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INTRODUCTION

The Resource Management Plan (RMP) for Acadia National Park (ACAD) describes the natural and cultural resources contained within the Park as well as current or potential activities for managing those resources. A wide variety of research initiatives, baseline studies and inventories, and manipulative and protective techniques are integrated into a comprehensive management program.

The Park was originally established as Sieur de Monts National Monument by presidential proclamation (# 1339) on July 8, 1916. Enduring name changes (Lafayette National Park - 1919, Acadia National Park - 1929) and a constantly changing boundary reflecting sporadic land acquisitions, Public Law 99-420 (1986) finally established the park's legislative boundary and outlined the park's role in acquiring further lands and conservation easements. Most of ACAD's land has been acquired through donation, juxtaposing public with private lands and creating a noncontiguous boundary.

ACAD preserves approximately 16,500 hectares in Hancock and Knox Counties, located along the Maine coast in the northeastern United States. It consists of land on Mount Desert Island (MDI) (approximately 50% of the entire island's land mass), plus both portions of and entire outlying smaller islands, a portion of Isle au Haut to the southwest of MDI, and the tip of the Schoodic Peninsula located on Maine's mainland to the east of MDI (Figures 1 & 2). In addition, the Park holds over 150 conservation easements in the Penobscot and Frenchman Bay areas. The Park was created to protect the natural beauty of the highest rocky headlands along the Atlantic shore of the United States, and the enabling legislation specifically mentioning the "historic significance" of the area and the unique natural resources which were of great "scientific interest".

Located just north of the populated eastern seaboard, the natural and cultural resources of ACAD provide a recreational opportunity for several million visitors each year. The principles and objectives for managing Park resources were established in the General Management Plan (1992) identifying the preservation of the scenic, natural, and cultural resources while offering Park visitors an increased awareness of their natural and cultural heritage.

The recent General Management Plan (GMP) (NPS 1992) describes its significance as a mix of islands and ocean unequalled along the Atlantic coast of the United States. Natural resources, as described within the GMP, emphasize the Park's unique location as a transition zone between temperate, deciduous, and northern coniferous forests overlaying glacially sculptured granite mountains with interspersed glacially scoured lakebeds and bounded by the high rocky headlands. Noteworthy natural resources within the Park include old-growth forests, sub-alpine communities, heaths and marshes, an exceptionally diverse flora, over 40 species of mammals, and documented sightings of over 300 bird species. Significant cultural resources include light stations, 19th century frame buildings, a 80 km carriage road system with 17 stone bridges, and the Islesford Historical Museum.

FIGURE 1. REGIONAL MAP DEPICTING ACADIA NATIONAL PARK AND ENVIRONS.

FIGURE 2. BOUNDARY MAP FOR ACADIA NATIONAL PARK. ISLE AU HAUT AND THE SCHOODIC PENINSULA ARE NOT SHOWN IN THEIR EXACT LOCATIONS. REFER TO TEXT.

Throughout ACAD's history, project funds from Washington and the North Atlantic Region (NAR) have resulted in a variety of scientific research and inventories (See Addenda #3); however, efficient resource monitoring and/or implementation of research recommendations have been woefully inadequate due to a lack of Park-based resource management programs. This has resulted in mostly token emergency (e.g., beaver management due to flooding on public-use roads) natural and cultural resource management and monitoring programs. Several community and taxa inventories are needed and even minimal curatorial operations are still lacking.

Continuing development pressures adjacent to the Park create increased fire danger, pollution, and habitat loss. High seasonal and concentrated visitor use may adversely affect local faunal and floral communities. Together, these represent a complex array of resource issues and related problems. Active management and/or manipulation of the Park's resources will likely become necessary in the face of such adverse impacts, but is contingent on a commitment from Park management and continued support from Washington and the NAR.

As ACAD approaches the 21st century, the specific objectives of this RMP are:

- To maintain and understand ecosystem function in as natural a condition as possible.

- Integrate the management of natural resources with the cultural heritage of the area.

- To identify and delineate the entire spectrum of resources within ACAD and to insure their continued viability.

- To establish and conduct efficient periodic inventory, monitoring, and assessment of the major resource systems within the Park.

- Insure public access and appreciation of ACAD's resources while providing adequate protection and preservation.

- Protect, preserve, and restore as appropriate, the cultural resources and heritage through expanded cultural resource programs.

PRESENT RESOURCE STATUS

NATURAL RESOURCE BASELINE INFORMATION

This overview describes present baseline information for ACAD's important natural resources. Levels of completeness of baseline data are based upon the standards for Natural Resources Inventory and Monitoring (I&M) for Level I (NPS 1991). A summary of all available information for ACAD's major resource groups is provided at the end of the RMP (see #3 in Addenda).

A potential tool for storing and analyzing baseline information on these resources is a Geographic Information System (GIS) which is now available at the Park using personal computer based ARC/INFO. Several thematic maps (e.g., soils, vegetation [ca. 1979], shoreline, water bodies) are now available on the GIS. Ultimately, effective implementation of this RMP will only be realized by staff use of this system and the acquisition of a dedicated GIS specialist.

Vegetation Resources

The Park's flora has been described in several publications and voucher specimens exist in both Park and university herbariums around the country (e.g., University of Maine at Orono, College of the Atlantic, University of Minnesota, Harvard University). A Park-wide rare plant inventory was recently completed (Greene 1990). Several plant communities (e.g., sub-alpine vegetation) and a few species are at the edge of their range or are found on only a small portion of Park-owned land (e.g., pitch pine [Pinus rigida], jack pine [Pinus banksiana], scrub oak [Quercus ilicifolia]), or are on the Maine threatened and endangered plant list (e.g., [Calamagrostis stricta var. inexpansa]).

The most recent aerial photography of Park fee boundary area was purchased from the National Aerial Photography Project (U.S. Geological Survey) in 1991, and plans are to acquire photos of the Park easement areas as funding becomes available. The Park has requested assistance from the NPS GIS division to digitize and photo interpret the new photography (including ground truthing), although this project remains unfunded. The Park's current vegetation maps were developed from aerial photography flown in 1979 have been digitized and are now available on the Park's GIS. Additional aerial coverage (ca. 1940-86) are also available but are not prepared for GIS application.

Floral investigations began in the 1890's and Greene (1990) compiled a comprehensive species list conducting literature and field surveys. Additional field surveys are needed to document all records and distributions. Other vegetation investigations and research have and are being conducted to determine the effects of air pollutants on various species, effects of human disturbance on vegetation (i.e., off trail impacts), beach stabilization, characterizing intertidal, sub-alpine, and heath plant communities, fire (see next section), documenting aquatic vegetation especially in response to non-point nutrient inputs, and numerous works on forest types including old-growth stands (see Greene et al. 1992, for a complete list of work on these topics). Most of this data are not incorporated into the park

GIS with the rare plant inventory being one exception.

Level I of the Inventory and Monitoring Standards have been met for certain aspects of the vegetation resource but not for others. For example, an initial rare plant inventory has been completed for vascular plants with a similar effort needed on bryophytes and other non-vascular species. Additional data (area distribution, population size and locations, etc.) are necessary to develop management plans and monitoring programs for all rare or sensitive plant species. Coordination with other plant conservation programs has been initiated.

Fire. Fire history for ACAD shows that large fires occurred at 100-150 year intervals and recent research examined fire history dating back 6000 BP. This research creates an extensive data base illustrating MDI's fire occurrence for the last several thousand years. Also, the information documents vegetative communities and fire's role in the ecology of island vegetative communities. The work was completed using pollen and charcoal analyses (see Patterson and Backman 1988b, Patterson and Backman 1988c). Other historical data on fire occurrence exists (Patterson et al. 1983a) including a large fire that burned approximately 1/3 of MDI in 1947; since that time all fires have been suppressed. General fuel inventories for the Park have been completed (Patterson et al. 1983) and permanent vegetative and fuel monitoring programs have been established. Site specific inventories are currently underway and will continue at various locations within the Park. Fire behavior for northeastern plant communities and the utility of certain fuel reduction methods (i.e., role of prescribed fire) is largely unknown. On-going research is addressing these questions and how this information will be used to manage and protect Park and adjacent area resources in the future.

A new position, Fire Management Officer (FMO), was added to the Resource and Visitor Protection Division in 1990. The FMO has completed the Fire Management Plan (FMP) which is being circulated for technical and management review at this time. The plan (FMP) describes how detailed fuel load information will be incorporated into prescriptions for small scale research burns using recent research data and the excellent long-term (> 50 years) records of climatic data to determine island fuel burning models, vegetative response, and the viability of fire as a management tool. Nevertheless, the current level of information, with the exception of short-term fire history, does not yet meet the Level I Standards for Inventory and Monitoring. This information is necessary for a proactive fire management program.

Threatened, Endangered, and Rare Plant Species. As noted, an inventory of rare and endangered plants has recently been completed for MDI and Isle au Haut. The Schoodic portion of the Park should also be inventoried in the future. Level I of the Inventory and Monitoring Standards will be attained with a complete inventory. Completion of the inventory is the first step in establishing a long-term management program. A project statement has been prepared to establish a management plan based on Greene's (1990) vegetative inventory and using White and Bratten (1981) and GRSM (1991, Rock pers. comm.). Locational data for species of concern is available using the Park GIS. However, updated species distribution maps and management plans for all species will be necessary

to insure the protection and preservation of these species.

Exotic Plant Species. A list of exotic plants was identified and the location of the 12 most ecologically invasive and geographically widespread alien species is available for the Park (McInnes 1986). This information needs to be updated to effectively monitor the distribution of these species and identify the long-term program needs for alien species control (see IPM section).

Purple loosestrife (Lythrum salicaria) was identified as the principal species of concern within the Park and data are now being collected to determine the annual and cumulative effectiveness of control efforts on populations of this species. Permanent transects have been established to evaluate control actions and monitor long-term wetland community compositions and data will continue to be collected and analyzed.

Animal Resources

Information on occurrence and management of animal species is extensive for some species while little information exists on others. Data for some animal taxa exceed minimum Level I requirements and species and distribution investigations are needed for several entire fauna taxa (e.g., amphibians, fish, landbirds, bats, shorebirds, reptiles, and most fresh and salt waters, and tidal zone invertebrate groups) do not meet minimum Level I requirements. Basic population ecology research is needed for several key species (e.g., harlequin duck [Histrionicus histrionicus], bog lemming [Synaptomys cooperi], etc.) and other research may be identified upon completion of species status inventories.

Wildlife observation data exists and continues to be collected; however, the quality and accuracy of this information is suspect. The entire data base needs to be computerized to determine the usefulness of this data and the park hopes to use volunteer assistance to achieve this objective.

Continuing development adjacent to the Park, changing land and water use practices, and increasing island visitation is of concern as the impacts to park fauna resources is unknown at this time.

Mammals. Research has periodically been conducted on beaver (Castor canadensis) and white-tailed deer (Odocoileus virginianus) (Favour 1940, Gilbert and Harrison 1982, McLaughlin 1968, Saeki 1991). Recent data are also available on river otter (Lutra canadensis) (Dubuc 1987), MDI's coyote (Canis latrans) population (Winter 1990), and the effects of browsing on vegetation by deer and snowshoe hare (Lepus americanus) (Saeki 1991). Small mammal populations have been monitored in recent years as a result of various research projects (Hazen Connery et al. 1992, Garmen 1992). Coman (1987) presents the most up-to-date mammal information on MDI. This data base for some groups meets NPS Level I Inventorying and Monitoring requirements but is still lacking for others.

Beaver harvests from non-Park land on MDI have declined in recent years compared to the 1970's (Maine Department of Inland Fisheries and Wildlife [MDIFW] Harvest Records). In addition, there has been a large decline in the number of active beaver colonies within the area burned by the 1947 fire compared to the 1960's and '70s (Mueller-Schwarze 1979). While subsequent hardwood regeneration provided an increased food source post-fire, questions remain as to the influence of other factors (physical land attributes, vegetation, precipitation, trapping vs. non-trapping) on this population. Information on beaver population size and historical distribution is currently being collected. Digitization of vegetation maps will better discern activity in relation to the amount of available habitat at different time periods. Given the apparent connection between beaver activity and MDI otter populations (Dubuc et al. 1990), further information on MDI beaver will hopefully assist the Park in addressing the issues of biodiversity, succession, and habitat loss on adjacent private lands.

The feasibility of reintroducing fisher (Martes pennanti) to Park lands is currently being completed. The study is constructing a model to examine survival rates of fisher (and selected other mammal species yet to be determined) as a possible preliminary step toward fisher reintroduction on MDI. Additional furbearer work is needed to focus on population status and distribution, the effects of trapping and habitat loss, and species ecology reflective of the changing land use on MDI with the Park as a refugia.

Other recent studies have inventoried mammal populations on Park lands. Historical mammal investigations were reviewed by Green et al. (1992) and may be identified in the resource management bibliography and library.

Birds. ANP and MDI are well known for their diversity of birds (330 documented species, Jones pers. comm.), many which are neotropical migrants and may serve as regional, international and global indicators of ecosystem conditions (Temple et.al., 1989). The landbird monitoring program has been identified in the RMP (ACAD-048) as an important natural resource and significant factor in visitor enjoyment. In preparation for landbird monitoring funding, the Park (Super 1993) conducted a preliminary field investigation of Park nesting landbird species and habitats, analyzed monitoring methodologies to determine their suitability to Park species and habitats, and contacted other NPS, other agency, and university researchers about monitoring methodologies and strategies. The report (Super 1993) reviewed Park options and recommended a step-up monitoring program based on funding availability. The program could be easily fitted to other terrestrial monitoring designs as outlined in the Park's Long-term Ecological Monitoring Plan (Connery et al. 1993).

Park staff have continued to monitor peregrine falcons (Falco peregrinus) in recent years to determine breeding success following the extensive reintroduction program of the mid 1980's. After several years of apparent failure, a pair of falcons successfully produced young in 1991, 1992, and 1993. Detailed information on the behavior of both parents and young have been collected and has been used annually in updating management actions (i.e., protection, interpretation, etc.) at the site and in monitoring the species with the state. Prey remains have been collected from the nest site and analyses will be performed as funding becomes available.

The location of bald eagle nesting sites within the Park are monitored cooperatively by MDIFW and the Park on an annual basis with specific locations and data being maintained by the state. In response to low reproduction rates, research began in 1993 to examine the population ecology, prey sources and level(s) of toxic contaminants, and types and extent of disturbances for the bald eagles in the Frenchman and Blue Hill Bay areas.

The Park will seek additional opportunities to work cooperatively with MDIFW and other local bird advocacy groups in establishing monitoring programs for other Federal and State listed bird species of concern and with other groups of birds (e.g., shorebirds, waterbirds, etc.). The Park is a cooperating member of the state's Partner's in Flight Program.

Fish. Cold and warm water fish species, including non-native brown trout are stocked in both Great Ponds and NPS waters by MDIFW and this practice has been on-going for many years. Stocking species lists are available and are updated annually. This information represents only what the State of Maine puts into these water bodies and should not be considered a thorough baseline inventory of this resource. In addition, the effect of this stocking on the native fish species ecology and genetic purity is unknown. Harvest data (i.e., harvest season, sex and age, total numbers, etc.) are lacking for fish species from all island water bodies. Current information does not meet Level I I&M Standards.

The Park is currently involved in developing a Water Resources Management Plan (WRMP). The plan will specifically recommend programs and action levels for inventory, monitoring, mitigation, and research for fish in Park waters. The Park is identified as a co-participant in a regional park fisheries inventory program that has been identified as a high priority in the region (i.e., FY 94). The inventory and research results will complement programs identified in the WRMP.

Amphibians and Reptiles. A statewide inventory of reptiles and amphibians has been completed but no comprehensive field survey has been conducted specifically within the Park or on MDI. Coman (1987) summarized herptile field observations and reports for MDI and surrounding islands. Recent herptile inventories of park lands on several small islands documented reptiles and amphibians.

Amphibian populations are recognized as indicators of microhabitat changes resulting from direct management activities, macrohabitat changes and habitat fragmentation (Hunter et al. 1992), or non-point sources of pollution (Jones 1988). Due to their contribution in monitoring aquatic community health (Jones 1993) and direct links with other park resource monitoring (i.e., air and water), the park has identified an amphibian inventory and monitoring project (ACAD-021a) as the second highest priority in the RMP. This inventory project has been submitted for FY94 funding by the NBS and investigations will be conducted in the four commonly recognized amphibian habitat types found in the Park.

Invertebrates (other than insects). Invertebrates comprise a diverse group of organisms found in many park habitats and vegetative communities. Early and recent investigations

(see Greene et al. 1992) have produced species lists of the more common species for most of the major Park habitats (i.e., marine, tidal zone, brackish, freshwater and terrestrial). Current information does not meet Level I I&M Standards.

New investigations need to be completed to verify species status and distribution and establish the baseline for monitoring programs. Indicator species would be used to investigate population status and ecology, to detect human impacts and over-use, and monitor other anthropogenic influences. The WRMP will be helpful in identifying possible indicator species, a strategy for re-investigating the major habitats, and identifying both monitoring programs and necessary research projects.

Insects. The park has an invaluable data set of insect fauna (Johnson 1927, Proctor 1946) with over 6500 species identified in Proctor's 27 field seasons of collecting. This diversity presents an unparalleled opportunity to monitor populations and related ecosystems. Identifying candidate taxa to be inventoried and monitored has professional support and has been proposed for the park (ACAD-N-0047).

Ginsberg (pers. comm., 1993) has conducted initial surveys in confirming taxa that have regional distribution and replicating previous collections (Proctor 1946). Continued funding (RMP Project Statement ACAD-N-047) will implement a three year study that will reinventory selected invertebrate taxa, establish a regional T&E/rare species list, identify suitable monitoring protocols and key monitoring locations, developing reference literature and a regional reference roster of entomologists and taxa specialists, and recommend species to be monitored in park communities (i.e., forest, aquatic, shoreline, etc.).

Insect monitoring programs are recommended for terrestrial, freshwater, saltwater, and marine habitats (see Proposed Long-term Monitoring Plan - Res. Mgmt. files.) The Park is a cooperator with the U.S. Forest Service Forest Health Monitoring Program and will continue to monitor gypsy moth (Lymantria dispar), spruce budworm (Choristoneura fumiferana), and hemlock looper (Lambdina fiscellaria) populations. This data base is extensive (see Integrated Pest Management Plan) and available on a regional basis for several parks. As a result, trends and comparative analyses can be made for the past ten years.

Among several insect pest issues at ACAD, the most destructive to park resources is the carpenter ant (Camponotus pennsylvanicus). The Park has numerous historic structures, many which have known insect infestations. Carpenter ant activity is reported annually in some of these buildings and presents a threat to employees, visitors, and the integrity of these resources.

Public Health and Safety. Several insect species are drawn to human waste collection and transfer sites and are an annual nuisance and safety risk for summer visitors. The park's Integrated Pest Management Plan (Connery 1991) initiated operational activities and public awareness messages on refuse and garbage management to reduce opportunities for yellowjackets (Vespula maculifrons, V. vulgaris) honeybees (Apis mellifera), bald-faced hornets (Vespula maculata), and paper wasp (Polistes fuscatus) at heavily used visitor sites.

Lyme disease has recently been reported from MDI in the vicinity of Bar Harbor. The northern deer tick (Ixodes dammini), primary vector of Lyme disease in the northeast is also present on MDI. Park staff conducted extensive small mammal surveys to determine the distribution of this and other tick species on MDI. The Park cooperated with Maine Medical Associates (Connery et al., 1992) in determining the presence, distribution, and rate of tick infection with the Lyme disease spirochete, Borrelia burgdorferi in the Park. Ixodes dammini are located primarily on the eastern side of MDI and IAH, with very low infection rates of B. burgdorferi. Visitor risk is low but not absent, and continuing education efforts directed to visitors and employees are appropriate.

The presence of giardia on MDI or within ACAD is unknown at this time. Bacteria levels (coliform) for local fresh and salt water, are monitored by the state and the Park at several Park visitor use areas. The data is shared between agencies and exceeds Level I I&M Standards.

The status of other zoonoses (e.g., tularemia, rabies) is unknown, but is thought to be extremely low on MDI based on State monitoring efforts. The Park meets the Inventory and Monitoring Level I Standards for other public health risks.

Aquatic Resources

A large variety of water quality information has been collected within the Park and on MDI by park staff, local universities and private individuals. While study objectives for this work have varied considerably, much of this data is useful to the Park as baseline information. A Water Resources Management Plan (WRMP) "Scoping Report" has been completed (NPS 1990) outlining the available information on the Park's water resources. This document, while not providing all the pertinent baseline information, synthesizes the most important water resource issues and provides the necessary reference and background information needed for developing the WRMP. Of particular importance are investigations on surface chemistry for 22 lakes and ponds and 18 streams, calibrated watershed research for Upper Hadlock Pond, nutrient and hydrologic data from Bass Harbor Marsh and Somes Sound, and the identification of important Park and MDI water resource issues. Data from these investigations are being used in the development of the Water Resources Management Plan by providing information on the condition of and inputs to watersheds and the baseline status for some of sensitive aquatic resources on MDI. This will be especially important as most major watersheds that enter ACAD do not lie entirely within Park boundaries. Thus, impacts associated with increasing development including sewage disposal, increased water withdrawals, and non-point source pollution originating outside the Park may affect surface and ground water resources in these watersheds.

A major influence relating to the management of water resources in Acadia National Park is the question of jurisdiction of "Great Ponds" which are lakes 10 acres or larger. The state has maintained jurisdiction of these water bodies based on the "Great Ponds Ordinance of Massachusetts Bay" of 1641-1647. Activities such as non-native fish stocking, hunting, trapping, and winter off-road vehicle (ORV) use are allowed by the state on Great Ponds.

The Park also collects precipitation data as part of the National Atmospheric Deposition Program (NADP) and the information exceeds Level I Inventory and Monitoring Standards.

The park cooperates with the Maine Department of Environmental Protection (DEP) and the MDI League of Towns in limited monitoring of basic water quality parameters of MDI Great Ponds. Temperature and secchi disk readings have been collected since the 1970's for several Great Ponds on MDI. Selected lakes on MDI have been intensively sampled every three years for a variety of physical and chemical parameters. With the exception of the fisheries resource which has been monitored and managed by the MDIFW for several decades, little is known about the biological condition of water resources in ACAD. In 1993 the park began sampling bacterial water quality at Echo lake, Long Pond, Lakewood, and Sand Beach swimming areas. Water quality in both Great Ponds and Park-owned waters is presumed to be excellent (Division of Fisheries, MDIFW, pers. comm.)

In summary, baseline data for ACAD's aquatic resources is very good in some areas but almost non-existent in others. With regard to NPS Inventory and Monitoring Standards, each resource component within the Aquatic Resource category (e.g., fishery, water chemistry) must be examined individually to determine the particular standard level. A variety of references for this resource category are available and a list can be found in the Historical Resource Inventory for ANP (Greene et al. 1992) and the water resources Scoping Report (NPS 1990).

Air Resources

The park, a Class 1 area under the Clean Air Act and the only NPS Class 1 area in the Northeast, cooperates with the NPS Washington Air Quality Division (WASO-AQD) and the North Atlantic Regional Office in implementing the air resources program. ACAD is one of 24 NPS air monitoring TREND sites. TREND sites represent the NPS's long-term air monitoring network and have been selected as representative of ecoregions, as well as areas of known air quality problems such as ozone non-attainment, atmospheric deposition, and visibility impairment at Acadia.

The air quality monitoring program at ACAD includes data on ozone, sulfur dioxide, nitrogen oxides, non-methane organic compounds/volatile organic compounds, visibility (optical and view monitoring), and particulate data and is establishing an excellent long-term data base. Since monitoring began in 1982, ozone levels at ACAD have occasionally exceeded the national standard, and have frequently exceeded the stricter state standard. Overall, ACAD has accumulated a significant data base for its air resources and exceeds Level I I&M Standards.

Due to its status as an area of significant national interest, Acadia has been a focal point in regional and state research and monitoring efforts aimed at verifying and quantifying present air quality conditions. The park has participated in regional air quality research studies with the Environmental Protection Agency, several northeastern state air resource agencies, Northeast States for Coordinated Air Use Management (NESCAUM), and Canadian agencies.

Previous air quality related research has focused on the biological effects of air pollution, primarily ozone. Eckert (91,92) and others have investigated ozone effects on vegetation, and have documented injury to several species at concentrations at or near historical levels. Additional research aimed at determining the effects, if any, of atmospheric deposition including mercury and toxic contaminants, and increased acidification on aquatic resources is needed.

Geologic Resources

The geology of the Park may be defined as a combination of marine erosion, glaciation, igneous activity, and sedimentation. There has been much research conducted on ACAD's geological landscape and a wealth of information is currently available.

Baseline data for most of the Park's geologic resources exceeds Level I NPS Inventorying and Monitoring Standards for MDI (NPS 1989b). It should be noted, however, that little of this information has been collected with Park management needs in mind. Much of the research has been conducted to satisfy academic inquiries and may not be immediately applicable to the needs of Park management. Nevertheless, some of the noteworthy studies that have been conducted include: Bradley 1983, Chadwick 1939, Metzger 1979, Raisz 1929.

A complete soil survey has been completed for MDI by the Soil Conservation Service's update of the Hancock County Soil Survey and is available in digital form as a Park GIS data layer. The published report of the soil survey is not expected until 1995 (Dupruis, pers. comm.).

Aesthetic Resources

Jacobson and Dominie (1988) identified historic, scenic vistas and viewsheds from numerous locations in the park. Many of these vistas have become overgrown due to lack of maintenance and have eliminated these aesthetic resources from park visitors.

Rieley's (1989) comprehensive work identified the location and description of vistas located along the Rockefeller Carriage Roads. Selected vistas were cut by the ACAD maintenance staff in 1988. Selected vistas were cut by the ACAD maintenance staff in 1988 and the University of Maine's Forestry Camp have been involved in the clearing of several vistas along the Carriage Road system over the past few years. This work was completed under a cooperative agreement between the University and the Park.

Special funding to rehabilitate the Carriage Road System was approved by Congress and began in FY92. The project identified other vistas suitable for rehabilitation with the work scheduled to begin in 1994 and last through 1998. All work projects require NEPA and historical compliance and must be completed prior to any additional field activities.

Baseline information on the aesthetic resources currently does not meet Level I I&M

Standards. Sufficient detailed information does not exist depicting all historic vistas and concomitant floral and faunal changes that have taken place over the years.

NATURAL RESOURCES

This section is an overview of ACAD's significant natural resources issues and gives an assessment of the current condition of these resources, program activities, and funding needs. Categories for this section are based on topics presented in the NPS-77, Natural Resource Management Guideline (NPS 1991). Specific resources problems and proposed programs with identified funding needs are identified in the project statements.

Additional information on specific natural resources and natural resource management programs in the Park can be found either in :

- Specific action plans (see list in Table of Contents)

- Park specific research reports (see Natural Resource Bibliography, Greene et al. 1991)

- RMP project statements found later in this document.

Vegetation Resources

Current vegetation patterns within ACAD reflect 18th and 19th century land management practices. Hardwoods now dominate where fire or other manipulative activities removed coniferous forests. More recently, vegetative communities and ecological processes on the eastern half of MDI reflect the 1947 fire that burnt approximately 17,000 acres. Most of these areas will ecologically succeed back to coniferous forests and an understory of spruce (*Picea* spp.) can be found in many hardwood and scrubland communities. On the western half of the MDI and on IAH, however, mature spruce-fir forests dominate the landscape with areas of heavy fuel buildups. With residential development expected to continue on MDI into the foreseeable future, the residential community/Park interface is growing and the threat of catastrophic fire presents the need to manage and protect both community and Park resources. This development also results in fragmented vegetative communities with changing structure, composition and richness, less opportunity for genetic exchange and altered ecological processes.

While the Park's natural resource management goals are defined within an ecological as well as sociological framework, future management decisions will become increasingly difficult as remaining land on MDI outside of ACAD's boundary changes from agricultural with few owners to residential with numerous small landowners.

Special status plants continue to be threatened by development, Park maintenance projects, heavy visitation, and a lack of current inventory and monitoring information. Small stands of jack pine (*Pinus banksiana*) exist within ACAD's boundaries. Recent research (Conkey et al. 1991) has shown that this species may be lost if the current fire management practices

continue. Also a small population of scrub oaks (Quercus ilicifolia) exists along the western edge of Somes Sound and is another species at the edge of its range in ACAD. Park management will determine if these stands are to be artificially maintained or if ecological succession will be allowed to function unimpeded which may result in the possible loss of this species in the park.

Other park vegetative resources have been identified by the Maine Natural Heritage Program's Critical Areas Program. Identified as significant natural resources or resource areas located within the state, the Park is cooperating with the State in the protection and management of these unique natural resources. The areas identified in the park include old growth pine and spruce stands, coastal mountain tops, heaths, intertidal zones and islands. The areas are described in several reports (Greene et al., 1992) and copies can be located in the Resource Management Office.

Two of these areas are unique old-growth forests with one 10 acre stand dominated by eastern white pine (Pinus strobus) and the other being a virgin spruce/fir forest occupying approximately 200 acres on Bernard and Mansell Mountains. The second stand is dominated by uneven aged red spruce (Picea rubens) and some trees are 200+ years of age and represent one of the few virgin spruce/fir forests along the entire coast of Maine (NPS 1981). Although the stands are not in immediate danger, current resource information would be valuable in addressing community change for other stands as well as provide information about the effects of climate change, air pollutants and acid deposition on mature and old-age forests and the resident species.

The main exotic plant species of concern is purple loosestrife. This species has invaded several roadsides and a few marshes in the Park threatening native vegetative species with the potential to effect whole systems. Effectiveness of the past and on-going management control programs is being determined to guide future management programs and activities. Park efforts have also included educating local nurseries and the general public in curbing the expansion of this alien species.

Air pollutants are known to impact plants and are suspected of causing abundance and distribution shifts for some species and within and between vegetative communities. Of special note are the research projects that have been investigating the effects of ozone on native vegetation (see bibliography, Greene 1992). Despite several air quality studies conducted on MDI and IAH (Wetmore 1984, Sanchini 1986, Jagels 1986, Jagels et al. 1989), results are inconclusive as to how ozone manifests itself in vegetation. A five year research effort to determine the effects of ozone on various plant species will be completed in 1994 (Eckert 1989). While it is generally felt that ACAD's vegetation is being impacted, the extent is unknown.

Scientific investigations have reported on the impacts of trampling and dispersed use on alpine vegetation (Synder 1974, Willard and Marr 1970). The park has documented increasing visitation in sub-alpine areas and the increasing development of social trails and related effects on vegetative communities and sensitive species have been recognized as an important management concern. Research to characterize the sub-alpine community and quantify use numbers and patterns began in 1991 (Foley et al. 1991). Sub-alpine areas in

the parked are identified in the Maine Critical Areas Program and several species of state listed plants (Greene 1988) have been identified as of particular concern, especially alpine clubmoss (Lycopodium selago).

As noted, a rare vascular plant inventory was recently completed and there are several state listed plants within the Park. The only occurrence of prototype quillwort (Isoetes prototypus) in the United States occurs in the Park. Several plants exist only in small populations within the Park (Greene 1990) and should be monitored through an approved management plan (see ACAD-N-071). Additional inventory work is necessary to more thoroughly survey all Park lands and conservation easements. All Park projects and operations will complete NEPA and other applicable compliance to determine if the proposed activity will negatively impact these or other park resources.

Interaction of Vegetation with Beaver, Deer, and Snowshoe Hare. The 1947 fire returned the eastern half of MDI to early successional vegetative communities and have resulted in a mosaic of hardwood forests. These early successional vegetative communities and hardwood forests provide exceptionally suitable wildlife habitat for some island and park mammals due to forage availability and productivity. Increased hardwood availability encouraged deer and beaver populations to expand from the 1950s to the 1970s. Deer reduction programs were conducted in the 1960's to control the expanding deer population and resulting severe overbrowsing on park and island vegetation. Beaver populations reached highs in the late 1970s (Mueller-Schwartz 1978), but these population numbers have apparently fallen in the last decade due to a decrease in suitable habitat from overuse and continued succession.

Research into the browsing impacts on vegetation by deer and snowshoe hare was recently completed and a final report has been submitted (Saeki 1991). Deer and hare do not appear to be overbrowsing the Park's vegetation at this time as had been documented and reported in the 1960s. In fact, research results suggest that populations of these species may be declining as determined by the high availability of preferred browse species (Saeki 1991).

Beaver distribution on MDI reflects their use of successional hardwood forest communities, many resulting from the 1947 fire. The suppression of fire and control of disturbances limits the regeneration of suitable beaver habitat and restricts an increase and expansion of the beaver populations on MDI. Further investigations and research are needed to determine beaver use impacts on vegetative composition, structure, and succession, and the effects of forest succession on beaver populations and habitat. The Park continues to manage beaver family groups that threaten park, private and state property with preventative management actions.

Animal Resources

Coyotes were first observed and documented on MDI in the early 1980's and their arrival raised questions pertaining to their affect on the other native island canine species (i.e., fox, Vulpes vulpes) and mammal populations as well as with visitor and local residents activities.

Coyote ecology research was initiated in 1988 to determine spatial relationships, interaction with and distribution relative to the other MDI canine. Habitat use and preference (Harrison 1988) were also determined. The principal investigator has offered to conduct further data analysis with the final report expected in early 1994. Additional research to determine the interaction of deer and coyotes on MDI (Harrison and O'Connell 1991) was initiated in the fall of 1991.

Beaver water impoundments and dam creation have been a problem since the 1960s as their activities flooded and undermined roads, flooded private property, and created safety hazards. These problems, although still prevalent, have decreased due to fewer beavers and the use of preventive management techniques, such as "beaver dam-foolers" in recent years. The park continues to develop a beaver management program and recognizes preventive techniques (i.e., education, preventive management actions, and habitat evaluations, etc.) as effective management practices in reducing nuisance problems, property damage, and maintaining beaver populations in the park. The program will repeat aerial cache surveys followed by ground-verification, similar to the 1989 survey, on a three year interval in monitoring beaver status and distribution. It is estimated that the beaver population has declined since the late 1970's.

Further investigations and research are needed to determine the availability of suitable beaver habitat, impacts of beaver activities on human structures and facilities, and the effects of human development and activities (e.g., trapping, water flow and quality, etc.) on beaver populations and ecology. Otter populations are directly linked to active beaver flowages (Dubuc et al. 1990) and further indicate the importance of understanding beaver ecology and the dynamics of wetland resources. Additional research will provide information on other species directly influenced by beaver activities (i.e., birds, other furbearers, etc.).

The effect of trapping and hunting on Park furbearers, upland gamebirds, and waterfowl populations and ecology are unknown. These activities occur on lands adjacent to and on the Great Ponds located in the Park. Most visitors and residents are unaware of this potential threat to park resources and ecosystem processes. Recent declines in trapping harvest and tagged pelt numbers for the MDI area raise concern about furbearer populations status and raise questions whether one or a combination of factors are responsible. Additional investigations and research are needed.

The presence of Lyme disease in New England raises a safety concern for Park visitors and MDI residents. Lyme disease vectors and pathogens have been identified on MDI (Connery et al. 1991, Ginsberg and Ewing 1988). The threat of humans contracting Lyme disease within the Park is possible and warrants the Park's continued monitoring of ticks and presentation of educational information about Lyme disease.

Twenty-three peregrine falcon chicks were hacked from a mountain within the Park in the mid-1980's (Breen and Anderson 1992). Peregrines returned to historical eyries in 1987, but no successful nesting occurred until 1991. Since then, ten peregrine chicks (i.e., 3 in 1991, 3 in 1992, 4 in 1993) have successfully fledged and left the Precipice Cliff face on the east side of Champlain Mountain. This event marks the first time in over 30 years this

raptor has successfully bred in the Park. The Park has instituted an integrated monitoring and interpretive program at the Precipice Cliff Trail parking area during the last three breeding seasons providing protection, species information, and interpretive outreach to several thousand visitors each summer. These chicks represent approximately 40% of Maine's known peregrine production for the 1991-93 years (Super 1993, unpubl., ACAD management report).

Park lands on the southern shore of Isle au Haut are a major wintering area for the western Atlantic population of harlequin ducks (Histrionicus histrionicus). The duck's status is unknown, but recent surveys indicate that the western Atlantic population is declining from the estimated 1989 population of 400 (Mittlehauser 1991). Annual surveys continue to be funded by the Maine Dept. of Inland Fisheries and Wildlife and the Park. The species was listed on the state's Species of Special Concern and as an endangered species in Canada in 1991. The duck is currently listed as a Category 2 species on the federal T&E roster (US Fish and Wildlife Service 1992) with that status being reviewed for possible upgrading to Threatened or Endangered. Although hunting has not been permitted in Canada and the United States in the past few years, the harlequin still faces hunting pressure in Greenland, Iceland, and other summer breeding and staging areas. Threats to the species wintering and breeding grounds, winter prey base, and ecology are generally unknown. The Park is working closely with MDIFW to locate funding and develop a research and monitoring program for this species.

The status of other native animal species (i.e., amphibians, insects, bats and other mammals, furbearers, most invertebrates, and many birds) is largely unknown. An unknown number of these species may be found to be federally or of special concern in the state. Continued development and changing successional patterns may result in the continuing loss or alteration of key habitat areas or the separation of genetic pools. Reintroductions are unlikely due to the loss of habitat and changing land use practices. Species knowledge is necessary to develop management programs and recovery plans. The Park has conducted investigations for flying squirrels (Glaucomys spp.), and spruce grouse (Canachites canadensis) and modeled population scenarios for the fisher (Martes pennanti) and other small furbearers based on habitat and prey availability. Additional investigations will provide much needed information in protecting species and habitats while establishing baseline distribution and population status and determining species of special management concern (i.e., T&E, etc.). Large mammals, (e.g., bear [Ursus americanus], moose [Alces alces], and feline predators), in addition to white-tail deer, are occasionally observed on MDI and regularly reported on park lands on the Schoodic Peninsula. Surveys of these species are needed to determine their presence within and adjacent to the Park.

Integrated Pest Management. In cooperation with the U.S. Forest Service, gypsy moth (Lymantria dispar) and spruce budworm (Choristoneura fumiferana) populations have been monitored over the last several years and hemlock looper (lambdina fiscellaria) monitoring began in 1993. This data base is extensive (see Integrated Pest Management Plan) and available on a regional basis for several parks. As a result, trends and comparative analyses can be made for the past ten years.

The Park has numerous historic structures many of which have unknown pest infestations. Carpenter ants (Camponotus pennsylvanicus) occur in several buildings each year and yellowjackets (Vespula maculifrons, V. vulgaris) honeybees (Apis mellifera), bald-faced hornets (Vespula maculata), and paper wasps (Polistes fuscatus) are an annual nuisance with summer visitors.

Detailed action plans for species of concern are available in the Integrated Pest Management Plan (which was approved in 1991) as well as a more detailed description of animal and plant pests found in the Park, current problems as well as an historical overview. In summary, information in this area meets minimum Level I Inventorying and Monitoring Standards.

Public Health and Safety. Lyme disease has recently been reported from MDI in the vicinity of Bar Harbor. The northern deer tick (Ixodes dammini), primary vector of Lyme disease in the northeast is also present on MDI. Park staff conducted extensive small mammal surveys to determine the distribution of this species on MDI (Hazen Connery et al. 1992). Ticks submitted by visitors and employees are also being examined for the presence of the Lyme Disease spirochete, Borrelia burgdorferi.

The presence of giardia on MDI or within ACAD is unknown at this time. Bacteria levels (coliform) for local fresh and salt water, are monitored by the state. These data are available to the Park and exceed Level I I&M Standards.

The status of other zoonoses (e.g., tularemia, rabies) is unknown, but the state monitors such diseases and occurrence on MDI is thought to be low. The Park has met Level I of the Inventory and Monitoring Standards for Lyme Disease but not for many other public health risks previously mentioned.

Aquatic Resources

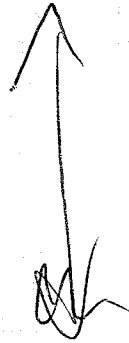
Water resources are an important component of natural processes and resources in the park. They help to define the park's scenic splendor, provide recreation, and some lakes are the source of drinking water for the communities on the island. Watersheds are closely related to adjacent terrestrial communities and reflect the inputs they receive and the outputs they provide (Likens 1985).

Numerous lakes and ponds are found within the Park or contiguous to the park boundary, and several are the sources of drinking water for island towns. However most MDI watersheds lie, at least partially, outside of the Park boundary. Impacts associated with development adjacent to Park lands, including increased water withdrawals, sewage disposal, and nonpoint source pollution, may affect surface and ground water resources. Other impacts to water resources may come from terrestrial or marine oil or hazardous waste spills, high visitor use, atmospheric deposition, economic development, and adjacent landfills. Impacts could be subtle or catastrophic. Monitoring of a few selected lakes on MDI, primarily for physical and chemical parameters, has been conducted intermittently by

become less wary of humans. Eagles in the ANP area and throughout Maine are now protected from this practice.

Reclassification Proposal

A draft proposal for downlisting the bald eagle to "threatened" status in the northern states recovery region was circulated by the USFWS in 1990. In four of five regions, recovery goals have been met to justify considering this change. In response, the Director of the National Park Service mentioned Acadia as one area where reproduction was still low and insufficient to ensure a stable population in the future. This reclassification proposal is still pending. State of Maine requirements for downlisting the bald eagle include federal downlisting, 120 nesting pairs, productivity greater than 1.00 eaglet per occupied nest, and permanent protection for 50 nest sites. These fifty sites will be selected based on their biological quality and their capability for protection under existing land ownership and local conservation interests.



failing park wastewater systems, bacterial water quality at swim beaches, Safe Drinking Water Act requirements for town water sources, and atmospheric deposition. The park cannot adequately evaluate current and future water resource conditions based on the limited information now available from a few sites, nor develop the management strategy needed to interact locally on land-use developments and zoning issues with towns, state and other interested parties. The WRMP is expected to identify a comprehensive water protection strategy that outlines water quality inventory and monitoring needs, research, planning, and jurisdictional responsibility to guide long-term management of the park's water resources.

Air Resources

Based on modeling of regional emission source data and back trajectory analysis it is generally felt that airborne pollutants carried from the eastern metropolitan (New York City/Philadelphia/Northern New York) and midwestern /Great Lakes (including Canada) industrial corridors significantly affect ACAD's airshed. Elevated levels of ozone are known to cause health problems for the general public, and research conducted at Acadia has shown adverse impacts to park vegetation. Sulfur dioxide/sulfate emissions contribute significantly to visibility impairment and to acid deposition. ACAD posted a health advisory for ozone for the first time in 1988 based on exceedances of the National Ambient Air Quality Standard (NAAQS). The park has continued to post health advisories for ozone, which is currently based on the stricter state standard of .081 ppm.

Visibility data collected since the early 1980's indicate visual air quality at ACAD is among the poorest in the NPS. Although this time period is too short to determine a trend it is generally believed that standard visual range at Acadia has been reduced dramatically over the past several decades and thus represents an existing adverse impact. Atmospheric deposition data collected over the past 12 years indicate acidic inputs are approximately 5 times normal levels. ACAD's ecosystem has very low natural buffering capacity and little is known about potential adverse impacts to aquatic systems and organisms.

In addition to impacts from the long range transport of pollutants several hundred miles away, there is concern with the continued development of major and secondary emission sources within the state. The possible development or modification of fossil-fuel or biomass electrical power plants and large paper mills, within 100 km of ACAD, have been proposed for different areas of central Maine. The park will continue to work closely with the NPS Air Quality Division and the state (MDEP) to evaluate these proposals and their potential effect on Park resources, as required in the Clean Air Act's regulatory authority for Class I areas.

The Clean Air Act of 1990 requires major reductions in air pollutants which promises to significantly improve air quality at ACAD and other NPS units. Continued long-term monitoring will provide a means of measuring the amount and rate of improvement.

Geologic Resources

The dynamic forces of geomorphology are largely absent and impacts to the mountain ranges and geologic resources of MDI reflect either on-going geophysical forces and/or human activities from the past two centuries. Also the increasing number of visitors to the island and park have resulted in soil erosion and impacts to sensitive vegetative species and communities in all use areas and especially along the highly used trails in the Park. A closer review, reveals the historic mining activities that occurred in the Park and vicinity where granite and/or gravel were mined and exported for local and regional development. Many of these sites have never been reclaimed and only preliminary surveys have been conducted in identifying what, if any, rehabilitation and revegetation activities may be needed.

The shallow soils which overlay MDI's unique geology, offer relatively little buffering capacity from acidic precipitation. The continuing deposition of acid precipitation is suspected of adversely impacting the soil resource's buffering capability which then will affect species, processes and all island and Park ecosystem components.

Sand Beach, a small calcareous beach, on the southeastern half of MDI (see Figure 1) has fluctuated in width due to prevailing climatic and marine hydrologic events. A beach morphology evaluation (Barden 1970) was recently repeated (i.e., J.H. Connery, pers. comm., 1988-89) to evaluate changes in the rates and seasonality of beach morphology. The project found that there has been little change in beach structure and dynamics during the last twenty years.

The coastal geology also reflects the dynamic interaction of climatic and marine forces observed at cobble beaches, tideline sea caves, stacks, and arches, as well as at historic cobble beaches and other shoreline formations that now lie several hundred feet above and inland of the present high tide line. Little is known of the ecology of the tideline sea caves and the descriptive characteristics and spatial extent for all of these phenomena have not been adequately documented. This data provides much needed information to monitor climatic change, biological diversity, human use and disturbance impacts, and provides references and benchmarks for resource protection.

Sea level rise represents a potential problem for areas like Sand Beach as well as intertidal marshes. Although very unlikely over the short-term (100 years), this type of threat should be considered for long range management planning.

Aesthetic Resources

The Park visitor's experience from scenic vistas and panoramic views is being diminished by the continuing development on private lands and lack of Park maintenance for most of the historically maintained vistas.

Community planning is underway and the Park needs to be fully involved to insure the future integrity of island resources both in and surrounding the Park. The Park's discontinuous parcels and easements, irregularly shaped boundary, and lack of adequately

surveyed and marked boundary lines further complicate the pressures placed upon Park resources by developers and adjacent landowners.

Road modification and upgrading of visitor contact areas have been made to accommodate an increasing number of visitors. Nevertheless, high visitation impacts the Park's resources and warrants the development of carrying capacity objectives and measures for both high and low-density opportunities. Trail erosion, nonpoint source pollution, human waste disposal, increased water use concomitant with continuing development, vegetation trampling, and increased volume of solid waste continue within a limited land base have been identified by Park and community leaders and continued planning and management cooperation is required to protect island values and Park resources.

While many visitors to MDI do not come specifically to visit the Park, once here, many experience Rockefeller's carriage road system. While this resource has enormous cultural significance (see cultural resources section of this Plan), restoration and preservation of this resource will undoubtedly affect associated Park natural resources. It will be incumbent on NPS management to insure the integration of inventorying, compliance, monitoring, and assessment procedures are completed prior to and during any such work.

CULTURAL RESOURCE BASELINE INFORMATION

The following information summarizes the status of Cultural Resource Baseline information for ACAD. Please refer to the NPS Cultural Resource Management Guideline (NPS-28), Chapter 2, Pages 3 through 22 for a complete discussion of the purpose and contents of these documents.

Planning Documents

Preauthorization and authorization - Current and approved. No further action required.

Statement for Management (SFM) - Currently out of date and in need of revision. SFM will be updated within 2 years of the completion of the General Management Plan (i.e., 1993).

Outline of Planning Requirements - Currently out of date and in need of revision. OPR will be updated in conjunction with the SFM.

General Management Plan - Approved 1992. No further action required.

Development Concept Plan (DCP) - A DCP was completed and approved in 1989 for the Isle au Haut unit. The remainder of the Park has been specifically addressed in the General Management Plan (GMP).

Resource Management Plan (RMP) - Draft plan submitted for review and approval in 1991. Updated plan (i.e, 12/1993) awaiting approval.

Interpretive Prospectus (IP) - The current IP is outdated. An updated plan is currently being prepared with a completion date of 1994.

Servicewide inventories, lists, catalogs, and registers

Cultural Resources Bibliography (CRBIB) - The current bibliography dates from January 14, 1987 and must be updated.

Cultural Sites Inventory (CSI) - needed (per conversation with NARO Archaeologist 9/25/90)

List of Classified Structures (LCS) - The list of classified structures on file dates from November 25, 1986 with an review scheduled for 1994.

National Catalog of Museum Objects - Submissions to the National Catalog of Museum Objectives were made annually; however, there will be no submission for FY90. A large backlog remains to be cataloged but there is no one to carry out this

work.

National Register of Historic Places - Five places have been listed on the National Register.

Basic Cultural Resource Documents

Archaeological Overview and Assessment - An archaeological overview and assessment has never been done for ACAD but is needed. (See project statement C-11)

Archaeological Identification Studies - These studies have not been conducted but may be required following the completion of an archaeological overview and assessment.

Archaeological Evaluation Studies - Same status as identification studies.

Ethnographic Overview and Assessment - This report has not been completed for the Park but is recommended.

Ethnographic Oral Histories and Life Histories - These documents have never been prepared for ACAD but are needed.

Ethnographic Program - This action plan may be required pending the completion of the ethnographic overview and assessment. At this time, however, it is not applicable.

Historical Base Map - Historic base maps have not been prepared for ACAD but are required.

Historic Resource Study (HRS) - These studies currently are needed: identifying properties eligible for inclusion on the National Register of Historic Places; documenting the significance of the Islesford collection to regional, state, and local research (while creating funding aids); and documenting the hiking trails. The National Register HRS was initiated by NARO but the contract was never completed. The Islesford collection study has been submitted for cooperating association funding for 1991. The trail study is described as a project but not funded.

Park Administrative History - An administrative history has not been prepared but is highly recommended (See project statement: C-18).

Scope of Collections Statement is currently in need of revision. It does not cover major portions of the collection.

Special Resource Studies and Plans

Archaeological and Ethnological Collections Studies - these studies have not been conducted despite a large collection of prehistoric artifacts. Needed (See project statement in Museum Collections Sections)!

Archaeological Data Recovery Studies - A number of site studies have been completed as required by various Park development projects.

Collection Management Plan (CMP)- An expanded draft is scheduled to be reviewed and approved in 1994.

Collection Storage Plan (CSP)- A draft collection storage plan for Islesford Historical Museum and MDI was prepared in 1989.

Collection Condition Survey (CCS)- This assessment is needed; however, with no Park staff to carry on with resulting recommendations by professional conservators, it will be an exercise in frustration.

Cultural Landscape Report (CLR) - A CLR was prepared for the carriage road system (Rieley and Brouse 1989). Colonial landscape assessments were completed for Sieur de Monts and Ocean Drive portion of the Park Motor Road. However, a wide variety of significant Park cultural landscapes, including the remainder of the motor road and many hiking trails, remain undocumented. (See project statement: C-02).

Ethnohistory - A beginning effort to identify ethnohistories was completed in 1993 and has been recommended as a priority for funding.

Exhibit Plan - needed.

Historic Furnishings Report - None have been prepared to date, but should be completed for the Carroll Farm, Storm Beach Cottage, and the Blue Duck Store.

Historic Structure Preservation Guide (HSPG) - HSPG's have not been prepared for any park structures. Preparation of these guides is one of the park's highest needs.

Historic Structure Report (HSR) - With the exception of the Carroll House, Bear Island Lightstation, and Baker Island Lightkeeper's House; these reports have not been completed but must be completed before historic preservation guides can be prepared.

Social Impact Study - This subject will be addressed in the Park's GMP.

Special History Study - Special History Studies have not been prepared but are recommended for the Park Loop Road and other cultural developments in the Park.

Traditional Use Study - These studies have not been conducted but may be required at a later date.

CULTURAL RESOURCES

Sites

An archaeological overview and assessment has never been prepared for ACAD and is still needed, although a number of individual studies, investigations, and excavations have been conducted. Individual sites evaluated include:

Frazier Point, Duck Harbor Group, Sand Beach, Mosquito Harbor, Thompson Island, Bennett Cove, Wonderland Peninsula, and Schoodic Peninsula (excavated by the University of Maine, contract number CX2000-6-0022, May 1977).

Fernald Point (excavated by the University of Maine under contract number 6-0022-77-03, February 1980.)

St. Croix Archaeological Site, St. Croix Island International Historic Site.

In addition, David Sanger conducted an archaeological survey in 1974 and Rhodes and Naglich made archaeological investigations in 1983. The best known site (National Register) at Fernald Point, is fairly well protected from human disturbance by its location on Somes Sound with access limited by private property. There are at least 22 recorded sites (NARO and WASO RMP reviewers), not including St. Croix Island. At the current time, it would appear that the studies conducted to date are not adequate to manage the archaeological resources of the Park. A comprehensive overview and assessment is strongly recommended. (R. Hsu, NAR Archaeologist, pers. comm.).

Structures

An inventory of structures completed in 1984 (Arbogast) evaluated all structures in ACAD. Twenty-seven structures have been listed in the National Register and over 40 additional structures may be eligible. Structures' significance arises from associations with 19th century lifestyles (Gilley House, Lightstations, Carroll House, Blue Duck General Store), with J.D. Rockefeller's road building (carriage road bridges, gatelodges), and the formation of the Park and preservation movements (Sieur de Monts springhouse, Old Farm/Storm Beach, Islesford Museum). The remaining structures are now being evaluated for thematic nomination by a private contractor. All structures require stabilization, preservation, monitoring, cyclic maintenance, and/or oversight to arrest or prevent deterioration. For example, slate roof tiles on the Islesford Historical Museum and the gatelodges are falling off, birds inhabit the Baker Island Lightkeeper's quarters, each rainstorm floods the Carroll House cellar, and mortar is deteriorating in carriage road bridges and gatelodges. At the present time, there is no comprehensive plan to manage and preserve important Park structures. HSR's, HSPG's, and adequate cyclic maintenance funds are critically needed.

Collections

ACAD has over 68,000 artifacts in three separate groupings. One group, located on MDI, contains the Carroll homestead furnishings and tools, restored carriages and carriage parts, archives, early photographs, furniture of the Park's founder, and archaeological items from road construction projects. Another group, kept on Little Cranberry Island, contains the Islesford Historical Museum collection of books, 18th and 19th century town records, documents, maritime and farming tools, furnishings, and photographs. The third grouping is stored at colleges and universities nationwide as well as the State museum. It consists of natural science and archaeological collections.

Attaining collections accountability by reducing the backlog of uncatalogued artifacts has been the one area of real progress for cultural resources at ACAD. However, continuation of this work is subject to the availability of Washington collections accountability funding distributed by the Region.

In FY90 there was no funding for any further ACAD accountability efforts, and after a year of work on "special projects" (e.g., researching and organizing carriage road blueprints, researching historic vista photos for the GMP), funded by various donations, the Park's curator resigned in frustration. Collection needs in the areas of staffing, conservation, and storage remain unanswered, although a CSP awaits only final approval.

Cultural Landscapes

Two 19th century homestead farm areas associated with National Register houses (Baker Island, Carroll Homestead), the nineteenth century cottage estate of the Park's founder and first superintendent, the approximately 50-mile National Register Carriage Road system with its 16 bridges and two gatelodges, and the 27-mile Park Motor Road system are all in need of cultural landscape identification, documentation and repair/maintenance prescriptions.

Beatrix Farrand, a landscape architect, designed landscaping to accompany the carriage roads as well as their original design by Frederick Law Olmstead, Jr. This was a major component of the Loop Road construction.

CULTURAL CONTEXT THEMES (NPS 1987)

Thematic Framework: (Each of the following headings correspond to those found in the previously mentioned reference)

- I. Cultural Developments:**
 - B: Post Archaic**
 - 14. Hunters/Gatherers of the Eastern Woodlands**
- II. European Colonial Exploration**
 - B. French**
- XIV. Transportation**
 - B: Ships, Boats, Lighthouses**
- XVI. Architecture**
- XVII. Landscape Architecture**
- XVIII. Technology/Transportation**
- XXXII. Conservation of Natural Resources**
 - C: Conservation Movement Matures, 1908-1941**
 - 6. Origin and Development of the NPS**
- XXXIII. Historic Preservation**
 - D. Regional Efforts:**
 - 1. New England, 20th Century**
 - 2. Private Historical Societies**

NATURAL RESOURCE MANAGEMENT PROGRAM

OVERVIEW OF CURRENT PROGRAMS AND NEEDS

The priority of the Park's first comprehensive RMP (1982) was to assemble baseline data to determine the type and condition of resources that were in the Park. However, due to inadequate base funding for personnel and infrastructure costs and project support, systematic data collection has been sporadic. Although ACAD is the North Atlantic Region's (NAR) only "National Park", the natural resource program (e.g., permanent basefunded personnel, budget, and operational resources) was the smallest among the NAR's four largest natural resource oriented areas (Cape Cod, Gateway, Fire Island, and ACAD) throughout the 1980's. As a result, projects and programs were often reactionary being based on available WASO and NARO program monies and the interests of research programs and scientists with only a few efforts addressing Park management concerns. Simply put, little pro-active management planning and resource stewardship can be achieved until the program is properly funded and staffed.

This plan is designed to continue and expand upon the objectives outlined in the first plan and the recently completed Park General Management Plan (GMP). New information reflecting management needs and the results of completed projects of the 1980s have also been incorporated. This RMP is designed to accomplish the following tasks: describe the present and future resource management program including budgetary, staffing, infrastructure, and program needs; monitor and assess the status and condition of all Park resources and ecosystems realizing that most are only portions or subsets of populations or systems found within the local geographical area; work cooperatively with other state, federal, and private management agencies and individuals in developing a holistic stewardship and management program for island and area resources including monitoring adjacent land use practices and development; identify and describe existing base-line data gaps along with the funding and program strategies and products to be received; identify projects and program needs arising from recent local and national initiatives and concerns, and previous research and monitoring; and provide an impetus for action plans for those resources where sufficient data exist and corrective and mitigatory actions have been recommended.

A thorough natural resource bibliographic inventory was completed in 1992 (Greene et al.) and is being updated annually. This work was funded as part of the national "Inventorying and Monitoring Initiative" in 1990 and compiled all previous research and natural resource management work related to the Park's natural resources. The bibliography provides an invaluable overview of science and natural resource management at ACAD and for the island over the past 130 years for Park managers, resource specialists, and park and non-park supported research and management efforts. Additional funding is being sought to maintain and expand upon this work. The bibliography outlines present levels of resource knowledge and gives locations for reference materials as well as recommends what inventory, monitoring, research is needed.

ACAD's natural resource management objectives over the next five years can be summarized as follows:

Develop the natural resource management program by (1) securing base funding to support the full complement of specialists as identified in the Park target staffing organization and for the development of resource and management programs, (2) acquiring one time funding to construct adequate infrastructure and support services to accommodate the full development of the Division of Resource Preservation, and (3) hiring the full complement of specialists and services that have been identified to meet the needs and mission of the park (GMP 1992).

Implement the Fire Management Plan pursuant with the acquisition of implementation funding and close coordination with the local town fire departments and the State of Maine.

Complete and implement Water Resource Management Plan pursuant with base funding to implement water quality, hydrologic, and aquatic biological and physical monitoring, protection, planning and research.

Develop, in cooperation with the other Park divisions, a comprehensive geographical information and data management system that serves to share and exchange data in monitoring, protecting, and planning for the preservation of natural and cultural resources of the park and for their use and enjoyment as found to be appropriate to the mission of the Park (GMP 1992) and the service. Further, (1) continue to acquire and develop spatial and relational data through cooperating agreements, contracted projects, and by staff specialists, (2) hire a full complement of GIS and data managers and specialists to develop and manage these programs activities, and (3) integrate the application of this data in analyzing and monitoring resources condition, strengthening the decision-making processes, and planning and managing park programs and operations.

Monitor air resources in an effort to maintain air quality through proactive assessment programs with the state (MDEP) and federal (EPA) authorities, especially involving new or existing permit processes and educational and interpretative programs.

Cooperate in developing an effective, comprehensive educational and interpretive program in the park and with other educational institutions that instructs visitors and local residents about the Park's diverse and complex array of resources, systems, and processes. The program will seek to enhance the visitors' understanding of the impacts and threats to Park resources and their stewardship role in protecting and preserving Park resources.

Develop resources protection programs based on resources impact assessments and use carrying capacity objectives and standards; utilizing research, resource and visitor monitoring programs, and educational/interpretative outreach programs.

Synthesize baseline data collected from research and subsequent monitoring and develop management plans, especially for sensitive, threatened, and endangered animal and plant species (state and federal) and resources specifically mentioned in the enabling legislation or other planning/management document (i.e., GMP, LPP).

Develop and implement a Long Term Monitoring (LTM) Program that provides an early diagnostic warning system, based on present natural resource conditions and with established limits of variation, to identify agents of change and evaluate management actions.

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Bruce Connery **Date**
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