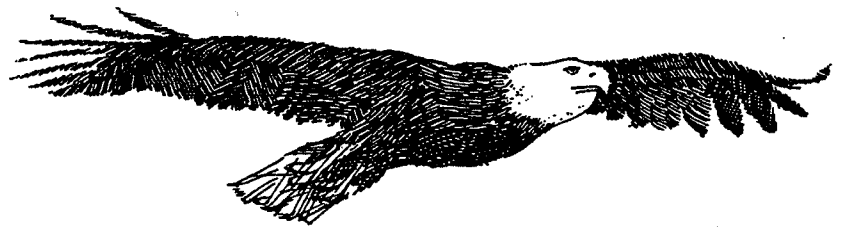


BALD EAGLE MANAGEMENT PLAN



ACADIA

National Park • Maine

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INTRODUCTION

PURPOSE AND NEED

In 1967 (32 Federal Register 4001; 3/11/67) the U.S. Fish and Wildlife Service (USFWS) listed the bald eagle (Haliaeetus leucocephalus) as an endangered species in the coterminous United States. In 1978, bald eagles in WA, OR, MN, WI, and MI were reclassified as threatened (43 Federal Register 6233; 2/14/78). Bald eagles nest throughout Acadia National Park (ANP) and adjacent lands in coastal Maine. The park's Resource Management Plan (1993) recommended the development of management plans for all sensitive, threatened, or endangered plant and animal species. This Bald Eagle Management Plan is a supplement to the Resource Management Plan. The Northern States Bald Eagle Recovery Plan (Grier 1983) called for site specific management plans. These were developed for park nesting areas by the Maine Department of Inland Fisheries and Wildlife (MDIFW) more than 10 years ago. This plan will update that effort and bridge the gap between the regional recovery plan and site specific plans for bald eagles within and adjacent to ANP.

As our national symbol and one of the most visible representatives of the Endangered Species Act (16 USC 1531 et seq.), the bald eagle is extremely popular with the general public. From its position at the top of the food chain it is a sensitive indicator of the overall health of the environment. The decline of the bald eagle throughout the lower 48 states has been well documented and attributed to habitat loss, shooting and trapping mortality, and environmental contamination (Grier 1983).

The recovery of eagle populations in Maine have lagged behind other states where reclassification has occurred, and other coastal populations in Maine have recovered faster than the population in the Acadia National Park/Frenchman's Bay area (Charles Todd, pers. comm.). The ANP/Frenchman's Bay area population was the subject of study in the late 1980's (Owen and Hodgman 1989). It is of particular concern because it includes three of the five nesting pairs in the park (1993) and offers the greatest potential for expansion of nesting pairs on park lands. The health and success of eagles within the park is directly related to the health and success of this area population from which recruitment takes place.

Major concerns for populations of bald eagles within ANP include food base contamination, human disturbance from recreation, and habitat loss. Habitat loss outside the park impacts all eagles in the area. Eagle nesting territories usually include several nest trees separated by as much as half a mile or more. This means the active nest tree may be inside the park boundary one year and outside the next. The patchwork boundary of the park also means nest sites in the park may be affected by activities or development on private lands. This action plan provides recommendations for the protection and enhancement of bald eagle populations in Acadia National Park and its immediate vicinity in accordance with the Northern States Bald Eagle Recovery Plan and State guidelines. The plan describes the park's role and responsibilities in cooperating with the MDIFW and the USFWS to protect eagles and eagle nesting territories in the ANP area.

AUTHORITY

The Bald Eagle Protection Act of 1940 and the Endangered Species Act of 1973, as amended, are the main statutory authorities for protection of the bald eagle. Bald eagles are also protected under the Migratory Bird Treaty Act (16 USC 701 et seq). The National Park Service (NPS) Management Policies (1988) state our responsibility for the conservation of all federally listed species within park boundaries and the protection of their critical habitat. The NPS Organic Act (16 USC 1) calls for the protection of park resources, including the "wild life therein". Acadia National Park's enabling legislation gives express warning "...to all unauthorized persons not to appropriate, injure, destroy, or remove any of the features or objects included within the boundaries of the Monument..." (Proclamation No. 1339, July 8, 1916, 39 Stat. 1785).

Acadia's General Management Plan (National Park Service 1992) states the park should give special emphasis to the protection and management of exceptionally significant or fragile natural resources. It encourages the park to cooperatively protect species and habitats of value. State or federal threatened and endangered species should have buffer zones established, and the park should assess the feasibility of active management to increase these populations. Coastal islands wholly owned by the park and habitats of state or federal threatened and endangered species are classified as Protected Natural Area Subzones under the management zoning process. Strict protection is recommended in these areas with minimal or no human intrusion.

NPS 77 (1992), the Natural Resources Management Guideline for the NPS provides more specific policy guidelines for endangered species management. All management must be in accordance with approved recovery plans and species must be actively managed for recovery. NPS 77 states that most wildlife management takes the form of visitor management or habitat management. Examples of habitat management include thinning tree stands and pruning branches. Native pests can be controlled as part of endangered species management also. Supplemental feeding is also permitted under specified conditions if it is part of an approved resource management plan. Significant manipulative actions are discouraged unless necessary to prevent species extirpation or extinction. A primary goal should be to minimize human impacts on natural animal population dynamics.

As mentioned, the park's Resource Management Plan (RMP) calls for the development of specific plans for endangered species. The RMP's objectives include insuring the continued viability of all resources, the establishment of periodic monitoring and assessment of major resource systems, and continued protection and preservation of resources.

PARK AND ECOSYSTEM DESCRIPTION

Acadia National Park consists of about 41,000 acres on the coast of Maine in Hancock and Knox Counties. Most of the park is on Mt. Desert Island (MDI), with outlying portions on Isle au Haut, Schoodic Peninsula, and scattered coastal islands. St. Croix Island International Historic Site in the St. Croix River bordering New Brunswick, Canada is also administered by the park. Though St. Croix is a separate park unit, for the purposes of

this plan it will be considered part of the park. Eagle nesting territories now exist on Isle au Haut and St. Croix Island, and around MDI with a concentration of sites in the Frenchman's Bay area (Figure 1). The St. Croix site is found amidst a concentration of nest sites in Passamaquoddy and Cobscook Bays.

Moderate weather compared to the rest of northern New England, old growth spruce forests and white pine stands, a 10-12 foot tidal range exposing mud flats and marshes with a rich intertidal flora and fauna, fisheries outside the intertidal zone, shallow ponds supporting warm water fisheries, and islands with colonial nesting birds are the ecosystem components of particular importance to coastal bald eagles.

The park is a popular tourist destination with high levels of visitation concentrated at specific times and places. July and August are the busiest months, but records show increasing numbers in late spring and early fall as well (National Park Service 1991). Fortunately, the most critical time period for nesting eagles occurs prior to the arrival of most summer visitors. Summer visitation does coincide with part of the nestling stage and fledging.

Apparent increases in recreational boating, (especially canoeing and sea kayaking), guide and boat rental services, and summer tour boat operations in recent years are of concern for possible disturbances to nesting bald eagles in spring and summer. There are no data on the amount of boating use in either season. Boating traffic 100 years ago was probably greater than it is now because it was the common mode of transport and commerce along the coast. Eagle population and behavioral data from this era are not available for comparative purposes. All monitoring or enforcement activities are hindered by the remote island locations and insufficient staff and funding.

RESOURCE DESCRIPTION AND CONDITION

Anecdotal accounts indicate bald eagles were common in Maine prior to the arrival of Europeans, and were especially numerous along the coast (Grier 1983). The decline of eagles nationwide has already been discussed.

In the fifteen year period from 1960 to 1975 only 7 young are known to have fledged in the ANP/Frenchman's Bay area (Owen and Hodgman 1989). Productivity in this area was 0.53 young per occupied territory in 1993 compared with the statewide average of 0.77. Potential breeding areas remain unoccupied while other breeding pairs fail to hatch eggs. Reestablishing eagles to these unoccupied territories around Frenchman's Bay is a major goal for the State eagle recovery effort (Owen et al 1986).

Table 1 and Figure 1 list and locate 26 eagle territories in Acadia National Park and near Mt. Desert Island in 1993. These 26 territories are the geographic scope of this plan. Since the Frenchman's Bay eagle population has been the subject of study and concern, it will be a focal point in the plan. The area of this population is extended (from that defined by Owen and Hodgman 1989) for the purposes of the plan to all territories near MDI, where most park land is located, and is shown in Figure 1. Twenty-four of twenty-six territories listed in Table 1 are in this expanded area. Data obtained from the state should

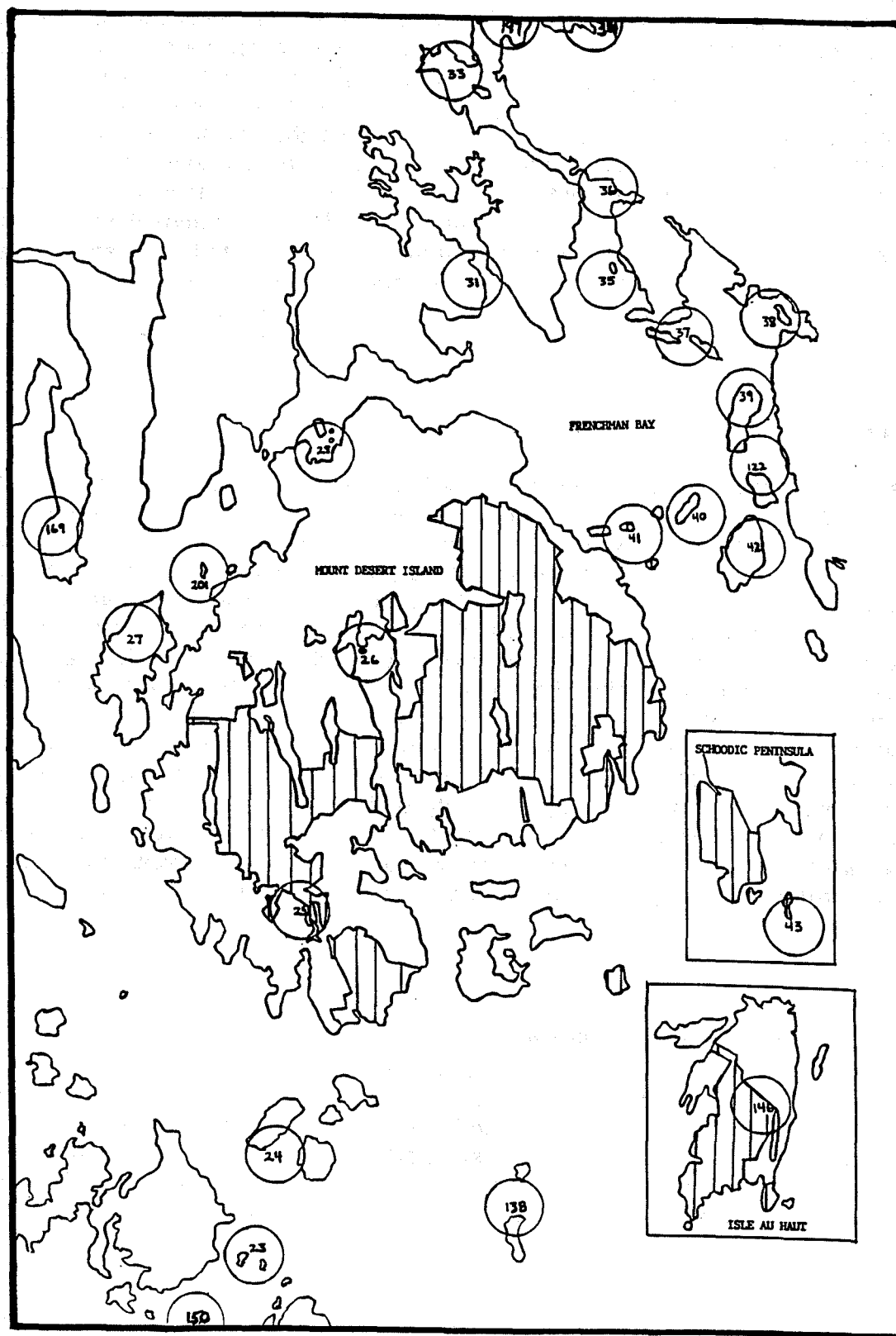
**TABLE 1: BALD EAGLE NESTING TERRITORIES IN THE ACADIA NATIONAL PARK AREA
AS DEFINED BY THIS PLAN AS OF 12/93.**

	MDIFW Territory Number	Territory Name
1	23	East Sister Island
2	24	Placentia Island(2)
3	25	Bass Harbor Marsh
4	26	Bar Island/Somes Pond (1)
5	27	Bartlett Island
6	28	S. Twin Island/Northeast Creek
7	31	Skillings River
8	33	Egypt Bay
9	34	Hog Bay
10	35	Sullivan Harbor
11	36	Sullivan
12	37	Preble/Calf Islands
13	38	Hog Island(2)
14	39	Stave Island
15	40	Burnt/Long Porcupine Islands
16	41	Bald/Sheep Porcupine Islands(1)
17	42	Ironbound Island(2)
18	43	Schoodic Island (1)
19	122	Jordan Island(2)
20	129	St. Croix Island (1)
21	138	Great Duck Island
22	146	Isle au Haut (1)
23	150	Johns Island(2)
24	169	Newbury Neck
25	197	Taunton Bay/Franklin
26	201	Crystal Cove/Black Island

(1) Active nest on park lands (1992 & 1993).

(2) Territory includes park easement property.

FIGURE 1: BALD EAGLE NEST TERRITORIES IN ACADIA NATIONAL PARK AND VICINITY (EXCEPT ST. CROIX ISLAND). MDIFW TERRITORY NUMBERS CORRESPOND TO TABLE 1. LINED AREA IS ACADIA NATIONAL PARK, BOUNDARIES APPROXIMATE.



use the area shown in Figure 1 (except for Isle au Haut) as a basis for monitoring trends. The Isle au Haut and St. Croix sites will be monitored but not included in comparative data for the MDI area.

Coastal habitat is extremely important for Maine's eagles. About two thirds of nesting eagles in the State are on the coast, with around half of them on coastal islands (Charles Todd 1992 pers. comm.). To put this further into perspective, these coastal nesting eagles comprised more than half of the territorial eagles in the New York-New England area in 1992, and only 27 of the 167 territorial pairs in this area were outside of Maine (USFWS 1991). Coastal nesting eagles are expanding their range very slowly. Except for the ANP/Frenchman's Bay area, densities on the coast are increasing (USFWS 1991). This increasing nesting density is likely the result of a combination of locally rich food supplies and lowered contaminant levels. Coastal eagles are also largely non-migratory, and the coast serves as a wintering area for eagles from inland Maine and other areas. Marine and estuarine habitats with undeveloped shorelines near open water are preferred by wintering eagles. Frenchman's Bay is one of four such areas on the Maine coast. Wintering eagles in the ANP area have not historically used park lands for roosting or foraging.

Prey Base

There is a significant difference in prey base between coastal and inland eagles. Inland eagles feed primarily on fish while coastal eagles, especially those of offshore islands, have an avian food base (Owen 1983, Todd et al 1982). Eagles wintering in coastal Maine continue to depend on seabirds for food (Charles Todd 1992 Pers. comm.). By feeding at this higher trophic level, coastal eagles may be subject to greater contamination levels of organochlorine pesticides (DDT, DDE), mercury, and PCBs (Todd et al 1982) because of bioaccumulation. When last examined in the late 1970's, Maine eagle eggs and eagle prey items had higher than acceptable levels of all three of these contaminants (Welch 1991). Individually, these contaminants all were associated with significant reproductive impairment in Maine eagles. They may be continuing to impair productivity of Maine eagles (Owen et al 1991). A study recently completed gathered contaminant data about Maine eagles and eagle prey and analyzed it with respect to regional eagle productivity. Final results are not yet available. Evidence from several areas nationwide suggests some eagle pairs experience reproductive failure several years after establishing a nesting territory, possibly due to an accumulating contaminant burden (Welch 1991).

Nesting

Coastal eagles begin nest building and courtship as early as February. Egg laying occurs by early April and incubation lasts four to five weeks. During the nestling stage, eaglets are highly vulnerable to mortality. Fledging occurs about ten to eleven weeks after hatching. On the Maine coast this could be anytime from mid-June to mid-August. An early nest failure rarely results in a renesting attempt. Winter and spring weather can dramatically impact nesting success and timing. Cold wet weather in 1989 is believed to have caused lower productivity statewide (Owen and Hodgman 1989). Survival through the first year is dependent on wintering conditions such as weather severity and food

availability (Grier 1983).

Bald eagles prefer to nest in supercanopy trees near large bodies of water. Inland, white pine is the tree of choice, but on the coast fewer pines means spruce trees are often chosen as nest trees. Hardwoods are also used on occasion. Bald eagle pairs exhibit a high degree of loyalty to nest territories. Eagle nesting on the Porcupine Islands in Frenchman's Bay can be traced back 30 years. Coastal nests are more vulnerable to structural failure because of exposure to wind and a lack of suitable large trees for support (Owen 1983). Osprey and eagles often exchange nests, with eagles usually the invader. Tall trees with accessible perches and good visibility are also important for perching and roosting eagles.

In a habitat model study, Livingston et al (1990) found eagle nests in Maine associated with forest edges, proximity to water, and distance from human disturbance, especially timber harvests. Nests were also positively associated with warm water or mixed warm and cold water fisheries. Near marine habitats, nests were associated with the number of diadromous fish species and waters less than 1.8 meters deep at low tide. Access to foraging areas for prey species, either fish or shorebirds, is an important habitat criteria for nest selection. The model worked well for lake and marine mainland eagle nests, but not for river or marine island nesting eagles.

Disturbance

Nesting eagles will usually avoid areas disturbed by human presence. Buehler et al (1991) concluded that the length of undeveloped shoreline might be the limiting factor for eagle populations in Chesapeake Bay. They found no evidence of eagles adapting to human presence by beginning to use shorelines previously avoided. The eagle nest on St. Croix Island in 1992 is believed to be the result of displacement from an upriver site due to nest disturbance from land development (Charles Todd, Pers. comm.).

Research has shown eagles to be highly variable in their responses to disturbance (Fraser et al 1985, Knight and Knight 1984, McGarigal et al 1991). Past exposure to disturbance, the nature of the disturbance, timing related to the breeding period, and the distance to the disturbance all influence eagle reactions. Human activity is not necessarily human disturbance; eagles can become habituated. Activity seen from the nest may have a greater impact than screened activity. For a comparison of bald eagle behavior and sensitivity during the nesting season, see Table 2.

Approaches by water seem to have a greater impact than those by land (Stalmaster and Newman 1978). Flush distances from boat disturbances vary somewhat by location and season but have generally been in the 150 to 300 meter range (Buehler et al 1991, McGarigal et al 1991, Knight and Knight 1984). Other studies discovered eagles will relocate nests away from roads and human recreational activity (Anthony and Isaacs 1989, Fraser et al 1985). Around Mount Desert Island evidence of this may be indicated by the movement of nests from Northeast Creek to South Twin Island, Somes Pond to Bar Island in Somes Sound, and the abandonment of the nest site at Bass Harbor Marsh. On the other hand, this may simply be representative of periodical movement of nest sites

TABLE 2: BALD EAGLE BEHAVIOR AND SENSITIVITY DURING NESTING SEASON¹
(FROM MONTANA BALD EAGLE WORKING GROUP 1991)

Reproductive Period	Nest Building	Incubation and Hatching
Timing	January 1 to Onset of Incubation	Onset of Incubation to 4 Weeks after Hatching
Behavioral Clues	* Eagles in vicinity * Stick gathering and nest Building * Courtship displays (swooping, aerial cartwheels and somersaults) * Copulation * Territorial behavior toward other eagles (screaming and chasing)	* Egg laying may begin late February; During egg laying female only on nest * Incubation approx. 35 days; during incubation, adult prone on nest nearly continually; some egg rolling with beak * Male and female switch incubation duties; chittering call associated with switch. * Brooding, shielding with wings, and feeding of young during later 4 weeks * Territorial behavior possible
Sensitivity	* Susceptible to nest abandonment * May lose reproductive season	* Likelihood of nest abandonment declines * Eggs or young highly susceptible to mortality through predation or thermal stress

1. After M. Prather, U.S.F.S., Unpublished 1983.

TABLE 2: (CONT.) BALD EAGLE BEHAVIOR AND SENSITIVITY DURING NESTING SEASON¹
(FROM MONTANA BALD EAGLE WORKING GROUP 1991)

Reproductive Period	Rearing Young	Pre-Fledging	Fledging
Timing	4-8 Weeks After Hatching	8-11 Weeks After Hatching	11-13 Weeks After Hatching
Behavioral Clues	* Wing flapping of young begins * Adults frequently away from nest * Feeding of young by adults	* Wing flapping of young intensifies * Young fully feathered * Young begin to feed themselves from food in nest	* Periodic flights away from nest
Sensitivity	* Low probability of nest abandonment * Young less susceptible to predation and thermal stress * Interference with feeding of young possible * Young vulnerable to premature fledging with mortality a likely consequence	* Young likely to leave nest prematurely with mortality a possible consequence	* Young may be displaced from nest site with unknown consequences

1. After M. Prather, U.S.F.S. Unpublished 1983.

that occurs in undisturbed areas as well.

Flushing of perched eagles in winter can be hazardous to survival because of high energy expenditure at low temperatures (Stalmaster 1983). Disturbance has also been suggested as a cause of reproductive failure. In 1989, Owen and Hodgman maintained increased human disturbance was detrimental to eagles in the Frenchman's Bay area, and that protection from disturbance was still the most important conservation issue there.

Park Nesting Status

There were 5 bald eagle nests on Acadia National Park lands in 1992 and 1993. Their locations were: 1. Sheep Porcupine Island (MDIFW Territory 41), 2. Bar Island (Somes Sound-MDIFW Territory 26), 3. Schoodic Island (MDIFW Territory 43), 4. Isle au Haut (MDIFW Territory 146), and 5. St. Croix Island (MDIFW Territory 129). These five sites produced 6 eaglets in 1992 and one from each nest for a total of five in 1993.

The park has conservation easements on five islands in Hancock and Knox Counties which contain current or historically important eagle nesting territories. Jordan (MDIFW Territory 122) and Ironbound (MDIFW Territory 42) Islands in Frenchman's Bay each have one of three historical nests intact but have not been active for some time. John's Island (MDIFW Territory 150), just south of Swan's Island, has one intact nest but has not been active recently either. The easement on Black Island (MDIFW Territory 24) is part of the territory of an eagle pair that successfully fledged two young on nearby Placentia Island in 1992 but failed to produce in 1993. The final easement on Hog Island (MDIFW Territory 38) in Flanders Bay (part of Frenchman's Bay) contains three nests. One of these was active in 1992 and produced two young. A pair of adults failed to produce young here in 1993.

Park Nest Histories

What follows is a short narrative describing the histories of nests of importance to the park. This information came from MDIFW files, and copies of territory history tables developed by them are in park files.

Schoodic Island has been occupied by territorial eagles all but four years since 1965. The last time it was unoccupied was 1984. Eagles produced young at this site in 1977(1), 1981(1), 1982(2), 1983(1), 1986(2), 1987(2), 1991(1) and 1993(1). It is noteworthy that the island supports large eider duck (Somateria mollissima), herring gull (Larus argentatus), black-backed gull (Larus marinus), and double crested cormorant (Phalacrocorax auritus) populations providing a steady source of potentially contaminated food. Knowledge of contaminant levels here could be revealing. Schoodic Island is also exposed to extreme conditions of wind and there is a danger of island-wide nest tree loss at some future date (Owen 1983).

The Bald and Sheep Porcupine Islands territory has been occupied continuously since 1968. The active nest has been on Sheep Porcupine Island since 1984. Twenty-one

eaglets have fledged from this territory since 1974. These eagles are seen by many visitors from tour boats out of Bar Harbor. The islands are also close to Bar Harbor and easily accessible to small boats. These eagles have done well despite the frequent human visitation.

The Bar Island (Somes Sound) nest site was occupied in 1992 after a twenty year absence. It produced one eaglet in 1969. In the intervening years, the active nest was outside the park on nearby Somes Pond. Production from this territory was zero in the 1970's, but nine eaglets were produced in the 1980's. One eaglet fledged in 1992 and one again in 1993. There was also one eaglet mortality in 1992; a three to four week old eaglet was found dead at the foot of the nest tree.

The Isle au Haut territory has been occupied since 1985 and has produced seven eaglets. It has been successful for the past five years. Two nests are near the north end of Long Pond and one is on the east side of Eastern Head.

St. Croix Island has produced five eaglets since being occupied in 1990. It was probably occupied from 1987-1989 as well, since a successful pair further upriver had been lost track of by surveys after 1986 (Charles Todd 1992 pers. comm.).

The territory in Bass Harbor Marsh was occupied in 1962, 1965, and 1977-1981. It fledged one young in 1977. All of this activity was on park lands. Although known use of this site is limited to only a few years, it may have a history dating back to the 1920's (Todd 1980b).

In the mid-1980's, eagles nesting on park land on Northeast Creek moved their nest to a nearby island. With the 1992 move of eagles from Somes Pond to Bar Island, there were no eagles nesting on Mt. Desert Island proper in 1992. Reasons for all these moves are unclear although disturbance is suspected.

The historical abundance of eagles in the area of Mt. Desert Island and ANP is not known. References to eagles do show up in the writing of early explorers and settlers (see Phillips 1978). Charles Eliot Jr. (1916) reports a huge nest and a pair of bald eagles on Newport (Champlain) Mountain, the only nest for twenty miles around. In 1931, Samuel Eliot Jr. notes Somes Sound as the favored haunt of Mt. Desert's famous eagles. Eagles were observed springing from the beach and perched on tennis court fence posts.

Park Naturalist Arthur Stupka visited a bald eagle nest overlooking Frenchman's Bay in the southeast corner of MDI in 1932 and reported one adult and one young eagle in the nest (Favour 1932). The fledgling was undisturbed by his view from the crown of a nearby tree and collection of prey remains (crow, herring gull) from below the nest tree. The nest tree was a red oak in heavy woods. In 1933 Stupka and another ranger visited a nest in the crown of a dead yellow birch on Beech Hill overlooking Long Pond (Favour 1933). He returned to the site nine days after a severe storm to find the nest tree had blown down. Two eaglets, one dead and one alive with an injured wing, were on the ground below. The dead bird was believed to have survived the fall and later starved. Remains of herring gulls, a black duck, osprey, flounders, a sculpin, other fishes and a deer leg (later determined to be from carrion) were found. Stupka kept the young eagle for several days,

nursing it back to health, and eventually gave it to an in-state zoo.

Tyson and Bond (1941) reported six eagle nests around MDI at Pemetic Mountain, Long Pond, Champlain Mountain, in a cedar swamp near Bass Harbor, in a marsh near Hio, on Burnt Porcupine Island, and Placentia Island. A photo in this guide also shows an eagle nest on Enoch Mountain. In 1957, Townsend reported banding eagles on Enoch Mountain in 1944 and in Southwest Harbor in 1949. Perhaps this Enoch Mountain site is the one described by Favour as located in the southeast corner of MDI. Bond (1969) later reported eagles seen as frequently as the first half of the century. Long (1982) in updating Bond (1969) reported active nests in 1949 at the base of Beech Mountain, near the Marshall Brook Truck Road, and near Town Hill, and in the late 1960's on the southeastern slopes of Bernard Mountain. Acadia National Park slide files include a picture of one young eagle in a nest in the amphitheater in 1949.

From these early records it is difficult to reach any firm conclusions about historical eagle populations around MDI and ANP. However, it does seem clear there were more nests on Mt. Desert Island earlier in this century.

MANAGEMENT HISTORY

Recorded bald eagle management at Acadia began in the 1960's as the NPS cooperated with the National Audubon Society's nationwide bald eagle investigation by providing basic information on population and breeding success. From 1969-1978 there were no references to bald eagle management found in park files. In 1978, Maine state officials asked the park to consider closing the Marshall Brook Fire Road to protect the Bass Harbor Marsh nest from late winter snowmobile traffic and other visitor use. The park responded that closure was not felt to be necessary based on usage and attempting to enforce such a closure could be counterproductive. Since 1978, park eagle management has become more active, and developed in stages as outlined below.

Territory Plans

In 1980 and 1981 the MDIFW developed site management plans (Todd 1980a, 1980b, and 1981) for three active bald eagle nest territories in Acadia National Park at Bass Harbor Marsh (Territory 25), Somes Sound (Territory 26), and Bald Porcupine Island (Territory 41). The plans followed the guidelines set forth later in the Northern States Bald Eagle Recovery Plan (Grier 1983). These USFWS guidelines describe concentric buffer zones of 330, 660, and 1320 feet. The territory plans were set up and adjusted as necessary to accommodate existing development within those limits. These zones were recommended for all nest sites in the territories, not just the active nests.

Land use recommendations by zone are described in Grier (1983). The inner, most restrictive zone recommends prohibition of all land use actions except those necessary to improve the nest site. Human entry and low level aircraft should also be prohibited during the most critical periods (courtship, nest building, and incubation) and the four weeks following hatching (a moderately critical period), when frequent brooding and feeding are

necessary. In the next zone, land use activities that change the landscape significantly (construction, land clearing etc.) should be prohibited. Minor activities can be permitted during the non-critical period. Human entry should be prohibited during the most critical period except for research purposes performed by qualified and authorized persons. Human entry at other times should be dependent on type of activity and duration. In the third zone, some activities are permitted except during the most critical period, again dependent on the type and duration.

For the Somes Sound territory, the site plan recommended preserving 17 tall white and red pine trees near the nest and posting Bar Island against entry on foot. It noted potential disturbances from nearby homes and recreational boating. At Bass Harbor Marsh, the site plan recommended preserving tall white pine trees near all nest sites and a February 1 closure of the Marshall Brook Fire Road to all use. Rerouting of the road was recommended as a more permanent solution to protection of the site. Snowmobiling was noted as a special hazard to the site. Recreational pressure from canoeing and fishing was felt to be infrequent along Marshall Brook in the upper reaches of the marsh. A number of other potential nest trees were available.

On Bald Porcupine Island, preservation of one dominant white pine was recommended and tree topping of some dominant red spruces should be considered if the nest tree is lost. Closure of the area to foot traffic was advised only if visitation became a problem in the future. Education of visitors on naturalist cruises about the problems of bald eagle management was strongly encouraged. The plan also noted windthrow susceptibility of trees on the island and light recreational pressure.

There are no records of the park closing eagle nesting territories within its jurisdiction, and the Marshall Brook Fire Road was never closed or rerouted. State wildlife biologists have only rarely tried to close territories through signing.

Cooperative Agreements

In 1983 the park, as a landowner, signed cooperative agreements with the State of Maine for eagle nest protection. Following the buffer zone guidelines, the park agreed to maintain an undisturbed sanctuary within 330 feet of a nest and permit light land use only during the non-critical period in the 330-660 zone. From 660 to 1320 feet (1/4 mile), new permanent construction would be excluded, no disruptive activities would be engaged in during the critical nesting period, and overall site integrity would be maintained.

Research

Phillips (1978) summarized territories, perches and feeding areas, and recorded human activity impacts. One unhatched egg was collected from the Northeast Creek nest site in 1977, and contaminant analysis showed it to have the highest level of DDE of four eggs collected in the state that year, and high levels of PCBs and dieldrin (in ppm, the measured levels were DDE-14, DDD-0.19, DDT-X, Dieldrin-0.20, and PCB-15).

The park cooperated with the University of Maine from 1985-1989 in a population study and winter feeding of bald eagles in the ANP area (Owen and Hodgman 1989). Study goals were to increase immature eagle survival and reestablish resident eagles. Increased survivorship may be more important than increased reproduction (Young 1968, Grier 1980, Buehler et al 1991, Stalmaster 1987). There was some modest success with the effort (see Table 3) as the number of nesting sites occupied increased from 8 to 11 in 1988 and has stayed at or above that level. Poor reproduction may eventually nullify this effort. Productivity of the population has dropped below 1.00 eaglet per occupied nest since the feeding program ended to levels comparable to those before the program. The report recommended a reassessment of the feeding program in 1994, five years after it stopped.

Through a cooperative agreement, the USFWS has delegated management authority for the bald eagle in Maine to the MDIFW. Federal money is channeled to MDIFW to support their program. Current eagle research in Maine consists of a USFWS funded study of contaminant burdens and reproductive rates. In 1991 and 1992, park nests at Bar Island, Sheep Porcupine Island, and Schoodic Island were visited to collect blood and feather samples from eaglets and prey remains. The eaglets were banded during these visits. Results of this study are not yet available. A new study of eagle ecology in the ANP area funded by the National Park Service began in 1993 is described later in this plan under Management Strategies.

State Eagle Program and State Law

The state's eagle management program is directed toward the protection of nesting territories. Overflights are conducted twice a year, usually in April to determine nesting status and in June to determine productivity. Relevant information is shared with the park. Cooperative agreements as described above are sought with all landowners. In 1990 Maine passed an 'Essential Habitat' law as an amendment to its Endangered Species Act of 1975 (MRSA Title 12, Ch. 713, subchapter V.). This law provides a review and approval process by the MDIFW for any project within an Essential Habitat that is permitted, licensed, funded, or carried out by a state agency or municipal government. Among the considerations during project reviews are seasonal timing; noise and human activity; impacts on wetlands, shorelands, and visual buffers; impacts on key habitat components of nesting, foraging, perching, and roosting; cumulative impacts; and the demonstrated tolerance of eagles for similar activities.

Eagle feeding by a Bar Harbor tour boat operator in 1986 created a controversy resulting in new state legislation enacted in 1987. The new law prohibits the feeding of endangered or threatened species except under authorized conditions for research or rehabilitation purposes. The park worked with the USFWS and the MDIFW in support of the law. The concern was that young eagles might become adapted to being fed during that early period when they are learning to hunt and forage on their own, and would become less wary of humans. Eagles in the ANP area and throughout Maine are now protected from this practice.

TABLE 3. NESTING AND PRODUCTIVITY OF BALD EAGLES IN THE ACADIA NATIONAL PARK/FRENCHMAN'S BAY AREA, 1972-1993. (OWEN AND HODGMAN 1989, UPDATED BY PERS. COMM., CHARLES TODD, 1993)

Year	Number of Nesting Sites		Eaglets Fledged	Nest Success (%)	X Brood Size	Productivity	
	Monitored	Occupied				Study Site	State Wide
1972	10	6	0	0	0.00	0.00	0.28
1973	11	6	0	0	0.00	0.00	0.19
1974	12	6	1	17	1.00	0.17	0.33
1975	12	5	2	20	2.00	0.40	0.35
1976	13	7	7	57	1.75	1.00	0.46
1977	14	6	3	33	1.50	0.50	0.70
1978	14	7	3	29	1.50	0.43	0.52
1979	14	6	3	50	1.00	0.50	0.73
1980	14	7	4	29	2.00	0.57	0.71
1981	15	8	9	75	1.50	1.12	0.78
1982	15	9	7	56	1.40	0.78	0.78
1983	15	7	4	43	1.33	0.57	0.81
1984	15	7	6	57	1.50	0.86	0.70
1985	15	8	8	75	1.33	1.00	0.87
1986	15	7	9	71	1.80	1.29	0.85
1987	17	8	11	75	1.80	1.37	0.71
1988	17	11	Nest success data not collected for 1988.				

TABLE 3. NESTING AND PRODUCTIVITY OF BALD EAGLES IN THE ACADIA NATIONAL PARK/FRENCHMAN'S BAY AREA, 1972-1993. (OWEN AND HODGMAN 1989, UPDATED BY PERS. COMM., CHARLES TODD 1993)

Year	Number of Nesting Sites		Eaglets Fledged	Nest Success (%)	X Brood Size	Productivity	
	Monitored	Occupied				Study Site	State Wide
1989	17	12	8	42	1.60	0.67	0.57
1990	17	11	6	36	1.50	0.55	0.80
1991	18	12	10	58	1.43	0.83	0.92
1992	19	14	9	50	1.29	0.64	0.81
1993	24*	17	9	53	1.00	0.53	0.77

* Monitored area expanded in 1993.

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.

MANAGEMENT OBJECTIVES

The overall bald eagle management goal for ANP is to maintain a healthy, self-sustaining eagle population requiring minimal active management.

Maintaining bald eagle habitat will be necessary to achieve this goal. Cooperation with USFWS as required by law and the MDIFW as the local responsible agency will continue to guide the park's involvement in achieving this goal. Continued existence of bald eagles in ANP is dependent on regional protection strategy, and ANP action alone cannot assure adequate protection. If the bald eagle is downlisted by the USFWS in our region to threatened, it will still be afforded the same amount of protection under the ESA. If it is delisted, the management objectives listed below should be reevaluated.

OBJECTIVE 1

Reach the carrying capacity for eagles (number of territorial pairs) in the ANP area (park lands and conservation easements and adjacent lands).

Maintain a stationary or increasing population of eagles until carrying capacity has been estimated.

Estimate eagle carrying capacity by 1997.

Achieve a sustained annual population increase of 7% by the year 2000, until the population has reached the estimated carrying capacity.

OBJECTIVE 2

Achieve the statewide productivity objective of > 1.00 eaglet per occupied nest site in the ANP area.

A productivity of > 1.00 eaglet per occupied nest is also the level for reclassification according to the Northern States Bald Eagle Recovery Plan. It should be maintained indefinitely or until new standards are recognized. Based on productivity of eagles in other regions of the country, this appears to be an attainable objective.

This second objective is critically important. The first objective might be achieved even if the ANP area were only a sink. The ANP population could persist, with poor reproduction, if surrounding healthier populations send immigrants. The ANP area population would not then be truly self-sustaining and would contribute little to the continued existence of the species. Continued monitoring of productivity and survival, and research into the causes of repeated nest failures should eventually make this picture clearer.

Each objective is easily measurable through existing aerial survey procedures conducted by the MDIFW. The park should annually obtain this territorial and productivity data to monitor population trends within the geographic area described earlier in this plan. A three year decline in the number of occupied nests or productivity, or a one year decline of 25 percent in either, should prompt an immediate evaluation of research needs and management actions based on consultations with the USFWS and MDIFW.

MAJOR ISSUES

Major issues arise when objectives are not met. Some progress appears to be occurring in the first objective, reestablishment. Data in Table 3 suggest a continuing slow increase in the number of occupied territories. The increase shown for 1993 is due to expansion of the monitored area around Mount Desert Island. With increasing visitation (potential disturbance) and changing demographics (habitat loss or encroachment) there is concern that this slow increase could be arrested or even reversed. Based on eagle nesting densities in comparable coastal regions of Maine, it appears that the food base in the ANP area can support more eagles.

Table 3 also shows productivity of the Frenchman's Bay area and the entire state for the past 22 years. While there has been significant improvement from the early years, the second objective is still far from being achieved. Data from the ANP area is inconsistent, and the most recent productivities greater than 1.00 eaglet per occupied nest coincide with the supplemental feeding program. This plan has already noted the poor productivity of the ANP area compared to other Maine coastal areas and the poor productivity in Maine compared with other states.

Human disturbance in all its forms and a contaminated prey base are still thought to be contributing to the continued slow recovery of the ANP area eagle population (Owen et al 1991, Owen and Hodgman 1989). Strategies described later in this plan are designed to reduce the impact of contamination and disturbance enough to achieve these objectives.

MANAGEMENT STRATEGIES

ALTERNATIVES

A wide array of eagle management strategies have developed over the past 20 years. More intensive techniques such as predator guards and banding were used earlier and continue to be used on smaller populations. As eagles increased in numbers, managers concentrated efforts in areas such as aerial monitoring, land protection, and education. Any of the alternative management techniques listed below may still be valid under particular conditions as part of a sound management program:

reintroduction through egg translocation, replacement clutching, fostering, transplanting, or hacking (this would require close scrutiny)

banding (not routinely done in Maine anymore)

nest augmentation (building nests, platforms, tree topping, limbing, predator guards)

perch site augmentation, including artificial perches

monitoring known nest sites twice a year for occupancy and productivity, by air

distribution surveys for new nest sites

research on all aspects of eagle biology and behavior, including disturbance, contaminant analysis, and predictive modelling of preferred habitats

education of landowners, hunters, trappers, and the general public about eagles and their protection

silvicultural practices to preserve nesting habitats (old growth forest and trees) and roosting habitats, including fire, disease, and insect pest management

prey base management (habitat enhancement for fisheries and waterfowl)

winter roost inventories

land and habitat protection (fee acquisition, easements, land use policies and law, voluntary cooperative agreements, zoning)

supplemental feeding of wintering eagles to promote survival (this would also require close scrutiny)

patrols of nest sites and other areas and enforcement of applicable laws, including area closures

monitoring causes of all eagle mortality

RECOMMENDED STRATEGY

ANP eagle management must be consistent with management throughout the State and region. ANP staff must continue to work closely with MDIFW Endangered Species Biologists who collect data important to the park and possess the expertise to advise on all aspects of eagle management. USFWS endangered species specialists can also provide this advice and must be consulted on proposed management actions. Through MDIFW and the USFWS, the park should stay informed of eagle management techniques and progress throughout the New York/New England area. The park must also investigate its authority to manage for eagles on park easements and determine its level of interest in such management.

Efforts to protect individual eagle nests or save individual eagles from harm must remain important parts of the overall strategy, while other strategies seek solutions to benefit the entire population. Inventory, monitoring, research, education, protection, and mitigation strategy will be described below for bald eagles. Considerable overlap exists among some of these program elements.

Inventory

The MDIFW inventories eagle nests throughout the State, sharing information of mutual interest with the park. Most of their available flight time is spent checking existing nests rather than searching for new ones. Both the State and the park would benefit from a more intensive survey periodically in the ANP area. A comprehensive and consistent annual inventory of the ANP area is the only measurement which will indicate when reestablishment to unoccupied territories (Objective 1) occurs. Park easements should be included in future nest inventories. In April 1993, one-half of the park and its easements were aerially surveyed for new nests, but none were found.

Monitoring

As mentioned, the State of Maine through the MDIFW monitors all existing eagle nests twice a year for occupancy and productivity. ANP should take a more active role in a complete monitoring program through periodic contaminant analysis of eggs, eagles, and eagle prey; twice yearly nest tree and area inspections; and regular observations of selected ANP nests during the critical time for status and disturbance. This should be coordinated with MDIFW and the USFWS field offices. All eagle nesting territories and other important habitats in the ANP area of interest as well as nesting success data, should be incorporated into the park's Geographic Information System.

Education

The major issues presented here--contaminants, disturbance, and habitat use of island nesting eagles--should be routine components of appropriate naturalist programs. Naturalist cruises in Frenchman's Bay offer an outstanding opportunity to interpret eagle

ecology because eagles are frequently seen. Education efforts should include the environmental education program, local sea kayaking guides and rental services, other boat rental services, seasonal employees of local businesses, and the general public through newspapers and trade publications. The best long term solutions for the improved welfare of eagles (and all other wildlife) are cleaning up the environment and developing human respect for wildlife to exist without disturbance. These should be an important part of the education program.

Education must also be accomplished through the Maine Warden Service and Department of Marine Fisheries. Town officials and landowners must also be kept informed.

Research

All research on the ANP area eagle population should be directed at answering the question of why recovery is lagging behind most other populations.

Among the possible reasons for this poor recovery are:

- contamination reducing productivity or survival
- food supply limiting productivity or survival
- disturbance
- habitat loss or encroachment

The ongoing eagle study is looking at: 1. habitat preferences and home ranges of island nesting eagles for the entire year; 2. the impact of human disturbance on their productivity and other activities; and 3. more detailed and comprehensive contaminant information and its impact on productivity. All of this should be directed at answering the above question, as should any follow-up research.

Other research needs are: 1. contaminant analysis in the marine environment--fish, invertebrates, and mud flats in the intertidal zone; 2. determination of carrying capacity for the ANP area and habitat modelling study, since Livingston's (1990) model did not work well for marine islands; and 3. survival study to determine what percentage of fledglings make it through the first and succeeding years. These projects should also strive to provide answers to the main research question.

Protection

Eagles and their habitat should be protected from harassment, disturbance, and destruction. Protection efforts should be focused on three program areas. First, routine patrols and regular observations, while extremely difficult because of the often isolated locations of nests, should be implemented. There are ways to fit in brief status checks of nests during the course of normal operations or boat trips, and patrols should be conducted whenever possible and observations recorded. Second, land protection efforts must continue. Eagle habitat, especially undeveloped, forested shoreline, should be a top priority of park easement and fee acquisitions. The easement program's limitation to

islands assures that it usually meets this criteria. The 1993 eagle study should help to identify these important lands. Finally, individual nest sites and other key habitats should receive appropriate fire, insect, and disease protection where possible until eagle populations in coastal Maine are flourishing or the bald eagle is delisted by the USFWS in this area.

As an interim procedure, rather than attempting to close islands with nesting habitat outright which might serve as an attractive nuisance and would be difficult to enforce, the park should follow the same policy as The Nature Conservancy and the State of Maine by requesting that visitors stay off these islands to avoid disturbing eagles. Any signing in relation to this should be carefully considered, as it might encourage use. Areas should be closed in response to specific problems as needed, and then signed and patrolled accordingly. The 1993 eagle study may well document specific disturbance problems with individual nest sites. Consideration should be given to closure as standard procedure for the future because of the continued poor productivity in the ANP area.

All park staff, the Maine Warden Service, and Department of Marine Fisheries, must be informed of locations of nests so they can be checked during patrols.

Mitigation

Most mitigation efforts will need to be directed at specific sites and include such techniques as tree topping or limbing, and nest building or augmentation. This assumes area eagles are limited by the number of adequate nest sites, which may not be the case. A need for supplemental feeding would be looked at closely by the USFWS; the underlying assumption of another feeding program would be that eagles are limited by the amount or quality of food. Based on the earlier program, the quality of food might be limiting. Prey base management is probably not viable except insofar as we can maintain populations of colonial nesting shorebirds. The ultimate mitigation strategy is to reduce the entry of contaminants to the environment and/or remove them from it. Realistically, this is beyond our capability. However, periodic contaminant research and monitoring can be used to document the problem and to help enact and enforce legislation in support of reduction or removal of contaminants. Education, protection, and research should contribute greatly to the mitigation process.

Immediate responses to catastrophic events (oil spills, severe wind storms, etc.) should consist of an intensive effort to protect eagles and eagle nests from harm and/or save injured eagles for rehabilitation. The State of Maine is preparing an oil spill response plan which will include designating coastal eagle nest territories for a high level of protection. All actions after any oil spill will necessarily be coordinated with many other state and federal agencies. If an injured, oiled, or abandoned eagle is in need of professional care, the park should call the USFWS Special Agent in Portland (Dick Stott) at 780-3235 for assistance. Veterinarian Ronald Lott in Old Town (827-7177) can treat raptors, but the best care available in our region is at the Tufts University Wildlife Veterinary Clinic (Dr. Mark Pokras-508-839-7918). If a dead eagle is recovered, the USFWS Special Agent should be notified immediately also. The USFWS National Wildlife Health Lab in Madison, Wisconsin conducts necropsies on all bald eagles shipped to them.

SCHEDULED ACTIONS

1. Initiate a more intensive survey (2 hour flight) for occupancy of existing eagle nests and discovery of new nests in the ANP area in cooperation with MDIFW. ANP staff should accompany MDIFW staff. This should be NPS funded. This was partially completed 4/93, and should be finished 4/94.

2. Build an eagle nest in an unoccupied territory on park lands, provided an appropriate territory with habitat exists, and conflicts between state law and private land use are resolved. The easement now being negotiated for Long Island in Blue Hill Bay may be an excellent candidate. It should be recognized that this may not be that important biologically since nest sites are probably not limiting, but it can be considered for the public relations and education value gained through publicity. No date.

3. Continue research on ANP area eagles to determine habitat requirements of island nesting eagles, measure the amount of and impact of disturbance on selected nests, and measure contaminant levels in eggs and eagles. The goal should be better understanding of why recovery of ANP area eagles is lagging. This project is already funded by the NPS for the University of Maine and it started 1/93.

4. New Research: Continue with research directed at answering the major question of why eagle recovery is lagging in the ANP area:

4.1 Sample ANP area eagle eggs, eagles, and eagle prey for contamination periodically based on recommendations from recent contaminant studies. 1/95.

4.2 Evaluate effectiveness of the supplemental feeding program five years after it ended as recommended in the study. 11/94.

4.3 Develop research proposal for determining ANP area eagle carrying capacity and modelling of coastal habitat.

5. Observe park eagle nests once a month for 4 hours from February through August, and in response to perceived problems, including severe storms. This should be coordinated with the 1993 eagle study and MDIFW. 2/94-8/94.

6. Continue to educate the public regarding eagle management concerns through interpretation and environmental education programs. Have state eagle biologists and researchers give presentations to interpretive staff. Use Beaver Log and park radio for bulletins. Develop exhibits for the visitor center and other locations. All of the latest research findings and survey results should be communicated to the interpretation staff on a regular basis. Ongoing.

7. Write a Bar Harbor Times Science Column on the 1993 eagle study and concerns about the eagle population in the ANP area. Completed 5/93.

8. Contact local guides and kayak/canoe rental companies about our concerns regarding

eagles. Determine where, when, and how often they take clients out and what practices they follow to avoid disturbing eagles (and other wildlife). Work with MDIFW and the USFWS to develop poster or brochure for boat rental/guide services to pass on to customers. Organize informational meeting between these groups and the park and state biologists. 6/94.

9. Share information with MDIFW about park easements to determine which ones contain known and potential eagle nesting territories. Work with MDIFW to assess suitability of these areas for reestablishment pending determination of Action 10 (below). Completed 3/93.

10. Determine the scope of authority and interest of the park in eagle nests on park easements. 6/94.

11. Incorporate ANP eagle nesting territories and other eagle management data into the park's Geographic Information System. All eagle research data generated should be GIS formatted. 12/94.

12. Make regular checks on park eagle nests a part of the routine law enforcement patrol function where possible. 4/94.

13. Inspect nest trees and immediate vicinity annually for damage, disease, and insect pests in September. 9/94.

14. Integrate eagle nest protection into the park Fire Management Plan for suppression of all fires threatening known nesting territories. 12/93.

15. Nest visits for research purposes will be set by ANP and MDIFW biologists with an ideal goal of one per year and only when eaglets are between the ages of 6 and 8 weeks old. Further intrusions that will help answer the question of why the ANP area population is lagging in its recovery may be permitted after consultations. 1/94.

16. Based on results of research not yet conducted, it may become necessary to determine sources of PCBs and mercury in the ANP area and work within appropriate channels with the MDIFW and the USFWS to reduce them. No date.

STAFF RESPONSIBILITIES

SUPERINTENDENT

The Superintendent has the overall responsibility for the conservation of endangered species within the jurisdiction of the park. The role of the superintendent is to review plans, strategies and proposed action alternatives and select preferred alternatives.

DEPUTY SUPERINTENDENT

The Deputy Superintendent, through the park planner and park ranger, land protection, serves as the main source of information on the park's easement program.

BRANCH CHIEF OF NATURAL RESOURCES

The Branch Chief of Natural Resources, in consultation with the MDIFW and the USFWS, is responsible for the development of plans, strategies, objectives, and action alternatives for the conservation of endangered species within the jurisdiction of the park. The Chief recommends management alternatives to the Superintendent and then carries out the approved actions to reach the stated management objectives through his or her staff and other park staff as appropriate.

COOPERATIVE PARK STUDIES UNIT LEADER, UNIVERSITY OF MAINE

The CPSU Unit Leader is responsible for conducting research and insuring the technical adequacy and completion of the research of others directed at solving management problems.

CHIEF OF INTERPRETATION

The Chief of Interpretation is responsible for integrating resource management issues into the interpretation/education programs of the park.

CHIEF OF VISITOR AND RESOURCE PROTECTION

The Chief of Visitor and Resource Protection is responsible for enforcing all applicable laws for the protection of endangered species and implementing patrol strategies for specific eagle habitats of concern.

MAINE DEPARTMENT OF INLAND FISHERIES WILDLIFE

The MDIFW has been delegated responsibility for Statewide eagle management from the USFWS. This includes annual nesting and productivity surveys and land protection strategies. In addition, MDIFW biologists provide expertise to the park for all aspects of eagle management and biology.

UNITED STATES FISH AND WILDLIFE SERVICE

Through regional and area offices the USFWS provides expertise in all areas of endangered species management, and assists other Federal agencies in meeting their Section 7 ESA obligations.

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