTICILLATA
+.1	29	BETULA	POPULIFOLIA
R.1	28	BETULA	PAPYRIFERA
	S1-30		
3.4	76	GAYLUSSACIA	BACCATA
3.4	93	KALMIA	ANGUSTIFOLIA
+.2	75	GAULTHERIA	PROCUMBENS
+.2	204	VACCINIUM	SPP.
+.1	16	ARONIA	MELANOCARPA
	H1-29		
1.1	153	PTERIDIUM	AQUILINUM
+.2	112	MAIANTHEMUM	CANADENSE
+.1	51	CORNUS	CANADENSIS
+.1	114	MELAMPYRUM	LINEARE
+.1	196	TRIENTALIS	BOREALIS
R.1	119	MONOTROPA	UNIFLORA
R.1	150	PRENANTHES	SPP.
	L 1A		
+.2	97	LICHENS	
+.2	120	MOSS	
	E 1A		
+.1	134	PICEA	RUBENS

TOTAL SPECIES = 19

REF. NO.: R03 MAP-UNIT-NO.: 24 DATE (DA.MO.YR)--22-08-80
LOCATION: BOWDITCH TRAIL, IAH, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS--

RED MAPLE-ASH SWAMP WITH CONIFER UNDERSTORY. DECIDUOUS STAND STARTED ABOUT 100 YEARS AGO. WHEN IT GOT TALL ENOUGH, CONIFERS CAME IN. ASH STARTING TO DI[E]
NOW,-OVERSTORY BREAKING UP.-MUCK-SOIL,-FULL OF CHARCOAL,-PROBABLY WASHED DOWN FROM SURROUNDING HIGH AREAS.
NFORS R. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D 6I		
3.2	3	ACER RUBRUM	
2.2	187	SORBUS AMERICANA	
R.1	26	BETULA ALLEGHENIENSIS OR BE	
	D3-4B		
1.2	8	ALNUS RUGOSA	
1.2	90	ILEX VERTICILLATA	
	E2-5R		
2.1	134	PICEA RUBENS	
1.1	1	ABIES BALSAMEA	
+.1	138	PINUS STROBUS	
	G1-3B		
1.2	78	GRAMINEAE	
	H1-2C		
5.5	191	SYMPLOCARPUS FOETIDUS	
3.4	110	LYCOPUS SPP.	
2.3	212	VIOLA SPP.	
1.2	78	GRAMINEAE	
+.3	67	FILICALES	
+.2	89	HYPERICUM VIRGINICUM	
+.2	148	POTENTILLA SIMPLEX	
+.1	21	ASTER NEMORALIS	
+.1	196	TRIENTALIS BOREALIS	
	B1-2A		
1.2	90	ILEX VERTICILLATA	
+.2	93	KALMIA ANGUSTIFOLIA	
	L 1P		
3.3	120	MOSS	
	M 1A		
+.1	3	ACER RUBRUM	
+.1	9	AMELANCHIER SPP.	
+.1	30	BETULA SPP	
+.1	69	FRAXINUS AMERICANA	
+.1	90	ILEX VERTICILLATA	
+.1	134	PICEA RUBENS	

TOTAL SPECIES = 22

REF. NO.: R04 MAP-UNIT-NO.: 04 DATE (DA.MO.YR)--22-03-80
LOCATION: HERRICK TRAIL, IAH, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025-HA.

REMARKS----

CEDAR BOG, OVERSTORY 20-40' TALL. NO INDICATION OF FIRE IN BOG, BUT CEDAR EXTENDS INTO SURROUNDING UPLANDS, WHERE IT'S SCARRED. NO SURFACE ROCKS.
SOIL: SPHAGNUM PEAT 1.5-2' DEEP OVER FINE SAND (SHALLOW) OVER ROCKS.
NFORS H. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E5-6I		
4.5	195	THUJA OCCIDENTALIS	
+.1	3	ACER RUBRUM	
	M3-+3		
1.1	195	THUJA OCCIDENTALIS	
+.1	3	ACER RUBRUM	
+.1	134	PICEA RUBENS	
	H1-2P		
3.4	191	SYMPLOCARPUS FOETIDUS	
+.2	46	COPTIS GROENLANDICA	
+.2	59	DROSERA SPP.	
+.2	212	VIOLA SPP.	
+.1	46	COMPOSITAE	
+.1	67	FILICALES	
+.1	80	HABENARIA BLEPHARIGLOTTIS	
+.1	84	HERB	
+.1	196	TRIENTALIS BOREALIS	
	G1-2C		
5.5	78	GRAMINEAE	
1.2	33	CAREX SPP.	
	B1-23		
1.2	93	KALMIA ANGUSTIFOLIA	
+.2	39	CHAMAEDAPHNE CALYCULATA	
+.2	74	GAULTHERIA HISPIDULA	
+.2	202	VACCINIUM OXYCOCCOS	
+.2	204	VACCINIUM SPP.	
+.1	51	CORNUS CANADENSIS	
+.1	96	LEDUM GROENLANDICUM	
+.1	188	SPIRAEA LATIFOLIA	
	M1-2A		
+.1	3	ACER RUBRUM	
+.1	90	ILEX VERTICILLATA	
+.1	95	LARIX LARICINA	
+.1	134	PICEA RUBENS	
+.1	195	THUJA OCCIDENTALIS	
	L 1C		
5.5	120	MOSS	

TOTAL SPECIES = 25

REF. NO.: R05 MAP-UNIT-NO.: 09 DATE(DA.MO.YR)--25-08-8
LOCATION: THE BOWL, MOI, MAINE
SURVEYOR--KAREN SAUNDERS AREA-COVERED--0.025 HA.

REMARKS----

POST-FIRE PAPER BIRCH-ASPEN STAND BY THE BOWL. OLD PIT AND MOUND TOPOGRAPHY
SCATTERED BOULDERS COVER ABOUT 20% OF THE SURFACE. LOTS OF DEAD DOWNED SPRUC
BEAVER-DOWNED ASPEN (FAIRLY RECENT). LOTS OF SPRUCE IN UNDERSTORY, GROWING
BEST CLOSE TO THE SHORE, WHERE BEAVER ACTIVITY HAS BEEN HEAVIEST, MAKING GAP
IN CANOPY. BIG OLD STUMP WITH A FIRE SCAR. LOTS OF CHARCOAL ON SURFACE OF SO
SOIL: ABOUT 2 CM A2 OVER YELLOW LOAMY SAND B.
NFORS-R. NFFL-8.

COVER/ABUNDANCE	REF.NO.	GENUS SPECIES
	D4-5C	
4.5	28	BETULA PAPYRIFERA
1.2	3	ACER RUBRUM
1.1	151	PRUNUS PENSYLVANICA
+.1	146	POPULUS GRANDIDENTATA
+.1	147	POPULUS TREMULOIDES
R.1	29	BETULA POPULIFOLIA
	E2-3P	
3.2	134	PICEA RUBENS
	D1-3B	
1.2	28	BETULA PAPYRIFERA
1.2	209	VIBURNUM CASSINOIDES
+.2	47	COMPTONIA PEREGRINA
+.2	93	KALMIA ANGUSTIFOLIA
+.2	123	NEMOPANTHUS MUCRONATA
+.2	158	QUERCUS RUBRA
+.2	204	VACCINIUM SPP.
+.1	3	ACER RUBRUM
+.1	9	AMELANCHIER SPP.
+.1	146	POPULUS GRANDIDENTATA
+.1	146	POPULUS GRANDIDENTATA
+.1	151	PRUNUS PENSYLVANICA
R.1	70	FRAXINUS NIGRA
	H1-2B	
1.2	153	PTERIDIUM AQUILINUM
1.2	196	TRIENTALIS BOREALIS
+.2	51	CORNUS CANADENSIS
+.2	119	MONOTROPA UNIFLORA
+.2	186	SOLIDAGO SPP.
+.2	206	VERONICA OFFICINALIS
R.1	23	ASTER SPP.
R.1	56	CYPRIPEDIUM ACAULE
	G1-2A	
+.2	78	GRAMINEAE
	L 1P	
3.3	120	MOSS

TOTAL SPECIES = 25 73

REF. NO.: R36 MAP-UNIT-NO.: C9 DATE(DA.MO.YR)--25-08-80
LOCATION: THE BOWL, MOI. MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----
RELEVE RUNS ALONG SHORE OF POND. NORTH SHORE OF POND THERE'S LOTS OF DEAD AND CUT SPRUCE IN WATER. SHORE RISES MUCH MORE STEEPLY FROM WATER THAN DOES SOUTH SHORE ALSO MUCH MORE ROCKY. LITTLE SOIL. MORE DEAD BIRCH THAN SPRUCE ON GROUND. LESS LIVE SPRUCE IN UNDERSTORY THAN IN R35. AND IT'S ALL SHORT (LESS THAN 3') SOME OAKS ABOUT 25' TALL SPROUTED FROM FIRE KILLED TREES. BEAVER MEADOW IMMEDIATELY SURROUNDS POND. INCREASED WATER LEVEL. MOST OF THESE OBSERVATIONS DON'T CONCERN RELEVE BUT SURROUNDING AREAS NOT COVERED BY EITHER RELEVE. REFERS R. NEFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D3-5R		
1.3	28	BETULA	PAPYRIFERA
1.2	29	BETULA	POPULIFOLIA
+.2	3	ACER	RUBRUM
+.2	171	SALIX	SP.
+.2	205	VIBURNUM	CASSINOIDES
+.1	151	PRUNUS	PENSYLVANICA
	E2-4A		
+.1	134	PICEA	RUBENS
	S1-2P		
2.3	121	MYRICA	GALE
1.2	7	ALNUS	CRISPA
1.2	93	KALMIA	ANGUSTIFOLIA
1.2	123	NEMOPANTHUS	MUCRONATA
+.2	39	CHAMAEDAPHNE	CALYCULATA
+.2	47	COMPTONIA	PEREGRINA
+.2	75	GAULTHERIA	PROCUMBENS
+.2	90	ILEX	VERTICILLATA
+.2	160	RHODODENDRON	CANADENSE
+.2	165	RUBUS	ALLEGHENIENSIS
+.2	166	RUBUS	SPP.
+.2	169	SPIRAEA	LATIFOLIA
+.2	189	SPIRAEA	TOMENTOSA
+.2	204	VACCINIUM	SPP.
	H1-2R		
1.3	19	ASTER	LINARIIFOLIUS
1.3	22	ASTER	UMBELLATUS
1.2	89	HYPERICUM	VIRGINICUM
1.2	153	PTERIDIUM	AQUILINUM
+.3	59	DROSERA	SPP.
+.2	51	CORNUS	CANADENSIS
+.2	62	DRYOPTERIS	SPP.
+.2	87	HYPERICUM	CANADENSE
+.2	110	LYCOPUS	SPP.
+.1	14	ARALIA	NUDICAULIS
+.1	140	POLYGONUM	SPP.
+.1	193	SOLIDAGO	GRAMINIFOLIA
R.1	84	HERB	
R.1	178	SCROPHULARIACEAE	
	G1-2P		
2.3	33	CAREX	SPP.
2.3	177	SCIRPUS	SPP.
2.2	124	NUPHAR	SPP.
2.2	125	NYMPHAEA	ODORATA
1.3	76	GRAMINEAE	
+.2	204	VACCINIUM	SPP.
+.1	170	SAGITTARIA	LATIFOLIA
	D1-2B		
1.2	28	BETULA	PAPYRIFERA
1.2	29	BETULA	POPULIFOLIA
+.2	2	ACER	PENSYLVANICUM
+.2	3	ACER	RUBRUM
+.2	9	AMELANCHIER	SPP.

TOTAL SPECIES = 43

REF. NO.: R27 MAP-UNIT-NO.: 03 DATE (DA.MO.YR) --27-08-8
LOCATION: TREMONT, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS

BIRCH-ASPEN STAND WITH CONIFERS ON TREMONT BURN. BELTS OF DENSE CONIFEROUS GROWTH ON EITHER SIDE, BUT MIDDLE IS SOMEWHAT OPEN BIRCH-ASPEN WITH SCATTERED CONIFERS. LOTS OF SIDELIGHT. NO BOULDERS ON SURFACE. NO DOWNED TRUNKS, JUST SMALL BRANCHES. ONE CUT STUMP IN RELEVE. CHARCOAL. SOIL: VERY SHALLOW, IN MOST PLACES JUST GROUND ROCK ABOVE SOLID ROCK. WHERE SOIL PRESENT, FINE LOAMY SAND.
NFORS R. NFFL-8.

COVER/ABUNDANCE	REF. NO.	GENUS SPECIES
	E--78	
1.1	134	PICEA RUBENS
	M5-5I	
3.3	28	BETULA PAPYRIFERA
3.3	146	POPULUS GRANDIDENTATA
1.2	3	ACER RUBRUM
1.1	1	ABIES BALSAMEA
1.1	134	PICEA RUBENS
1.1	138	PINUS STROBUS
	M3-48	
1.2	7	ALNUS CRISPA
1.2	209	VIBURNUM CASSINOIDES
+.2	28	BETULA PAPYRIFERA
+.1	1	ABIES BALSAMEA
+.1	134	PICEA RUBENS
	H1-2R	
1.1	51	CORNUS CANADENSIS
+.2	153	PTERIDIUM AQUILINUM
+.1	14	ARALIA NUDICAULIS
+.1	22	ASTER UMBELLATUS
+.1	23	ASTER SPP.
+.1	112	MAIANTHEMUM CANADENSE
+.1	196	TRIENTALIS BOREALIS
R.1	62	DRYOPTERIS SPP.
	G1-2A	
+.2	78	GRAMINEAE
	D1-2I	
4.4	204	VACCINIUM SPP.
1.3	93	KALMIA ANGUSTIFOLIA
+.2	7	ALNUS CRISPA
+.2	28	BETULA PAPYRIFERA
+.2	47	COMPTONIA PEREGRINA
+.2	168	RUBUS SPP.
+.1	123	NEMOPANTHUS MUCRONATA
+.1	146	POPULUS GRANDIDENTATA
+.1	209	VIBURNUM CASSINOIDES
	L 1A	
+.3	120	MOSS

TOTAL SPECIES = 23

REF. NO.: R08 MAP-UNIT-NO.: 02 DATE(DA.MO.YR)--27-08-80
LOCATION: TREMONT, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

VERY OPEN RED PINE STAND ON TREMONT BURN. LOTS OF BARE BOULDERS AND BEDROCK. APPEARS THAT ONLY SCATTERED TREES SURVIVED FIRE PROBABLY BECAUSE SEVERE GROWING CONDITIONS MADE IT DIFFICULT FOR DAMAGED, SCARRED TREES TO SURVIVE. TREES SEEM TO HAVE BEEN GRADUALLY SEEDING IN AS LICHENS AND SHRUBS GRADUALLY CLOTHE ROCKS. CHARCOAL PRESENT IN DEPRESSIONS. SOIL ALMOST NONEXISTENT OVER MUCH OF THE AREA. NFORS Q. NFFL 6.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
		E 68	
+.1	136	PINUS RESINOSA	
		D2-4B	
1.2	28	BETULA PAPYRIFERA	
1.2	146	POPULUS GRANDIDENTATA	
		S2-3P	
2.3	76	GAYLUSSACIA BACCATA	
1.2	93	KALMIA ANGUSTIFOLIA	
1.2	209	VIBURNUM CASSINOIDES	
+.2	122	MYRICA PENSYLVANICA	
+.2	160	RHODODENDRON CANADENSE	
+.1	16	ARONIA MELANOCARPA	
		E1-5R	
2.1	134	PICEA RUBENS	
2.1	136	PINUS RESINOSA	
1.1	1	ABIES BALSAMEA	
+.1	138	PINUS STROBUS	
		S 1P	
3.2	204	VACCINIUM SPP.	
+.3	63	EMPETRUM NIGRUM	
+.2	9	AMELANCHIER SPP.	
+.2	16	ARONIA MELANOCARPA	
+.2	75	GAULTHERIA PROCUMBENS	
+.2	91	JUNIPERUS COMMUNIS	
+.1	76	GAYLUSSACIA BACCATA	
+.1	93	KALMIA ANGUSTIFOLIA	
		L 1P	
3.3	37	LICHENS	
		H 1A	
+.2	153	PTERIDIUM AQUILINUM	
+.1	112	MAIANTHEMUM CANADENSE	
+.1	196	TRIENTALIS BOREALIS	
		G 1A	
+.2	33	CAREX SPP.	

TOTAL SPECIES = 22

LOCATION: TREMONT, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

SPRUCE-HARDWOOD STAND IN TREMONT BURN. AREA MAY HAVE BEEN LOGGED BEFORE BURNING. THIS COULD EXPLAIN SLOWNESS OF CONIFERS TO SEED IN. LIMITED SEED SOURCE. OLD MAPLES ARE SPROUTS. YOUNG OF BOTH SPROUT & SEED ORIGIN. SCATTERED ROCKS AND BOULDERS ON SURFACE. CHARCOAL. NFDRS H. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M5-6I		
3.1	134	PICEA RUBENS	
2.2	3	ACER RUBRUM	
1.1	28	BETULA PAPYRIFERA	
+.2	9	AMELANCHIER SPP.	
	D3-4B		
1.2	123	NEMOPANTHUS MUCRONATA	
1.2	201	VACCINIUM CORYMBOSUM	
1.2	209	VIBURNUM CASSINOIDES	
	M2-4R		
2.1	134	PICEA RUBENS	
1.2	1	ABIES BALSAMEA	
1.2	3	ACER RUBRUM	
R.1	95	LARIX LARICINA	
	S1-2P		
2.3	93	KALMIA ANGUSTIFOLIA	
2.3	204	VACCINIUM SPP.	
1.2	76	GAYLUSSACIA BACCATA	
+.3	203	VACCINIUM VITIS-IDAEA	
+.2	47	COMPTONIA PEREGRINA	
	H1-2B		
1.2	153	PTERIDIUM AQUILINUM	
+.2	51	CORNUS CANADENSIS	
+.1	112	MAIANTHEMUM CANADENSE	
+.1	196	TRIENTALIS BOREALIS	
R.1	14	ARALIA NUDICAULIS	
R.1	67	FILICALES	
R.1	186	SOLIDAGO SPP.	
	D1-2A		
+.3	91	JUNIPERUS COMMUNIS	
+.2	3	ACER RUBRUM	
+.2	123	NEMOPANTHUS MUCRONATA	
+.1	9	AMELANCHIER SPP.	
+.1	28	BETULA PAPYRIFERA	
+.1	187	SORBUS AMERICANA	
R.1	134	PICEA RUBENS	
	L 1R		
2.3	97	LICHENS	
1.3	120	MOSS	

REF. NO.: R16 MAP-UNIT-NO.: 02 DATE(DA.MO.YR)--28-08-80
LOCATION: EAGLE LAKE, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

MIXED RED AND WHITE PINE STAND ON NORTH EDGE OF EAGLE LAKE. CHARCOAL UNDER A BLOWDOWN. SOIL: VERY SHALLOW. MOR HUMUS OVER POWDERED ROCK IN MOST PLACES. IN DEPRESSIONS, BLACK LOAMY SOIL BETWEEN. NFORS H. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 7I		
3.1	136	PINUS	RESINOSA
3.1	138	PINUS	STROBUS
1.1	3	ACER	RUBRUM
	E5-6P		
2.3	134	PICEA	RUBENS
1.2	3	ACER	RUBRUM
1.1	1	ABIES	BALSAMEA
+.1	136	PINUS	RESINOSA
	H3-4P		
2.3	76	GAYLUSSACIA	BACCATA
1.2	1	ABIES	BALSAMEA
1.2	123	NEMOPANTHUS	MUCRONATA
+.2	9	AMELANCHIER	SPP.
+.2	209	VIBURNUM	CASSINOIDES
+.1	134	PICEA	RUBENS
+.1	158	QUERCUS	RUBRA
R.1	136	PINUS	STROBUS
	H1-2A		
+.2	14	ARALIA	NUDICAULIS
+.2	51	CORNUS	CANADENSIS
+.2	158	QUERCUS	RUBRA
+.2	186	SOLIDAGO	SPP.
+.1	112	MAIANTHEMUM	CANADENSE
+.1	196	TRIENTALIS	BOREALIS
R.1	15	ARISAEMA	TRIPHYLLUM VAR. STE
	H1-2R		
1.3	76	GAYLUSSACIA	BACCATA
1.2	93	KALMIA	ANGUSTIFOLIA
1.2	204	VACCINIUM	SPP.
+.2	47	COMPTONIA	PEREGRINA
+.2	75	GAULTHERIA	PROCUMBENS
+.2	115	MITCHELLA	REPENS
+.2	195	THUJA	OCCIDENTALIS
+.1	3	ACER	RUBRUM
+.1	9	AMELANCHIER	SPP.
+.1	134	PICEA	RUBENS
+.1	158	QUERCUS	RUBRA
+.1	209	VIBURNUM	CASSINOIDES
R.1	66	FAGUS	GRANDIFOLIA
R.1	136	PINUS	RESINOSA
	L 1A		
+.2	120	MOSS	

REF. NO.: R11 MAP-UNIT-NO.: 01 DATE(DA.MO.YR)--25-06-80
LOCATION: SCHOODIC PENINSULA, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

SPRUCE STAND WITH LOTS OF REGENERATION. OVERSTORY SEEMS TO HAVE STARTED AFTER A FIRE. UNDERSTORY COMING IN GRADUALLY AS OVERSTORY BREAKS UP. UNDERSTORY QUITE DENSE IN MOST PLACES. LOTS OF DOWNED TREES, MOSTLY SPRUCE, SOME BIRCH AND FIR. SOME STANDING DEAD TOO. LOTS OF CHARCOAL UNDER SEVERAL BLOWDOWNS. VERY FEW BOULDERS ON SURFACE. ROCK 6-15" BELOW SURFACE. SOIL: A2 IS 4-5 CM OVER RED-BROWN LOAMY SAND B. NFDRS G. NFFL 10.

COVER/ABUNDANCE	REF.NO.	GENUS SPECIES
	E 7P	
3.1	134	PICEA RUBENS
	M 5R	
2.1	134	PICEA RUBENS
1.1	29	BETULA POPULIFOLIA
	E3-5I	
3.1	134	PICEA RUBENS
2.1	1	ABIES BALSAMEA
1.1	28	BETULA PAPYRIFERA
+.1	195	THUJA OCCIDENTALIS
	H1-2A	
+.3	51	CORNUS CANADENSIS
+.3	196	TRIENTALIS BOREALIS
+.2	13	ARALIA HISPIDA
+.1	112	MAIANTHEMUM CANADENSE
	G1-2A	
+.2	33	CAREX SPP.
	H1-2B	
1.2	1	ABIES BALSAMEA
+.3	204	VACCINIUM SPP.
+.2	28	BETULA PAPYRIFERA
+.2	167	RUBUS IDAEUS
+.2	203	VACCINIUM VITIS-IDAEA
+.1	9	AMELANCHIER SPP.
+.1	134	PICEA RUBENS
R.1	123	NEMOPANTHUS MUCRONATA
R.1	187	SORBUS AMERICANA
	L 1R	
2.4	120	MOSS

TOTAL SPECIES = 17

143

REF. NO.: R12 MAP-UNIT-NO.: 22 DATE(DA.MO.YR)--29-08-80
LOCATION: LAKEWOOD, MDI, MAINE
SURVEYOR--KAREN-SAUNDERS AREA COVERED--0.025-HA.

REMARKS---

BURNED AREA BEWEEN LAKEWOOD AND FAWN POND. NORM DODGE SAYS IT WAS BURNED ABOU 6 YEARS AGO. MOSTLY BARE ROCK (20-25%). AND SHRUB-SPROUT SCRUB. AREA WAS ALSO BURNED IN THE 47 FIRE. TREES ALIVE AT THE TIME WERE RED MAPLE. RED OAK AND RED PINE MOSTLY. STUMPS 55-65 YEARS OLD CUT BEFORE 47 FIRE.
TWO LIVING LARGE RED PINES JUST OUTSIDE BURNED AREA. BOTH SCRAGGLY.
SPINDLY . LOOKS LIKE LEFT BEHIND FROM HIGHGRADING. MOST OF RED PINE SEEDLINGS ASSOCIATED WITH ONE OF THESE TWO TREES. PROBABLY A FIRE WENT THROUGH HERE ABOUT 120 YEARS AGO. SOIL: IN PROTECTED HOLLOW. HAS DEEP A2 (ABOUT 12 CM) STRONGLY PODZOLIZED WITH YELLOWISH-ORANGE-BROWN B FINE SILTY.
NFORS 5. NFFL 1.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D 3B		
1.2	156	QUERCUS	RUBRA
+.2	3	ACER	RUBRUM
+.2	29	BETULA	POPULIFOLIA
+.2	146	POPULUS	GRANDIDENTATA
	H1-2B		
+.2	10	ANAPHALIS	MARGARITACEA
+.2	153	PTERIDIUM	AQUILINUM
+.2	181	SOLIDAGO	CANADENSIS
+.2	184	SOLIDAGO	PUBERULA
+.1	13	ARALIA	HISPIDA
+.1	18	ASTER	ACUMINATUS
R.1	12	APOCYNUM	ANDROSAEMIFOLIUM
	G1-2B		
1.3	76	GRAMINEAE	
+.2	33	CAREX	SPP.
	D1-2I		
2.4	47	COMPTONIA	PEREGRINA
2.4	204	VACCINIUM	SPP.
1.3	76	GAYLUSSACIA	BACCATA
+.2	16	ARONIA	MELANOCARPA
+.2	28	BETULA	PAPYRIFERA
+.2	29	BETULA	POPULIFOLIA
+.2	167	RUBUS	IDAEUS
+.1	9	AMELANCHIER	SPP.
+.1	136	PINUS	RESINOSA
+.1	135	PINUS	STROBUS
+.1	146	POPULUS	GRANDIDENTATA
+.1	147	POPULUS	TREMULOIDES
+.1	158	QUERCUS	RUBRA
R.1	171	SALIX	SP..

TOTAL SPECIES = 24

REF. NO.: R13 MAP-UNIT-NO.: 12 DATE(DA.MO.YR)--29-08-8
LOCATION: LAKEWOOD, MOI, MAINE
SURVEYOR--KAREN--SAUNDERS AREA-COVERED--0.025 HA.-

REMARKS

POST-FIRE OAK STAND BESIDE RECENTLY BURNED R12, LAKEWOOD-FAWN POND AREA. A CHARRED STUMP, CUT BEFORE 1947, HAS TWO FIRE SCARS. THEY'RE ABOUT THIRTY-THIRTY-FIVE YEARS APART, BUT IT'S HARD TO TELL. RED PINE STUMPS SCARRED AT 30-32 YEARS OLD (ONE FOOT) PROBABLY FROM A SPRING BURN, LIGHT GROUND FIRE.
SOIL: A2 AS MUCH AS 12 CM DEEP OVER FINE YELLOW-BROWN B.
NFORS R. NFFL 8.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	D 51		
3.2	158	QUERCUS	RUBRA
2.1	136	PINUS	RESINOSA
1.1	3	ACER	RUBRUM
+.1	28	BETULA	PAPYRIFERA
+.1	29	BETULA	POPULIFOLIA
	E3-4P		
2.1	134	PICEA	RUBENS
1.2	28	BETULA	PAPYRIFERA
1.1	1	ABIES	BALSAMEA
1.1	132	PICEA	GLAUCA
1.1	136	PINUS	RESINOSA
1.1	138	PINUS	STROBUS
+.2	29	BETULA	POPULIFOLIA
	H1-2A		
+.2	13	ARALIA	HISPIDA
+.1	112	MAIANTHEMUM	CANADENSE
+.1	153	PTERIDIUM	AQUILINUM
+.1	186	SOLIDAGO	SPP.
	G1-2A		
+.2	33	CAREX	SPP.
+.2	78	GRAMINEAE	
	H1-2P		
2.3	76	GAYLUSSACIA	BACCATA
2.3	204	VACCINIUM	SPP.
1.2	47	COMPTONIA	PEREGRINA
+.2	3	ACER	RUBRUM
+.2	28	BETULA	PAPYRIFERA
+.2	29	BETULA	POPULIFOLIA
+.2	167	RUBUS	IDAEUS
+.2	168	RUBUS	SPP.
+.2	188	SPIRAEA	LATIFOLIA
+.1	9	AMELANCHIER	SPP.
+.1	136	PINUS	RESINOSA
+.1	138	PINUS	STROBUS
+.1	156	QUERCUS	RUBRA

TOTAL SPECIES = 22

1

REF. NO.: R14 MAP-UNIT-NO.: C1 DATE(DA.MO.YR)--28-08-
LOCATION: SAND BEACH, MDI, MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--2.925 HA.

REMARKS----

MIXED SPRUCE - BIRCH STAND JUST SOUTH AT THE BEEHIVE AND ACROSS OCEAN DRIVE FROM SAND BEACH. THIS STAND IS VALUABLE AS AN ANALOGUE TO AC09- SOUTH OF DORR MOUNTAIN AND AC26 ON THE WEST PEAK OF BERNARD MOUNTAIN. BOTH THIS AND AC09 HAVE REGENERATED FOLLOWING THE FIRE OF 1947 - AC26 IS REGENERATING FOLLOWING THE BREAKING UP OF PREVIOUS OLD - GROWTH SPRUCE STAND. THERE USED TO BE A LITTLE MORE ASPEN IN CANOPY, BUT IT'S DIED OFF. FIVE TO 10 FOOT - SQUARE PATCHES OF BRACKEN ARE SPRINKLED THROUGHOUT THE AREA. BIRCH AND ASPEN ARE GENERALLY SLIGHTLY SHORTER SPRUCE, INSTEAD OF MUCH TALLER, AS IN AC09. THERE'S FUEL SCATTERED ON GROUND - 2 SOURCES:

1. LEFT - OVER FROM SALVAGE OPERATION AFTER FIRE OF 1947 - MOSTLY SPRUCE OF VARIOUS SIZES.
2. DEAD BIRCHES - DIED WITHIN LAST FEW YEARS, ABOUT 1 - 2" DIAMETER.

LITTLE (OR NO) SOIL. JUST ORGANIC MAT OVER ROCK IN MOST PLACES. STUMPS FROM PREFIRE STAND ARE SCATTERED THROUGHOUT. MOSTLY 6 TO 12" DIAMETER. THERE'S A BIG STUMP NEAR CENTER OF RELEVE ABOUT 15" DIAMETER AND 2' TALL. WHITE PINE, KILLED BY FIRE AND CUT DOWN. GREW VERY SLOWLY LAST 50 YEARS OF IT'S LIFE SOMEWHERE BETWEEN 120 - 150 YEARS OLD IN 1947. ABOUT 18" IN DIAMETER WHERE CUT.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	M3-41		
3.3	174	PICEA	RUBENS
2.2	29	BETULA	POPULIFOLIA
1.3	26	BETULA	PAPYRIFERA
+.1	147	POPULUS	TREMULOIDES
R.1	3	ACER	RUBRUM
	D 28		
2.4	76	GAYLUSSACIA	BACCATA
1.3	93	KALMIA	ANGUSTIFOLIA
+.3	204	VACCINIUM	SPP.
1.2	47	COMPTONIA	PEREGRINA
+.2	29	BETULA	POPULIFOLIA
+.2	188	SPIRAEA	LATIFOLIA
R.1	58	DIERVILLA	LONICERA
R.1	174	PICEA	RUBENS
R.1	152	PRUNUS	SEROTINA
	H1-28		
1.1	153	PTERIDIUM	AQUILINUM
+.1	23	ASTER	SPP.
	G1-28		
1.3	78	GRAMINEAE	
	L 18		
2.4	122	MOSS	
1.3	97	LICHENS	

TOTAL SPECIES = 17

1

REF. NO.: F15 MAP-UNIT-NO.: 39 DATE(DA.MO.YR)--26-18-
LOCATION: THE BOWL PATH, MT. MAINE
SURVEYOR--KAREN SAUNDERS AREA COVERED--0.025 HA.

REMARKS----

BIRCH STAND WITH SEDGE GROUND COVER. THE SUGAR MAPLES IN OVERSTORY ARE BY TRAIL AND HAVE BIG [illegible]. NOT MANY CATKINS ON BIRCHES. NO SPRUCE PRESENT. LOOKS LIKE MAYBE WILL TURN INTO NORTHERN HARDWOODS WITH TIME. PREVIOUS STAND HAD SOME ENORMOUS WHITE PINE, AS MUCH AS 4' IN DIAMETER, ALSO THE REMAINS OF A FAIRLY GOOD SIZED BIRCH FOUND. SOME SMALLER DIAMETER SPRUCES (6 - 8") ALSO, AND SOME VERY BIG BIRCH.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	04-50		
4.4	28	BETULA PAPYRIFERA	
1.3	4	ACER SACCHARUM	
1.2	66	FAGUS GRANDIFOLIA	
1.1	3	ACER RUBRUM	
1.1	152	PRUNUS SEROTINA	
	0 39		
1.2	66	FAGUS GRANDIFOLIA	
	H1-29		
1.3	85	HIERACIUM PRATENSE	
+.3	206	VERONICA OFFICINALIS	
+.2	49	CORALLORHIZA SPP.	
+.1	14	ARALIA NUDICAULIS	
+.1	23	ASTER SPP.	
+.1	196	TRIENTALIS BOREALIS	
	G1-20		
5.5	33	CAREX SPP.	
	S1-23		
1.2	66	FAGUS GRANDIFOLIA	
+.2	28	BETULA PAPYRIFERA	
+.2	152	PRUNUS SEROTINA	
+.1	3	ACER RUBRUM	
+.1	4	ACER SACCHARUM	
+.1	209	VIBURNUM CASSINOIDES	
F.2	2	ACER PENSYLVANICUM	
P.2	102	LONICERA SPP.	
	L 14		
+.3	97	LICHENS	
+.3	120	MOSS	

TOTAL SPECIES = 17

83

REF. NO. 1   835   MAP-UNIT-NO. 1 C1   DATE(DA.MO.YR)--27-08
LOCATION: WEST PEAK OF BERNARD MT., MDI, MAINE
SURVEYOR--KAREN SAUNDERS   AREA COVERED--0.025 HA.

REMARKS----

AC26. BLOWDOWN OLD GROWTH SPRUCE. STAND HAD BARELY LIVE OVERSTORY TREES VERY OCCASIONALLY AND STANDING DEAD SNAGS MORE OFTEN, BUT THIS RELEVE HAD NEITHER. DEAD TREES LITTER THE GROUND. BENEATH LIVE-WORTS AND MOUNTAIN CRANBERRY (SOMETIMES JUST NEEDLES) COVER A MAT OF ORGANIC MATTER, WHICH IN TURN COVERS BOULDERS. MUCH OF REGENERATION IS GROWING QUITE WELL - THERE ARE PATCHES OF DIFFERENT SIZES, THAT TURN OUT NOT TO BE DIFFERENT AGES MOSTLY - EXCEPT WHERE THERE ARE PATCHES OF 12 - 15" BIRCH. BIRCHES ARE EITHER PAPER OR GREY - ITS HARD TO TELL - LEAVES LOOK LIKE PAPER BUT GROWTH HABIT IS THAT OF GREY AND THE ONE TREE FOUND FLOWERING HAD SINGLE CATKINS LIKE GREY BIRCH. BUT SNAGS AND OCCASIONAL LIVING OVERSTORY BIRCHES ARE PAPER. THESE TREES SEEM TO HAVE BLOWN DOWN OVER A PERIOD OF YEARS - MULTIPLE SKELETONS NOT ALL IN A PREVAILING DIRECTION BUT EVERY WHICH WAY - SOME SNAPPED OFF, SOME WITH ROOTS OVERTURNED. SEEMS THAT MANY MAY HAVE BEEN DEAD BEFORE BLOWING OVER.

COVER/ABUNDANCE	REF.NO.	GENUS	SPECIES
	E 58		
1.1	1	ABIES	BALSAMEA
	M3-41		
3.3	134	PICEA	RUBENS
2.2	26	BETULA	PAPYRIFERA
1.2	187	SORBUS	AMERICANA
1.1	1	ABIES	BALSAMEA
	H 23		
1.3	57	DENNSTAEDTIA	PUNCTILOBULA
1.2	62	DRYOPTERIS	SPP.
+.2	13	ARALIA	HISPIDA
	G1-29		
1.3	33	CAREX	SPP.
	M1-25		
2.2	134	PICEA	RUBENS
1.[illegible]	2[illegible]4	VACCINIUM	SPP.
1.2	23	BETULA	PAPYRIFERA
1.2	1[illegible]	[illegible]	[illegible]
+.2	187	SORBUS	AMERICANA
+.1	123	NEMOPANTHUS	MUCRONATA
+.1	3	ACER	RUBRUM
	L 18		
2.4	120	MOSS	
+.2	97	LICHENS	
	H 14		
+.2	51	CORNUS	CANADENSIS
+.2	112	MAIANTHEMUM	CANADENSE
+.2	195	TRIENTALIS	BOREALIS
	B 16		
2.4	203	VACCINIUM	VITIS-IDAEA
+.2	31[illegible]	VACCINIUM	VITIS-IDAEA MACROCARPON

TOTAL NO. OF SPP. = 19

1

APPENDIX E

Vegetation Summaries Based Upon all Releves Occurring in a Cover Type (Map Unit)

MAP UNIT 11 NO. RELEVES = 22 % PLV PRESENCE #RELEVES IN HEIGHT CLASS., EV-IMPACT MODAL-SOCI.

TAXON	NAME
[illegible]	[illegible]

MAP UNIT 32   NO. RELEVES = 2   # RLV %PRESENCE # RELEVE IN HEIGHT CLASS.   AV-IMPORT MODAL-SOCI.

TAXON	NAME	# RLV	%PRESENCE	1	2	3	4	5	6	7	8	AV-IMPORT	MODAL-SOCI.
204	VACCINIUM SPP.	2	100.00	2	1	0	0	0	0	0	0	7.500	2
112	MAIANTHEMUM CANADENSE	2	100.00	2	1	1	0	0	0	0	0	1.500	1
7	AMELANCHIER SPP.	2	100.00	2	1	1	1	0	0	0	0	2.000	2
196	TRIENTALIS BOREALIS	2	100.00	2	1	0	0	0	0	0	0	1.500	1
134	PICEA RUBENS	2	100.00	2	2	2	2	2	1	0	0	4.000	1
136	PINUS RESINOSA	2	100.00	2	2	1	1	2	2	1	0	5.000	1
137	PINUS STROBUS	2	100.00	1	1	2	2	1	0	1	0	3.000	1
209	VIBURNUM CASSINOIDES	2	100.00	1	2	1	1	0	0	0	0	2.500	2
75	GAULTHERIA PROCUMBENS	2	100.00	2	1	0	0	0	0	0	0	1.000	2
76	GAYLUSSACIA BACCATA	2	100.00	2	2	2	1	0	0	0	0	5.000	3
1	ABIES BALSAMEA	2	100.00	1	1	1	2	2	1	0	0	3.500	1
93	KALMIA ANGUSTIFOLIA	2	100.00	2	2	1	0	0	0	0	0	7.000	2
29	BETULA PAPYRIFERA	1	50.00	1	1	1	1	0	0	0	0	1.500	2
165	SOLIDAGO SPP.	1	50.00	1	1	0	0	0	0	0	0	1.000	2
33	CAREX SPP.	1	50.00	1	1	0	0	0	0	0	0	1.000	2
91	JUNIPERUS COMMUNIS	1	50.00	1	1	0	0	0	0	0	0	1.000	2
195	THUJA OCCIDENTALIS	1	50.00	1	1	0	0	0	0	0	0	1.000	2
97	LICHENS	1	50.00	1	1	0	0	0	0	0	0	2.000	3
47	COMPTONIA PEREGRINA	1	50.00	1	1	0	0	0	0	0	0	1.000	2
51	CORNUS CANADENSIS	1	50.00	1	1	0	0	0	0	0	0	1.000	2
123	NEMOPANTHUS MUCRONATA	1	50.00	1	0	1	1	0	0	0	0	1.500	2
122	MYRICA PENSYLVANICA	1	50.00	1	1	1	0	0	0	0	0	1.000	2
127	MOSS	1	50.00	1	1	0	0	0	0	0	0	1.000	2
115	MITCHELLA REPENS	1	50.00	1	1	0	0	0	0	0	0	1.000	2
63	EMPETRUM NIGRUM	1	50.00	1	1	0	0	0	0	0	0	1.000	3
66	FAGUS GRANDIFOLIA	1	50.00	1	1	0	0	0	0	0	0	0.500	1
16	ARONIA MELANOCARPA	1	50.00	1	1	1	0	0	0	0	0	1.500	1
15	ARISAEMA TRIPHYLLUM VAR. STE	1	50.00	1	1	0	0	0	0	0	0	0.500	1
14	ARALIA NUDICAULIS	1	50.00	1	1	0	0	0	0	0	0	1.000	2
146	POPULUS GRANDIDENTATA	1	50.00	1	1	1	1	0	0	0	0	1.500	2
159	QUERCUS RUBRA	1	50.00	1	2	1	1	1	0	0	0	2.000	1
3	ACER RUBRUM	1	50.00	1	1	0	0	1	1	1	0	3.000	1
153	PTERIDIUM AQUILINUM	1	50.00	1	0	0	0	0	0	0	0	1.000	2
160	RHODODENDRON CANADENSE	1	50.00	1	1	1	0	0	0	0	0	1.000	2

MAP UNIT 64 NO. RELEVES = 5 # ELV XPRESENCE # RELEVE IN HEIGHT CLASS. AV-IMPORT MODAL-SOCI.

TAXON	NAME			1	2	3	4	5	6	7	8	AV-IMPORT	MODAL-SOCI.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MAF UNIT 68 NO. RELEVES = 2 # FLV PRESENCE # RELEVE IN HEIGHT CLASS. AV-IMPORT MODAL-SOCI.

TAXON	NAME	# FLV	PRESENCE	1	2	3	4	5	6	7	8	AV-IMPORT	MODAL-SOCI.
196	TRIENTALIS BOREALIS	2	100.00	2	2	0	0	0	0	0	0	1.500	1
120	MOSS	2	100.00	2	0	0	0	0	0	0	0	3.000	3
112	MAIANTHEMUM CANADENSE	2	100.00	2	2	0	0	0	0	0	0	1.500	1
9	AMELANCHIER SPP.	2	100.00	2	2	0	0	0	0	0	0	1.500	1
195	THUJA OCCIDENTALIS	2	100.00	2	2	0	0	1	1	2	0	4.000	1
134	PICEA RUBENS	2	100.00	1	1	1	1	2	2	2	0	[illegible].500	1
135	PINUS RESINOSA	2	100.00	2	2	0	1	0	0	2	0	4.000	1
136	PINUS STROBUS	2	100.00	2	2	1	0	0	0	2	0	3.500	1
3	ACER RUBRUM	2	100.00	2	2	0	0	0	1	1	0	7.500	1
1	ABIES BALSAMEA	2	100.00	2	2	1	1	1	1	0	0	7.500	1
93	KALMIA ANGUSTIFOLIA	2	100.00	2	2	0	0	0	0	0	0	1.500	2
97	LICHENS	2	100.00	2	2	0	0	0	0	0	0	1.500	2
204	VACCINIUM SPP.	2	100.00	2	2	0	0	0	0	0	0	1.500	2
209	VIBURNUM CASSINOIDES	1	50.00	1	1	0	0	0	0	0	0	1.000	1
79	GRAMINEAE	1	50.00	1	1	0	0	0	0	0	0	1.000	2
56	CYPRIPEDIUM ACAULE	1	50.00	1	1	0	0	0	0	0	0	0.500	1
187	SORBUS AMERICANA	1	50.00	1	1	0	0	0	0	0	0	1.000	1
92	ILEX VERTICILLATA	1	50.00	1	1	0	0	0	0	0	0	0.500	1
30	BETULA SPP.	1	50.00	1	1	0	0	0	0	0	0	1.000	1
28	BETULA PAPYRIFERA	1	50.00	1	1	0	0	0	0	1	0	1.500	1
84	HERB	1	50.00	1	1	0	0	0	0	0	0	0.500	1
153	PTERIDIUM AQUILINUM	1	50.00	1	1	0	0	0	0	0	0	1.000	2
7	ACER PENNSYLVANICUM	1	50.00	1	1	0	0	0	0	0	0	0.500	1
14	ARALIA NUDICAULIS	1	50.00	1	1	0	0	0	0	0	0	0.500	1

MAP UNIT 17 NO. RELEVES = 3

TAXON	NAME	# RLV	%PRESENCE	1	2	3	4	5	6	7	8	AV-IMPORT	MODAL-SOCI.
47	COMPTONIA PEREGRINA	3	100.00	3	3	0	0	0	0	0	0	1.667	2
112	MAIANTHEMUM CANADENSE	3	100.00	3	3	0	0	0	0	0	0	1.333	1
156	QUERCUS RUBRA	3	100.00	3	3	0	0	2	2	0	0	6.667	1
78	GRAMINEAE	3	100.00	3	3	0	0	0	0	0	0	1.333	2
153	PTERIDIUM AQUILINUM	3	100.00	3	3	1	0	0	0	0	0	2.333	1
142	PICEA GLAUCA	3	100.00	2	2	2	2	0	0	0	0	1.333	1
204	VACCINIUM SPP.	3	100.00	3	3	0	0	0	0	0	0	3.000	3
3	ACER RUBRUM	3	100.00	3	3	0	1	3	2	0	0	0.667	2
173	PRUNUS SEROTINA	3	100.00	3	2	1	2	1	0	0	0	1.667	1
29	BETULA POPULIFOLIA	3	100.00	1	1	2	1	2	0	0	0	3.333	2
76	GAYLUSSACIA BACCATA	2	66.67	2	2	0	0	0	0	0	0	2.000	3
165	SOLIDAGO SPP.	2	66.67	2	2	1	0	0	0	0	0	0.667	1
146	POPULUS GRANDIDENTATA	2	66.67	1	1	1	0	1	2	0	0	2.000	1
75	GAULTHERIA PROCUMBENS	2	66.67	2	2	0	0	0	0	0	0	1.000	2
97	LICHEN	2	66.67	2	2	0	0	0	0	0	0	1.000	2
174	PICEA RUBENS	2	66.67	1	1	2	2	0	0	0	0	2.000	1
22	BETULA PAPYRIFERA	2	66.67	1	1	1	1	1	1	0	0	1.667	1
9	AMELANCHIER SPP.	2	66.67	2	2	0	1	0	0	0	0	1.000	1
195	TRIENTALIS BOREALIS	2	66.67	2	2	0	0	0	0	0	0	1.000	1
125	MOSS	2	66.67	2	2	0	0	0	0	0	0	2.000	3
2	ACER PENSYLVANICUM	2	66.67	2	2	1	2	2	0	0	0	3.667	2
205	VERONICA OFFICINALIS	1	33.33	1	1	0	0	0	0	0	0	0.667	2
48	CORNUS CANADENSIS	1	33.33	1	1	0	0	0	0	0	0	0.333	1
115	MITCHELLA REPENS	1	33.33	1	1	0	0	0	0	0	0	0.667	2
136	PINUS RESINOSA	1	33.33	1	1	1	1	1	0	0	0	2.333	1
33	CAREX SPP.	1	33.33	1	1	0	0	0	0	0	0	0.667	2
189	SPIRAEA LATIFOLIA	1	33.33	1	1	0	0	0	0	0	0	0.667	2
1	ABIES BALSAMEA	1	33.33	1	1	1	1	0	0	0	0	1.000	1
167	RUBUS IDAEUS	1	33.33	1	1	0	0	0	0	0	0	0.667	2
17	ARALIA HISPIDA	1	33.33	1	1	0	0	0	0	0	0	0.667	2
93	KALMIA ANGUSTIFOLIA	1	33.33	1	1	0	0	0	0	0	0	0.667	2
155	RUBUS SPP.	1	33.33	1	1	0	0	0	0	0	0	0.667	2

MAP UNIT 14 NO. RELEVES = 5 # FLV %PRESENCE # RELEVE IN HEIGHT CLASS. AV-IMPORT MODAL-SOCI.

TAXON	NAME	# FLV	%PRESENCE	1	2	3	4	5	6	7	8	AV-IMPORT	MODAL-SOCI.
120	MOSS	5	100.00	5	0	0	0	0	0	0	0	2.400	3
134	PICEA RUBENS	5	100.00	[illegible]	3	5	6	5	[illegible]	2	0	8.000	1
3	ACER RUBRUM	5	100.00	[illegible]	2	1	2	2	4	2	0	4.000	1
1	ABIES BALSAMEA	5	100.00	1	0	4	6	5	1	0	0	2.200	1
196	TRIENTALIS BOREALIS	4	80.00	4	4	0	0	0	0	0	0	1.000	1
204	VACCINIUM SPP.	4	80.00	4	2	1	0	0	0	0	0	1.400	2
112	MAIANTHEMUM CANADENSE	4	80.00	[illegible]	[illegible]	0	0	0	0	0	0	1.000	1
9	AMELANCHIER SPP.	4	80.00	2	2	0	0	0	[illegible]	1	0	1.000	1
2	ACER PENSYLVANICUM	4	80.00	[illegible]	2	2	3	2	2	1	0	3.000	1
139	PINUS STROBUS	4	80.00	4	2	[illegible]	[illegible]	1	0	1	0	1.000	1
37	LICHENS	3	60.00	[illegible]	0	0	0	0	0	0	0	1.400	2
26	BETULA ALLEGHENIENSIS OR BF	3	60.00	1	1	1	1	1	3	1	0	2.400	2
78	GRAMINEAE	3	60.00	3	3	0	0	0	0	0	0	0.900	2
28	BETULA PAPYRIFERA	3	60.00	3	1	0	0	0	3	2	0	2.200	2
33	CAREX SPP.	3	60.00	3	3	0	0	0	0	0	0	0.800	2
153	PTERIDIUM AQUILINUM	3	60.00	3	3	0	0	0	0	0	0	1.000	2
124	LYCOPODIUM ANNOTINUM	2	40.00	2	2	0	0	0	0	0	0	1.400	3
32	BETULA SPP	2	40.00	2	[illegible]	0	0	0	0	0	0	0.000	1
43	COPTIS GROENLANDICA	2	40.00	2	2	0	0	0	0	0	0	0.600	2
136	PINUS RESINOSA	2	40.00	[illegible]	0	0	0	0	2	1	0	0.600	1
4	ACER SACCHARUM	2	40.00	1	1	0	0	0	2	2	0	0.800	1
195	THUJA OCCIDENTALIS	2	40.00	1	0	0	1	1	2	1	0	1.600	1
54	WEED	1	20.00	1	1	0	0	0	0	0	0	0.200	1
186	SOLIDAGO SPP.	1	20.00	1	1	0	0	0	0	0	0	0.200	1
76	GAYLUSSACIA BACCATA	1	20.00	1	1	1	0	0	0	0	0	0.900	4
75	GAULTHERIA PROCUMBENS	1	20.00	1	1	1	0	0	0	0	0	0.500	2
113	MONOTROPA UNIFLORA	1	20.00	1	1	0	0	0	0	0	0	0.400	2
79	FRAXINUS NIGRA	1	20.00	1	1	0	0	0	1	1	0	1.000	1
66	FAGUS GRANDIFOLIA	1	20.00	[illegible]	0	0	0	0	1	1	0	0.400	2
62	DRYOPTERIS SPP.	1	20.00	1	1	0	0	0	0	0	0	0.400	2
57	DENNSTAEDTIA PUNCTILOBULA	1	20.00	1	1	0	0	0	0	0	0	0.400	2
91	JUNIPERUS COMMUNIS	1	20.00	1	1	0	0	0	0	0	0	0.400	3
149	POTENTILLA TRIDENTATA	1	20.00	1	1	0	0	0	0	0	0	0.400	2
93	KALMIA ANGUSTIFOLIA	1	20.00	1	1	1	0	0	0	0	0	0.800	3
145	POPULUS GRANDIDENTATA	1	20.00	0	0	0	0	0	1	1	0	0.600	1
137	PINUS RIGIDA	1	20.00	[illegible]	0	1	1	1	0	0	0	0.600	1
13?	OXALIS MONTANA	1	20.00	1	1	0	0	0	0	0	0	0.400	3
114	MELAMPYRUM LINEARE	1	20.00	1	1	0	0	0	0	0	0	0.400	1
212	VICIA SPP.	1	20.00	1	1	0	0	0	0	0	0	0.400	2
201	VACCINIUM CORYMBOSUM	1	20.00	1	1	1	0	0	0	0	0	0.400	2
122	MYRICA PENSYLVANICA	1	20.00	1	1	1	0	0	0	0	0	0.600	2
29	BETULA POPULIFOLIA	1	20.00	0	0	1	1	1	0	0	0	0.600	2
16	ARONIA MELANOCARPA	1	20.00	1	1	1	0	0	0	0	0	0.600	1

UNIT. 11 NO. RELEVES = 5 # RLV %PRESENCE # RELEVE IN HEIGHT CLASS. AV-IMPORT MODAL-SOCI.

CN	NAME	# RLV	%PRESENCE	1	2	3	4	5	6	7	8	AV-IMPORT	MODAL-SOCI.
36	TRIENTALIS BOREALIS	5	100.00	5	4	[illegible]	0	0	0	0	0	1.200	2
29	MOSS	5	100.00	5	[illegible]	0	0	[illegible]	0	0	0	2.600	3
56	FAGUS GRANDIFOLIA	5	100.00	[illegible]	[illegible]	[illegible]	5	5	5	2	0	10.600	2
34	PICEA RUBENS	5	100.00	[illegible]	4	3	2	2	1	1	0	2.[illegible]	1
28	BETULA PAPYRIFERA	5	100.00	[illegible]	1	0	1	1	5	2	[illegible]	3.000	2
33	CAREX SPP.	5	100.00	5	5	0	0	0	0	0	0	1.200	2
4	ACER SACCHARUM	5	100.00	[illegible]	3	1	2	2	5	2	0	3.400	1
97	LICHENS	5	100.00	[illegible]	1	[illegible]	0	0	0	0	0	1.400	2
2	ACER PENSYLVANICUM	5	100.00	5	5	2	4	[illegible]	[illegible]	1	[illegible]	5.800	2
3	ACER RUBRUM	4	80.00	[illegible]	[illegible]	0	0	0	2	0	0	1.600	1
12	MAIANTHEMUM CANADENSE	4	80.00	[illegible]	[illegible]	0	0	[illegible]	0	0	0	0.[illegible]	1
46	POPULUS GRANDIDENTATA	3	60.00	[illegible]	3	1	[illegible]	[illegible]	2	[illegible]	0	2.000	2
49	CORALLORHIZA SPP.	3	60.00	[illegible]	3	0	0	0	0	0	0	0.400	1
73	GRAMINEAE	3	60.00	3	[illegible]	0	0	0	0	0	0	1.[illegible]	3
7	AMELANCHIER SPP.	[illegible]	[illegible]	[illegible]	[illegible]	2	[illegible]	[illegible]	0	0	0	0.600	1
86	SOLIDAGO SPP.	2	40.00	2	2	0	0	0	0	0	0	0.400	1
25	BETULA ALLEGHANIENSIS CR OF	2	40.00	[illegible]	[illegible]	0	1	1	1	1	0	0.500	1
29	BETULA POPULIFOLIA	2	40.00	[illegible]	0	0	0	[illegible]	1	0	0	0.800	1
44	POLYSTICHUM ACROSTICHOIDES	2	40.00	2	2	0	0	0	0	0	0	1.000	2
69	FRAXINUS AMERICANA	2	40.00	[illegible]	[illegible]	1	0	0	1	0	0	0.800	1
62	DRYOPTERIS SPP.	2	40.00	2	2	[illegible]	0	0	0	0	0	0.800	2
64	VACCINIUM SPP.	2	40.00	2	1	0	0	0	0	0	0	0.600	1
72	FRAXINUS SPP.	1	20.00	[illegible]	[illegible]	[illegible]	0	0	0	0	0	0.[illegible]	1
65	VERONICA OFFICINALIS	1	20.00	1	[illegible]	0	0	[illegible]	0	0	0	0.400	2
19	MONOTROPA UNIFLORA	1	20.00	1	1	0	0	0	0	0	0	0.400	2
36	HIERACIUM VULGATUM	1	20.00	1	1	0	0	0	0	0	0	0.200	1
23	OSTRYA VIRGINIANA	1	20.00	[illegible]	0	0	0	0	1	0	0	0.600	1
93	THELYPTERIS NOVEBORACENSIS	1	20.00	1	1	0	0	0	0	0	0	0.400	2
32	PICEA GLAUCA	1	20.00	1	1	0	0	0	0	0	0	0.200	1
45	COMPOSITAE	1	20.00	1	1	0	0	0	0	0	0	0.400	2
95	THELYPTERIS PHEGOPTERIS	1	20.00	[illegible]	[illegible]	0	0	0	0	0	0	0.400	2
47	POPULUS TREMULOIDES	1	20.00	[illegible]	[illegible]	0	0	0	1	[illegible]	0	0.600	2
53	PTERIDIUM AQUILINUM	1	20.00	[illegible]	[illegible]	0	0	0	0	0	0	0.200	1
1	ABIES BALSAMEA	1	20.00	[illegible]	1	0	0	0	0	0	0	0.200	1
30	BETULA SPP.	1	20.00	[illegible]	1	0	0	0	0	0	0	0.400	2
31	BOTRYCHIUM LANCEOLATUM	1	20.00	1	1	0	0	0	0	0	0	0.200	1

MAP UNIT 22 NO. RELEVES = 1 # RLV %PRESENCE # RELEVE IN HEIGHT CLASS. 1 2 3 4 5 6 7 8 AV IN ...

TAXON	NAME
147	FOPULUS TREMULOIDES
146	FOPULUS GRANDIDENTATA
173	SALIX SP..
74	GRAMINEAL
18	ASTER ACUMINATUS
224	VACCINIUM SPP.
1?	[illegible]
76	GAYLUSSACIA BACCATA
2?	BETULA PAPYRIFERA
29	BETULA POPULIFOLIA
1?3	FINUS STROBUS
184	SOLIDAGO RUBICULA
33	CAREX SPP.
136	FINUS RESINOSA
1?6	[illegible] PEREGRINA
6	ACER RUBRUM
3	ACER RUBRA
1??	[illegible] CANADENSIS
1?1	[illegible]
1??	[illegible] SPP.
3	AMELANCHIER [illegible]
1?	ANAPHALIS MARGARITACEA
??	ACCLYNUM ANDROSAEMIFOLIUM
??	ARALIA HISPIDA
167	RUBUS IDAEUS

AV	
2.000	1
3.000	1
1.000	1
?.000	3
2.000	1
4.000	2
2.000	2
2.000	3
2.000	2
2.000	2
2.000	1
2.000	2
4.000	2
4.000	1
2.000	4
2.000	2
2.000	1
2.000	2
2.000	2
1.000	1
2.000	2
2.000	1
	1
	2

MAP UNIT 23   NO. RELEVES = 5   # RLV %PRESENCE # RELEVES IN HEIGHT CLASS.   AV-IMPORT MODAL-SOCI.

TAXON	NAME	# RLV	%PRESENCE	1	2	3	4	5	6	7	8	AV-IMPORT	MODAL-SOCI.
93	KALMIA ANGUSTIFOLIA	5	100.00	4	5	4	1	0	0	0	0	3.600	4
76	GAYLUSSACIA BACCATA	5	100.00	4	5	4	1	0	0	0	0	4.000	3
97	LICHENS	5	100.00	5	0	0	0	0	0	0	0	2.200	2
134	PICEA RUBENS	5	100.00	3	2	5	5	3	2	0	0	4.000	1
129	MOSS	5	100.00	5	5	0	0	0	0	0	0	2.400	2
204	VACCINIUM SPP.	5	100.00	[illegible]	[illegible]	[illegible]	0	0	0	0	0	3.000	3
2[illegible]	BETULA PAPYRIFERA	4	80.00	[illegible]	[illegible]	[illegible]	4	1	1	0	0	1.[illegible]00	1
137	PINUS RIGIDA	4	80.00	2	2	3	3	2	0	0	0	2.800	1
112	MAIANTHEMUM CANADENSE	4	80.00	4	4	0	0	0	0	0	0	0.800	1
29	BETULA POPULIFOLIA	4	80.00	2	2	4	4	1	0	0	0	1.800	2
9	AMELANCHIER SPP.	4	80.00	4	4	1	1	0	0	0	0	1.000	1
3	ACER RUBRUM	4	80.00	4	4	1	1	1	1	0	0	1.400	1
153	PTERIDIUM AQUILINUM	3	60.00	3	3	0	0	0	0	0	0	1.000	1
7	ALNUS CRISPA	3	60.00	2	2	3	3	0	0	0	0	1.200	2
203	VIBURNUM CASSINOIDES	3	60.00	[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	0	1.600	2
15	ARONIA MELANOCARPA	3	60.00	3	3	[illegible]	0	0	0	0	0	0.400	1
195	TRIENTALIS BOREALIS	3	60.00	3	3	0	0	0	0	0	0	0.600	1
114	MELAMPYRUM LINEARE	3	60.00	3	3	0	0	0	0	0	0	0.300	1
74	GRAMINEAE	3	60.00	1	3	0	0	0	0	0	0	1.000	2
33	CAREX SPP.	2	40.00	2	2	0	0	0	0	0	0	0.800	2
75	GAULTHERIA PROCUMBENS	2	40.00	2	1	1	0	0	0	0	0	0.800	2
51	CORNUS CANADENSIS	2	40.00	2	2	0	0	0	0	0	0	0.600	1
47	COMPTONIA PEREGRINA	2	40.00	2	2	0	0	0	0	0	0	0.600	1
167	SORBUS AMERICANA	2	40.00	2	2	1	1	0	0	0	0	0.600	1
149	POTENTILLA TRIDENTATA	2	40.00	2	2	0	0	0	0	0	0	0.800	2
147	POPULUS TREMULOIDES	2	40.00	2	2	2	2	0	0	0	0	1.000	2
14	ARALIA NUDICAULIS	2	40.00	2	2	0	0	0	0	0	0	0.600	1
23	ASTER SPP.	2	40.00	2	2	0	0	0	0	0	0	0.400	1
160	RHODODENDRON CANADENSE	1	20.00	1	1	1	0	0	0	0	0	0.800	1
158	QUERCUS RUBRA	1	20.00	1	1	0	0	0	0	0	0	0.200	1
54	DIERVILLA LONICERA	1	20.00	1	1	0	0	0	0	0	0	0.200	1
63	EMPETRUM NIGRUM	1	20.00	1	0	0	0	0	0	0	0	0.400	[illegible]
185	SOLIDAGO SPP.	1	20.00	1	1	0	0	0	0	0	0	0.400	1
151	PRUNUS PENSYLVANICA	1	20.00	1	1	1	1	0	0	0	0	0.400	1
171	SALIX SPP.	1	20.00	1	1	1	1	0	0	0	0	0.200	1
89	HYPERICUM GENTIANOIDES	1	20.00	1	1	0	0	0	0	0	0	0.600	5
90	ILEX VERTICILLATA	1	20.00	1	0	1	1	0	0	0	0	0.400	2
91	JUNIPERUS COMMUNIS	1	20.00	0	1	1	0	0	0	0	0	0.400	2
1[illegible]	SPIRAEA LATIFOLIA	1	20.00	1	1	1	0	0	0	0	0	0.400	2
123	NEMOPANTHUS MUCRONATA	1	20.00	1	1	1	1	0	0	0	0	0.800	2
122	MYRICA PENSYLVANICA	1	20.00	1	1	1	0	0	0	0	0	0.600	2
1[illegible]5	THUJA OCCIDENTALIS	1	20.00	0	0	1	1	1	1	0	0	0.600	1
201	VACCINIUM VITIS-IDAEA	1	20.00	1	0	0	0	0	0	0	0	0.600	1
133	PINUS STROBUS	1	20.00	0	0	1	1	0	0	0	0	0.200	1
119	MONOTROPA UNIFLORA	1	20.00	1	0	0	0	0	0	0	0	0.200	1
135	PINUS BANKSIANA	1	20.00	1	1	1	1	1	1	0	0	1.400	1
132	PICEA GLAUCA	1	20.00	0	0	1	1	0	0	0	0	0.400	1
19	ASTER ACUMINATUS	1	20.00	1	1	0	0	0	0	0	0	0.400	2
21	ASTER MACROPHYLLUS	1	20.00	1	1	0	0	0	0	0	0	0.400	2
150	PRENANTHES SPP.	1	20.00	1	1	0	0	0	0	0	0	0.200	1

APPENDIX F

Cluster Analysis Dendrograms Based on Standardized and Absolute Distance and Associated Reordered Data Matrices

** PROGRAM AGGLOM **

AGGLOMERATION METHOD FOR CLASSIFICATION OF COMMUNITIES
(ORLOCI, L. 1967. J. ECOLOGY 55:193-206)

ACADIA CLUSTER DATA. JAN. 26, 1982.

63 PLOTS ACCEPTED FROM DATA FILE. RUN CONTINUES

** RAW DATA MATRIX **

ID	Abies balsamea 1	Acer pensylvanicum 2	Acer rubrum 3	Acer saccharum 4	Acer spicatum 5	Alnus crispa 6	Amelanchier spp. 7	Aralia nudicaulis 8	Aronia melanocarpa 9	Aster acuminatus 10	Aster macrophyllus 11	Aster umbellatus 12	Aster spp. 13	Betula alleghaniensis 14	Betula papyrifera 15
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	3.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	1.000	5.000
[illegible]	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	2.000
[illegible]	[illegible]	9.000	[illegible]	5.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	4.000	4.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	5.000
[illegible]	[illegible]	3.000	[illegible]	6.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	3.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	1.000
[illegible]	5.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	3.000	0.000
[illegible]	[illegible]	5.000	7.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	7.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	2.000	6.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	0.000	3.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	4.000	0.000
[illegible]	3.000	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	4.000	2.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	0.000	1.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	2.000	0.000	3.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	1.000	0.000	3.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	0.000	6.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	2.000	0.000	7.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	3.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	4.000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	3.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	2.000
[illegible]	[illegible]	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	3.000
[illegible]	7.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	4.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	4.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	[illegible]
[illegible]	[illegible]	5.000	4.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	5.000	0.000
[illegible]	[illegible]	[illegible]	5.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	4.000	6.000
[illegible]	[illegible]	[illegible]	3.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	5.000	4.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	[illegible]	5.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	3.000
[illegible]	[illegible]	6.000	[illegible]	[illegible]	[illegible]	[illegible]	5.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	5.000
[illegible]	[illegible]	[illegible]	7.000	1.000	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	3.000
[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	1.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	3.000	4.000

25PA	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
RC2	0.000	5.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000
RC3	3.000	[illegible]	6.000	[illegible]	[illegible]	[illegible]	2.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000	1.000
RC4	0.000	0.000	4.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000
RC5	0.000	0.000	4.000	0.000	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.000	[illegible]
RC6	0.000	2.000	3.000	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	2.000	0.000	0.000
RC7	4.000	0.000	3.000	0.000	0.000	4.000	[illegible]	1.000	0.000	0.000	0.000	2.000	2.000	0.000
RC8	3.000	0.000	0.000	0.000	0.000	[illegible]	2.000	1.000	3.000	0.000	0.000	0.000	0.000	0.000
RC9	3.000	0.000	7.000	0.000	0.000	0.000	3.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000
R10	5.000	0.000	6.000	0.000	0.000	0.000	3.000	[illegible]	0.000	0.000	0.000	0.000	0.000	0.000
R11	6.000	0.000	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000
R12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	[illegible]	[illegible]
R13	3.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000
R14	0.000	0.000	1.000	3.000	1.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000
R15	0.000	1.000	4.000	4.000	0.000	[illegible]	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.000	0.000
R16	5.000	0.000	2.000	0.000	0.000	[illegible]	[illegible]	[illegible]	1.000	[illegible]	[illegible]	0.000	0.000	0.000

PLOTS	VARIABLES 16 Betula populifolia	17 Betula spp.	18 Carex spp.	19 Chamaedaphne calyculata	20 Composite	21 Coptis [illegible]	22 Cornus [illegible]	23 Cornus canadensis	24 Cypripedium acaule	25 Dennstaedtia [illegible]	26 [illegible] spp.	27 Dryopteris spp.	28 Empetrum nigrum	29 Fagus grandifolia
1PA	0.000	0.000	0.000	0.000	0.000	[illegible]	[illegible]	0.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000
1PB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2PA	2.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.000
2PB	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	12.000
2PC	3.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	13.000
3PA	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000	0.000	11.000
3PB	0.000	2.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	11.000
4PA	0.000	2.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4PB	0.000	2.000	2.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000
4PC	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000
5PA	0.000	2.000	2.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5PB	2.000	2.000	2.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	5.000	1.000	0.000
6PA	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6PB	0.000	2.000	3.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000
7PA	3.000	0.000	0.000	0.000	1.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
7PB	5.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8PA	4.000	0.000	3.000	3.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8PB	4.000	0.000	2.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9PA	0.000	0.000	2.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000
9PB	3.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	2.000
10PA	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10PB	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11PA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[illegible]	0.000	0.000	0.000	0.000	0.000
11PB	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12PA	0.000	1.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12PB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000
13PA	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
13PB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14PA	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	5.000	0.000	1.000	0.000	0.000
15PA	0.000	3.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
16PA	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16PB	0.000	2.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000
17PA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18PA	0.000	0.000	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19PA	0.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
19PB	0.000	0.000	2.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20PA	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20PB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000
21PA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	3.000	0.000
22PA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.000	0.000	0.000
23PA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
23PB	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.000	[illegible]	0.700

[illegible]	5.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
5	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.000	[illegible]	[illegible]	2.000	0.000	0.000	0.000	0.000	0.000
6	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.000	4.000	4.000	0.000	0.000	0.000
7	0.000	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.000	[illegible]	[illegible]	4.000	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.000	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	3.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
6	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	2.000	0.000	0.000	0.000	0.000	0.000

VARIABLES	Picea mariana 61	Picea rubens 62	Pinus banksiana 63	Pinus resinosa 64	Pinus rigida 65	Pinus strobus 66	Polystichum acrostichoides 67	Populus grandidentata 68	Populus tremuloides 69	Potentilla tridentata 70	Prenanthes sp. 71	Prunus pensylvanica 72	Pteridium aquilinum 73	Quercus rubra 74	Rhododendron canadense 75
[illegible]	[illegible]	12.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	1.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	1.000	0.000
[illegible]	[illegible]	5.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.000	[illegible]	[illegible]	0.000	0.000	1.000	0.000	0.000
[illegible]	[illegible]	3.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	1.000	0.000	0.000
[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	[illegible]	4.000	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.000	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	1.000	1.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	1.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.000	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	2.000	0.000
[illegible]	[illegible]	7.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	2.000	1.000	0.000	0.000	0.000
[illegible]	[illegible]	6.000	[illegible]	[illegible]	[illegible]	5.000	[illegible]	2.000	[illegible]	0.000	0.000	0.000	0.000	1.000	0.000
[illegible]	[illegible]	7.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	2.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	3.000	9.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.000	[illegible]	[illegible]	0.000	0.000	4.000	7.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.000	[illegible]	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	2.000	0.000	1.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	2.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	5.000	0.000
[illegible]	0.000	11.000	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	4.000	0.000
[illegible]	[illegible]	11.000	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	9.000	0.000	4.000	[illegible]	4.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	9.000	[illegible]	5.000	[illegible]	4.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	11.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	8.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	8.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	11.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	7.000	[illegible]	[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	8.000	[illegible]	[illegible]	[illegible]	3.000	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	9.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	12.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	12.000	[illegible]	[illegible]	[illegible]	3.000	[illegible]	4.000	[illegible]	[illegible]	0.000	0.000	3.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.000	4.000	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	2.000	0.000	0.000
[illegible]	[illegible]	6.000	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000	3.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	0.000	1.000	0.000	0.000	0.000
[illegible]	0.000	6.000	[illegible]	[illegible]	0.000	[illegible]	[illegible]	[illegible]	0.000	[illegible]	0.000	5.000	0.000	0.000	0.000
[illegible]	0.000	[illegible]	0.000	[illegible]	[illegible]	[illegible]	[illegible]	7.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	0.000	9.000	[illegible]	[illegible]	[illegible]	2.000	[illegible]	3.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
[illegible]	0.000	[illegible]	0.000	[illegible]	[illegible]	[illegible]	[illegible]	4.000	3.000	[illegible]	0.000	4.000	3.000	4.000	0.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	[illegible]	0.000	0.000	0.000	0.000	2.000	0.000	4.000

PLOTS \ VARIABLES	Rubus idaeus 76	Rubus spp. 77	Salix spp. 78	Scirpus spp. 79	Solidago spp. 80	Sorbus americana 81	Spiraea latifolia 82	Symplocarpus foetidus 83	Thelypteris noveboracensis 84	Thelypteris palustris 85	Thuja occidentalis 86	Trientalis borealis 87	Tsuga canadensis 88	Vaccinium corymbosum 89
R04	0.000	5.000	0.000	0.000	0.000	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000
R05	0.000	5.000	0.000	0.000	0.000	[illegible]	[illegible]	3.000	3.000	0.000	0.000	4.000	2.000	2.000
R06	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	3.000	0.000
R07	0.000	0.000	0.000	0.000	0.000	3.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000
R08	0.000	4.000	0.000	5.000	0.000	2.000	0.000	2.000	0.000	0.000	0.000	0.000	2.000	0.000
R09	0.000	8.000	0.000	0.000	0.000	[illegible]	0.000	[illegible]	[illegible]	[illegible]	0.000	0.000	3.000	0.000
R10	0.000	6.000	0.000	6.000	0.000	5.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000
R11	0.000	13.000	0.000	6.000	0.000	[illegible]	0.000	[illegible]	3.000	[illegible]	0.000	0.000	0.000	2.000
R12	0.000	2.000	0.000	2.000	0.000	[illegible]	0.000	1.000	3.000	[illegible]	0.000	0.000	2.000	4.000
R13	0.000	4.000	0.000	7.000	[illegible]	4.000	0.000	[illegible]	[illegible]	0.000	0.000	0.000	2.000	6.000
R14	0.000	5.000	0.000	0.000	0.000	[illegible]	0.000	[illegible]	2.000	0.000	0.000	0.000	3.000	0.000
R15	0.000	1.000	0.000	0.000	0.000	0.000	0.000	[illegible]	0.000	0.000	0.000	0.000	[illegible]	[illegible]
R16	0.000	8.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[illegible]	0.000	5.000	0.000
1RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	5.000	0.000
2RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
2RB	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
2RC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
3RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
3RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
4RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000	0.000	0.000
4RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000	0.000	0.000
4RC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.000	2.000	0.000	0.000
5RA	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.000	2.000	0.000	0.000
5RB	0.000	0.000	0.000	0.000	2.000	0.000	2.000	0.000	0.000	0.000	10.000	2.000	5.000	0.000
6RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	2.000	7.000	2.000	4.000	0.000
6RB	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	2.000	0.000	8.000	2.000	0.000	0.000
7RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
7RB	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
8RA	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000
8RB	0.000	0.000	1.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9RA	0.000	0.000	0.000	0.000	2.000	1.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
9RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[illegible]	2.000	0.000	0.000
10RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	[illegible]	2.000	0.000	0.000
10RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	17.000	2.000	0.000	0.000
11RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.000	2.000	0.000	0.000
11RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.000	2.000	0.000	0.000
12RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	2.000	0.000	0.000
12RB	0.000	2.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
13RA	0.000	0.000	0.000	0.000	0.000	6.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
13RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
14RA	0.000	2.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	2.000	0.000	0.000
15RA	2.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	5.000	2.000	0.000	0.000
16RA	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
16RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
17RA	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	1.000	2.000	0.000	0.000
18RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.000	2.000	0.000	0.000
18RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	2.000	0.000	0.000
19RB	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000	0.000	0.000	3.000	2.000	0.000	0.000
20RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000
20RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	5.000	2.000	0.000	4.000
21RA	0.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
22RA	3.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
23RA	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.000	2.000	0.000	0.000
23RB	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.000	3.000	0.000
24RA	0.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
25RA	0.000	0.000	3.000	0.000	0.000	0.000	3.000	0.000	0.000	0.000	0.000	2.000	0.000	0.000
R01	0.000	0.000	0.000	0.000	0.000	3.000	[illegible]	0.000	0.000	0.000	3.000	2.000	0.000	0.000
R02	0.000	0.000	0.000	0.000	0.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000	2.000	0.000	0.000
R03	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.000	[illegible]	[illegible]	[illegible]	2.000	0.000	0.000

5C5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C7	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	0.000	0.000	6.000
5C8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	[illegible]	[illegible]	0.000	0.000	2.000	0.000	0.000	5.000
5C9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	2.000	2.000	0.000	0.000	4.000
510	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	2.000	2.000	0.000	0.000	3.000
511	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	2.000	2.000	0.000	0.000	2.000
512	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.000	2.000	0.000	0.000	0.000	4.000
513	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000	4.000
514	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000	3.000
515	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.000	0.000	2.000	0.000	0.000	6.000
516	[illegible]	[illegible]	[illegible]	4.000	[illegible]	[illegible]	0.000	0.000	0.000	0.000	2.000	0.000	0.000	0.000	3.000

VARIABLES / PLOTS	Veronica officinalis 31	Viburnum acerifolium 32	Viola spp. 33	Vaccinium vitis-idaea 34	Prunus serotina 35	Vaccinium macrocarpon 36
[illegible]	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.000	2.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	3.000	[illegible]	2.000	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.000	2.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.000	4.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.000	[illegible]	[illegible]	2.000	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	0.000	[illegible]	[illegible]	2.000	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	2.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	3.000	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	3.000	[illegible]	[illegible]

R06	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R07	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R08	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R09	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R13	0.000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
R16	0.000	[illegible]	0.000	4.000	[illegible]	[illegible]

APPENDIX G

Constants for Acadia Planar Intersect Computations

APPENDIX G

Constants for Acadia Planar Intersect Computations

	0 - ½"		½ - 1"		1 - 3"		3"+(sound)	3"+(rotten)
	d^2	s	d^2	s	d^2	s	s	s
Beach	0.015	0.768	0.37	0.768	3.49	0.64	0.64	--
Birch (Paper)	0.0256	0.66	0.23	0.66	2.62	0.55	0.55	0.41
Maple (Red)	0.0324	0.648	0.26	0.648	2.92	0.54	0.54	0.40
Red Spruce	0.0179	0.49	0.325	0.49	2.19	0.41	0.41	0.31
Cedar	0.0256	0.37	0.22	0.37	3.31	0.31	0.31	0.23
Red Oak	0.0361	0.756	0.31	0.756	1.74	0.63	0.63	0.47
Pitch Pine	0.0289	0.66	0.35	0.66	2.50	0.55	0.55	--
White Pine	0.0289	0.42	0.31	0.42	--	0.35	0.35	0.26
Red Pine	--	0.528	0.23	0.528	--	--	--	--
Fir	--	--	--	--	3.65	0.36	0.36	0.27
Yellow Birch	0.0256	0.744	0.23	0.744	--	--	--	0.47
Aspen	0.0324	0.456	0.31	0.456	2.25	0.38	0.38	0.29
Hemlock	0.0064	0.48	--	0.48	--	--	--	--

APPENDIX H

Biomass equations used in the Acadia National Park analysis.

Species

Source: Equations to calculate dry weight from Young et al. (1980)

Species	Component	DBH>1" Ln Pounds=A+B(Ln Inches) A	DBH>1" B	DBH<1" Ln Grams=A+B(Ln Inches) A	DBH<1" B	Height Ln Grams=A+B(Ln Feet) A	Height B
Abies balsamea	CT[1]:	0.81615350	2.41397800	7.59150700	0.60002862	2.98109500	1.91625200
	AG[1]:	0.59580000	2.40170000	7.37363200	0.60028150	2.75989400	1.91891700
	L[1]:	-1.64523300	2.45061400				
	B[1]:	-2.20596000	2.46049300				
	S[1]:	0.24870420	2.41165800				
Acer pensylvanicum	CT:	1.18759600	2.37025000	7.48889400	1.65463600	2.01292400	1.20678500
	AG:	0.93920000	2.38040000	7.22695900	1.64779600	1.76839800	1.19879400
	L:	-1.19552200	1.83217300				
	B:	-0.95645660	2.20554900				
	S:	-0.56836780	2.48984700				
Acer rubrum	CT:	1.18759600	2.37025000	7.44179200	1.40476600	1.36305800	1.93635400
	AG:	0.93920000	2.38040000	7.19895700	1.40496800	1.12093500	1.93563800
	L:	-1.19552200	1.83217300				
	B:	-0.95645660	2.20554900				
	S:	0.56836780	2.48984700				
Acer saccharum	CT:	1.47775300	2.32156500	7.48493500	1.21227300	1.66752300	1.34199800
	AG:	1.24510000	2.33290000	7.19566600	1.18266700	1.43091200	1.33620100
	L:	-1.56098100	1.89005700				
	B:	-1.39710700	2.55149300				
	S:	1.10715000	2.23942200				
Acer spicatum	CT:	1.18759600	2.37025000	7.58057600	1.54305800	2.01292400	1.20678500
	AG:	0.93920000	2.38040000	7.27232200	1.48353900	1.76839800	1.19879400
	L:	-1.19552200	1.83217300				
	B:	-0.95645660	2.20554900				
	S:	0.56836780	2.48984700				

Alnus crispa	CT:	1.01033500	2.18733000	7.25654300	1.30021900	2.60869500	1.07826900
	AG:	0.71640000	2.20870000	6.96885400	1.29989000	2.31852700	1.08000900
	L:	-1.10482400	1.22740400				
	B:	-0.57856350	1.52005800				
	S:	0.11787260	2.57554200				
Betula alleghaniensis	CT:	1.34505300	2.33547300	7.52030400	1.44156300	0.39526730	2.45307300
	AG:	1.12970000	2.33760000	7.29086700	1.45853600	0.16681110	2.42980500
	L:	-1.53371500	1.97834800				
	B:	-0.82579230	2.37346100				
	S:	0.75123020	2.34119000				
Betula papyrifera and Betula spp.	CT:	0.74343000	2.63933700	7.49564600	1.55730900	0.39526730	2.45307300
	AG:	0.47920000	2.66340000	7.24332600	1.55779800	0.16681110	2.42980500
	L:	-1.42137000	2.04938000				
	B:	-1.05362600	2.24940200				
	S:	-0.14638250	2.89680400				
Betula populifolia	CT:	1.36489600	2.29507300	7.25453900	1.06520600	1.10790500	2.76885100
	AG:	1.09310000	2.31460000	7.02164700	1.06014500	0.90522390	2.76563800
	L:	-1.24976400	1.22755100				
	B:	-0.39690960	1.62873200				
	S:	0.65417760	2.52990300				
Fagus grandifolia	CT:	1.55455000	2.29108700	7.64782400	1.28607600	1.26894200	2.14792900
	AG:	1.33030000	2.29880000	7.36242100	1.25670600	1.03130900	2.14331900
	L:	-1.42520600	1.91575500				
	B:	-0.63784310	2.36340900				
	S:	1.04626600	2.29974100				
Larix laricina	CT:	1.33653500	2.11088600	7.14878200	0.99712120	2.06076200	1.67357700
	AG:	0.81620000	2.24530000	6.91990400	1.05133000	1.59819900	1.73747700
	L:	-0.66820240	1.72455900				
	B:	-0.41679500	1.96097400				
	S:	0.36461690	2.30509900				
Picea glauca, Picea mariana and Picea rubens	CT:	1.10651000	2.29838800	8.28710700	0.98631420	3.05134400	2.01567000
	AG:	0.80790000	2.33160000	8.07674600	0.99665740	2.78024100	2.02161200
	L:	-0.79805540	2.13806100				
	B:	-1.35131800	2.33838500				
	S:	0.39604330	2.37464500				
Pinus resignosa	CT:	0.83456220	2.41850000	7.52329300	0.54688170	3.21296800	1.55645100
	AG:	0.71570000	2.38650000	7.26525300	0.54682770	3.07702100	1.51414800
	L:	-1.21076500	2.18029000				
	B:	-1.50861600	2.50108500				
	S:	0.30788810	2.44812500				

APPENDIX H

Biomass Equations Used in the Acadia National Park Analysis

Pinus strobus	CT:	0.57248650	2.46779800	7.52329300	0.54688170	2.48719800	2.23702300
	AG:	0.40800000	2.44900000	7.26525300	0.54682770	2.22807600	2.23807700
	L:	-1.37906100	1.96742600				
	B:	-1.70111500	2.48576200				
	S:	-0.04659058	2.54586400				
Populus grandidentata and *Populus tremuloides*	CT:	0.76458130	2.56546700	6.93296500	1.15285200	0.60967810	2.20482000
	AG:	0.46890000	2.60870000	6.65083400	1.15294300	0.31695000	2.21111200
	L:	-1.78193400	2.07660500				
	B:	-1.65957500	2.52443000				
	S:	0.17295520	2.67092600				
Prunus pensylvanica	CT:	1.26671500	2.16567700	7.19472200	1.29521200	1.59057000	1.31507800
	AG:	0.97580000	2.19480000	6.99015900	1.30661200	1.34674900	1.31258000
	L:	-1.20785700	2.03796600				
	B:	-0.62594580	1.91965800				
	S:	0.57936450	2.29877500				
Salix spp.	CT:	1.14450100	2.07159600	7.48897000	1.43934300	1.58552800	1.53443800
	AG:	0.88560000	2.05520000	7.23135700	1.43923700	1.33181100	1.53148000
	L:	-1.14277500	1.69210100				
	B:	-0.39098130	1.65143400				
	S:	0.24657880	2.33210600				
Thuja occidentalis	CT:	1.32942000	1.91905100	7.34123500	0.43290430	2.69001100	2.13444000
	AG:	1.11820000	1.92690000	7.12959700	0.47551990	2.47183100	2.13493100
	L:	0.13436860	1.33518800				
	B:	-0.46634940	1.91101400				
	S:	0.28814400	2.13004100				
Tsuga canadensis	CT:	0.86452250	2.38591000	7.17652300	0.70027650	2.86838200	1.43232400
	AG:	0.68030000	2.36170000	6.91590200	0.70031560	2.60729600	1.43225200
	L:	-0.61855840	2.03004900				
	B:	-1.77509500	2.70333800				
	S:	0.26077140	2.36616100				

Source: *Diameter equations to calculate wet weight from Young (unpublished).*

Height equations to calculate dry weight from Young et al. (1980).

Equations:		DBH>1" Ln Pounds=A+B(Ln Inches)		DBH<1" Ln Grams=A+B(Ln Inches)		Height Ln Grams=A+B(Ln Feet)	
		A	B	A	B	A	B
raxinus americana, Fraxinus nigra and Fraxinus spp.	CT:	1.77579000	2.35518000	7.82802000	1.16301000	1.67863100	1.61645100
	AG:					1.46559600	1.62076500
uercus rubra	CT:	1.43023000	2.58505000	7.47789200	1.04894100	3.30667500	0.65307600
	AG:			7.23946500	1.02155200	3.10845900	0.65323440

Source: *Equations to calculate wet weight from Young (unpublished).*

Equations:		DBH>1" Ln Pounds=A+B(Ln Inches)		DBH<1" Ln Grams=A+B(Ln Inches)		Height Ln Grams=A+B(Ln Feet)	
		A	B	A	B	A	B
uniperus communis	CT:	3.60033000	1.89027000	8.25416000	0.53290000	1.76139000	2.35084000
strya virginiana	CT:	1.57465000	2.18375000	7.99728000	1.31950000	1.95087000	2.29944000
roup A	CT:	3.64146000	0.86504000	7.99728000	1.31950000	1.73584000	2.10955000
roup B	CT:	2.34275000	1.43670000	7.99728000	1.31950000	1.73584000	2.10955000
roup C	CT:					1.73584000	2.10955000

Source: Diameter equation to calculate dry weight from Whittaker and Woodwell (1968).

Equation: $\mathrm{Log}_{10}\ \mathrm{Grams} = A = B(\mathrm{Log}_{10}\ \mathrm{cm}\ DBH)$

		A	B
Pinus banksiana and Pinus rigida	AG:	2.01710000	2.33730000
	S:	1.87580000	2.32610000

[1]CT = Complete tree, AG = Above ground, L = Leaf, B = Branch, S = Stem

[2]Group A = Ilex verticillata, Nemopanthus mucronata and Sambucus pubens.

[3]Group B = Amelanchier spp., Aronia spp., Hamamelis virgiana, Kalmia angustifolia, Lonicera spp., Myrica pensylvanica, Rhododendron canadense, Rubus allegheniensis, Rubus idaeus, Sorbus americana, Vaccinium corymbosum and Viburnum cassinoides.

[4]Group C = Comptonia peregrina, Corylus cornuta, Cornus florida, Diervilla lonicera, Empertrum nigrum, Gaylussacia baccata, Ribes glandulosum, Rosa spp., Rubus spp., Sirea latifolia and Vaccinium spp.

APPENDIX I

Bylaws - Hancock County Mutual Aid Agreement of 1973

BY-LAWS

HANCOCK COUNTY MUTUAL AID AGREEMENT OF 1973

ARTICLE I NAME and OBJECTS

Section 1 This Activity shall be known as the HANCOCK COUNTY MUTUAL AID AGREEMENT OF 1973.

Section 2 The object of this AGREEMENT shall be to promote the scie of fire prevention and the methods of fire suppression by joining together and collectively working to reduce the life and property loss from fire within the County.

ARTICLE II MEMBERS

Section 1 Qualification for membership shall be as prescribed in Article I of the HANCOCK COUNTY MUTUAL AID AGREEMENT of 1

Section 2 Membership shall be open to the fire suppression services any and all agencies and political subdivisions, specifie in Article I of the aforementioned AGREEMENT, whose offic have been granted authority to legally subscribe their si natures to the AGREEMENT.

ARTICLE III OFFICERS

Section 1 The HANCOCK COUNTY MUTUAL AID AGREEMENT OF 1973 does not require, nor does it provide for the election of, any officers except as specified in Section 2, below.

Section 2 The County Coordinator, duly elected by the Hancock Count Firemen's Association, is hereby granted the necessary authority to administer all sections of the AGREEMENT.

Section 3 The members of the Board of Arbitration, five (5) in numb shall be appointed by the President of the Hancock County Firemen's Association, pursuant to the requirements of Article I of the HANCOCK COUNTY MUTUAL AID AGREEMENT OF 1

Section 4 The purpose of the Board of Arbitration shall be to arbit any disputes regarding the interpretation of the MUTUAL A AGREEMENT. Also to bring to the attention of all parties concerned the development of situations where, through la of interest and failure to maintain proper standards of p paredness, any parties to this AGREEMENT might show an unwillingness to bear a fair proportion of the burden.

Section 5 Further duties of the Board of Arbitration shall be as sp in Article I of the AGREEMENT.

ARTICLE IV MEETINGS

Section I The County Coordinator shall be given, and is hereby given, the necessary authority to request the Chairman of Arbitration to call such meetings of the said Board as the Coordinator shall deem necessary in the best interests of the subscribers to the AGREEMENT.

Section 2 The Chairman of the Board of Arbitration is authorized to call such meetings of the Board as he may deem necessary to best carry out the intentions and requirements of the MUTUAL AID AGREEMENT. An annual meeting shall be held as soon as possible following the annual April meeting of the Hancock County Firemen's Associat

ARTICLE V AMENDMENTS

Section 1 These articles, or any section thereunder, may be ame at any meeting, specifically called for, in writing 7 days in advance, for that purpose by the County Coordi at which eighteen (18) or more signatories to the HANC COUNTY MUTUAL AID AGREEMENT OF 1973 are present. Voti shall be by show of hands. The County Coordinator sha be exempt from voting except to break a tie vote.

MUTUAL AID AGREEMENT of 1973

PREAMBLE:

The occurrence of fires in Hancock County is a matter of grave concern to all citizens, as dramatically demonstrated by the Bar Harbor Fire of 1947. The effectiveness of cooperation in fire prevention and fire suppression as a result of the activities of the Hancock County Firemen's Association, together with the mutual aid agreement of 1955, is furthermore shown by the gratifying results in recent years. Advantage should now be taken of accumulated experience to propose a revised contract correcting the weaknesses that have become evident in the former setting forth the rights and obligations of the respective signers in a more definite manner. Provision should also be made for the settlement of any disputes that might arise.

This is a compact between "contracting units" as subsequently defined, by which each signatory party binds itself to the best of its ability to carry out the functions of "requestin units" and of "responding units" as circumstances demand.

ART. I - DEFINITIONS:

A contracting unit may consist of a town, city or any ot political subdivision of the State, an agency of the State of Ma or of the United States of America, a quasi-municipal corporatio or an organized volunteer fire company. In any case it must hav responsible officers with authority to commit their organizatio by signature, and when appropriate by corporate seal, to abide tracting unit shall possess a minimum of one (1) mobile unit in operating condition and command a sufficient number of men experienced in fire fighting to be able in the opinion of the hereinafter defined Board of Arbitration to render effective aid in case of emergency.

A mobile unit shall be a self propelled piece of fire apparatus.

A requesting unit is a contracting unit which seeks assistance by reason of fire or emergency of such magnitude that it can be successfully coped with by local means, or which threatens to spread to property outside of its own proper limits.

A responding unit is a contracting unit which upon order the hereinafter defined County Coordinator, or upon direct request from a requesting unit confirmed by directive from said County Coordinator, dispatches men and/or equipment to the aid of said requesting unit.

The County Coordinator is an officer of the Hancock County Firemen's Association, who must be in a position to have an office constantly attended, reached by telephone without delay at any ho and he shall be the administrator of the cooperative undertaking provided for in this agreement.

A mutual aid call is an emergency alarm ordering men and/ equipment to move from its own jurisdictional area to another, either to render active assistance or to stand-by as replacement for equipment already responding. To qualify as such, and thus

The Board of Arbitration shall consist of five members,
three of whom shall be regular members and two of whom shall be
associate members of the Board. All members of the Board shall be
appointed by the President of the Hancock County Firemen's Associ
tion as soon as possible after the annual meeting of the Associat
which is held in April of each year. In 1973 the President shall
appoint one regular member of the Board to serve for one year, or
for two years and one for three years. In each year thereafter h
shall appoint one regular member to the Board to serve for three
years. In 1973 the President shall appoint one associate member
serve for two years and one for four years. Upon the expiration
the term of each associate member, the President shall appoint or
associate member to serve for four years. After the second year
senior regular member shall be Chairman of the Board. Prior to t
time the chairman shall be elected by the members at their organi
tion meeting. The associate members shall act only in case a reg
lar member of the Board shall be unable to act, due to interest,
absence from the county or physical incapacity. The Board shall
keep a written record of all its meetings and may call a hearing
to be held after notice to all interested parties. The purpose o
this Board is to arbitrate any dispute that may arise between con
tracting units regarding the interpretation of this agreement, an
to avoid as far as possible the development of situations where
through lack of interest and failure to maintain proper standards
of preparedness, any parties to this agreement might show unwilli
ness to bear a fair proportion of the burden.

1. To provide effective cooperation for mutual assistance between the contracting units in combatting and in preventing fi

2. To pool the fire fighting resources of the contracting units with a view to dispatching equipment and men to the scene a fire at the earliest possible moment.

3. To expedite communication between the contracting units in order to carry out effective plans to fight fires.

4. To provide cooperation in investigating and determining the cause of any fire.

ART. III - OBLIGATIONS:

SEC. I GENERAL. All units signatory to this agreement:

1. Shall report promptly to the County Coordinator all fires needing outside assistance.

2. Recognize the principle that the officer in charge in the territory where the fire or emergency is located shall be in supreme command.

3. Will, when requested to do so, assist as far as possibl in the determination of the origin and cause of the fire.

4. Will abide by rules which from time to time may be form lated for the purpose of more efficient operation by representat of such units as shall have authorized their Chiefs of Fire Depa ment to act in their behalf.

5. Recognize that while there is nothing to prevent the co tracting units from entering into other agreements with third pa nothing in such compacts should be incompatible with the obligat assumed under this agreement.

State or County emergency.

7. Will report promptly to the County Coordinator such equipment as may be out of service for repairs, and to report when said equipment is again available.

SEC. II <u>OBLIGATIONS OF REQUESTING UNITS.</u> All units signatory to this agreement, who hereafter assume the status of requesting units, agree:

1. To transmit all requests for assistance to the office of the County Coordinator.

2. To be responsible for men and tools and equipment of the responding units, but only to the extent of those actually request

3. To pay for or replace all gas, oil and food consumed by the responding units.

4. To release men and equipment of the responding units as soon as possible after control of fire has been accomplished.

5. As an exception in case of Forest Fire, in addition to payment or replacement of gas, oil and food as specified in Sectio II-3, to pay to the responding unit the prevailing rate of pay fo similar service current in the municipality of the responding uni

SEC.III <u>OBLIGATIONS OF RESPONDING UNITS</u>. All units signatory to this agreement, who hereafter assume the status of responding units, agree:

1. To report to the County Coordinator when equipment is returned to its home station after answering a call.

2. On arrival at the fire scene, that its officer in charge shall report to the local officer in charge and shall recognize h as the one in authority.

serve as ordered by the County Coordinator, but to avoid comple
stripping of all fire protection until assured of coverage by o
units.

4. To make no charge for service of men and tools or equi
ment engaged in fighting structural fires, but in such cases th
requesting unit will be obliged to pay for or replace all gas,
and food as set out in Section II-3 above.

5. To be ready to send equipment on request of the County
Coordinator to other headquarters for stand-by service.

6. At the request of the County Coordinator, to post one
man at the home station to assist in communication and direct
stand-by service.

ART. IV - TERMINATION:

This agreement shall terminate on April 1, 1978, but may b
renewed for an additional term of five (5) years by any two or
of the contracting parties by giving a notice in writing of int
tion to renew to the County Coordinator within thirty (30) days
prior to April 1, 1978. The renewal of this agreement shall be
effective only as to those parties who sign the agreement after
proper authorization and within thirty (30) days prior to April
1978.

ART. V - PENALTY:

The willful failure to respond to a call as provided herei
or failure to maintain a standard of preparedness satisfactory
the Board of Arbitration, may be cause for loss of standing as
contracting unit and the Board of Arbitration, after hearing wi
due notice to the parties in interest, shall have power to dete

Arbitration does determine that such penalty shall be imposed, then the contracting unit which is in default under this agreeme shall have no further rights or obligations under this agreement and shall be so informed, in writing, by the Chairman of the Boa of Arbitration.

IN WITNESS WHEREOF, the parties hereto have executed this instrument as of June 19, 1973.

ACADIA NATIONAL PARK	BAR HARBOR
BLUE HILL	BROOKLIN
BROOKSVILLE	BUCKSPORT

CASTINE	CRANBERRY ISLE
[illegible] [illegible]	[illegible] Henry F. Butler
DEDHAM	**DEER ISLE**
[illegible] [illegible]	[illegible] [illegible]
ELLSWORTH	**FRANKLIN**
C Thomas [illegible] [illegible] [illegible] [illegible]	[illegible] Beck Dwight Wallace
GOULDSBORO	**HANCOCK**
William [illegible] Billings [illegible] [illegible] Bishop	[illegible] Earl [illegible] Johnston Leon S. Simpson

ISLESFORD [illegible] Harry J. Bunker	LAMOINE Ashley L. Stratton Maurice E. [illegible]
LUCERNE IN MAINE [illegible] [illegible] [illegible]	MAINE FOREST SERVICE Luther Davis Regional Ranger Eastern Region
NORTHEAST HARBOR, MAINE John D. [illegible] [illegible] M. [illegible] John E. [illegible]	ORLAND Paul [illegible] Wayne [illegible] Clyde [illegible]
OTTER CREEK John D. [illegible] [illegible] M. [illegible] John E. [illegible]	PENOBSCOT Daniel Reynolds William [illegible] Frederick Wight

SEAL HARBOR

SEDGWICK

SOMESVILLE

SORRENTO

SOUTHWEST HARBOR

STONINGTON

SULLIVAN

SURRY

TRENTON [illegible] [illegible]	**TOWN HILL** [illegible] [illegible] [illegible] [illegible]
TREMONT [illegible] Clarence Lunt [illegible] [illegible] [illegible] [illegible]	**WINTER HARBOR** [illegible] [illegible] [illegible]

ATTORNEY GENERAL'S OFFICE

May 27, 1973

I certify that I have examined the foregoing interlocal cooperation agreement, and that I find the same to be in proper form and compatible with the laws of the State of Maine.

Assistant Attorney General

HETRA ADP OPERATIONS
A-76 REVIEW

Name: ____________________

Grade: ____________________

Site: ____________________

Date: ____________________

Initials: ____________________

Function: ____________________

Description: ____________________

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Program Area	Daily	Weekly	Biweekly	Monthly	Quarterly	Semiann.	Annually				

ISLESFORD

LAMOINE

Maurice E. George

LUCERNE IN MAINE

MAINE FOREST SERVICE

Luther Davis
Regional Ranger
Eastern Region

NORTHEAST HARBOR, MAINE

ORLAND

OTTER CREEK

PENOBSCOT

Frederick Wight

SEAL HARBOR

SOMESVILLE

SOUTHWEST HARBOR

SULLIVAN

SEDGWICK

SORRENTO

STONINGTON

SURRY

TRENTON	TOWN HILL
[illegible signature] [illegible signature]	[illegible signature] [illegible signature] [illegible signature] [illegible signature]
TREMONT	**WINTER HARBOR**
[illegible signature] [illegible signature] [illegible signature] [illegible signature] [illegible signature] [illegible signature]	[illegible signature] [illegible signature] [illegible signature]

ATTORNEY GENERAL'S OFFICE

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Assistant Attorney General

HETRA ADP OPERATIONS
A-76 REVIEW

Name: ______________________

Grade: ______________

Site: ______________

Date: ______________

Initials: ______________

Function: ______________________________

Description: ______________________________

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Program Area	daily	weekly	biweekly	monthly	quarterly	semiannually	annually				
Total Hours :											