



United States Department of the Interior

NATIONAL PARK SERVICE

Acadia National Park

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RESOURCE MANAGEMENT DIVISION

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IN REPLY REFER TO:

March 5, 1990

Y14(ACAD)

(x)Isle au Haut

Memorandum

To: Division Chiefs

From: Chief, Visitor Services

Subject: Draft Fire Management Plan - Isle au Haut

Attached for your review and comments is the Draft Fire Management Plan for Isle au Haut. Please forgive the temporary maps (Figures 1-6); more detailed computer generated maps will be included in the final plan.

If you happen to get a plan which does not have all of the maps please see me. I didn't have enough to insert in all the copies.

Len
Len Bobinchock

Enclosures

ACADIA NATIONAL PARK
RESOURCE MANAGEMENT DIVISION

REC-11

DRAFT

FIRE MANAGEMENT PLAN

ACADIA NATIONAL PARK

Isle au Haut Unit

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CHAPTER 1 POLICY AND OBJECTIVES

1.1 Purpose of the Plan

This Plan documents the fire management policy, objectives, operational programs, and research required to effectively manage wildland fire and vegetation within the Isle au Haut unit of Acadia National Park.

The Fire Management Plan for Isle au Haut is a component of Acadia's Comprehensive Resource Management Plan and is designed to facilitate the achievement of legislative mandates and Park resource management and visitor protection goals.

1.2 National Park Service Policy

Fire Management Policy for the Department of Interior can be found in Departmental Manual DM 910. National Park Service (NPS) policy, which supports Departmental policy, is contained in the National Park Service Fire Management Guidelines (NPS-18). NPS policy requires that each unit of the National Park system with vegetation capable of supporting fire to develop and maintain a park-specific Fire Management Plan. The Plan must address both the protection of human life and property and the natural role of fire in the development and perpetuation of the park's ecosystem. The Fire Management Plan must be approved by the park superintendent and regional director and reviewed by the Chief, Branch of Fire Management. Annual reviews and amendments, if necessary, are required forty-five (45) days prior to the beginning of the park's fire season.

1.3 Acadia National Park Policy

The policy of Acadia National Park (ANP) is to suppress all wildfires and to develop a program of fuels and vegetation management having the dual objectives of maintaining natural ecosystems and manipulating fuel loadings as an aid to the prevention and control of future wildfires.

Given the present quantities and distribution of fuels and ANP's limited suppression capabilities, all fires burning within the Park pose a threat to cultural resources and physical facilities both within and outside the Park's boundary. Therefore, all natural and human caused wildfires will be suppressed.

1.4 Resource Management Objectives

The management objectives for the Isle au Haut unit of ANP are taken from P.L. 97-335 which established a permanent boundary for this unit of the Park. They are:

- a. To preserve this unit of the Park in as nearly its present state and condition as possible. No development or plan for the convenience of Park visitors shall be undertaken which would be incompatible with the preservation of the flora and fauna or the physiological conditions now prevailing.
- b.. To preserve the local, traditional, resource based economy outside the Park.
- c. To strictly limit visitation to assure negligible adverse impact on the resources, to conserve the character of the town, and to protect the quality of the visitor

experience.

- d. To develop, establish, and enforce visitor carrying capacities.

1.5 Fire Management Objectives

The fire management objectives for Acadia National Park support the mandates of P.L. 97-335. They are:

- a. To protect life and property from wildfire.
- b. To protect natural and cultural resources from the effects of wildfire and wildfire suppression activities.
- c. To research, develop, and implement a program of fuels and vegetation management designed to reduce the size and spread of wildfires while maintaining, as nearly as possible, natural ecosystems and habitats.
- d. To involve the State of Maine and local fire districts in the development and implementation of fire plans to ensure fire programs compliment rather than contradict State and local fire policy and programs.
- e. To develop a more complete understanding of the ecological role, behavior, and effects of fire through applied research.

CHAPTER 2: DESCRIPTION OF THE AREA

2.1 Location and Setting

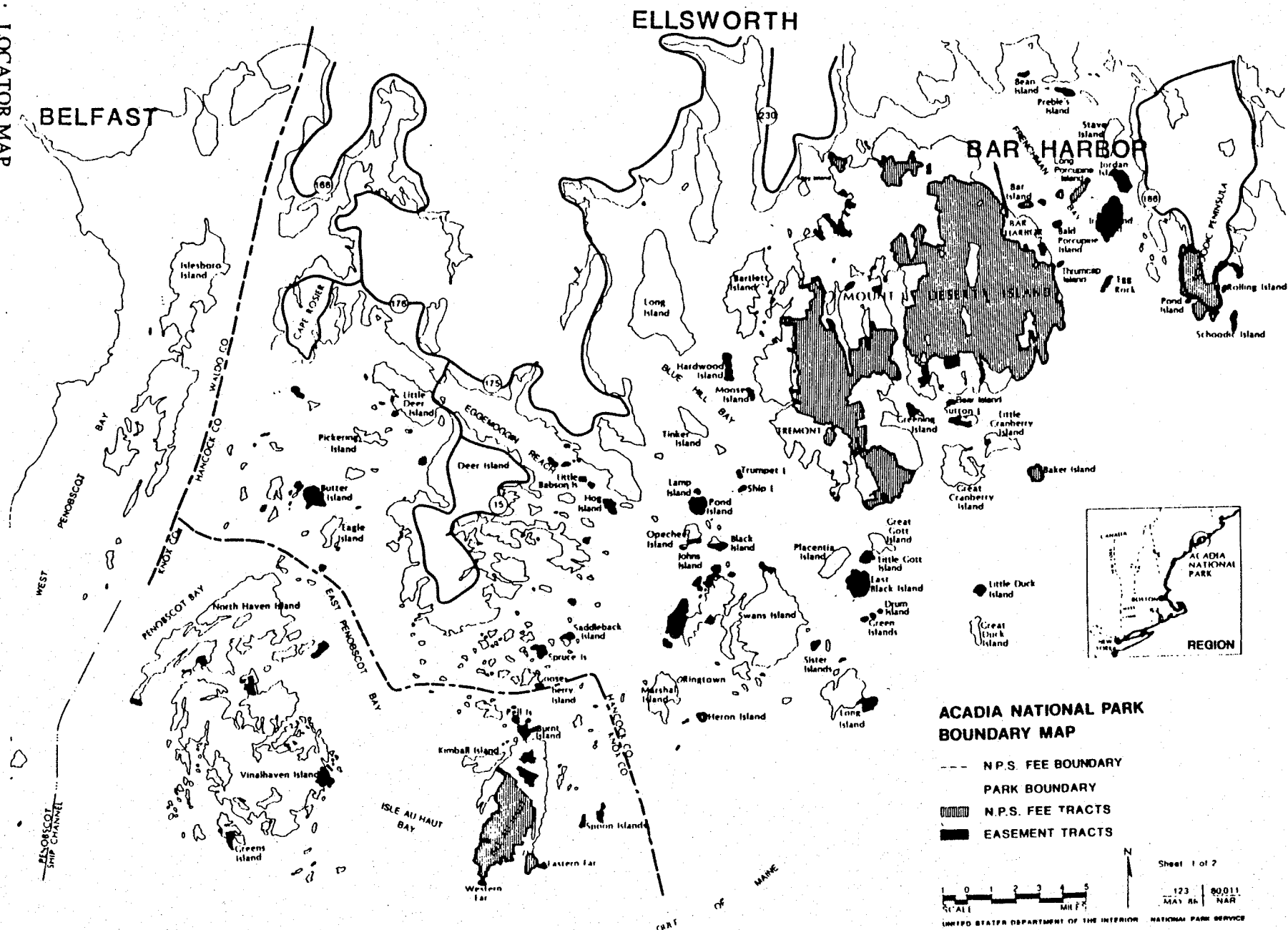
Isle au Haut is a 6,800 acre island located 15 miles southwest of Mount Desert Island in the Gulf of Maine (Atlantic Ocean) at 44 N and 68 W (Figure 1). The island, which is bisected by a ridge along its north-south axis, is 2.5-3 miles wide and 6 miles long.

Isle au Haut is accessible from the mainland only by boat. The only settlement on the island is a town also called Isle au Haut. The resident population consists of 40-50 people in the winter and up to 300 residents in the summer. There are approximately 165 privately owned structures on the island. A gravel road which circles the island provides access to most of the shoreline, and a network of trails provides further access into the interior. The southern half of the island (3,200 acres) is under NPS ownership and is managed as part of the West District of Acadia National Park. The NPS maintains a seasonal ranger station near the Town of Isle au Haut, a patrol cabin near Eli Creek, a primitive campground with five lean-tos, and a boat dock at Duck Harbor on the southwest side of the island (Figure 2). Park visitation occurs principally in the summer and is restricted to 50 day use visitors and 30 campers per day. Hiking and camping are the major recreational pursuits.

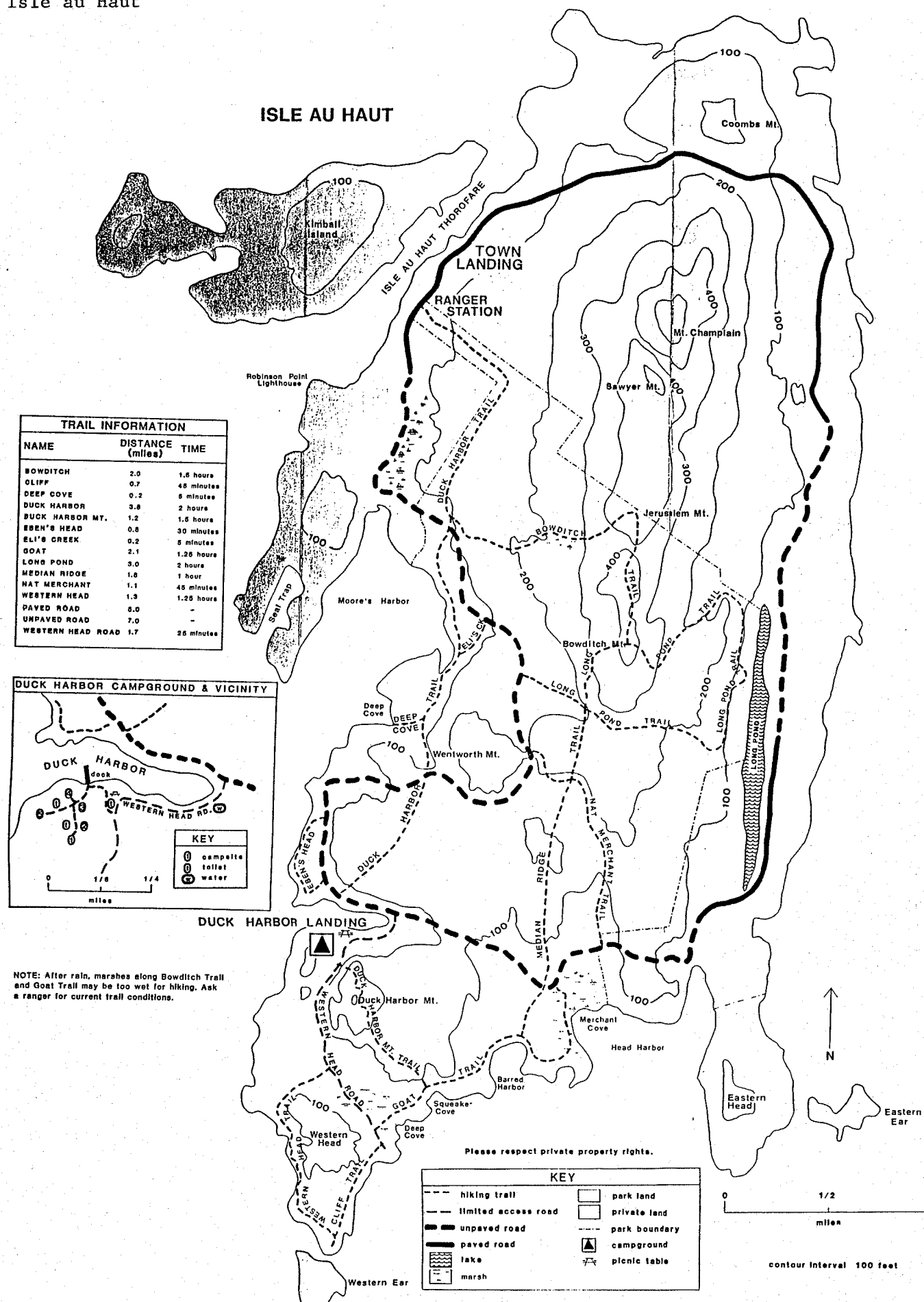
2.2 Topography

The topography of Isle au Haut is dominated by the median ridge that runs most of the length of the island's long axis. The

Figure 1: LOCATOR MAP



Orientation Map
Isle au Haut



northern half of the ridge is highest, averaging 400 feet above sea level and reaching its highest elevation at 543 feet on the summit of Mt. Champlain. The southern half of the ridge averages somewhat under 200 feet above sea level, but attains an elevation of 314 feet on its southern end at the summit of Duck Mountain.

2.3 Geology

Isle au Haut is part of an island complex in Penobscot Bay that has had a long, complex geologic history covering at least 460 million years (Butcher 1977). Movement of continents, igneous activity, sedimentation, erosion, and at least four glacial advances have all acted in turn to create the varied and spectacular landforms of these islands. The landforms consist of a series of north-south oriented ridges separated by deep U-shaped valleys that were formed by the grinding action of glaciers. Because sea level was some 325 feet lower during the height of the last (Wisconsin) glacial period, the Maine coast at that time extended much further seaward. As the ice melted and retreated some 10,000 years ago, rising sea level flooded the former coastline, causing the outer ridges, hills and long stream valleys to become the peninsulas, islands and long bays that characterize the distinctive Maine coast of today.

Because of glacial movement in a northwest to southeast direction, the north and northwest exposures of the major mountain ridges on Isle au Haut tend to slope gently, becoming arched or rounded near the top, whereas the south, southeast and east exposures tend to be steep, sharply cut, step-like profiles. One

of the best examples is Mt. Champlain on the northern part of Isle au Haut.

This varying topography greatly influences fire behavior. The major differences in slope and aspect on the island's mountain ridges, especially with respect to prevailing winds, soil cover and vegetation type, are critical factors in determining fire behavior.

2.4 Soils

Glacial soils predominate on Isle au Haut with lesser deposits of post-glacial erosion. Thick deposits of organic matter occur in areas where mature coniferous forests have developed and numerous bogs occur in low areas gouged out by the glacier. These organic soils are generally quite shallow, coarse textured and acid. The Maine Coastal Inventory (MCI 1977) Soils Map No. 3-2 shows the distribution of four soil associations on Isle au Haut. Overall, there is a high potential for soil erosion on steep slopes following intense fires.

2.5 Climate

The Maine coastal climate is cool, moist, and maritime. The mean annual temperature is 45.6 F. The warmest month is June with a mean daily temperature of 61.6 F; January is the coldest month with a daily average temperature of 23.2 F. Average annual rainfall is 49.63" and is fairly uniform throughout the year. Mean annual snowfall is 60.70" and occurs principally from November through April. The wind is predominately from the southwest in spring and summer and from the northwest during the late fall and

winter. Strong winds and heavy precipitation often accompany winter storms (northeasters), and hurricanes occasionally reach the area. Thunderstorm activity is infrequent and seldom results in wildland fire. Generally, fire danger remains low to moderate, although periods of short-term drought occur. The combination of late summer/early fall drought, combined with strong winds and low relative humidities (cold, dry fronts) can result in catastrophic fires (Bar Harbor Fire 1947).

2.6 Vegetation

Mature spruce-fir forests are the most common forest type on Isle au Haut (Garman et al, 1987). Red spruce (Picea rubens) is the predominant species and occurs throughout the island. 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. Balsam fir (Abies balsamea) occurs only occasionally on Isle au Haut and is less common overall in these coastal forests than in the spruce-fir forests of inland Maine.

Two other conifer species occur on Isle au Haut. Pitch pine (Pinus rigida) grows in xeric communities in shallow, nutrient-poor soils primarily on the northern part of the island (especially on the north face of Mt. Champlain). In contrast, northern white cedar (Thuja occidentalis) grows on the central part of the island in mesic to wet communities, either in sphagnum bogs or mixed hardwood-conifer stands consisting of red spruce, cedar and yellow birch (Betula alleghaniensis). Other species characteristic of wet

sites and commonly occurring on Isle au Haut are red maple (Acer rubrum), sheep laurel (Kalmia angustifolia), black alder (Ilex verticillata) and leatherleaf (Chamaedaphne calyculata).

At the southern end of the island near Western Head, there are mixed stands of white spruce, balsam fir, red spruce, mountain ash (Sorbus americana) and paper birch (Betula papyrifera). Sheep laurel, huckleberry (Gaylussacia baccata), bayberry (Myrica gale), high and low bush blueberry and mountain cranberry (Vaccinium spp.), wintergreen (Gaultheria procumbens), partridge berry (Mitchella repens), skunk cabbage (Symplocarpus foetidus) plus ferns (Dennstaedia punctiloba and Pteridium aquilinum), lycopods (Lycopodium spp.), grasses, sedges, moss, lichens and forbs typical of moist, northern forests make up the various shrub and herb layers on Isle au Haut as well as the rest of ANP (Patterson et al, 1983).

2.7 Wildlife

Because Isle au Haut lies some distance offshore, the fauna of the island differs from that commonly found on the mainland in eastern coastal Maine. The land mammal population is relatively small and consists of few species, while the bird population is large and includes a great many species. The marine fauna is abundant in the waters around the island and, because of the lack of pollution, is generally more diverse than that found in the waters closer to the mainland.

Land mammals found on Isle au Haut include white-tailed deer, varying hares, red squirrels, otters, mink, muskrats, weasels,

bats, and several species of mice, shrews, moles, and meadow voles. Skunks, porcupines, and beavers -- all relatively common on the mainland -- are not found anywhere on the island. White-tailed deer are quite abundant, although they are generally smaller in stature than those found on the mainland.

Water birds are abundant on the shores of Isle au Haut and on the small islands that surround it. During the summer, large numbers of gulls, terns, cormorants, and eider ducks nest on the smaller, more remote islands that lie off the eastern and southern shores of Isle au Haut. In the winter, a great many ducks, especially old squaws, goldeneyes, buffle heads, mergansers, black ducks, and eiders take up residence in the bays and coves around the island. Ocean birds, such as shearwaters and petrels, are sometimes seen nearby the island, and migrating shorebirds--mainly sandpipers and plovers--are common during late spring and late summer. A number of species of land birds are found on Isle au Haut, including ⁿ ~~rays~~ ^{harlequin ducks}, great blue herons, great egrets, ospreys, woodcock, and several species of warblers, vireos, thrushes, and sparrows. The ring-necked pheasant was introduced on the island in the late 1800's but managed to survive only until the 1950's.

The federally endangered bald eagle has occasionally nested in the larger "monarch" white pines on the island, and peregrine falcons have been observed in the air over the island. No other endangered, threatened, or rare species are known to occur on the island.

2.8 Water Resources

Water resources of Isle au Haut consist of Long Pond, a 70-acre fresh water body in the southeastern section of the island, and numerous streams and bogs. Due to the limited size of the watersheds, topography and shallow soils of the island, many streams and bogs are intermittent. Long Pond supports brook trout, landlocked salmon and smelt. Steep slopes adjacent to the western shore of Long Pond present a potential for sedimentation and nutrient loading of the pond following intense fires.

2.9 Significant Natural and Cultural Resources

Natural Resources:

A number of sites on Isle au Haut have been identified as significant natural features. A few of these sites are currently being considered for inclusion on the Maine Critical Areas program. Most of these sites, however, are geologic features and would not be significantly affected by fire. Six sites, however, have been identified as important natural areas and are botanical in nature. They are:

- (1) Rare plant site (Duck Harbor Mountain)
- (2) Great Meadow rare plants site
- (3) Screw stem site (Head Harbor)
- (4) Carex adusta rare plant site (Duck Harbor)
- (5) Pitch pine/huckleberry stands (Duck Harbor Trail)
- (6) Rare plant site (Aster folicens)

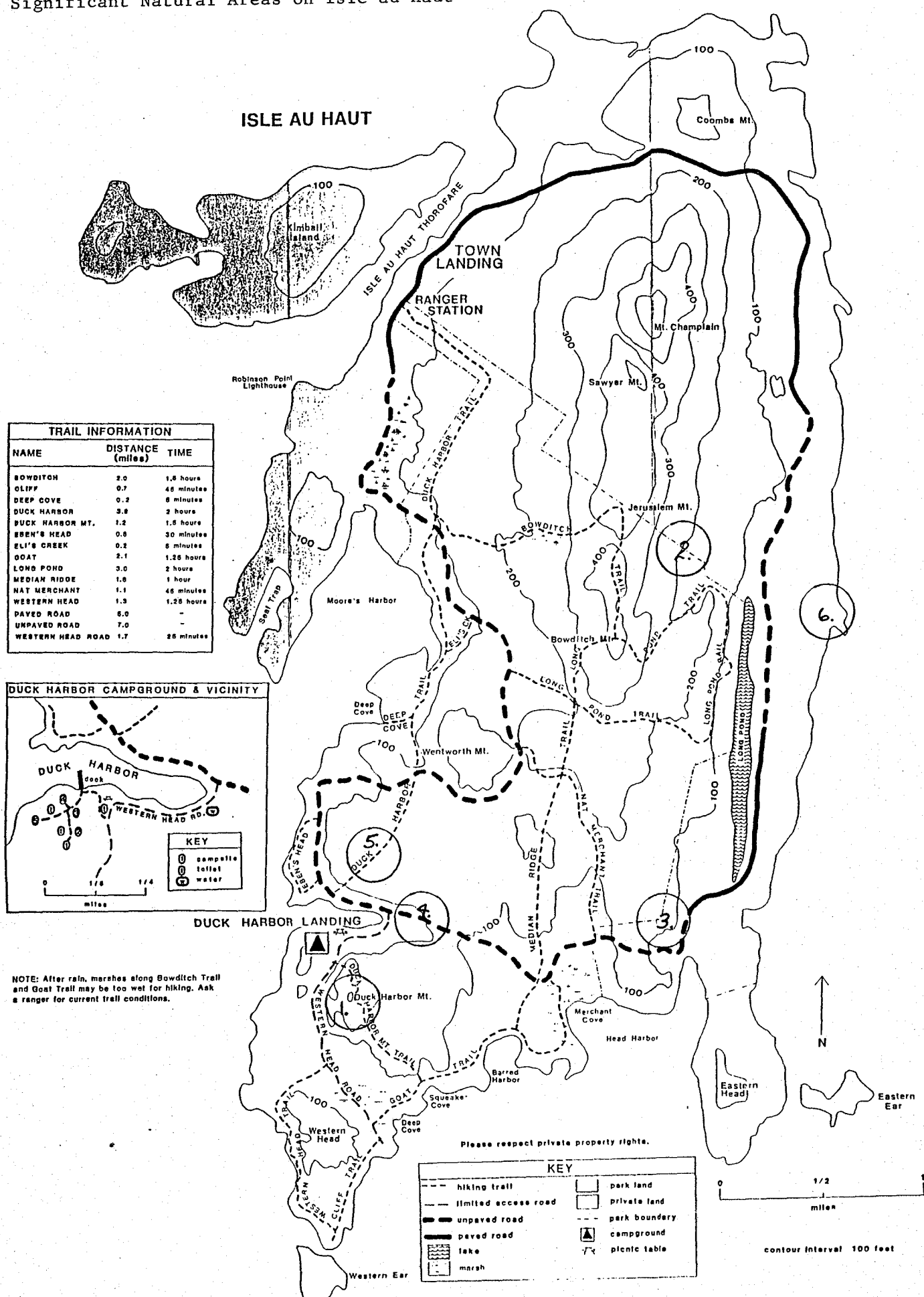
Cultural Resources:

The first inhabitants of Isle au Haut predate European man by as much as 1,600 years. Evidence of their existence can be found at two archeological sites, one at Duck Harbor and the other at Eli Creek. Both pre-Columbian sites consist primarily of shell midden, although some implement manufacturing occurred at Duck Harbor. Neither site is on the National Register of Historic Places, nor are they recommended for that designation.

Although little development has taken place on the island since European settlement, over 100 structures are concentrated on private lands at Point Lookout, Village of Isle au Haut, Rich's Cove, and Head Harbor. Many of these structures are old, and most are of wood frame construction. None of these structures have been included on the National Register of Historic Places, but all of them could be threatened by wildfire due to their juxtaposition with forested land.

Areas of significant natural resources are depicted in Figure 3. Detailed maps and descriptions of these sites can be found in the Park's Natural Resource Management office. The Incident Commander will consult with the Park's resource advisor when any of these sites are threatened and, whenever possible, before suppression action is taken.

Figure 3
Significant Natural Areas on Isle au Haut



CHAPTER 3: FIRE MANAGEMENT INFORMATION

3.1 Fire History

Several methods to determine when fires occurred and their causes in both the pre-settlement and post-settlement periods (before and after approximately 1760 AD) were used on Isle au Haut. Modern fire records, historical accounts, and dendrochronological studies were used to determine when and where fires occurred during the past two centuries (Patterson et al 1983). For earlier times, charcoal and pollen fragments taken from lake bottom sediments (Long Pond) were used to reconstruct vegetation and fire patterns to approximately 1400 AD (Patterson and Backman 1988, Patterson and Sassaman 1988). Based on this research, the fire history of Isle au Haut can be divided into two periods: (1) the pre-settlement period (1400 -1760 AD); and (2) the post-settlement period (1760 AD-present).

Pre-settlement Period:

Although few fires have occurred on Isle au Haut in recent years, Isle au Haut has had a long history of fire. Pollen and charcoal analysis suggests that the species composition of the pre-settlement forest was basically the same as today and that periodic fires occurred prior to the arrival of European settlers. Lacking in these data are large charcoal peaks indicative of a major catastrophic fire such as the Bar Harbor Fire of 1947. The data suggest that although the species composition of forest was similar to today's; the age class diversity may have been greater, and

fires may have been more frequent but less intensive than in post-settlement times. Natural fire ignitions (lightning) are, and most likely were in the past, of little importance on Isle au Haut. Unlike interior sections of Maine, lightning accounts for only 2% of all fires in coastal Maine. The lack of lightning fires is attributed to the general suppression of thunderstorm activity along the coast and the often humid conditions common during the summer.

Native Americans camped on Isle au Haut during this early period. In their shell heaps and burial sites are found the remains of deer, otter, mink, muskrat and waterfowl (Manville 1964). Assuming that weather patterns during this period were similar to those of today, fire activity, whether accidental or intentional, can be attributed to Indians. Whether periodic Indian fires, or a combination of periodic fires and greater natural age diversity of the stands prevented major, high intensity fires, remains unknown. It is possible that large catastrophic fires occurred in early times, but prior to the period for which research data are available. Additional lake bottom sediment cores spanning several thousand years will be collected and analyzed over the next several years. This information will be very helpful in confirming the pre-settlement fire history and developing strategies for coping with current and future fuel conditions.

Post-settlement Period:

In 1604, Samuel de Champlain explored the Maine coast and named Isle au Haut, which means the High Island. It was not,

however, until 1792 that Peletiah Barter and his two brothers settled on the island. By 1800, Isle au Haut had around 50 residents, and by 1864, its population increased to 300. Since that time the number of permanent residents has declined to the original number of 40-50 residents, while the summer population still remains about 300.

Early occupations were fishing, lumbering, and sheep raising. Subsistence farming, the harvesting of fish, lobsters, blueberries, and pulpwood have been practiced on Isle au Haut for many years and continue to be important today. It is reported that as many as 400 sheep grazed, unfenced, on Isle au Haut in the 19th century, where much damage to its low vegetation occurred. As a result of extensive overgrazing, there was little underbrush, and people could walk anywhere through the woods.

The buying of land by summer visitors in the 1880's led to a decrease in sheep grazing which allowed undergrowth, flowers, and shrubs to regenerate.

In 1879, a fire believed to have been started by blueberry pickers burned over the summit of Mt. Champlain for about six weeks until extinguished by snow and rain. This fire was intensive enough to burn off all of the soil, exposing bedrock. A smaller fire is reported to have burned in 1894 south of Duck Harbor; and in 1949, a fire burned northeast of Long Pond. All of these fires have been corroborated by fire scars, tree ring analysis, or charcoal in the duff. Concern over increasing fuels and the need for fire control prompted the construction of the County Road in 1952. No additional fires have been reported since 1949.

The patterns of logging and sheep grazing in the 19th century significantly altered the spatial coverage and age distribution of Isle au Haut's vegetation. The result has been many even-aged stands of 100-110 years old red spruce that have grown to maturity in the 20th century. Many of these stands are approaching the age when they will overmature and become susceptible to windthrow, a common problem with the shallow rooted spruce. After blowdown, the mass of downed fuel accumulates because spruce decomposes at a slow rate (twenty years). The cool, moist climate of Isle au Haut also contributes to a slower decay rate of dead trees. As a result, fuel loadings and the fire hazard on Isle au Haut should increase dramatically within the next few decades.

The post-settlement fire regime for other areas of coastal Maine, including the Mount Desert/Schoodic sections of Acadia, appears to coincide with the maturation cycle of the spruce forest. A few small fires generally occur over a long period of time (100+ years), followed by the infrequent but catastrophic fire as the forest reaches overmaturity (125 years).

3.2 Fuels

Spruce:

Eighty-two per cent (82%) of the current vegetation on Isle au Haut is even-aged red spruce, 100-110 years old. The average dead and downed woody fuel loadings in these stands are 10.38 tons/acre and fall into the following time lag fuel classes: 1 hr.=1.40; 10 hr.=1.04; 100 hr.=1.37; and 1,000 hr.=6.58. National Fire Danger Rating System (NFDRS) Model H is currently used to project fire

danger and Northern Forest Fuels Laboratory System (NFFLS) Model 10 is used to estimate fire behavior.

However, the fuel situation on Isle au Haut is changing as the spruce forest matures. Logging and sheep grazing in the 19th century has resulted in numerous even-aged stands. Many of these stands are approaching the age when they will overmature and become subject to windthrow, a common problem with this shallow rooted species, especially in coastal areas. After blowdown, the mass of downed woody fuels accumulates and remains for some twenty years due to a slow rate of decomposition. As a result, fuel loadings and the fire hazard will increase dramatically in the next few decades. Most of the spruce stands now represented by NFDRS Model H and NFFLS Model 10 will progress to NFDRS Model G and NFFLS Model 12 or 13 as fuels accumulate. Dead and downed woody fuel loadings of 60-80+ tons/acre can be expected in future years. This process has already begun in isolated pockets on the island and is expected to accelerate over the next 10-20 years.

Pitch Pine/Huckleberry:

Two per cent (2%) of the current vegetation of the island is pitch pine. Downed woody fuel loadings in these seral stands are generally low (4 tons/acre), but the vegetation is extremely flammable due to huckleberry shrubs in the understory and a thick ground cover of pine needles. Pitch pine reaches its northern range in Acadia and is therefore important as an ecological indicator of environmental change. The pitch pine/huckleberry habitat appears to be fire-adapted. In the absence of fire, these

stands may be eventually replaced by spruce.

Northern Hardwoods:

Northern hardwood species (red maple, yellow birch, American beech) occupy 11% of Isle au Haut. Dead and downed woody fuels in these stands are low. Northern hardwood stands generally occur on deeper, moister soils, at lower elevations and, with the exception of periods of severe drought, are fairly fire resistant.

Grasslands:

Five per cent (5%) of Isle au Haut are either active or abandoned fields and meadows located on the northern half of the island. Fuel loadings are low. Although grasslands may be easily ignited when cured, fire intensity and difficulty of fire suppression is low. For this reason, northern hardwood stands and grasslands provide effective fuel breaks for fires burning in the much more flammable spruce and pitch pine stands.

The fuel types of Isle au Haut are summarized in Table 1 and illustrated in Figure 4.

TABLE 1.

Vegetation of Isle au Haut			
Cover Type	Park (Acres)	Non-park (Acres)	Total
Spruce	2,723	2,258	5,281
N. Hardwoods	289	457	746
Pitch Pine	40	107	147
Grass	<u>44</u>	<u>255</u>	<u>299</u>
Totals	3,096	3,377	6,473

3.3 Fire Season

The typical fire season for Isle au Haut is April 1 through September 15. Analysis of thirty-three years of fire records for Acadia (Mount Desert Island) indicates that 92% of all fires occur between April 1 and August 31. The period September through November accounts for only seven percent (7%) of all fires, but during droughts the most damaging fires are likely to occur during this period (Bar Harbor Fire, October 1947).

3.4 Fire Behavior

Dense Conifer (Spruce):

In the current spruce stands (NFFLS Model 10), fire would likely spread through the dead and downed wood fuels and spruce regeneration where present. Torching of individual trees and spotting would be likely. With steep slopes, strong winds, and an abundance of ladder fuels, running crown fires could develop. Fire line intensity could easily exceed the capability of hand crews.

Overmature, Windthrown Conifer:

As dead and downed fuels increase (NFFLS Model 12 or 13), fire intensity and behavior will also increase. Rapidly spreading fires with high intensities capable of generating firebrands and spot fire could be common. Fire in these fuel types generally continue until a fuel break or change in fuels occurs. Fire line intensity could easily exceed the capability of hand crews.

Pitch Pine/Huckleberry:

In the pitch pine/huckleberry stands (NFFLS Model 7), fire can spread through the surface fuels and shrub strata with equal ease and can occur at higher dead fuel moisture contents because of the flammable nature of the live vegetation. The huckleberry shrub layer is often two to four feet high and often forms a continuous horizontal fuel bed under the pines. Flame lengths of six to twelve feet could occur with spotting and torching of individual pine trees. Fires burning on steep slopes and with strong winds could result in crown fires. Rate of spread and fire intensity would be high and could easily exceed the capabilities of hand crews.

Northern Hardwood:

In the northern hardwood stands (NFFLS 9), fire would spread primarily in the surface litter of dead, dry leaves. Individual trees may torch out where concentrations of woody fuels are encountered. Under most conditions, fires are of low intensity and short duration. Flame lengths of two feet or less are common, and fire spread is influenced principally by wind and topography.

Fires in this fuel type can usually be controlled by hand crews.

Grassland:

Fire in the grasslands (NFFLS Model 1) consume the fire herbaceous fuels that have cured or nearly cured. Such fires are of low to moderate intensity and short duration. Fires in this fuel type spread very rapidly, usually under the influence of wind and topography. Flame lengths of one to four feet are common depending on fine fuel moisture content, height of the grass, and wind. Grass fires can normally be controlled by hand crews.

Weather:

The cool, moist maritime climate on Isle au Haut creates meteorological conditions that are rarely conducive to the ignition of fires. The winds are highly variable on the island, according to the season. In the winter, winds blow from the northeast off the cold Atlantic, bringing cold air and heavy precipitation that greatly reduces fire danger during the winter months. In summer, the prevailing winds are out of the south or southwest. These southerly winds blow over the cooler surface waters of the Gulf of Maine, which increases the moisture content of the air and lowers the ambient temperature to near the dew point. The result is higher relative humidity, fog, and more frequent and greater amounts of precipitation on Isle au Haut compared to inland areas. Except during severe drought, these moisture laden winds tend to maintain fire danger at low to medium levels during the drier summer months. In the spring and fall, there is less temperature

difference between the land and sea and generally lower humidities, less fog and precipitation. Cold fronts blowing out of the northwest off the continental land mass bring colder dry air and, most important to fire management, strong winds that blow steadily during the passage of the front. This type of weather front probably occurred in 1879 when the last major fire on Isle au Haut burned most of Mt. Champlain clear to bedrock. A cold front during the Bar Harbor Fire in 1947 produced hurricane force winds which rekindled a ground fire and resulted in a major conflagration.

Topography:

The two most important topographic parameters with respect to fire behavior are slope and aspect because of their potential to influence fire spread rates and fuel moisture contents. Because of the rugged topography on Isle au Haut, the complex interplay of slope and aspect is critical to the analysis of fire behavior and fuel hazards on the island. The most severe hazard areas occur on the western (windward) sides of north-south ridges where there are steeper slopes, especially on the west-central and southwest parts of the island.

3.5 Fire Effects

Vegetation:

Spruce has a very low resistance to fire due to its thin bark, shallow root system, flammable foliage, and stand configuration. The current fire regime appears to coincide with the maturation cycle of the spruce forest. The catastrophic fire occurs when

heavy fuels loads, unusual weather conditions and an ignition combine. Following a major fire such as the Bar Harbor Fire of 1947, mature spruce forests killed by the fire are quickly replaced by a combination of spruce, birch, and aspen regeneration. The fire hazard during the first twenty years following a fire (Phase #1) is rather high due to the combination of remaining dead spruce (ground and aerial) and young regeneration. Over the next fifty years (Phase #2), birch, aspen, and spruce compete for available sunlight, moisture, and nutrients, with spruce gradually outliving the other species. Fire danger during this period is low. Over the next fifty years (Phase #3), healthy spruce dominate the stand, and the fire hazard remains moderate. At approximately 110 years, the spruce begin to overmature and become subject to windthrow. During the next twenty to forty years (Phase #4), large quantities of dead and downed fuel accumulate due to windthrow, crown break-up, and a slow rate of fuel decomposition. During this period the fire hazard is very high, and the stage is again set for a major fire. Should a fire occur, the cycle begins anew (Phase #1). If a fire does not occur, young spruce continue to fill the void created by blowdowns. The fire hazard during this period (Phase #5) remains high due to the combination of young spruce and heavy fuel loads. As the downed woody fuels decompose, the stand will eventually assume the properties described in Phase #3, and a gradual increase in age class diversity will occur. (Table 2).

Pitch pine is a fire adapted species with a high resistance to fire and the ability to sprout prolifically following fire. Current pitch pine stands are expected to be replaced by spruce in

the absence of fire. In general, pitch pine would be expected to slowly increase in numbers and distribution following fire.

Northern hardwoods have a low resistance to fire and would not be expected to prosper following fire. An exception may be American beech (Fagus grandifolia) which has the ability to sprout from the root.

TABLE 2
Spruce Succession

<u>Phase</u>	<u>Time since disturbance</u>	<u>Description of Vegetation</u>	<u>Fire Hazard</u>
1	0-20 yrs.	Dead spruce (ground and aerial); young spruce, birch, aspen regeneration.	high
2	20-70 yrs.	Birch, aspen, spruce.	low
3	70-110 yrs.	Healthy spruce.	moderate
4	110-150 yrs.	Windthrown spruce.	very high
5	110-170 yrs.	Windthrown spruce with spruce regeneration.	high

Fuels:

Few studies have examined the effects of fire on fuels in the northeast. Data presented for logged-over spruce-fir in the lake states show that a total average fuel loading of approximately 32 tons/acre fell into the following four size classes: 8% in 1 hr., 14% in 10 hr., 20% in 100 hr., and 58% in 1,000 hr. time lag fuels. An additional 20 tons/acre of larger material was removed from these recently harvested stands. Prescribed fires reduced loadings

by 25% overall and by size class as follows: 90% for foliage and 1 hr., 81% for 10 hr., 27% for 100 hr., and 3% for 1,00 hr. time lag fuels. Fires on Isle au Haut may produce similar patterns of fuel reduction, although total fuel loadings are higher in Maine.

In addition, fuel distributions are probably less uniform than in logged-over areas and burn patterns less predictable.

Soils:

Fire effects on soils may be either positive or negative depending on such factors as soil texture, depth, permeability, drainage, slope, and the frequency and intensity of fire. The soils of Isle au Haut can be divided into two risk classes: low and high. Low risk soils are generally deep, coarse textured soils with good permeability and drainage which are usually found on shallow slopes. 20% of the land mass of Isle au Haut falls into this category. High risk soils are fine textured, shallow soils, with poor permeability and drainage located on steep slopes. 80% of Isle au Haut falls into this category. The effects of fire on the low risk soils are generally positive. Periodic fires remove surface fuels releasing nutrients, cations and compounds (potassium hydroxide) which help neutralize the soils. Good permeability and drainage of the soils limit erosion. The result is exposure of bare mineral soil which quickly revegetates. The effects of fire on the high risk soils are generally negative. Fires burning in this risk class combine with post fire erosion to expose bedrock which is slow to revegetate or may not revegetate at all.

Fire effects water regimes both at the burn site and downstream. On-site, fire reduces interception and infiltration and increases soil moisture storage, snow accumulation, overland flow, and surface and mass erosion. Erosion effects depend on the relative risk of the soils as previously discussed and the characteristics of rainfall and snowmelt. Soil water regimes may stabilize within a few years in areas of low risk soils, but the exposed rocky slopes of Isle au Haut (high risk soils) are sites where the effects of fire on both soil and water regimes would be evident for many years. Downstream effects on Isle au Haut are less important than on-site effects because most streams terminate in the ocean. The only significant body of water on Isle au Haut is Long Pond which is located at the base of very steep cliffs composed of high risk soils. Long Pond may experience a temporary increase in turbidity and aquatic productivity due to the transport of sediment and nutrients released by a fire.

Wildlife:

Fire effects on the wildlife of Isle au Haut are not well understood. Descriptions of long and short term ecosystem responses to burning are almost completely lacking, particularly for the northeast.

Data collected elsewhere suggest that few animal species are directly effected by fire due to their mobility. Most animal species can escape a fire by flying, running, swimming or hiding in sufficiently insulated areas. Many populations of wildlife do not change in density or abundance following fire. Bendell (1974)

notes that 80% of animal and bird populations remained about the same following fires. Birds in particular and large mammals show little change in abundance after fire, although some species are generally favored by habitat changes resulting from fire.

Fire should have little long-term effect on most bird and mammal species that occur on Isle au Haut although short-term adjustments in abundances and distributions could occur. Species most likely to be effected include: white-tailed deer, varying hare, red squirrel, ruffed grouse, and cavity-nesting birds. White-tailed deer, varying hare, ruffed grouse, and cavity-nesters would be expected to increase due to an increase in browse, edge-effect, and an abundance of snags following a fire. Red squirrel, which prefers mature conifer forests, may decline depending on the extent and intensity of the burn.

Bald eagles and osprey periodically nest in the few remaining large white pines on the island. As previously discussed, pine species are declining on Isle au Haut and in the absence of fire will be replaced by spruce. The eventual exclusion of pine on the island could effect future nesting populations of these species.

CHAPTER 4 FIRE MANAGEMENT ZONING

4.1 Fire Management Area

The Isle au Haut unit of Acadia National Park has been designated as a separate Fire Management Area (FMA) because it is geographically isolated, lies in a different county than the remainder of the park, and is generally removed from conventional fire suppression resources common on the mainland. Two Fire Management Units (FMU's) are proposed for Isle au Haut based on landownership: park lands and town lands.

4.2 Park Fire Management Unit

This Fire Management Unit consists of all NPS owned lands on Isle au Haut as shown in Figure 5. The goals of this FMU are to:

- A. Prevent human caused fires.
- B. Quickly detect and respond to any wildfires that do occur.
- C. Suppress both human and lightning caused fires using minimum impact suppression techniques wherever possible.
- D. Implement fuels and vegetation management in designated areas to reduce the size and spread of wildfires.
- E. Apply fire where appropriate to maintain natural ecosystems.
- F. Conduct research and monitoring of the ecological role of fire.
- G. Prevent fires whenever possible from spreading onto private lands.

4.3 Town Fire Management Unit

This FMU consists of private and town owned lands on Isle au Haut as shown in Figure 5. The goals of this FMU are to:

- A. Assist the town in preventing human caused fires.
- B. Quickly detect and respond to any wildfires that do occur.
- C. Provide direct support to the town and the state in the prevention and suppression of wildfires.
- D. Provide advice to the town and private landowners on methods and techniques available for managing fuels.
- E. Prevent the spread of fire, whenever possible, from this management unit onto park lands.

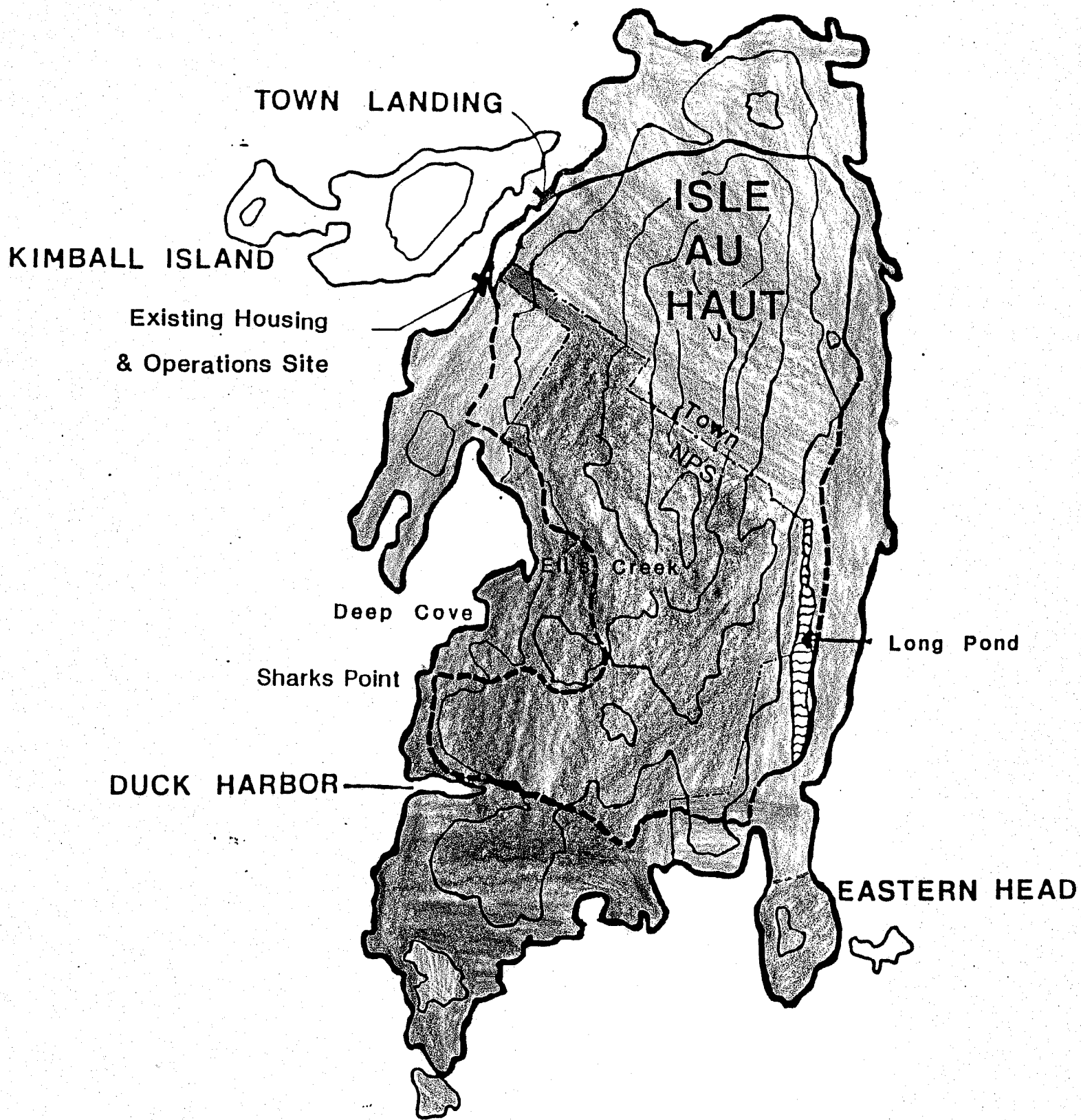


Figure 5. Fire Management Units

Legend:

Scale = 1" = 82,000'

● = Park Land

● = Town Land

SCALE 1"=82,000'



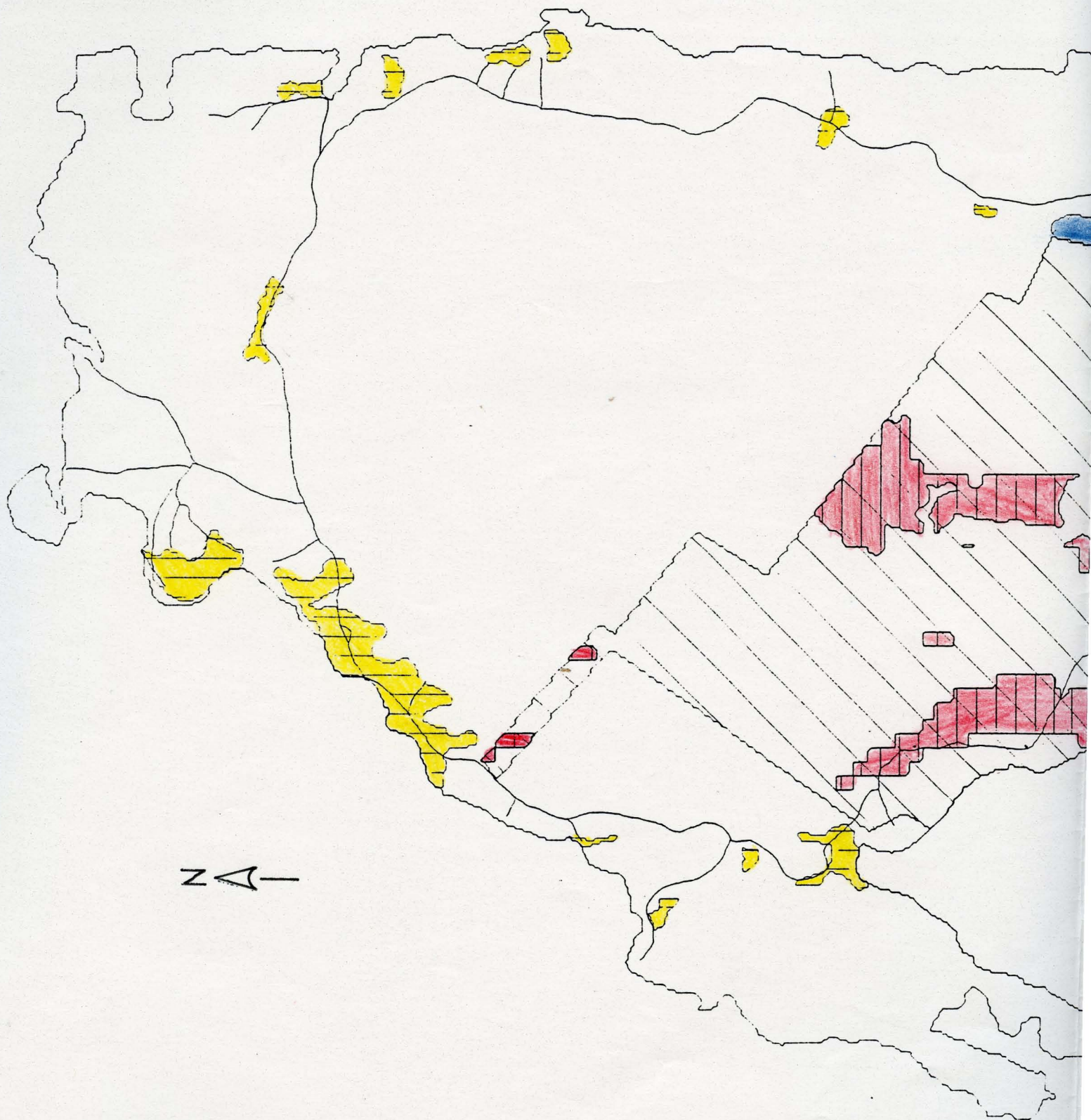
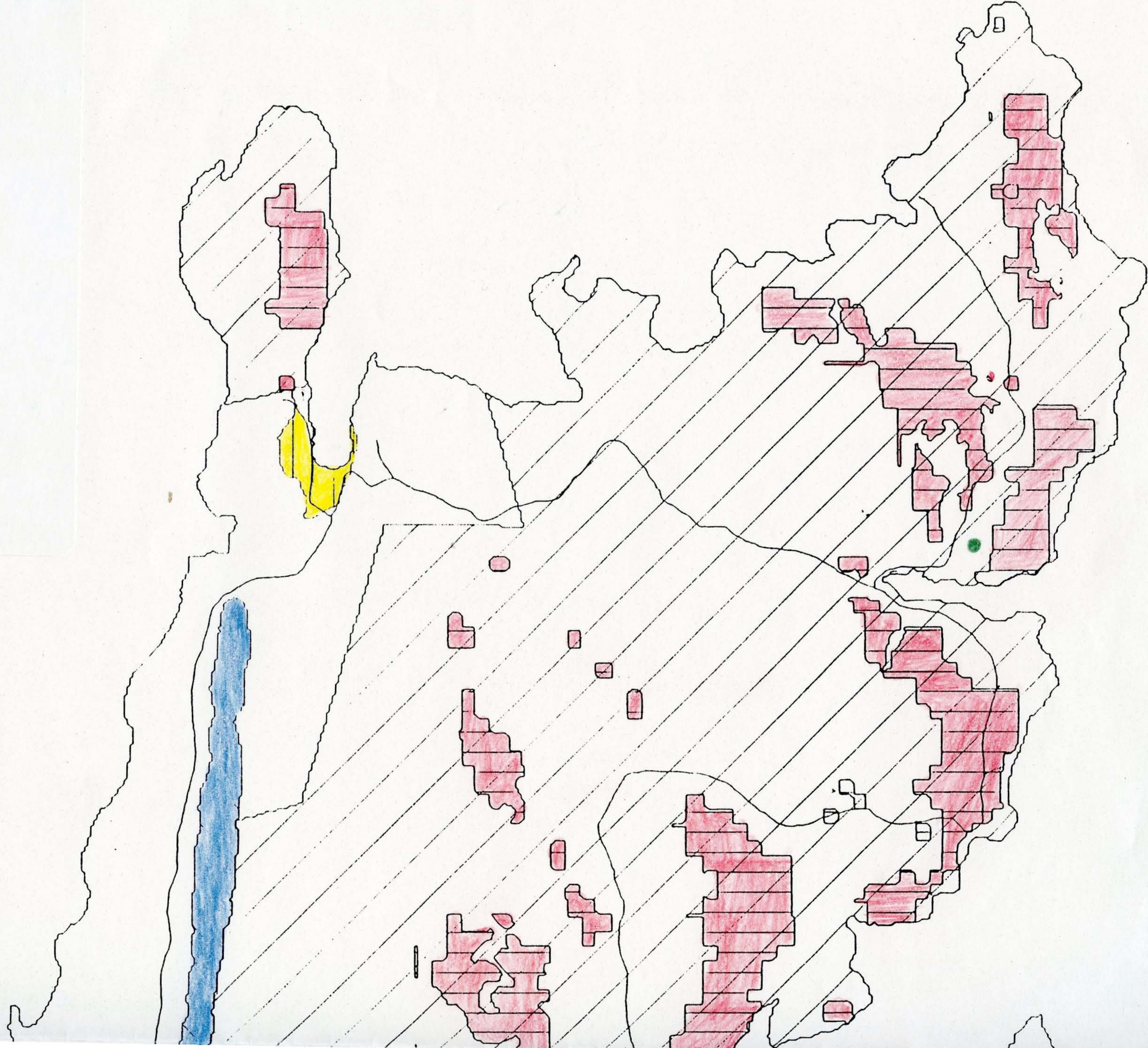


Figure 6. Hazard Fuel Distribution and Risk Areas

Legend:

Scale = 1:24,000

- Hazard Fuels
- Developed Areas
- Campground
- Pond





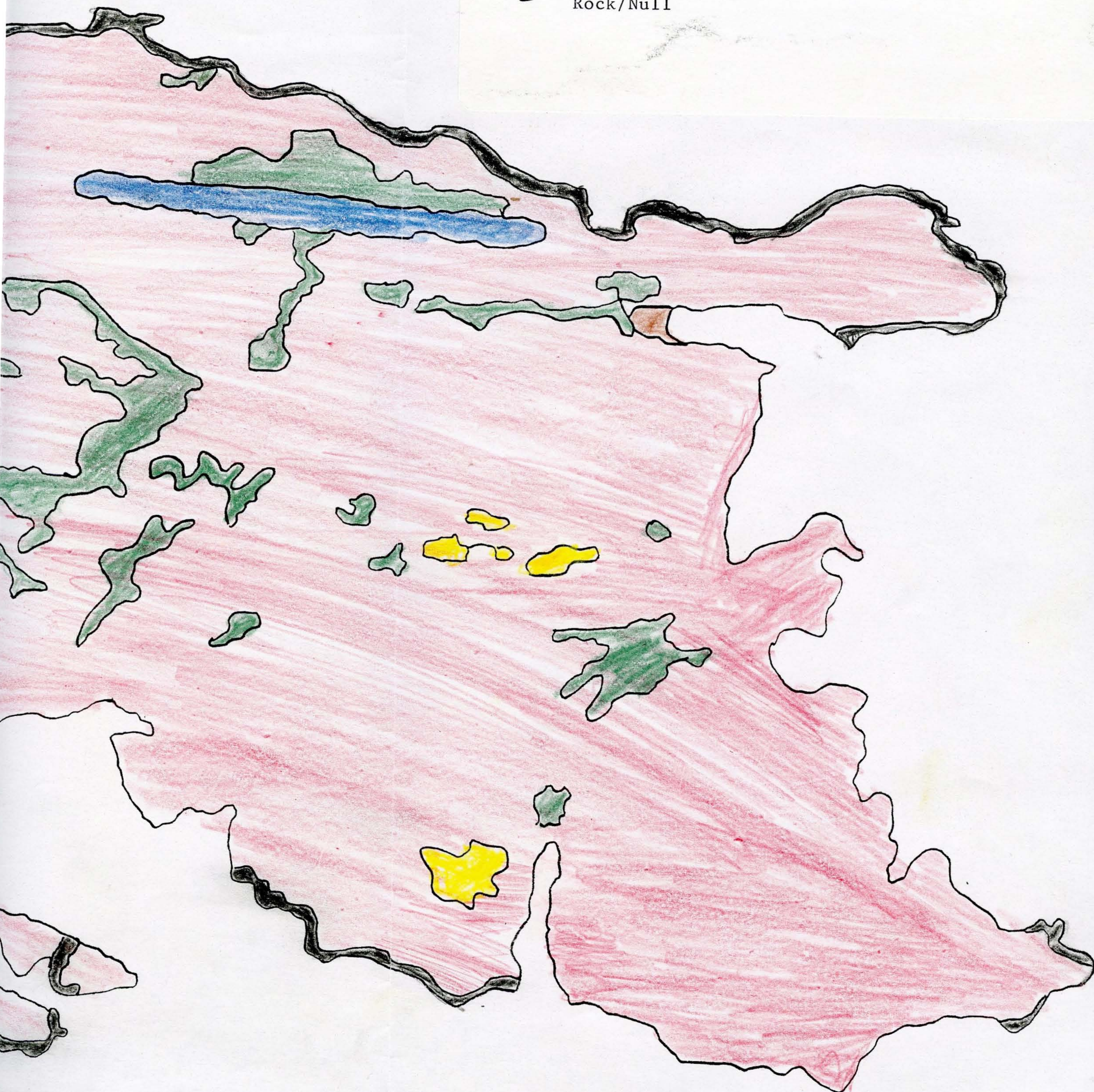
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Figure 4. Fuel Types on Isle au Haut

Legend:

Scale = 1:24,000

- Spruce - NFDRS Model H
- Pitch Pine - NFDRS Model Q
- Hardwood - NFDRS Model E/R
- Grass - NFDRS Model L
- Pond
- Rock/Null



CHAPTER 5 FIRE ORGANIZATION

5.1 Acadia National Park

Superintendent

As administrative head of Acadia National Park, the Superintendent is responsible to the Regional Director for all work and activities within the park including fire management.

Chief, Visitor Services

The Chief, Visitor Services serves as Assistant Superintendent for operations and is responsible for the supervision of activities relating to Resource Management, Interpretation, and Visitor Protection. He or she chairs the parkwide Fire Management Working Group and coordinates the parkwide Fire Management Program.

Fire Management Working Group

The Fire Management Working Group consists of representatives from each of the park's divisions. The purpose of the working group is to provide guidance and direction for fire planning, program implementation and evaluation.

Chief Ranger

The Chief, Visitor Services has delegated full authority to the Chief Ranger for management of the park's Fire Prevention, Detection, Presuppression and Suppression Programs. He or she is responsible for planning, executing, evaluating and updating fire programs.

Fire Management Officer (FMO)

The Fire Management Officer reports to the Chief Ranger and is responsible for planning, managing, and implementing the parkwide fire program. He or she identifies and coordinates research and rehabilitation with the Chief, Resource Management and Science.

Chief, Resource Management and Science

The Chief, Visitor Services has delegated full authority to the Chief, Resource Management and Science for the management of the park's research, monitoring, and rehabilitation programs. He or she coordinates fire and vegetation research and monitoring with the FMO.

Park Ranger (Fire Management)

The Park Ranger (Fire Management) is responsible to the FMO for day to day activities in fire prevention, detection, presuppression, and suppression. He or she manages the park's central fire cache, rolling stock, national fire danger rating system, and NPS wildland fire qualification system. He or she must be qualified at the level of crew boss or incident commander, single resource.

District Park Rangers

Acadia National Park is divided into two administrative ranger districts-- east and west. The two District Rangers are responsible to the Chief Ranger for the execution of the fire plan as it applies to their districts. The West District Ranger is

directly responsible for the daily management of Isle au Haut. Some of the specific functions of the District Rangers include:

1. On going fires may be assigned to fire command or line positions appropriate to their fire qualification and experience.
2. Assure that their subordinates are fully knowledgeable of this plan as it relates to their individual responsibilities in fire.
3. Are responsible for providing initial attack on all fires within their respective districts. All manpower and resources as may be required for initial attack over and above the first responding unit (normally a patrol ranger) will be requested via channels through fire dispatch.
4. Assure that adequate staff are withheld from fire duty in order to cover minimum visitor services and emergencies.
5. Provide for people and traffic control at and around fires and carry out such public warnings or evacuations as may be required for a fire emergency.
6. Are responsible to the FMO for assuring that all fire suppression equipment in outlying stations in the districts is in place and maintained in a ready condition for fire response. (The central fire cache at McFarland Hill is maintained by fire control staff.)
7. Carry out the implementation of the fire prevention portion of this plan under the direction of the Chief Ranger (e.g. trail closures, prohibition of open fires,

public notices, etc.).

8. Insure that the resources and personnel under their control are made ready and available under changing fire conditions as outlined in the park's "Fire Step-Up Plan".

Park Rangers and Technicians

Assist the respective district rangers as appropriate in carrying out all phases of their fire responsibilities as listed above. Perform field duties as assigned relating to fire management.

Seasonal Fire Control Staff

These temporary positions are recruited for the duration of the fire season and stationed either at McFarland Hill or on Isle au Haut. Their priority for work assignments shall be to those functions and projects related to the execution of this plan. Primary duties shall consist of fire presuppression, prevention, detection and control. Other assigned duties shall not unduly interfere with the timely accomplishment of fire management responsibilities.

Other Park Operation divisions

The Interpretive, Maintenance, and Administrative divisions are responsible for ensuring that their respective responsibilities are carried out under changing fire conditions on a day to day basis as specifically outlined in the park's "Fire Step-Up Plan". Upon request from the Chief, Visitor Services, the division chiefs

will provide rosters showing the location of all personnel within their divisions.

During a fire emergency, each park division will render all possible assistance and see that all resources at their command, including personnel, equipment and supplies are available for fire control.

Other Regular NPS Employees

All NPS employees will maintain a constant alert for fires as they perform their regular duties. Any employee discovering a fire will report it and, within reason, make an individual effort to extinguish or contain it.

All physically able employees may be called for fire duty as the need arises. Collateral duty fire personnel will be identified early in the fire season. Employees from all divisions will be trained in basic firefighting (S-130) and fire behavior (S-190). Each employee will be required to secure a medical examination (once every three years) and pass a physical fitness test annually. All park personnel responsible for fire suppression will maintain a "ready pack" with hardhat, eye protection, gloves, Nomex, fire shelter, canteen, and 8" leather boots.

In addition, selected maintenance personnel will be designated to operate fire trucks, pumps, and the water tanker.

5.2 Isle au Haut Unit

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As previously discussed, the West District Ranger is directly responsible for daily operations of Isle au Haut including fire management. The West District Ranger has assigned the following responsibilities to the seasonal staff on Isle au Haut:

Supervisory Park Ranger (Isle au Haut)

This position is responsible for daily implementation of the fire prevention, detection, presuppression, and initial attack fire programs. He or she is responsible for:

1. Advising park visitors and island residents of daily fire danger level.
2. Coordinating fire prevention, detection, presuppression, and initial fire suppression with town fire officials.
3. Implementing the provisions of the park's emergency presuppression plan including restrictions on smoking, open fires, and area closures.
4. Enforcing regulations relating to camping, fires, and visitation.
5. Maintaining all fire pumps, vehicles, and equipment in a condition ready for immediate response.
6. Taking initial attack action on all fires and advising park headquarters of additional assistance needed.

Park Ranger (Isle au Haut)

In addition to the Supervisory Park Ranger, one or two Seasonal Park Rangers are normally assigned to Isle au Haut during the period May through September. These positions are directly

responsible to the Supervisory Park Ranger (Isle au Haut) for implementation of daily fire programs as identified above.

5.3 Town of Isle au Haut

Fire protection for the town of Isle au Haut is provided by a volunteer fire department. Equipment includes one four wheel drive 300 gallon pumper and a 1000 gallon tanker. Fire training and the number of personnel available to respond to fires is rather limited. The park does not currently have a written formal agreement for cooperative fire activities with the town.

5.4 State of Maine

The Maine Forest Service, Division of Fire Control is responsible for providing wildland fire prevention, detection, and suppression on state and private lands. The Division of Fire Control maintains overhead teams, Type II handcrews, rotary wing aircraft, and heliattack crews. These resources are available to the park although there is no formal agreement between the park and the state for cooperative fire activities on Isle au Haut.

5.5 Regional Agreements

Acadia National Park, through the North Atlantic Regional Office, is a participating member of the Northeast Forest Fire Compact. Through this compact, Federal and State fire management agencies have agreed to share fire resources. Mobilization and dispatch of fire resources is through the Eastern Interagency Fire Coordination Center (EIFCC) via the Regional Fire Coordinator.

Resources available include Class II overhead teams, 30 Type II handcrews, aircraft, and support services. Detailed procedures for requesting assistance are documented in Chapter 10, Fire Suppression.

5.6 National (Interagency) Agreements

The National Park Service is a participating member of the Interagency Cooperative Fire Agreement between the U.S. Forest Service, Department of Agriculture; the Bureau of Indian Affairs; the Bureau of Land Management; and the U.S. Fish and Wildlife Service, Department of the Interior. Through additional agreements between the U.S. Forest Service, state, and private forestry, and the state wildland fire agencies, many of the states also participate in this agreement. A principle objective of this agreement is the cooperative and cost-effective sharing of fire resources during National and Regional emergencies.

A wide variety of fire resources and support services can be made available to units of the National Park Service through this agreement. Any request for assistance through this agreement must be channeled through the Eastern Interagency Fire Coordination Center by the Regional Fire Coordinator. Procedures for requesting assistance are detailed in Chapter 10, Fire Suppression.

5.7. Fire Qualifications & Training Staffing

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NPS Fire Management Guidelines states that individual parks are required to provide the means for using park staff to control 90% of the historic fire occurrences. Beyond that level, regional and interagency assistance should be provided for on a pre-planned basis. Acadia National Park staff is expected to handle the predicted fire load when fire danger adjective ratings are low through high (Manning Class I to III).

Within its normal compliment of staffing, Acadia will recruit, train and maintain the following fire organization:

<u>Position</u>	<u>Number</u>
Incident Commander MR	2
Single Resource Boss	2
Prescribed Burn Boss	1
Squad Boss	6
Firefighter	18-20

The park will train and maintain one 18-20 person handcrew of fully qualified firefighters during the fire season. In the event of a major fire, cooperating agencies and departments will be requested to provide additional personnel. One of the park's Single Resource Leaders (Crew Boss) will be stationed on Isle au Haut during periods of high fire danger. The remoteness and high fire hazard on Isle au Haut demand that the minimum decision-making capability for fire be at the Single Resource Leader level. This individual is expected to lead fire suppression actions without immediate support from elsewhere in the park. In addition, at least one Incident Commander (Multi-Resource) will be available in the park during periods of high fire danger. The complexity of

initial attack using fire resources from several agencies (NPS, State, towns) requires this level of expertise.

All National Park Service employees including Emergency Fire Fighters (AD casuals) engaged in fire operations will comply with standards outlined in the document NPS-18, Appendix F, Wildland Fire Qualification System.

CHAPTER 6 FIRE PREVENTION

6.1 Fire Prevention Goals

Fire prevention includes all activities designed to reduce the number of human caused fires. The goal of the Fire Prevention Program for Isle au Haut is to eliminate, as nearly as possible, all preventable, human caused fires.

6.2 Human Caused Fire Risk Analysis

Human caused fire risk on Isle au Haut falls into two broad categories: park visitors and island residents. An analysis of each risk source follows.

Park visitors--Access to Isle au Haut is by boat only. Most visitors arrive via the mailboat from Stonington, while a few come by private vessel. Those visitors arriving by mailboat receive an orientation and strong fire prevention message by rangers. Visitor use of the island is also regulated as mandated by P.L. 97-335. During the spring and fall seasons, day use visitation is limited to 25 visitors per day and overnight camping is prohibited. Between May 15 and October 15, camping is permitted by reservation only and is limited to 30 people per night. Campers must utilize one of the five Adirondack shelters within the Duck Harbor Campground which is strategically located between Isle au Haut Bay on the east, Duck Harbor on the north, and a fire road on the west. The location of the campground would severely limit the spread of an escaped fire.

Between July 1 and September 15, day use visitation is limited to 50 visitors per day and 30 campers per night. Day use visitation does not include the small number of visitors that arrive by private boat or from town (residents and guests).

Overall, the total number of park visitors to the island on any given day is rather limited particularly during the spring and fall seasons when annual vegetation is cured. Given the park's legislative mandate to establish a carrying capacity for the island, a major increase in visitation is unlikely.

As previously discussed, few fires have been recorded in recent years on the island and in most cases a definitive cause could not be determined. Potential visitor caused fires, however, would most likely involve an escaped campfire from the campground, illegal camping or warming fires along the trails, smoking, and/or incinerism.

Island residents--Island residents include permanent and seasonal occupants of private property and their guests, and park employees and cooperators duty stationed on the island. Overall, the resident population is very fire conscientious and like visitors, pose a low risk of fire. Possible sources of resident fires could include: a structural fire which spreads to wildlands, open burning (refuse, grass, brush, slash), equipment (vehicles, power saws), logging, or downed power lines.

6.3 Fire Prevention Program

In the Acadia National Park area, active fire prevention programs are carried out by the Maine Forest Service Division of Fire Control and many of the neighboring communities. The park will carefully coordinate its prevention program with these agencies to insure that activities are complimentary and reinforce, rather than contradict, one another. Coordination of ANP's prevention program and their implementation on Isle au Haut shall be the responsibility of the Fire Management Officer and the West District Ranger.

In most cases, human-caused fires are the result of carelessness, lack of knowledge concerning the ease with which fire may spread to surrounding vegetation, and ignorance of fire danger conditions and burning regulations. Therefore, in the interests of better fire prevention, all uniformed personnel in their daily contact with visitors and park neighbors shall, as appropriate, call attention to the need for care with fire and shall take immediate corrective action to eliminate or reduce the fire danger associated with any hazardous condition or activity encountered.

The use of signs, posters and similar materials can be of considerable value to remind the public of fire safety and to advise them of current fire danger conditions. To be most effective, these items must be properly timed. They may be used at all points of visitor concentration, in this case, the two public landing docks, the Ranger station in town, the Duck Harbor campground and trail heads (Figure 2).

In addition, Fire Danger Class Boards will be maintained at the two landing docks on Isle au Haut. These information boards shall be of modest size and unobtrusive. It will be the responsibility of the FMO to keep the employees on Isle au Haut currently informed as to fire danger ratings so that they in turn may keep the posting current.

On Isle au Haut all campfires within the park are restricted to the fireplaces located in the Duck Harbor campground. All fire places shall be inspected periodically and maintained in good repair, in order to prevent the escape and spread of fires. Rock fireplaces are illegal and unsafe, and when found, will be dismantled and scattered to prevent their further use. Excessively large campfires (bonfires) will not be permitted.

Good law enforcement is an effective measure in fire prevention. Park regulations regarding the use of fire and any special restrictions imposed during periods of high fire danger will be rigorously enforced. The level of enforcement actions, as with any violations, shall be appropriate to the circumstance and aimed at gaining compliance. However, no violation posing a threat of wildfire may be ignored by enforcement personnel. All wildfires and structural fires will be thoroughly investigated to determine the exact cause and, if human-caused, to apprehend the person(s) responsible, so as to serve as a basis for preventing a recurrence. A copy of the investigative report is a required part of the Fire Report for all human-caused fires.

The following program will be implemented annually unless an evaluation recommends modifications:

1. Ensure all park employees on Isle au Haut are aware of fire danger conditions throughout the fire season.

Responsibility: Fire Management Officer, West District Ranger, Park Dispatch

2. Ensure all park employees appraise visitors of current fire danger conditions and current regulations and precautions.

Responsibility: FMO, West District Ranger, Isle au Haut staff

3. Continue to meet each mailboat, orient visitors, and provide a strong fire prevention message.

Responsibility: West District Ranger, Isle au Haut staff

4. Ensure all open fires are restricted to approved fire grills in the Duck Harbor Campground.

Responsibility: West District Ranger, Isle au Haut staff.

5. Post fire prevention signs and information at the ranger station, Eli cabin, Duck Harbor campground, both boat landings, and selected trail heads.

Responsibility: FMO, West District Ranger, Isle au Haut staff

6. Ensure adequate supplies of fire prevention materials are available for distribution to the public at the ranger station and in patrol vehicles.

Responsibility: FMO, West District Ranger, Isle au Haut staff

7. Conduct annual fire inspection of all park structures and campgrounds.

Responsibility: West District Ranger, Isle au Haut staff

8. Ensure "No Smoking" is enforced when refueling motorized equipment.

Responsibility: West District Ranger, Isle au Haut staff

9. Coordinate fire prevention programs with the town of Isle au Haut and the state of Maine.

Responsibility: FMO, West District Ranger, Isle au Haut staff

10. Implement the provisions of the Emergency Presuppression Plan (Chapter 7) as necessary.

Responsibility: FMO, West District Ranger, Isle au Haut staff

11. Encourage the town fire warden and state of Maine to enforce open burning regulations.

FMO, West District Ranger

CHAPTER 7 PRESUPPRESSION

7.1 Presuppression Goals

The goal of the presuppression program is to provide a level of fire preparedness necessary to meet normally expected wildland fire workloads. The presuppression program consists of an annual presuppression program and an emergency presuppression plan. The annual program includes all activities related to fire cache maintenance, operation of the National Fire Danger Rating system, fire planning, training, and employee certification. The emergency presuppression program includes all activities above the annual program required to provide an additional level of fire prevention, detection, and initial attack during periods of high to extreme fire danger. These later activities are identified in the emergency presuppression plan (step-up plan) and are funded through the emergency presuppression account (PWE 343). This account may be activated when the burning index of the National Fire Danger Rating System exceeds the 90th percentile of historic burning indices for the park. Use of this project account requires approval by the Regional Fire Coordinator and a memorandum to the file (Y-14) documenting the need.

7.2 Fire Weather Stations and Fire Danger

Acadia National Park maintains one (1) fire weather station to the standards established in the Fire Weather Observers Handbook. The station is located at McFarland Hill on Mount Desert Island. In addition, the park owns a remote automated weather station

(RAWS) which is located on Jerusalem Mountain on Isle au Haut. RAWS data can be retrieved via computer (Affirms) from park headquarters on Mount Desert Island.

Weather observations are taken daily at 1300 hr. EST from the McFarland station and entered into the Affirms system. Data from the RAWS unit on Isle au Haut is also accessed and compared with the McFarland observations. The park also has the capability to calculate fire danger manually or using the TI-59 and HP-71B handheld calculators.

The weather station catalog for Acadia is:

Station name: McFarland Hill

Station number: 170701

Location: Lat. 44° 22' 25"; Long. 68° 15' 35"

Green up date: May 15

Freeze up date: Oct. 15

Observation time: 1300 EST

Elevation: 470'

Fuel model: H

Slope class: 1

Climate class: 3

Herb. vegetation: P

Dates of operation: April 1 - Nov. 15

RAWS Unit

Station identifier: 324161 DA

Parameters recorded include:

Temperature

Relative humidity

Wind speed

Wind direction

Precipitation amount

Experimental 1 hr. and 10 hr. full

7.3 Fire Cache

A fire cache is maintained at Isle au Haut sufficient to equip a ten person initial attack crew plus a follow-up crew of twenty people. Follow-up forces from off the Island would be expected to come equipped with their own personal gear and fire clothing. Tools and fire equipment would be supplied from the cache. The cache contains tools for thirty people, three portable pumps, approximately 5,000 feet of hose, a trailer mounted 500 gallon pumper, and a 200 gallon slip-on fire pumper mounted on a 4x4 truck.

In the town of Isle au Haut there is a small community fire station, 300 gallon pumper, and 1,000 gallon tanker, which would provide support in case of a wildfire emergency.

The fire cache on Isle au Haut is supported by the Park's main fire depot at McFarland Hill headquarters. This larger cache can supply equipment and supplies for a minimum of one hundred firefighters.

Fire Cache Standards

Fire tools and fire equipment are held for the exclusive use of fire suppression. No equipment shall be removed from the fire caches without permission of the Fire Cache Supervisor.

Tools and equipment will be inspected periodically and are to be ready for use at all times. Pumps and pumpers will be operated and tested on a scheduled basis. (See Step-Up Plan.)

Immediately after a fire, tools and equipment will be inspected. Isle au Haut tools and hose needing reconditioning will be replaced with fresh equipment from the Park headquarters' cache.

Fire cache inventories may be found in the Appendix.

7.4 Annual Presuppression Program

1. Review Fire Management Plan, fire agreements, and draft fire programs for upcoming year.

Responsibility: Chief Ranger, FMO, West District Ranger

Due date: January 30

2. Secure arduous duty medical examinations for identified fire personnel (3 year rotation for permanent and long term seasonals).

Responsibility: FMO, West District Ranger

Due date: January 30

3. Identify personnel for participation on regional fire crew.

Responsibility: Chief Ranger, FMO, District Rangers

Due date: April 15

4. Conduct meeting with the state of Maine and town of Isle au Haut to determine local fire strategies for upcoming fire season and any changes in operations or regulations.
Responsibility: Chief Ranger, FMO, West District Ranger, Isle au Haut staff
Due date: February 28
5. Administer physical fitness test (step test or 1.5 mile run) to all fire personnel.
Responsibility: FMO, Park Ranger (fire suppression)
Due date: March 31
6. Update employee fire qualifications (training, experience, fitness).
Responsibility: FMO
Due date: within 7 days of training or fire assignment; at least annually by February 28
7. Check and service all radios.
Responsibility: Chief Ranger, FMO, District Rangers
Due date: February 28
8. Inventory and re-stock fire cache. Fire cache to contain supplies and equipment for (1) twenty person crew.
Responsibility: Park Ranger (fire suppression), Isle au Haut staff
Due date: March 1 and August 1 and after each fire
9. Service and test all pumps and engines.
Responsibility: Park Ranger (fire suppression), Isle au Haut staff
Due date: April 1 and weekly throughout the fire season

10. Mount slip-on units on 4x4 vehicles prior to the beginning of each fire season.

Responsibility: Park Ranger (fire suppression), Isle au Haut staff

Due date: April 1

11. Activate NFDRS station two weeks prior to expected fire season; daily observations taken at 1300 hrs EST and entered into Affirms system.

Responsibility: Park Ranger (fire suppression)

Due date: April 1

12. Brief entire park staff on proposed fire management activities for the upcoming year.

Responsibility: Chief Ranger, FMO

Due date: March 15

13. Prepare daily situation report; transmit to branch of fire management per instructions in the NPS, Wildland Fire Computer System.

Responsibility: FMO

Due date: April 1 - Oct. 31

14. Identify park fire training needs for upcoming fiscal year; forward to Regional Fire Coordinator.

Responsibility: Chief Ranger, FMO

Due date: October 31

15. Inventory and order report forms, fire prevention signs, and notices needed for upcoming fiscal year.

Responsibility: FMO

Due date: October 31

16. Ensure all fire reports have been entered into the NPS Wildland Fire Computer System.

Responsibility: FMO

Due date: December 31

7.5 Emergency Presuppression

The following Step-Up Plan for ANP (with a supplement for Isle au Haut) outlines the responses, primarily manning, to five stages of fire danger. These five stages, or Manning Classes (MC), are based on the NFDRS burning index (BI) (Deeming et al. 1977). MC IV and V represent the 90th and 97th percentile, respectively, of historic BI's. The actual distribution of these values is given in the Firefamily analyses, located in the office of the FMO. The Step-Up Plan for ANP is for fuel model H; slope class 2; climate class 3; herbaceous type P (perennials).

MC 1 and II Fire Danger Low and Moderate

A. Normal operations for all divisions.

B. Bar Harbor Fire Department, Blue Hill Fire Tower, and on-duty employees are informed of fire danger ratings each day at 1300 EST.

C. Minimum level of detection required, relying on observations from normal patrol functions, Blue Hill Fire Tower, or reports of fire from other sources.

MC III Fire Danger High

- A. Park Resource Technician (Fire Control Aid) on duty daily to insure condition and availability of suppression equipment.
- B. Protection personnel advised of fire danger and insure availability for assignment as needed.
- C. Reconnaissance may be scheduled when ignition component is "high", particularly in locations of high risk.
- D. Open communications maintained with Maine Division of Forestry and local fire departments.
- E. Regional Office will be notified as fire danger increases.

MC IV Fire Danger Very High

- A. Fire tower may be manned if need is apparent.
- B. Fire Control Aid on duty 0900 to 1800.
- C. All protection personnel in radio contact with dispatcher's office during working hours. At least one permanent member of the division on call during off-duty hours.
- D. Keep currently informed on maintenance crew locations. All maintenance crews and pump operators alerted for fire call during working hours.
- E. Other divisions continue normal operations unless directed by Fire Chief to assume other duties.
- F. Protection personnel lieu days may be cancelled.
- G. Regional Office will be informed of current fire danger levels.
- H. Information may be obtained regarding availability of equipment and manpower from local departments and the Maine

Forest Service.

- I. Air patrols may be initiated on a daily basis.

MC V Fire Danger Extreme

- A. Fire tower may be opened and manned.
- B. Fire Control Aid on duty 0900 to 1800.
- C. All protection personnel in radio contact with dispatcher's office during working hours.
- D. Keep currently informed on maintenance crew locations. All maintenance crews and pump operators alerted for fire call during working hours.
- E. Naturalist and administrative divisions available for duty during duty hours, nights, and weekends when so requested.
- F. Protection personnel lieu days may be cancelled.
- G. Regional Office will be informed of current fire danger levels.
- H. Information will be obtained regarding availability of equipment and manpower from local departments and the Maine Forest Service.
- I. Air patrols may be initiated on a daily basis during peak burning periods. Aircraft to be assigned to Park under equipment rental during this period.
- J. All open camp and picnic fires may be prohibited except for gas or propane stoves. Smoking prohibited while hiking. Fire roads will be closed. Employ emergency fire control personnel as needed during instances of extreme fire danger.

- K. All protection personnel may be on call 24 hours and/or emergency standby will be authorized.
- L. Procedures will be initiated to obtain interregional or interagency (BIFC) support for the suppression effort.
- M. Maintenance crews including pump operators will be organized for emergency duty after hours, nights, and weekends.

ADDITIONAL STEP-UP PROCEDURES FOR ISLE AU HAUT

Personnel at Isle au Haut will employ all phases and actions of this plan in so far as they are applicable. In addition, the following measures also apply:

MC IV Fire Danger Very High

- A. Daily contact maintained with town authorities to inform them if high danger and to determine strength and readiness of their manpower and equipment.
- B. Lieu days may be cancelled for all personnel.
- C. Fire suppression equipment may be pre-positioned at Duck Harbor, particularly backpack pumps.
- D. All arriving visitors, both campers and day users, are advised of high danger either in person or by other appropriate means.

- E. At least one Isle au Haut employee is in 24 hour radio contact with Park Headquarters.

MC V Extreme Fire Danger

- A. Lieu days may be cancelled for all personnel and emergency stand-by pay authorized.
- B. All open fires including charcoal fires prohibited at Duck Harbor Campground.
- C. Depending on extent and severity of fire danger, Duck Harbor Campground may be closed.
- D. All hiking trails may be closed.
- E. Fire suppression personnel and/or equipment may be pre-positioned on Isle au Haut.
- F. One employee will remain at the Ranger Station at all times with fire equipment ready to respond to report of fire.
- G. Fire detection patrols are conducted continuously in so far as possible.

CHAPTER 8 HAZARD FUELS MANAGEMENT

8.1 Goals and Objectives

The goal of the Hazard Fuel Management Program is to research, develop, and implement a strategy of fuels and vegetation management designed to reduce the size and spread of wildfires while maintaining, as nearly as possible, natural ecosystems and habitats. Although most of the fuels on Isle au Haut can be considered dangerous especially during dry, windy periods, much of the interior section of the island is inaccessible to the public and therefore presents little risk of human ignition. On the other hand, certain fuels, because of their physical properties, location on the landscape, and proximity to human use pose a much greater risk. Hazard fuels on Isle au Haut are defined as spruce and pitch pine/huckleberry located on dry aspects (S, SW, W, NW, flat) steep slopes (9-35%) and adjacent to human use areas such as campgrounds, roads, trails, and park boundaries. Table 3 summarizes hazard fuels on Isle au Haut and Figure 6 illustrates the spatial distribution of those fuels.

TABLE 3 HAZARD FUELS

Cover type	NFDRS model	NFFLS model	Park acres	Non-Park acres	Total
Spruce	H	10	547	411	958
Pitch pine	Q	7	<u>13</u>	<u>25</u>	<u>38</u>
Total			560	436	996

8.2 Program Design

Hazard fuels management will be achieved by encouraging greater natural age diversity of the forest stands (spruce) while treating small areas of fuels in selected high risk areas. Greater age diversity can be achieved by excluding fire over large areas of the interior of the island, and allowing periodic blowdowns and forest succession to prevail. Generally, the interior sections of the island pose a low risk of human caused fires because it is inaccessible to the public. Similarly, lightning ignitions are very infrequent. If fire can be excluded, a forest of greater age class structure will eventually develop. To help achieve this objective, fuels in high risk areas such as along roads, trails, and campgrounds will be treated to reduce the probability that a human caused fire will start and spread uncontrollably over the island. Fuels in these high risk areas will be reduced using mechanical techniques. Crews will cut and remove concentrations of dead and down fuels, fell snags, and trim tree branches to a height of ten feet above the ground. The primary objective is to reduce the quantity of fine flashy fuels in close proximity to high visitor use. The treatment area will be generally restricted to 20 feet on each side of roads, trails, and campgrounds. Slash created by mechanical treatment will be piled and burned during the winter or wet periods in the spring and fall. Larger fuels (100 and 1000 hr. t.l.) can be cut, split, and used in approved fire rings or allowed to naturally decompose where feasible. An exception to mechanical treatment are the pitch pine/huckleberry stands. Research conducted at Cape Cod suggests the best method to reduce

the hazard of fire in this fuel type is to prescribe burn at 2-3 year intervals. Prescribed burns are best conducted in the spring when the exposed pine needles and huckleberry shrubs are dry enough to burn, but the duff and heavier forest fuels (spruce needles, branchwood, etc.) are still too moist to support fire. This fuel type is rather limited on the island (13 acres). It is estimated that 1 acre or less of pitch pine/huckleberry will require treatment on park lands. Application of periodic prescribed burns will have the added benefit of perpetuating the ecologically sensitive, fire adapted pitch pine community. The use of prescribed fire to reduce fuel levels in spruce is rather restricted, but should be explored on an experimental basis. Prescribed fire is discussed in greater detail in Chapter 14.

8.3 Annual Program

The hazard fuels management program at Acadia relies exclusively on project funding (Regional cyclic maintenance, servicewide hazard fuels funds). On the average, the park has received \$35,000 from Region and \$10-15,000 from Washington each year. These funds will be used to hire 4-5 seasonal forestry technicians to conduct mechanical treatment between May and October. Project work will be conducted on both Isle au Haut and Mount Desert Island. Areas identified for fuels treatment on Isle au Haut include:

1. Fuels adjacent to gravel roads (model H, steep, dry)
2. Fuels adjacent to hiking trails (model H,Q, steep, dry)

3. Fuels in and adjacent to the campground (model H)

Overall, less than 100 acres of fuels would be treated. An annual program will be developed whereby 5-10 acres of fuels would be treated each year. Hazard fuel reduction plans will be developed annually; pre- and post-treatment monitoring will be conducted to assess and document program success.

CHAPTER 9 FIRE DETECTION

9.1 Fire Detection Goals

The goal of the fire detection program for Isle au Haut is to quickly detect any wildland fires which occur and to effect a timely and appropriate initial attack.

9.2 Fire Detection Analysis

Currently there is no routine organized fire detection program for Isle au Haut. The closest state operated fire tower is in Blue Hill which is generally beyond the visual range of Isle au Haut. Similarly, state aerial detection flights seldom cover the island. However, island residents are very concerned about fire, and numerous fisherman traverse the waters around the island by boat and aircraft. During periods of high fire danger the park's emergency presuppression plan authorizes the use of NPS procured aerial reconnaissance and increased ground patrol.

9.3 Fire Detection Program

The following provisions will be implemented as part of this plan:

1. Secure the support of local fishermen, mailboat operators, and U.S. Coast Guard in detecting and reporting fires.

Responsibility: FMO

2. In cooperation with the U.S. Coast Guard, fishermen, boaters, and town officials, identify fire reporting

procedures and radio frequencies to be used.

Responsibility: FMO

3. Secure the support of the state of Maine in providing cooperative aerial reconnaissance during periods of high fire danger.

Responsibility: FMO

4. Implement the provisions of the emergency presuppression plan (Chapter 7) as appropriate.

Responsibility: FMO, West District Ranger, Isle au Haut staff

CHAPTER 10 FIRE SUPPRESSION

10.1 Goals and Objectives

The goals of the fire suppression program are:

1. To protect life and property from wildfire.
2. To protect natural and cultural resources from the effects of wildfire and wildfire suppression activities.

The Incident Commander is expected to balance aggressive fire suppression with tactics to achieve these goals. Acceptable suppression tactics include confinement, containment, and control in increasing order of aggressiveness.

Confinement:

Confinement is defined as a wildfire which is confined wherever possible to natural fire barriers such as streams, wetlands, or favorable changes in fuel conditions until burned out. The use of the burn-out technique is preferred over the construction of firelines.

Containment:

Containment is defined as a wildfire restricted to a certain geographic area using natural or man-made barriers to stop the spread of fire under the prevailing and forecasted weather conditions. On Isle au Haut, maximum use should be made of roads, trails, streams, wetlands, shorelines, and the burn-out technique. Firelines may be constructed to link natural and man-made barriers. The construction of firelines should be minimized and handline is

preferred over lines constructed by equipment.

Control:

Control is defined as a wildfire aggressively fought through the skillful use of personnel, equipment, and aircraft to establish firelines around a fire to halt its spread, and to extinguish all hotspots until burned out.

The control tactic should be considered when:

1. Human lives are at risk.
2. Significant natural or cultural resources are at risk and the effect of the fire is greater than the effects of the suppression action.
3. Damage to private property outside of the park is likely.

Special precautions

The following should be avoided whenever possible:

1. The construction of unnecessary firelines particularly on slopes.
2. The use of heavy equipment especially on steep slopes and shallow soils.
3. The creation of new fire roads.
4. Operating vehicles off existing roads.

10.2 Reporting and Dispatch

Wildland fires on Isle au Haut may be discovered and reported by park employees, island residents, park visitors, fishermen, or aerial patrol. Initial reports may be directed to the Isle au Haut ranger staff, park headquarters on Mount Desert Island, the town

fire department, Maine Forest Service, or U.S. Coast Guard. Regardless of the reporting source, the following information should be obtained, when possible, from the reporting party:

1. The exact location of the fire or smoke.
2. Identifiable landmarks where possible.
3. The type of fire, i.e. ground, surface, crown.
4. The approximate size of the fire and direction of spread.
5. The type of fuel burning, i.e. grass, hardwood, spruce.
6. The approximate elevation of the fire, i.e. flat, base of slope, mid-slope, ridge top.
7. Secure a name, address, and telephone number of the reporting party.
8. Keep the reporting party on the line if possible.

In the event of a wildfire on Isle au Haut, resources will be dispatched in the following order:

1. Isle au Haut park personnel and equipment, along with the town fire department.
2. Park personnel and equipment from Mount Desert and Schoodic.
3. Maine Forest Service (heliattack crew).
4. NPS, North Atlantic Region fire crews.
5. Interagency resources (through Northeast Fire Compact).

10.3 Initial Attack

Initial response to a wildland fire on Isle au Haut will include: one 4x4 with 200 gallon slip-on unit, tools and equipment for 10-20 firefighters, and all available fire personnel duty

stationed on the island.

Upon arrival at the fire, the initial attack Incident Commander will conduct an assessment of the fire, brief park dispatch, and deploy personnel and equipment as needed. When more than one agency is involved in fire suppression (NPS and town, or NPS, state, and town), a unified command will be established, thereby allowing joint decision making among the agencies. If it appears that the fire can not be contained with the initial attack resources available, the Incident Commander (unified command) will immediately request assistance as identified in section 10.4 (extended attack) of this plan.

10.4 Extended Attack

The potential for extended attack on Isle au Haut is great. The isolated nature of the island, heavy and continuous fuels, topographic and weather conditions, and limited fire suppression resources present a strong possibility that a fire will escape initial attack. The relatively small size of the island, resources at risk, and the difficulties of providing additional fire support dictate that additional fire resources be identified and requested early in the fire incident.

Should the need for extended attack arise, the Incident Commander will:

1. Prepare the fire complexity assessment.
2. Prepare the escaped fire analysis.
3. Identify the needed resources on the resource order form (NFES 1470).

4. Request resources through the FMO, Chief Ranger, or Park Dispatcher.
5. Prepare for the arrival of resources (overhead team) by completing the delegation of authority form.
6. Continue suppression efforts on section of the fire where available resources can work safely and effectively.

10.5 Mobilization

Emergency wildland fire suppression support for Acadia National Park can be obtained by contacting the National Park Service Regional Fire Coordinator and describing the type and amount of resources needed and the time it is needed in the park. Resources from the U.S. Forest Service Region 9, the National Park Service (North Atlantic, Mid-Atlantic, National Capital Regions), and the Bureau of Indian Affairs will respond if available. Support can also be obtained from the states within the Northeast Compact, which includes the Province of Quebec; also from the Mid-Atlantic Compact States, and State and private forestry interests.

As is common practice in the interagency fire community, the "closest available forces" concept applies. Given this procedure, it is most probable that Maine fire resources will be among the first requested to respond to the assistance of Acadia. An exception would be if the State of Maine is already over-stressed with its own internal fire problems. within the northeastern United States, there are a minimum of thirty-three (33) Type 2 handcrews, as well as overhead, infrared units, and miscellaneous support services available.

To request resources, the resource order form (NFES 1470) should be completed and the information telephoned to the Regional Fire Coordinator, North Atlantic Regional Office. If the Regional Fire Coordinator or designated alternates can not be reached, the request should be forwarded to the Eastern Interagency Fire Coordination Center in Milwaukee, Wisconsin. Emergency telephone numbers are contained in the park's dispatch guide.

10.6 Support Services

The isolated nature of Isle au Haut requires careful planning and timely deployment of support services. Immediately following the confirmation of a wildland fire, the Chief of Maintenance will be appraised and the park's 32 ft. vessel and captain placed on stand-by. In addition, the Maine Forest Service will be contacted and requested to place their helicopters and heliattack crews on alert, and the Isle au Haut Company ferry from Stonington will be instructed to terminate transportation of park visitors to Duck Harbor.

In the event that support crews and equipment must be transported to the island from the mainland, the following will be used:

1. Park boat (depending on number of personnel to be transported and the urgency of the situation).
2. Mailboat from Stonington (to be used when 10 or more personnel must be transported and time is not critical).
3. Maine Forest Service helicopter (to be used to quickly transport crews of 6 or less).

10.7 Air Operations

Department of Interior regulations and National Park Service policy require that aircraft used for agency business including fire operations meet either Office of Aircraft Services (OAS) or U.S. Forest Service certification for both pilot and aircraft. Military aircraft, which do not meet the above certifications, may be used in an emergency to save lives or property. The use of military aircraft, however, should not be relied upon for fire operations.

Air support for fire operations in New England is limited. Within the Northeast Forest Fire Compact, only the State of Maine and the Province of Quebec own aircraft. Several private vendors provide fixed and rotary wing aircraft certified for low level reconnaissance, but air tankers and helicopters with buckets are generally unavailable from private sources in New England.

Acadia National Park has utilized, on occasion, OAS certified aircraft for fire detection in the past and will continue to do so as outlined in Chapter 7, Emergency Pre-suppression.

For fire suppression support, the park will rely on the Maine Forest Service. The MFS currently has four Huey helicopters capable of handling a 200 gallon water bucket or transporting personnel. These aircraft are based across the state depending on fire danger conditions. The closest air base to Acadia is Old Town. However, there is no guarantee that MFS aircraft will be available for response to Isle au Haut on any given day, or that a response could be effected in a timely manner. In addition, the

MFS has not consistently requested OAS or U.S. Forest Service certification of their pilots and aircraft. Acadia National Park will strongly encourage the MFS to have aircraft and pilots annually certified. The park will coordinate with OAS inspectors and cover the costs associated with certification.

A serious concern with the use of helicopters on Isle au Haut is the lack of safe helispots. A number of potential sites have been identified but will require the removal of a few trees to provide adequate clearance.

As part of this plan, the park will:

1. Use only OAS or U.S. Forest Service certified aircraft except in extreme emergencies where military aircraft may be used.
2. Encourage the MFS to annually seek OAS or U.S. Forest Service certification for pilots and aircraft. NPS will coordinate inspections and cover any costs incurred.
3. Identify several strategically located helispots and remove trees to provide safe clearance.
4. Comply with all Department of Interior and OAS policies and regulations applicable to air operations.

10.8 Evacuation

Upon detection of a wildfire on the Island, the Isle au Haut Company ferry will be instructed to terminate ferry transportation of Park visitors to Duck Harbor. Visitors and campers on the Island will be advised of the emergency situation and will be given instructions and/or assistance to relocate to the nearest facility

to be transported off-island (town dock or park dock at Duck Harbor). The most expedient method of transport for park visitors and island residents will be used, depending upon the state of emergency, and will include the Isle au Haut Company ferry, the park boat, and other emergency vessels, as well as local vessels that are willing and able to transport passengers safely and efficiently. The priority for utilization of motor vessels is as listed above, with the Isle au Haut Company ferry being the first priority for use and private vessels being the last priority for use.

CHAPTER 11 REHABILITATION

Regeneration is the natural regrowth of plants destroyed by fire. Rehabilitation is the artificial replacement of man-made facilities or natural resources after their destruction or removal. The policy of Acadia National Park is to encourage regeneration and minimize rehabilitation. Before any major rehabilitation is undertaken, an evaluation of the burned area and an assessment of alternatives and impacts will be conducted. The following minor rehabilitation projects will be implemented following fires:

1. All litter and trash will be removed from the fire site, fire camps, and staging areas.
2. All fire lines constructed will be refilled and water bars installed where necessary to prevent erosion.
3. Hazard trees along roads and trails will be removed.
4. Photo plots will be established and post-fire monitoring conducted to evaluate regeneration and to determine short and long term fire effects.
5. Research will be requested as identified in Chapter 12.

CHAPTER 12 RESEARCH

Research conducted on MDI and Isle au Haut in 1981-83 provided a basis for much of what is addressed in this plan. Fire histories and weather data were compiled and evaluated; fuel loadings for the major vegetation types were determined; and fire regimes were described (Patterson et al. 1983; Barnicle 1984; Patterson et al. 1985). More needs to be learned, however, about the dynamics of fire behavior and post-fire ecosystem responses on Isle au Haut and the rest of Acadia National Park. Many of the conclusions about fire behavior and fire effects in the Northeast are based on extrapolations from the results of western research, which pertain to very different conditions. More fire-related research should be conducted in the Northeast to produce data based on and relevant to local fire conditions and management needs. Acadia National Park, and in particular, Isle au Haut, has a chronic need for fire-related data that is locally generated.

Among the fire management objectives stated in Chapter 1 are two that pertain to fire-related research: 1) to research, develop, and implement a program of fuels/vegetation management to reduce the size and spread of wildfires while maintaining natural ecosystems and habitats within the Park; and 2) to develop a more complete understanding of the ecological role of fire in Acadia National Park's ecosystems, based on the results of comprehensive fire research.

The first objective can be met by basic research on fire behavior specific to the local conditions on Isle au Haut, and by experimental programs in types of fuel/vegetation management

suitable to the Island's fire conditions and management priorities.

The second objective can be met by a variety of research programs. Locally generated data, both short-term and long-term, are needed in the following areas: local weather patterns; interactions between fire and vegetation or wildlife, and fire effects on life cycles, behavior, habitat, soil, watersheds, etc.; and detailed long-term fire histories.

12.1 Fire Behavior/Fuel Management

Basic research in fire behavior involves simulation of ignition and spread. As part of this plan, the limited use of small prescribed research burns for this purpose has been proposed for Isle au Haut under carefully monitored conditions. Programs established to manage fuels on Isle au Haut, whether by prescribed fire or mechanical means, will carefully document both short- and long-term effects of management activities on fuel loading and distribution, as well as vegetation succession. permanent sampling plots will be established and then monitored regularly by Park staff. The resulting data will provide much needed local information for Isle au Haut and will be essential in planning future efforts at fuel modification on the Island.

12.2 Wind Climatology

Because a RAWS unit was not operational on Isle au Haut until 1982, only seven years of weather data have been collected on the Island itself. Given the variable, rugged topography on the Island, the weather patterns, and most particularly, wind behavior,

may be quite different than on MDI, especially on a local scale. This plan recommends that weather data continue to be collected directly from Isle au Haut via the RAWS unit in order to create the long-term weather records needed for a better understanding of the interactions between the particular wind behavior on the Island and its complex, variable topography. In turn, this information will contribute to a more complete understanding of fire behavior specific to the Island's conditions.

Direct weather records for Isle au Haut are also essential for research on smoke behavior on the Island. The behavior of smoke, especially important for prescribed fire, is directly related to wind behavior and topography. A better understanding of the effects of smoke (particulates and gases) on air quality is important in terms of both pollution and aesthetics. For example, does the amount of smoke, type of matter produced, and its effects on air and vegetation vary with the species being burned? This is of particular interest for red spruce, the dominant species on Isle au Haut. Much information is still needed on the complex relationships between smoke behavior and the local weather and topography on Isle au Haut, because so little is known about this important area of fire management.

12.3 Vegetation/Wildlife--Fire Interactions

Within this general category resides a host of areas requiring research. For example, descriptions of long- and short-term ecosystem responses to burning are almost completely lacking, as are data on how wildlife might be affected by variations in the

properties of fire. General information exists (Bendell 1974), but little that is specific to the Acadian forest. Also needed is more information on how fire alters cover patterns and habitat, and how these fire-induced changes affect wildlife in terms of abundance, distribution, and behavior, especially reproductive behavior.

There are no known specific studies concerning effects of fire on the fauna found on Isle au Haut itself. An example would be the pair of bald eagles observed nesting in a large white pine near the western shore of Long Pond (Patterson, personal observation 1985). White pines are rare on the island, and those that do occur are probably susceptible to being struck by lightning. It would be helpful to know if eagles are dependent upon the presence of white pine for nesting sites on the island, and how fire management activities might impact both the regeneration of white pine on Isle au Haut and the suitability of mature trees for nest sites.

An ecosystem of great concern from a fire management perspective is the system of pitch pine-huckleberry stands that occur mostly on the northern part of Isle au Haut around Mt. Champlain and on the hills north and east of Duck Harbor. Although covering only a small percentage of the island's land surface, these stands are very important because of their high flammability and high fire hazard. The shrub stratum of huckleberry, along with extensive mats of lichen and pitch pine needles on the forest floor, requires additional research, because little is known about fire behavior and fire effects in this ecosystem. Research underway at Cape Cod National Seashore will provide information that can, to a degree, be applied to Isle au Haut, and the rest of

Acadia National Park as well (Patterson, unpublished).

Another important area of research concerns the ecological role of fire in various ecosystems and its effect on regeneration of vegetation following fires, especially severe ones. Little is known about regeneration/rehabilitation on Isle au Haut, because there have been no major fires there since 1879, and thus, no locally generated information. To date, information gained from the 1947 Bar Harbor fire has been extrapolated to Isle au Haut, but for the future, data must be collected directly from the island itself. Of particular interest is the regeneration of hardwoods (the dominant pioneer species in burned areas), because the reintroduction of hardwoods into the dominant spruce-fir cover type on Isle au Haut (as well as the rest of Acadia National Park) would help break up the flammable H/G fuel complex with intervening areas of less flammable E/R fuels.

In addition to research relating fire to vegetation or wildlife, much research is still needed to provide basic information on life histories, changes in population abundance and distribution, intra- and inter-specific relationships and interactions, and specific habitat requirements. These vital data are lacking for many key faunal groups (Lyons et al. 1978).

Fire effects on soils will also demand further research. Most of the soils on Isle au Haut are shallow and often on steep slopes, which makes them very susceptible to erosion once vegetative cover has been removed. Here too, the rate of regeneration is of critical interest. Basic data relating soil erosion to factors like slope, aspect, depth to bedrock, texture, structure and rate

of revegetation are sorely needed for Isle au Haut. many of the soils are organic, which presents special problems in terms of fire effects. Little is known about relations between fire and organic soils. Fire, particularly a severe one, can adversely affect the amount of organic matter in soil. This is important, because organic matter is one of the major factors determining such soil parameters as water holding capacity, water and nutrient cycling, and cation exchange capacity (CEC), which directly affects the availability of key nutrients. Would the type of fires most likely to burn on Isle au Haut be hot enough to oxidize and volatilize most of the organic matter in the soil, leaving a residue of mostly mineral soil, and thus greatly decreasing the CEC of that soil? Does fire affect the organic matter content in the soil, such that it changes the type, amount, or structure of the organo-metallic chelate complexes that determine the way soil holds or releases various cations (i.e. nutrients) to the roots of plants? These are a few examples of the types of questions that need to be examined by future soils-related fire research on the island.

The effects of fire on water regimes have been studied less completely than have those on soil. Tiedemann et al. (1979) review the present state of knowledge. little is known about effects of fire on watersheds in the Northeast, because most such studies have been done in the West where very different conditions prevail. It is possible, for example, that moderate fires could benefit water resources through the release of charcoal and cations that could help neutralize acidic deposition. Conversely, nutrients released by fires may cause short-term increases in productivity (i.e.

eutrophication) in streams and ponds like Long Pond. In any case, many of the questions concerning fire effects on water sheds are related to similar questions about fire and soil.

More specific information is also needed on the locations of areas of special ecological, geologic, archeological, historical, scientific or scenic interest on Isle au Haut. The exact locations on the island of rare, threatened, and endangered plant sites and animal habitats should also be pinpointed.

12.4 Long-term Detailed Fire History

Earlier work by Backman (1984) documented the occurrence on Isle au Haut of wildfires in the few centuries just prior to settlement by Europeans. A fire about 1600 A.D. initiated changes in the vegetation that were similar to those associated with the 1879 fire. It is from Backman's analysis that one can conclude that fire is a natural force influencing vegetation developments on the island. It is not known to what extent fire was important on Isle au Haut in the several thousand years before the time the island was first charted by early explorers. Were fires caused by lightning and thus rare, occurring as catastrophic large fires at several thousand intervals? Or were Indians an important ignition source, lighting frequent fires at intervals that kept fuel loading low and fire intensity moderate? Answers to these important questions can only be gained through detailed pollen and charcoal analyses of cores spanning several millennia (Patterson et al. 1987).

CHAPTER 13 RECORDS, REPORTS, AND REVIEWS

13.1 Permanent Park Records

The following old records presently in the park will be retained in the park as permanent historic records:

1. Fire reports (10-400, DI-1201, and TF-1202)
2. "Fire Atlas"
3. Fire weather records
4. Historic records of the park, including any photographs showing vegetative cover, cover type maps, and descriptions. Monthly reports, case incident records, or other files which may represent the only documentation of fire occurrence or fire behavior in the park.
5. Fire protection acreage reports or maps.
6. All other maps, aerial photographs, studies, or records pertinent to fire management.

13.2 Situation Reports

A situation report will be prepared daily throughout the fire season and transmitted via NPS Wildland Fire Computer System to the Regional office and NPS, Branch of Fire Management. The situation report must be received in the Branch of Fire Management by 1100 hr. EST. Procedures for completing and submitting the situation report are contained in the Document NPS, Wildland Fire Computer System.

13.3 Fire Weather Records

Acadia enters daily fire weather data into the Affirms system, which automatically archives data into the National Fire Weather Data Library. Affirms will continue to be used unless directed otherwise.

13.4 Fire Reports

A fire report (TF-1202) will be prepared for all fire incidents (wildland fire, prescribed fire, false alarms, and support actions) within seven days of the incident. Fire reports will be entered on the NPS, Wildland Fire Computer System following the procedures identified in the Document NPS, Wildland Fire Computer System with the original hard copy retained in the park.

13.5 Fire Reviews

A fire review will be conducted for every wildland and prescribed fire within the park. The fire review procedures outlined in NPS-18, Chapter 16 will be followed.

CHAPTER 14 PRESCRIBED FIRE

14.1 Definitions

All fires in National Park areas are classified as either prescribed fires or wildfires. Prescribed fires may be either fires deliberately ignited by park managers (prescribed burns) or fires of natural origins (lightning) permitted to burn (prescribed natural fires) to achieve predetermined resource management or hazard reduction objectives. (NPS Management Policies 1988). As stated in Chapter 1, the policy of Acadia National Park is to suppress all natural and human-caused wildfires. The use of prescribed natural fire to accomplish resource management or hazard fuel reduction objectives is not considered appropriate on Isle au Haut and will not be used. The current quantities and distribution of fuels, Acadia's limited suppression capabilities, landownership patterns, and infrequency of lightning ignitions makes prescribed natural fire totally impractical. The use of prescribed burns to reduce hazard fuel levels and perpetuate fire dependent habitats, however, has merit and will be considered as a management tool on Isle au Haut.

14.2 Prescribed Fire Objectives

An experimental prescribed fire program is proposed for Isle au Haut to:

1. Determine the feasibility of using prescribed fire to perpetuate fire dependent habitats such as the limited pitch pine/huckleberry stands.

2. Determine the appropriateness of using fire to reduce quantities of hazardous fuels in selected high risk areas.
3. Better understand local fire behavior and the interrelationships between fire and vegetation/wildlife.
4. Train fire suppression personnel and test fire suppression tactics and equipment.

14.3 Program Design

prescribed burns are fires deliberately ignited by fire managers under predetermined conditions of temperature, wind, relative humidity, and fuel moisture to accomplish a specific goal. Burns proposed for Isle au Haut would be small scale (less than 1 acre), conducted only under carefully developed prescriptions and with enough suppression personnel and equipment to ensure containment of the fire to predetermined boundaries. Because the proposed program on Isle au Haut is of research nature, initial prescriptions will be developed on the low side of the spectrum to ensure a low rate of spread and intensity.

Research conducted at Cape Cod has shown that small successful prescribed burns can be conducted in pitch pine/huckleberry with total confidence and with minimal suppression forces. Similar results can be expected on Isle au Haut in this habitat.

The use of prescribed fire to reduce hazard fuel levels in the spruce forest is rather limited. The low fire resistance of spruce and the flammable nature of the foliage does not permit burning in standing spruce stands. However, prescribed fire may be a very

useful tool to reduce large quantities of foliage, 1 hr. and 10 hr time lag fuels in areas where widespread blowdowns have occurred. In this respect, the blowdowns would be treated as logging slash with fire used to reduce large quantities of dead and down flash fuels, and to prepare the seed bed for more fire resistant hardwood species.

14.4 Prescribed Fire Guidelines

All prescribed fires proposed for Isle au Haut must comply with the standards outlined in NPS, Fire Management Guidelines, Chapter 18. All fires will:

1. Be documented in an approved fire management plan.
2. Have an approved prescribed burn plan for each burn.
3. Be implemented by an approved (certified) prescribed burn boss and qualified staff.
4. Be documented on the Individual Fire Report (TF-1202).

14.5 Prescribed Burn Plan

Each proposed burn for Isle au Haut will have an approved prescribed burn plan. A prescribed burn plan is a site specific action plan which describes the purpose, objectives, prescription, and operational procedures needed to properly prepare for, and safely conduct, a fire treatment. Each prescribed burn plan will be reviewed and approved by:

1. The Park Superintendent
2. The Regional Fire Coordinator
3. The Regional Director

4. The Branch of Fire Management
5. the Selectmen of Isle au Haut
6. The Fire Chief, town of Isle au Haut
7. The town Fire Warden
8. The Maine Department of Forestry, Division of Fire Control
9. The Maine Department of Environmental Protection, Bureau of Air Quality

All proposed burns will be carefully coordinated with the U.S. Weather Bureau, Fire Weather Forecaster in Boston, MA, and a burning permit will be secured from the town Fire Warden. Cooperating agencies such as the town of Isle au Haut Fire Department and the Maine Division of Fire Control will be invited to participate in the burn and/or monitor activities. Public information meetings will be conducted if requested by the town Selectmen.

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