NATURAL RESOURCE MANAGEMENT PLAN

CAPE HATTERAS NATIONAL SEASHORE

Superintendent, Cape Hatteras National Seashore

APPROVED:

Regional Director, Southeast Region
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Overview and Needs

Cape Hatteras National Seashore identified 24 threats in the 1980 "Threats to the Parks" report. The majority of these threats can be classified as resulting from pressures of adjacent land development (7) and shoreline processes or erosion (4). There is considerable overlap of these two concerns, as shoreline erosion itself would pose no threat without the concerns of existing development. Other categories include effects of off-road vehicles, vegetation trampling and hazardous spills.

The 1984 General Management Plan calls for several resource management activities. Foremost, the development of a vegetation map to include major communities, endangered and exotic species, is 75% complete. These vegetation maps form the basis for the recently completed fire management plan. Further information is needed on the natural role of fire on the islands, fire behavior and fuel models. The GMP also calls for monitoring water quality, beach erosion, and ORV impacts as well as the health and status of wildlife populations.

The Park Operations Evaluation team in 1982 recommended for natural resources a simple fire plan for Buxton Woods and an evaluation of the Banker horse herd on Ocracoke Island. They also recommended a review of ORV access corridors to maintain and mark those needed and close those not needed.

The Statement for Management (1986) identified the following resource management goals:
- To manage Cape Hatteras National Seashore in ways that will enhance the natural processes of barrier island dynamics and succession of native vegetation and wildlife and will mitigate the impacts of human interference with these processes.

- To integrate planning and management for Cape Hatteras National Seashore into regional planning and economic considerations.

The Seashore is a resource in transition from a stabilized island system to more natural conditions. Heavy development pressures exist which need to be considered by management during this transition. Resource management will be guided by the enabling legislation which calls for both recreational use and the protection of natural resources.

While it does accommodate heavy recreational demands, the Seashore contains outstanding natural areas and resources of regional, national and international significance. It is the wintering home for a significant percentage (over half) of North America's population of the greater snow goose as well as large numbers of other waterfowl. The largest populations of colonially nesting shorebirds on natural beaches in North Carolina are within the Seashore. Significant numbers of black ducks, a species of concern nationally, nest here. A number of state listed rare plants (principally aquatic species) occur in Seashore fresh and brackish wetlands. The Seashore is noted for containing some of the more diverse wetlands in the state as well as one of the largest undeveloped maritime forest areas (Buxton Woods).

Primary natural areas include the Bodie Island and Ocracoke marshes, Buxton Woods and associated fresh wetlands, and the wide beach spits...
associated with inlets or the cape. Recreational pressures are not
great in the wetland areas; however, they are heavy on the beach spit
areas. Residential and resort development pressures are great within
Buxton Woods. The Seashore will need to monitor recreational and
developmental impacts within these areas.
Research Within the Seashore

The Seashore, Outer Banks and surrounding areas have had numerous studies in geomorphology and erosion. Early park research (1950's and 60's) focused almost entirely on building dunes and planting vegetation to stabilize the islands. The early 1970's to present has seen the focus shift to coastal processes, overwash and inlet processes. Areas other than geomorphology have not been as well studied. Prior to 1984, wildlife research was largely limited to Quay's Birds, Mammals, Reptiles and Amphibians of Cape Hatteras National Seashore, 1959. Vegetation research prior to 1984 consisted of early descriptive studies by Burke and Brown and studies on vegetation response to goose grazing.

Recent (Post 1984) Research Completed

- Bibliography and History of Scientific Research at Cape Hatteras National Seashore (Rutgers CRU)
- Final Report, Aquatic Resources Advisory Team
- Inventory of rare, endangered and exotic vegetation
- Update of shoreline change data base (compatible with park IBM-PC)
- Digitized vegetation zone map of Ocracoke and Hatteras Islands
- Summary of sea turtle nest monitoring 1977-1985
- Colonial waterbird nesting census 1984, 1985
- Piping plover nest census 1985
- Vegetation and disturbance history of Buxton Woods
- Vegetation map and vegetation cover analysis, Buxton Woods
- Fuels assessment of Buxton Woods
- Vegetation and disturbance history of Bodie Island
- Vegetation map of Bodie Island
- Vegetation patterns analysis for Bodie Island
- Vegetation responses to fire
- Deer census for Buxton Woods
- Vegetation and carrying capacity of Ocracoke pony pen
- Breeding bird census of Buxton Woods
- Monitoring ORV impacts and mitigation at Hatteras Inlet

**Ongoing Studies - Funded, Not Completed**

- Shrub and vista management, prescribed burning on Bodie Island
- Ocracoke horse herd genetic survey (blood and tissue sampling)
- Sea turtle nest temperature monitoring

**Studies/Monitoring Ongoing in Seashore by Other Agencies**

- Gypsy moth monitoring, Agricultural and Public Health Inspection Service
- Annual fall raptor migration; banding, census - Carolina Raptor Center
- Relationship of soil salinities to vegetation cover; graduate thesis - East Carolina University
- Winter waterfowl census - U. S. Fish and Wildlife Service
- Mapping colonial waterbird colonies of North Carolina, 5-year rotation - Jim Parnell, University of North Carolina-Wilmington
- Shellfish bacteriological sampling, Pamlico Sound - N. C. Shellfish Sanitation

- Monitoring dunes and grass plantings on Ocracoke - Ernest Seneca, North Carolina State University

- Groundwater monitoring wells, Bodie Island - N. C. Division of Environmental Management

Potential Studies (Proposals) by Other Agencies

- Study of Lyme disease vector potential - Jim Oliver, Georgia Southern University

- Analysis of freshwater wetlands, Buxton Woods - Joan Ehrenfeld, Rutgers University

- Plant dispersal mechanisms, response to catastrophic events - Ted Styles, Rutgers University
ADDITIONAL ACTION PLANS

Under National Park Service planning policies, the Natural Resource Management Plan is a sub-component of the General Management Plan. The General Management Plan guides park policies and operations for a medium range (5-10 year) period. The Natural Resource Management Plan develops specific strategies for the identification and protection of the park's natural resource base. Still more specific actions for resource protection are spelled out in single resource action plans such as a Fire Management Plan or a Bird Management Plan. The following plans, procedures and guidelines are hereby adopted as action plans under the Cape Hatteras Natural Resource Management Plan:

-- Fire Management Plan
-- Final Report, Aquatic Resource Advisory Team
-- Guidelines for Spoil Deposit Within Seashore
-- Biological Opinion, USFWS, Sea Turtle Nesting
-- Biological Opinion, USFWS, Peregrine Falcon
-- Biological Opinion, USFWS, Piping Plover
-- Superintendent's Directive R-1, Pest Management
-- Superintendent's Directive R-3, Hunting
-- Superintendent's Directive R-4, Fishing
-- Superintendent's Directive R-6, ORV Access and Routes
-- Superintendent's Directive R-7, Handling of Stranded Sea Turtles
-- Superintendent's Directive R-10, Colonially Nesting Waterbirds
-- Superintendent's Directive R-11, Sea Turtle Nesting
-- Superintendent's Directive R-12, Marine Mammal Strandings and Sightings
-- Superintendent's Directive R-15, Injured or Oiled Birds
-- Superintendent's Directive R-20, Hazardous Material Spill or Discovery Procedures
Water Quality Monitoring (Park Priority No. 1)

The Boundary for Cape Hatteras National Seashore excludes several villages existing at its establishment: Nags Head on the northern end; Rodanthe, Waves, Salvo, Avon, Buxton, Frisco and Hatteras along the Seashore; and Ocracoke at the southern end. Although these villages existed prior to the Seashore, residential and resort development has greatly accelerated in recent years to the point that Dare County is the fastest growing county in North Carolina.

Shortage of fresh water is already a concern for these communities, and increased withdrawal of water may initiate hydrologic changes for the entire Outer Banks. Rapidly increasing development adjacent to the Seashore also means potentially increased wastewater and urban run-off loads within the Seashore. Current (and expected) wastewater management consists solely of septic tanks and drainfields. Several drainage ditches flow from developed areas through Seashore property towards the sound.

Little data has been generated concerning the surface water quality of ponds, tidal creeks, and ditches within the Seashore, other than bacteriological counts for shellfish beds (by the state). The fresh water aquifer has been mapped, but little is known of the hydrology and intercompartment mixing. A proper understanding of the hydrological dynamics of the park is not only necessary to maintaining ecologically rich interior wetlands but may also be important to understanding dynamics of terrestrial plant communities, such as the forest stands in Buxton Woods. Water quality of the shallow aquifer may also relate to the safety of visitors and residents.
To address and prioritize these issues and plan a response, the Seashore assembled an Aquatic Resources Advisory Team of biologists, ecologists, and a hydrologist in March 1986. The team identified the following priority management actions: hydrological study and ecological analyses of Buxton Woods wetlands; assessment of water quality park-wide, including drainage ditches; monitoring natural wetlands changes; assessing current regulatory protection and monitoring by state and other federal agencies; and public information dissemination.

**Proposed Actions**

**Fiscal Year 87**

(1) Initiate park-wide water monitoring program, including water level stations in the wetlands in Buxton Woods, E. coli/fecal Strep. ratios at various stations (to include Buxton Woods and Bodie Island drainage ditches), physical chemistry parameters (conductivity, salinity, pH, DO) at various stations, and lead samples at various stations. Work to be accomplished through research technician or possibly graduate student. Local state shellfish sanitation lab can assist with bacteriological samples.

**Funding/Staffing Required**

- Personnel (.5 person year @ GS-5) $ 9,100
- Equipment and Sample Processing 11,500
- Vehicle and mileage 2,000

$22,500
Fire/Vegetation Management Plan (Park Priority No. 2).

Vegetation management in this section refers to the management of shrub encroachment into marsh areas, vista management, and the control of exotic plants (primarily *Phragmites sp.*) through the use of prescribed fire. The monitoring of park vegetation is also covered under "Vegetation Monitoring," park priority No. 5.

The prevention of ocean overwash by the creation of the artificial duneline and drainage modifications have allowed shrub encroachment within former open grasslands and marsh areas. The park entrance road, NC Highway 12, is closed in by a disturbance-induced shrubline which blocks the formerly open marsh vistas. These induced changes have also reduced migratory waterfowl habitat. Private developments adjacent to park lands are located in these high fuel areas.

Buxton Woods, a significant natural area containing 3,000 acres of maritime forest on NPS and private lands, contains high fuel loadings and continuous fuels. A fire and disturbance history of the woods has been completed, as has a vegetation zone map (such maps are also completed for the entire Seashore).

*Phragmites sp.*, common reed, exists in scattered patches throughout the Seashore, including Ocracoke. This reed, considered non-native to the region, is a highly effective colonizer of disturbed soils, and it grows in monospecific patches. The reed has limited value to wildlife and can greatly reduce species diversity in a marsh area.

The Seashore has an approved Fire Management Plan based upon vegetation and fuels mapping. The intent of the plan is to eliminate resource damaging suppression methods and to determine the effectiveness of
prescribed fire in shrub, vista and Phragmites management. (Note: Phragmites is fire tolerant; fire is used in conjunction with emergent sprout treatments).

The Seashore is currently in the second year of a three-year research program by the NPS-UGA Coop Unit working on shrubs and Phragmites control by fire and other disturbances.

Proposed Actions

Fiscal Year 1987

(1) Continue prescribed burn research project by NPS-UGA, including multiple disturbance (salting) for shrub and vista management and phragmites control.

(2) Establish fire break and trail system in Buxton Woods.

(3) Establish more specific fire action plan for Buxton Woods.

Funding/Staffing Required

Above three projects are base funded by NPS-UGA project or park.

(4) Establish fuel break around Little Kinnakeet Lifesaving Service Station complex.

Funding/Staffing Required

Three days of forestry crew @ $150/day $ 450
Shoreline Monitoring (Park Priority No. 3)

A data base exists (updated through 1984) for the shoreline changes (erosion or accretion) occurring at 100-meter intervals along the Seashore. This data base has been made compatible with the park's PC for more efficient retrieval. The need for the protection of NC 12, as well as threatened park facilities, necessitate periodic updating of information on shoreline status and trends.

The data base referred to above is restricted to ocean shoreline position; it does not address cross-island topography (and therefore sediment budgets) or the sound-side shoreline position, both critical components of the barrier system. A system of cross-island surveys (transects) was established the length of the Seashore in 1937. This system was reestablished and comparisons made in 1977 (though some markers were lost). This benchmark survey system is an invaluable data base which will be maintained and periodically updated.

A seawall/revetment has been selected as the permanent erosion protection method for the Cape Hatteras Lighthouse. Construction may begin in 1987. This structure will require shoreline monitoring during construction and after completion to assess shoreline changes and impacts and to plan timing of the final closure of the landward two sides of the octagonal seawall.

There is a growing consensus among climatologists (see EPA documents) that a global rise in temperature resulting from increased atmospheric carbon dioxide will greatly accelerate sea level rise through melting of polar ice and thermal expansion. Current models indicate that sea level, in recent past rising one-foot per century, may rise four to
seven feet over the next century. Obviously, this will have a tremendous impact on barrier island and coastal management. The existing data base on shoreline positions should be important to future predictive studies with management implications for all seashore facilities and operations.

Unvegetated inlet spit areas experience the highest concentration of recreational and wildlife use. They are the most popular fishing spots, and they are essential to shore nesters and certain species of rare plant pioneers. These areas change continually; two of the four in the park are accreting. A review of changes in these areas and management implications would be helpful in allocating this resource.

Proposed Actions

Fiscal Year 87

(1) Develop computerized shoreline change data base.

Currently funded.

Fiscal Year 88

(1) Reestablish benchmarks and resurvey original 1937 transects for shore and volumetric changes.

Funding/Staffing Required

Contract $30,000

Fiscal Year 89

(1) Conduct monitoring set forth in planning documents for seawall/revetment for Cape Hatteras Lighthouse
Bird Management (Park Priority No. 4)

The Seashore is a significant nesting area for several shorebirds, including the least, common, Forster's, Caspian and gull-billed terns; black skimmers, oyster catchers, and the recently federally listed, endangered piping plover. Numerous other colonially nesting waterbirds, brown pelicans, herons and gulls, nest on dredge spoil and estuarine islands adjacent to Seashore lands. The Seashore contains the largest colonies of colonial waterbirds nesting on natural beaches in North Carolina.

Thousands of waterfowl winter here: snow geese, Canadian geese, cormorants, brant and 26 species of ducks. The majority of the North American population of the greater snow goose winter here. Several species of ducks, including the declining black duck, nest within the Seashore. Several rare species of rails nest within the Seashore. The Seashore also is a key corridor and resting area for spring and fall migrations of shorebirds, warblers and raptors.

All nesting shorebird colonies within the Seashore were censused and mapped in 1984 and 1985; the breeding birds within Buxton Woods were censused in 1986; little other information has been produced other than general species lists.

Waterfowl habitat, especially on Bodie Island, is being encroached by shrubs. Significant fresh and brackish pond habitats are threatened by increased private water needs adjacent to the park. Shorebird species may be impacted by recreational pressures. Little information is available about which species use which habitats at which time of the year, and whether significant habitat areas (such as the Bodie Island Lighthouse pond) are deteriorating.
Vegetation Monitoring (Park Priority No. 5)

Twenty-two state listed rare plants (including two under consideration for federal listing) exist within the Seashore. The majority of these are fresh or brackish wetland plants; one (Amaranthus pumilis, the most rare), occurs on tidal sand flats. Amaranthus will require monitoring and posting for protection.

The Bodie Island marsh, important to wintering waterfowl, has been noted as one of the more diverse marshes in North Carolina (N. C. Natural Heritage Program); the Ocracoke Island marshes are also unusually broad and diverse for the region. The Seashore also contains a portion of Buxton Woods, a significant maritime forest.

The vegetation patterns within the Seashore have been modified due to drainage, plantings, and the artificially constructed dune line. Shrubs are encroaching former open wetlands (see Fire Management Plan, priority two). Buxton Woods has been modified by grazing and timbering; it appears to be succeeding toward a live oak forest.

There have been several recent vegetation studies within the Seashore: survey of rare and exotic plants, preparation of vegetation zone maps for Ocracoke and Hatteras Islands, detailed vegetation maps for Buxton Woods and Bodie Island, and vegetation cover analysis of Buxton Woods and Bodie Island. Twenty permanent monitoring plots were established in Buxton Woods; five permanent vegetation transects were established on Bodie Island. The park has begun mapping the stands of Phragmites, the most potentially damaging exotic. The park has also begun vista management on Bodie Island (see Fire Management, priority two).
Poison ivy, while native, is a troublesome plant and safety hazard along nature trails and residence areas on Bodie Island, Buxton, and Ocracoke. It has been handled by cutting, but other methods, such as herbicides, may be necessary for safety and efficiency. Herbicides may also be necessary to control vegetation growing adjacent to historic structures and maintenance areas and for control of prickly pear in housing areas.

Vegetation cover, and thus habitat, could see great changes in the foreseeable future due to aquifer drawdown, sea level rise, major storm events, or the erosion of the dune line.

Proposed Actions

Fiscal Year 87

(1) Continue mapping of Phragmites and exploring control methods. Funded through NPS-UGA Coop for two seasons.

(2) Install a series of permanent photopoints throughout the Seashore to document current vegetation cover and monitor successional or catastrophic event changes. Base funded.

(3) Determine effectiveness of sea salt, or herbicide, or torch wilting in eliminating or retarding emergent growth of poison ivy along nature trails. Establish control methods for vegetation or weeds growing onto historic structures, in maintenance yards or service areas, and for prickly pear in housing areas. Base funded.

(4) Work with other agencies and funding sources to initiate modeling of sea level rise impacts. Base funded.
Boundary Encroachment (Park Priority No. 6)

The eight village enclaves adjacent to the Seashore continue to grow at a rapid rate. The county's current population (20,000) is expected to double by the year 2000. The peak summer population, also increasing, is approximately 125,000.

Anticipated problems of water quality and quantity are addressed under Water Quality, park priority No. 1. This growth will bring demands in addition to water (utility and transportation corridors/cleared lands) which will impact the Seashore.

Approximately one-half of the developable land on Hatteras Island has been developed. As growth expands to fill all private lands, existing habitats on private lands will be filled, drained and cleared, causing wildlife dispersal that could impact the Seashore populations. Creation of additional roads and trails, changes in drainage patterns, and the clearing of presently vegetated areas will also impact the Seashore's vegetation community.

Boundary or edge effects of roads, trails and development are well documented in the general conservation literature. These potential effects have not been studied; however, in the increasingly fragmented natural areas on barrier islands adjacent to urbanized areas.

A study is proposed to monitor water quality within the Seashore, but no studies are currently proposed to monitor other boundary or edge impacts from increased development. Baseline data on wildlife populations is scant; better information is available on vegetation communities.
Sea Turtle Monitoring (Park Priority #7)

Approximately 40 loggerhead sea turtle crawls are discovered yearly through ranger beach patrols, or reports from visitors or the park pilot. All crawls are investigated, and approximately 20 are found with nests. (Approximately 10 nests are also found on Pea Island NWR.) The Seashore has consulted with the U. S. Fish and Wildlife Service for a biological opinion concerning sea turtle management under Section 7 of the Endangered Species Act. The Seashore cooperates with FWS and the North Carolina Wildlife Resources Commission for management of this endangered species.

Nests are marked to facilitate monitoring during incubation and follow-up after hatching. Nests laid in an area threatened by erosion or heavy recreational use are relocated to a safer area of the beach. A 300-foot segment of the beach is closed to vehicle traffic after laying date plus 50 days to prevent disturbance of hatchlings. Following hatch, nests are dug to monitor success.

During 1985 and 1986, nest and beach temperatures were monitored; this project was supervised by Rutgers University. Purpose was to monitor incubation temperatures in light of finding that incubation temperatures determine hatchling sex ratio. This work will continue if sufficient personnel are available.

Annually, about 15 stranded sea turtles, dead, sick or injured, are investigated by National Seashore personnel. Measurements are recorded, with any wounds and tag numbers and locations, on a form standardized by the National Marine Fisheries Service. Completed forms are forwarded.
to the Cape Hatteras National Seashore Resource Management Specialist, who relays them to the State Coordinator at the North Carolina Natural Heritage Program, working with the North Carolina Wildlife Resource Commission. All injured turtles are reported to Pea Island Wildlife Refuge; dead turtles are then normally buried where found.

The goal of our activities in protecting sea turtle nests is to reduce to the practical minimum loss of eggs and hatchlings from human disturbance and from ocean overflow or beach erosion, and thereafter to hold this minimum. The goal of our activities in recovering data on stranded sea turtles is to cooperate with the National Marine Fisheries Service for maximum practical recovery of data on mortality factors, movements of tagged turtles, etc.; also to hold to the practical minimum any taking of sea turtle parts by visitors in violation of the Endangered Species Act of 1973.

This is a continuing annual activity. Costs to the National Park Service are currently borne out of operating funds for this National Seashore. No reason appears why annual costs for manpower, equipment or supplies and materials should greatly increase during the next five years; however, student interns or volunteers should be sought to facilitate better data collection and management, especially if ranger staff is cut.

Proposed Actions

Fiscal Year 87

Continue existing activity of monitoring sea turtle crawls and nests, and classify area near hatching date according to ORV Plan.
Wildlife Management Information (Park Priority No. 8)

Several species listed as endangered or threatened under the Endangered Species Act of 1973 occur in the National Seashore. Six listed sea turtles have been recorded from the National Seashore's beaches or adjacent waters, although only the loggerhead is known to nest within the Seashore. The peregrine falcon is a seasonal migrant through the Seashore, and occasional sightings of the bald eagle occur adjacent to and within the Seashore. The piping plover, federally listed endangered, nests on Seashore beaches; Cape Lookout Seashore is the only other known nesting area in North Carolina for this species.

The last comprehensive inventory of the wildlife within the Seashore was the study by Dr. Thomas L. Quay in 1959, "The Birds, Mammals, Reptiles, and Amphibians of Cape Hatteras National Seashore Recreational Area." Many changes have occurred since then, especially increases in developments within the villages along the seashore. An update is needed to detect and follow any changes in species and populations which may have occurred. A deer census of Buxton Woods was conducted in 1984; it needs to be updated and perhaps replicated on Bodie Island as well.

"An Atlas of the Colonial Waterbirds of North Carolina Estuaries," Parnell and Soots, 1979, listed the nesting areas, species, relative abundance and management requirements for colonial waterbirds within the Seashore. The Seashore monitored, through student intern, the populations of colonial waterbirds (including piping plovers) in 1984 and 1985. The Seashore needs to continue to monitor nesting areas, especially in regard to ORV effects and changes needed in interim ORV plan, and changes in habitat caused by storms or vegetation. Other recommendations for bird management are listed under priority No. 4.
Little is known about the ecology of fresh water ponds within the Seashore or the arthropod or mollusk populations within the Seashore. It is known that Island Creek, Ocracoke, harbors a regionally significant population of marsh killifish *Fundulus confluentes*. Certain organisms may be indicators of environmental health. Studies should be encouraged to acquire this baseline data.

Plastic refuse in the environment is becoming an increasingly important world-wide wildlife issue. The Seashore should monitor, when possible, the incidence of mortality through plastic ingestion or entanglement.

**Proposed Actions**

**Fiscal Years 87, 88, and 89**

(1) Contract for an inventory of the small mammal populations within the Seashore. A comparison of the Seashore versus the developed areas of the Outer Banks may provide information on development impacts. The North Carolina Natural History Museum may be interested in such a study.

**Staffing/Funding Required**

Contract or student intern $6,000

(2) Contract for ecological inventories of the freshwater ponds within the Seashore. This may be a sub-set of work under Water Quality Monitoring, priority one.

**Staffing/Funding Required**

Contract or student intern $5,000

(3) Encourage other inventories of reptiles, amphibians, arthropods and mollusks within the Seashore through interns. $3,000
Digitized vegetation zone and fuel model maps have been produced for all the Seashore except Bodie Island. A computerized erosion and shoreline change data base is now available for park use. Soil maps for the Seashore were produced in 1977; the park's aquifer has also been mapped.

Other data bases summarized over the last two years include fire history, sea turtle nest location, shorebird nesting areas, rare and endangered plant species, ORV trails and duck blind locations.

The existing digitized vegetation maps and shoreline change maps would provide an excellent foundation for a geographic information system (G.I.S.). Such a system would greatly assist in park planning and enable the meshing for management of numerous scattered data bases. This is particularly important for an area with so many demands (utilities, roads, dredge spoil) from adjacent private lands. The system would also form the basis for potential modeling of resource changes associated with barrier dynamics. Additionally, the system would ensure the storage and use of valuable resource data.

**Proposed Action**

Several local universities have expressed an interest in providing such a system on available IBM-PC compatible software. Park involvement would be in providing graduate stipend and purchase of software and plotter, possibly digitizer. This should be pursued as funding is available.

**Funding/Staffing Required**

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Off-Road Vehicle Management (Park Priority No. 10)

In common with other Seashore areas, off-road vehicles (ORV) are popular pieces of equipment for utilization of this area. Used predominately by surf fishermen in pursuit of migrating schools of fish, ORV's are also used by surfers, swimmers, and sunbathers for access to beach areas of low use. In the past five years, park management has gained a measure of support for an interim plan consisting of marked corridors, partial seasonal closures and temporary limited sound-side access. Almost all that can be accomplished under existing regulations has been done. Speed limits, permit system, prohibition of specific non-fishing related ORV activities (wheelies, cutting doughnuts, etc.) require special regulations.

The Seashore has placed a lot of effort in upgraded maintenance of ORV corridors and dune crossing ramps; if the interim ORV management plan is to work, continued maintenance of beach and sound access routes is critical. Posting sensitive vegetation and habitat areas is a never-ending process. Increased identification of sensitive plant and wildlife habitat areas will require more posting.

Marked and maintained access corridors have mitigated ORV impacts in some areas; however, impacts on wildlife and vegetation need better assessment. The interim ORV plan needs to be updated and finalized with a review of natural resource impacts, access areas, travel corridors, and needs for closures. A study of inlet morphology (see park priority No. 3) would aid in corridor siting.

The Seashore should also develop solid information on ORV numbers and use areas and seasons of use.
Banker Horse Herd Program (Park Priority No. 11)

The park currently maintains a herd of horses in a 200-acre fenced enclosure on Ocracoke Island. This herd, believed by many to be direct descendants of stock brought to the new world by the earliest European explorers and colonists, now numbers 21 and one loaned exotic stallion. Numbering 10 in 1974, the general health and appearance considerably improved with regular veterinary care, medication and attention.

The death of two foals in the spring of 1981 from Haemolytic Anemia, a condition similar to the Rh factor in humans, led local veterinarians to recommend an infusion of new blood to reduce the mutuality of the gene pool. Upon recommendation of veterinarians, an Andalusian stallion was obtained by loan from Mr. Mel Baron of Afton, Wyoming, to breed with existing mares. Three Andalusian-Banker foals were born in 1982. Breeding has been terminated pending further study.

The park's goal has been to increase the size and health of the herd to a point where its survivability would be insured and so that the interpretation of one facet of Outer Banks culture (before widespread use of motor vehicles and the advent of paved roads) can be perpetuated.

The park's cultural resource plan discusses the need for research to document the cultural significance of the herd. Corollary to the cultural assessment of the herd is a need to determine the genetic significance of the herd and to develop a breeding program which will ensure the survival of the herd and maintain genetically significant characteristics. Blood samples of 19 animals were taken in 1986 and will be assessed genetically for relationships within the herd and to other coastal herds to aid in the process.
An assessment was made in 1984 of the impact of the horse enclosure and management practices upon the endemic vegetation, including the possible introduction of exotic species and of the forage potential of the horse enclosure area. There does not appear to be a problem with the spread of exotics outside the enclosure, and forage is sufficient for the foreseeable herd size.

Proposed Actions

Fiscal Year 87

(1) Review past practices within the horse enclosure area; develop briefing and recommendations.

(2) Continue genetic bloodwork which is portion of funded NPS-UGA project.

(3) Investigate use/need of prescribed fire on pasture for parasite control.

Fiscal Years 88 and 89

(1) Develop breeding plan to ensure survivability of the herd.

(2) Develop Horse Herd and Pasture Management Plan.
Pollution Abatement (Park Priority No. 12)

There are currently leased oil exploration tracts approximately 35 miles off Cape Hatteras. The potential exists for other leases in the area with projected tracts of proposed OCS sale number 78 lying 17 miles offshore. Current oil prices seem to have slowed interest in exploration of the leased tracts. The lessee does not expect a greater than 2% chance of recoverable oil in the area, and even should a field be developed, the staging and landfall area will be considerably to the south (Morehead City). The main oil threat to the Seashore is expected to remain that of sunken tankers, or more frequently, discharge of bilge oil.

Air quality (the Seashore is Class II area) is periodically threatened locally by highway traffic; however, the generally windy climate, adjacent bodies of water, and seasonal nature of traffic tend to negate effects of traffic exhausts. The park should determine the extent of local air quality monitoring programs conducted by the EPA and the state and obtain their data. The Seashore should also determine extent of state and federal acid deposition stations and obtain data.

The Seashore developed an Oil Spill and Hazardous Material Plan in 1986; its effectiveness should be monitored, and the plan updated as needed. The Seashore works closely with the local Coast Guard during spill events.

The Seashore needs to continue to monitor underground storage tanks of hazardous materials, principally gasoline, to ensure RCRA compliance. An assessment should be made of park-wide hazardous (RCRA) substances housekeeping practices.
Public Health (Park Priority No. 13)

The report from the 1986 Cape Hatteras Aquatic Resources Advisory Team (see priority No. 1) suggested that the Seashore "seek assistance from public health agencies to determine mosquito vector potential generated by the park's fresh wetlands. This may be helpful should drainage requests be couched in public health issues."

The Seashore, in keeping with NPS policy, does not undertake mosquito control measures, as mosquitoes, while a nuisance, are a part of the natural system. Also, control measures are frequently harmful to natural systems. However, the Seashore should have baseline data about the vector potential to deal with this issue.

A more potentially serious question is the possibility of Lyme disease from ticks within the Seashore. The park should have tick and host populations monitored for the causal spirochetes. Guidance should also be sought from public health agencies of the need to monitor other wildlife host diseases, such as rabies and tularemia.

Proposed Action

Fiscal Year 87

(1) Seek inclusion of Cape Hatteras in funded (outside NPS) Lyme disease study.

(2) Consult with public health agencies for possible monitoring of other wildlife vector illnesses.
Integrated Pest Management (Park Priority No. 14)

NPS guidelines for pesticide or herbicide use have clearly established that the Service will make every effort to reduce or eliminate the need for introduction of chemical pest controls into parks. Any such use will be based upon sound integrated pest management practices of monitoring, establishing action levels, and seeking alternative treatments.

During the summer of 1982, the Hyde County Health Department threatened to close Ocracoke Campground due to persistent complaints of mosquito bites and welts by campers. Scattered complaints were raised along the Seashore during 1986 (a heavy mosquito season) but generally, the park does not have the mosquito control pressures experienced by other east coast parks. However, Public Health (park priority No. 11) does call for assessing our mosquito vector potential.

The largest pest threat facing the Seashore comes from the gypsy moth. The Seashore has captured male moths in traps supplied by the U. S. Forest Service for a number of years. These moths are believed to originate from egg masses on recreational vehicles from northern states. However, the Agricultural and Public Health Inspection Service (APHIS) has found active infestations on private property outside Buxton Woods and in Southern Shores, 20 miles north of the park. They have treated these with *Bacillus thurengensis* (B.T.), a biological control, and the release of sterile males.

APHIS trapped moths on a grid system within the county and the park during the summer of 1986. Their trappers placed their trailers (seasonal housing) on NPS trailer pads under an agreement. We will
continue to cooperate with APHIS to monitor gypsy moths. Treatment strategies will consist, most likely, of B.T. and release of sterile males. It is probably just a matter of time until breeding populations are within the park.

The other general pest problem within the park consists of wasps and black widow spiders living in wooden historic structures used as offices or visitor centers. Control comes through blocking entry, where possible, and pyrethrin foggers as needed.

**Proposed Action**

(1) Encourage mosquito vector analysis (see priority No. 11).

(2) Continue to work with Forest Service, APHIS to monitor the gypsy moth. Develop action plan with APHIS for active infestation. Base funded.
Dredge Spoil Management (Park Priority No. 15)

The Seashore frequently is requested by the Army Corps of Engineers or the state DOT to accept dredge materials from navigation channel maintenance dredging. The north and south ends of Ocracoke, the south end of Hatteras Island, and Bodie Island have all had placement of dredged material.

Such material is generally a positive resource; it can renourish beaches and build shorebird nesting habitat. Several offshore islands in the sound were developed solely as dredge material placement areas. These islands now support 75 - 80% of the state population of colonially nesting waterbirds. The North Carolina Wildlife Resources Commission is developing a management plan for North Carolina to use spoil from channel dredging to maximize its potential as bird habitat.

For that reason, the Seashore developed dredge spoil management guidelines for the placement of dredged materials. The guidelines state that the park will cooperate with the colonial bird management plan and attempt to work with dredging agencies to place dredge materials for maximum bird habitat. Secondary consideration will be as erosion mitigation.

Proposed Actions

(1) Cooperate with North Carolina Wildlife Resources Commission in the development and implementation of colonial waterbird management plan.

(2) Place dredging materials, as projects arise, in accordance with guidelines.
Resource Management Information Management (Park Priority No. 16)

Much current information relevant to resource management exists in scattered files or is stored randomly and thus, hard to retrieve. A great need exists to organize information in a useful and retrievable manner.

The resource management office will review all articles in the technical files for relevance and to ensure that the card catalog and articles match. This review will also be used to develop abstracts and subject bibliographies (by project statement titles and geographic location) for all relevant entries. Resource management zones will be established for the Seashore with map overlays and administrative histories of studies, impacts, uses and threats developed for each zone. Park files will be searched and oral interviews conducted to augment this process.

The Seashore has a computer program available for building a bibliography. However, input worksheets have been prepared for only 5% of all articles. This bibliography needs to be completed.

The Resource Management Office has acquired an IBM-PC and should explore its potential for resource management. The park has a computerized shoreline change data base. Other uses should be explored, such as wildlife sightings, water quality data and vegetation data. The park should explore a G.I.S. system (see priority No. 9 for overlays of rare plants, trails, turtle crawls, and fire history.

The park has numerous files, reports and photographs over 50 years old. These include invaluable information on early park and area
conditions. The park should make archival copies and working copies of these materials and seek professional assistance in conservation of the originals.

**Proposed Actions**

**Fiscal Year 87**

(1) Continue work on resource management zone data base and overlays. Base funded.

(2) Continue development of computerized bibliography, target 50% of total. Base funded.

(3) Acquire professional conservation assistance for old reports, maps and photos. Contract. $1,500

(4) Update park bibliography and technical files on yearly basis. Update resource overlays as needed. Base funded.
Campgrounds and Walks (Park Priority No. 17)

Resource management assessments for the campgrounds, nature trails, and developed areas need to be performed early in the season and continuously to determine visitor impacts and general conditions. Assessment checklist would include: vegetation impacts, mosquito counts and habitat survey, survey of trails and paths, poison ivy assessment, rodent burrows, wasp and yellow jacket counts, clearing perimeter check, and weeds in pavement cracks. Findings will provide basis to establish risk or treatment levels and necessary actions. 10-575's for follow-up actions and any necessary IPM approvals should be obtained.

Proposed Actions

(1) Monitor campgrounds, trails, and other developed areas for risks, visitor impacts and pest species; establish action levels; implement as necessary.
1.1 CAHA - N1 - Water Quality Monitoring

1.2 Statement of Issue or Problem

Little data has been generated concerning the surface water quality of the ponds and tidal creeks within the Seashore. The only data consists of bacteriological counts for shellfish beds. The fresh water aquifer has been mapped, but little is known of hydrology and inter-compartment mixing of ponds and ground water.

The Seashore faces potentially drastic changes in surface water quality and fresh water tables (drawdown) from rapidly increasing development in the adjacent villages. Current wastewater management consists solely of septic tanks and drainfields for individual developments; a recent EPA 201 wastewater study recommends that septic tanks are the preferred management for the area. The park is concerned over impacts from septic tanks and urban surface runoff upon the quality of ground and surface waters, and thus upon dependent fauna and flora.

The Cape Hatteras Water Association, with a well field adjacent to the NPS boundary in Buxton Woods, provides water for all of Hatteras Island. To meet increased development and peak population levels, the Water Association intends to double their plant capacity from its current 800,000 gallons per day to 1.6 million gallons per day. The effects of this production on the fresh water table, and thus the extensive fresh water marsh communities is unknown, from the standpoint of drier conditions, seasonal fluctuations, and saltwater intrusion.
Current Action

The park compiles shellfish bed bacteriological data collected by the state. The state has some groundwater monitoring wells (for saltwater intrusion) on Hatteras and Bodie Islands.

1.3 Alternative Actions and Their Probable Impacts

(1) Continue Present Management

This is essentially no action, except for the compilation of data generated by the state. Baseline data needed to monitor seriously threatened park resources will not be available.

(2) Proposed Action

The Rutgers Cooperative Research Unit has funded an assessment of water monitoring needs by an advisory team of experts in the field. This occurred in March 1986 and generated recommendations for action and a work statement for proposed monitoring programs. The proposal included:

(a) Surface water quality in ponds and tidal creeks.
(b) Hydrology and mixing of surface and subsurface waters.
(c) Assessment of general health of aquatic organisms and benthics; indicator species.
(d) Monitoring impacts of aquifer drawdown and urban inputs.
(e) Mitigation strategies.
1.4 Recommended Course of Action

Proceed with recommendations of the advisory team, both through in-house and contracted monitoring. Seek funding from Rutgers Cooperative Research Unit.
2.1 CAHA - N2 - Fire Management Plan

2.2 Statement of Issue or Problem

Buxton Woods, a significant natural area containing 3,000 acres of maritime forest on NPS and private lands, contains areas of high fuel loadings and continuous fuels. A fire and disturbance history has been completed by the NPS Cooperative Unit at the University of Georgia, as has a vegetation zone map. Twenty permanent monitoring plots have been established. This information was reflected in a recent Fire Management Plan for the Seashore, but fuel breaks and trails recommended by the plan have not been developed.

The prevention of overwash by the creation of the artificial dune line and drainage modifications have allowed shrub encroachment within former open grasslands and marsh areas. The park entrance road, NC Highway 12, is closed in by a disturbance induced shrubline which blocks the former open marsh vistas. Induced changes have also reduced wildlife (migratory waterfowl) habitat. Private developments adjacent to park lands are located in these high fuel areas.

Current Management Action

The Seashore recently completed, but has not implemented, a Fire Management Plan. Vegetation zone and fuel model maps have been recently developed for the entire Seashore. A disturbance history of Buxton Woods has been completed, and a disturbance history of Bodie Island is in press.

The park has been funded for a three-year study to conduct prescribed burns for vista management.
2.3 Alternative Actions and Their Probable Impacts

(1) **Continue Present Management**

Implement the policies and fire break system of the Fire Management Plan, proceed with prescribed burning research program, and continue under park base if indicated as beneficial and cost effective.

(2) **No Action**

Do not build prescribed burn program beyond research study term.

2.4 **Recommended Course of Action**

Implement Fire Management Plan, continue funded prescribed burn study, implement prescribed burn in park base if indicated.
3.1 CAHA - N3 - Shoreline Monitoring

3.2 Statement of Issue or Problem

A data base exists (updated through 1984) for the shoreline changes (erosion or accretion) occurring at 100-meter intervals along the Seashore. This data base will be made compatible with the park's PC for more efficient retrieval. Demands for the protection of private property and NC 12, as well as threatened park facilities, necessitate periodic updating of information on shoreline status and trends.

The data base referred to above is restricted to ocean shoreline position; it does not address cross island topography (and therefore sediment budgets) or the sound side shoreline position, both critical components of the barrier system. A system of cross island surveys (transects) was established the length of the Seashore in 1937. This system was reestablished and comparisons made in 1977 (though some markers were lost). This benchmark survey system is an invaluable data base which should be maintained and periodically updated.

A seawall/revetment has been selected as the permanent erosion protection method for the Cape Hatteras Lighthouse. Construction may begin in 1987. This structure will require shoreline monitoring during construction and after completion to assess shoreline changes and impacts and to plan timing of the final closure of the landward two sides of the octagonal seawall.

There is a growing consensus among climatologists (see EPA documents) that a global rise in temperature resulting from increased atmospheric carbon dioxide will greatly accelerate sea level rise through melting
of polar ice and thermal expansion. Current models indicate that sea level, in recent past rising one-foot per century, may rise four to seven feet over the next century. Obviously, this will have a tremendous impact on barrier island and coastal management. The existing data base on shoreline positions should be important to future predictive studies of CAHA, with management implications for all Seashores.

Unvegetated inlet spit areas experience the highest competition for resources in the area, i.e., they are the most popular fishing spots, and they are essential to shore nesters and certain species of rare plant pioneers. These areas change continually; two of the four in the park are accreting. A review of changes in these areas and management implications would be helpful in allocating this resource.

Current Action

The Seashore has updated the data base for shoreline position (Dolan) through 1984, and it will be computerized for park use. The Corps of Engineers maintains extensive baseline surveys of the Cape Hatteras Lighthouse and Oregon Inlet areas.

3.3 Alternative Actions and Their Probable Impacts

(1) Continue Present Management

Ocean shoreline positions and erosion rates updated through 1984 are available for park use. The Corps of Engineers should continue to survey the Lighthouse and Oregon Inlet areas.
(2) Augment above data with updated cross island surveys and sound side shoreline position. Periodically update both data bases. Develop monitoring and resource management programs for inlet spit areas. Initiate research program, through blending shoreline, vegetation and hydrology data bases, for implications of rapid increase in sea level.

3.4 **Recommended Course of Action**

Alternative two will broaden our knowledge of barrier dynamics, provide a strong data base for management, and assist in planning and protection of park facilities and resources.
4.1 CAHA - N4 - Bird Management

4.2 Statement of Issue or Problem

The Seashore is a significant nesting area for several shorebirds, including the least, common, Forster's, Caspian and gull-billed terns; black skimmers, oyster catchers and the recently federally listed endangered piping plover. Numerous other colonially nesting waterbirds, brown pelicans, herons and gulls, nest on dredge spoil and estuarine islands adjacent to Seashore lands.

Thousands of waterfowl winter here: snow geese, Canadian geese, cormorants, brant and 26 species of ducks. Several species of ducks, including the declining black duck, nest within the Seashore. The Seashore also is a key corridor and resting area for spring and fall migrations of shorebirds, warblers and raptors.

All nesting shorebird colonies within the Seashore were censused and mapped in 1984 and 1985; little other information has been produced other than general species lists.

Waterfowl habitat, especially on Bodie Island, is being encroached by shrubs. Significant fresh and brackish pond habitats are threatened by increased private water needs adjacent to the park. Shorebird species may be impacted by recreational pressures. Little information is known on which species use which habitats at which time of the year and whether significant habitat areas are deteriorating.

Current Action

Shorebird nesting areas are located and closed to the public; shorebird censuses were conducted in 1984 and 1985. The Seashore is cooperating in
development of a state (NC Wildlife Resources Commission) sanctioned colonial waterbird management plan.

4.3 Alternative Actions and Their Probable Impacts

(1) Continue Present Management

Shorebird colonies will be protected. Baseline data on other species or on recreational impacts or habitat utilization and quality will not be developed.

(2) Proposed Action

Continue to post and protect shorebird colonies and work with the state for a comprehensive colonial waterbird management plan. Develop data on specific habitat utilizations within the Seashore and the status (quality) of those habitats. Develop information on breeding birds (song birds) within the Seashore. Assess recreational impacts upon bird populations within the Seashore.

4.4 Recommended Course of Action

Implement proposed action for necessary baseline data for management, continue site protection for nesting shorebirds.
5.1 CAHA - N5 - Vegetation Monitoring

5.2 Statement of Issue or Problem

Twenty-two state listed rare plants (including two under consideration for federal listing) exist within the Seashore. The majority of these are fresh or brackish wetland plants; one (Amaranthus pumilis, the most rare) occurs on tidal sand flats. Amaranthus will require monitoring and posting for protection.

The Bodie Island marsh, important to wintering waterfowl, has been noted as one of the more diverse marshes in North Carolina (N. C. Natural Heritage Program); the Ocracoke Island marshes are also unusually broad and diverse for the region. The Seashore also contains a portion of Buxton Woods, a significant maritime forest.

The vegetation patterns within the Seashore have been modified due to drainage, plantings, and the artificially constructed dune line. Shrubs are encroaching former open wetlands (see Fire Management Plan, priority two). Buxton Woods has been modified by grazing and timbering; it appears to be succeeding toward a live oak forest.

There have been several recent vegetation studies within the Seashore: survey of rare and exotic plants, preparation of vegetation zone maps for Ocracoke and Hatteras Islands, detailed vegetation maps for Buxton Woods and Bodie Island, and vegetation cover analysis of Buxton Woods and Bodie Island. Twenty permanent monitoring plots were established in Buxton Woods; five permanent vegetation transects were established on Bodie Island. The park has begun mapping the stands of Phragmites, the most potentially damaging exotic. The park has also begun vista management on Bodie Island (see Fire Management, priority two).
Poison ivy, while native, is a troublesome plant and safety hazard along nature trails on Bodie Island, Buxton, and Ocracoke. It has been handled by cutting, but other methods may be necessary for safety and efficiency.

Vegetation cover, and thus habitat, could see great changes in the foreseeable future due to aquifer drawdown, sea level rise, major storm events, or the erosion of the dune line.

Current Management Action

Rare and exotic plants have been mapped. Research is underway on shrub management through prescribed burning. Some posting of rare plant areas is done; more is needed. Permanent monitoring plots have been established in Buxton Woods and on Bodie Island.

5.3 Alternative Actions and Their Probable Impacts

(1) Continue Present Management

The shrub management program will continue for two more years, establishing management alternatives. No other management activities will take place. This will not establish all necessary data for long-term management.

(2) Augment Present Management

Further actions are needed in developing permanent transects on Ocracoke, developing better information on our fresh marsh areas, managing Phragmites, managing poison ivy, establishing permanent photopoint monitoring, and developing better protection for Amaranthus and other sensitive areas. This will lead to comprehensive vegetation management plan.
5.4 Recommended Course of Action

Augment current information to develop full monitoring and vegetation management plan.
6.1 CAHA - N6 - Boundary Encroachment

6.2 Statement of Issue or Problem

The eight village enclaves adjacent to the Seashore continue to grow at a rapid rate. The county's current population (20,000) is expected to double by the year 2000. The peak summer population, also increasing, is approximately 125,000.

Anticipated problems of water quality and quantity are addressed in project statement CAHA-N1, but village growth will bring demands in addition to water (utility and transportation corridors/cleared lands) which will impact the Seashore.

Approximately one-half of the developable land on Hatteras Island has been developed. As growth expands to fill all private lands, existing habitats on private lands will be filled, drained and cleared, causing disruptions in wildlife dispersal that could impact the Seashore populations. Creation of additional roads and trails, changes in drainage patterns, and the clearing of presently vegetated areas will also impact the Seashore's vegetation community.

Boundary or edge effects of roads, trails and development are well documented in the general conservation literature. These potential effects have not been studied, however, in the increasingly fragmented natural areas on barrier islands adjacent to urbanized areas.

Current Management Action

A study is proposed to monitor water quality within the Seashore, but no studies are currently proposed to monitor the boundary or edge
impacts from increased development. Baseline data on wildlife populations is scant; better information is available on vegetation communities.

6.3 Alternative Actions and Their Probable Impacts

(1) Continue Present Management

This is essentially no action. No impacts related to development will be monitored except water quality.

(2) Monitor Impacts from Boundary Encroachment

Develop assessment of impacts to vegetation communities and wildlife populations from increased clearing and ground disturbance and the disruption of existing dispersal patterns.

6.4 Recommended Course of Action

Assess impacts of boundary encroachments.
7.1 CAHA - N7 - Sea Turtle Monitoring

7.2 Statement of Issue or Problem

(1) Statement of Condition

The loggerhead sea turtle, a species listed as threatened under the Endangered Species Act of 1973, nests within this National Seashore. Also, dead, sick or injured loggerheads and other listed species are occasionally stranded on Seashore beaches. As the Seashore is situated near the northern limit of loggerhead nesting areas, failure to locate and protect nests could result in the elimination of loggerheads as a breeding species in this National Seashore.

(2) Current Management Action

During turtle nesting season, all turtle crawls are checked by park personnel to determine whether or not eggs were laid. Depending on probability of egg destruction by human or natural forces, eggs are left in place or transferred to a safe hatching area.

Unrelocated nests are unobtrusively marked, and 50 days after laying date, a segment of the beach containing the nest is posted from tide to dunes to close the beach to off-road vehicle use to prevent loss of turtle hatchlings in vehicle tracks. If hatching has not occurred by laying date plus 75 days, the beach is reopened to vehicle traffic.
(3) Result of Current Action

Most turtle nesting sites are protected, resulting in larger numbers of young turtles reaching the ocean.

7.3 Alternative Actions and Their Probable Impacts

(1) Continue Present Management

Little adverse comment or complaint has resulted from closures of necessary beach to ORV use. A larger proportion of young turtles reach the ocean than would otherwise be the case.

(2) Discontinue Present Management Actions

Under this alternative, no posting or monitoring activities would be taken. There would be no visitor inconvenience. Mortality rate of young turtles would increase.

7.4 Recommended Course of Action

Alternative 1, continue present action, is recommended, as this action balances preservation with use.
8.1 CAHA - N8 - Wildlife Management Information

8.2 Statement of Issue or Problem

Several species listed as endangered or threatened under the Endangered Species Act of 1973 occur in the National Seashore. Six listed sea turtles have been recorded from the National Seashore's beaches or adjacent waters, although only the loggerhead is known to nest within the Seashore. The peregrine falcon is a seasonal migrant through the Seashore, and occasional sightings of the bald eagle occur adjacent to and within the Seashore. The piping plover, federally listed endangered, nests on Seashore beaches; Cape Lookout Seashore is the only other known nesting area in North Carolina for this species.

The last comprehensive inventory of the wildlife within the Seashore was the study by Dr. Thomas L. Quay in 1959, "The Birds, Mammals, Reptiles, and Amphibians of Cape Hatteras National Seashore Recreational Area." Many changes have occurred since then, especially increases in developments within the villages along the seashore. An update is needed to detect and follow any changes in species and populations which may have occurred. A deer census of Buxton Woods was conducted in 1984; it needs to be updated and perhaps replicated on Bodie Island as well.

"An Atlas of the Colonial Waterbirds of North Carolina Estuaries," Parnell and Soots, 1979, listed the nesting areas, species, relative abundance and management requirements for colonial waterbirds within the Seashore. The Seashore monitored, through student intern, the populations of colonial waterbirds (including piping plovers) in 1984 and 1985. The Seashore needs to continue to monitor nesting areas, especially in regard to ORV effects and changes needed in interim
ORV plan, and changes in habitat caused by storms or vegetation. Other recommendations for bird management are listed under priority No. 4.

Little is known on the ecology of fresh water ponds within the Seashore or the arthropod or mollusk populations within the Seashore. It is known that Island Creek, Ocracoke, harbors a regionally significant population of marsh killifish _Fundulus confluences_. Certain organisms may be indicators of environmental health. Studies should be encouraged to acquire this baseline data.

Plastic refuse in the environment is becoming an increasingly important world-wide wildlife issue. The Seashore should monitor, when possible, the incidence of mortality through plastic ingestion or entanglement.

8.3 Alternative Actions and Their Probable Impacts

(1) **Continue Present Management**

Necessary baseline information on wildlife populations will not be developed. Changes in populations will not be detected; opportunities for mitigation of impacts may be missed.

(2) **Develop Wildlife Inventories**

Develop information on small mammal populations, ecological inventories of fresh ponds, reptiles, and amphibians, and monitor recreational and pollution impacts.

8.4 **Recommended Course of Action**

Develop needed baseline information.
9.1 CAHA-N9 - G. I. S. (Geographical Information System)

9.2 Statement of Issue or Problem

Digitized vegetation zone and fuel model maps have been produced for all the Seashore except Bodie Island. A computerized erosion and shoreline change data base will be available for park use in 1986. Soil maps for the Seashore were produced in 1977; the park's aquifer has also been mapped.

Other data bases summarized over the last two years include fire history, sea turtle nest location, shorebird nesting areas, rare and endangered plant species, ORV trails and duck blind locations.

The existing digitized vegetation maps and shoreline change maps would provide an excellent foundation for a geographic information system (G.I.S.). Such a system would greatly assist in park planning and enable the meshing for management of numerous scattered data bases. This is particularly important for an area with so many demands (utilities, roads, dredge spoil) from adjacent private lands. The system would also form the basis for potential modeling of resource changes associated with barrier dynamics. Additionally, the system would ensure the storage and use of valuable resource data.

9.3 Alternative Actions and Their Probable Impacts

(1) Continue Present Management

This is the no action alternative. Data bases remain scattered and not integrated for use; much data potentially lost or overlooked during planning.
2) Develop G. I. S.

This would enhance our planning and data use capability as well as ensure maintenance of archival data.

9.4 Recommended Course of Action

Develop G. I. S. for park use.
10.2 Statement of Issue or Problem

(1) Statement of Condition

Off-road vehicle (ORV) use on the beaches and soundside trails of Cape Hatteras National Seashore, either in active pursuit of fish by anglers or as a recreation in itself, is a common activity. Under the authority of Chapters 2 and 4 of Title 36 of the U. S. Code of Federal Regulations, ORV use is limited to licensed drivers and vehicles; there are no requirements for permits or other restrictions. Through better communications with local and national ORV user groups, a better climate of understanding of mutual problems and fears has been developed. Currently, only about one mile of beach, fronting the Cape Hatteras Lighthouse, is permanently closed to ORV use. Seasonal closures, from prior to Memorial Day until after Labor Day, close approximately one-third more of the beach. These seasonal closures are in effect in major pedestrian use areas fronting the villages on Hatteras Island and at park swimming beaches.

(2) Results of Current Action

Most ORV users and non-ORV users accept current status, although there is a significant minority at either end of the scale who advocate few restrictions on ORV's or complete elimination from the Seashore. Control of ORV use is a major time-consuming activity of park personnel. Twenty to twenty-five percent of all law enforcement actions involve ORV's,
and a considerable amount of time is required to maintain ORV trail markings. ORV activity may cause losses to colonial water birds. Impacts to vegetation have been reduced due to ramp system and interim ORV plan.

10.3 Alternative Actions and Their Probable Impacts

(1) **Continue Present Management Action**

Both ORV users and non-users are accommodated but not to the degree that either user considers ideal. Present action has flexibility, in that management can adjust programs to meet the changing conditions. Large expenditures of funds and personnel time are required to maintain dune crossings, mark ORV trails, and monitor and control use. With decreasing appropriations and effects of inflation, necessary funding needs have not been met, causing poorly maintained and marked ORV use areas and trails.

(2) **Eliminate ORV Use Completely**

Funds now devoted to ORV trail maintenance and control could be reprogrammed to other needs. Park short-term visitation would be reduced by 500,000 or more visits per year with a consequent loss in revenue by local businesses. Visitation would probably slowly return to pre-ORV elimination level. There would be little or no affect on natural scene or wildlife by ORV's. This is not considered a viable alternative due to the popularity of ORV use and historical use patterns.
10.4 Recommended Course of Action

Continue present action of allowing controlled ORV use, as it meets the desires or needs of the majority of both ORV users and non-users. Continue or increase posted areas for shorebirds and plant habitat.
11.1 CAHA - N11 - Banker Horse Herd Program

11.2 Statement of Issue or Problem

The park currently maintains a herd of 21 horses in a 200-acre fenced enclosure on Ocracoke Island. Many believe this herd to be descendents of stock brought to the new world by early European explorers and colonists. Numbering 10 animals in 1974, the viability of the herd was in question. General health and appearance considerably improved with regular veterinary care, medication and attention.

Research and monitoring are needed to determine the cultural significance, genetic viability, and resource demands of the herd.

Current Management Action

For approximately four years, the park's goal was to increase the size and health of the herd to a point where its survivability would be insured. Horses are maintained in a 200-acre fenced enclosure with food supplements and veterinary care.

Results of Current Action

Health of the individuals and of herd is sound. Stable area exists for supplemental feeding; 200 acres of grass and marshland is utilized for the horses.

11.3 Alternative Actions and Their Probable Impacts

(1) Manage herd as cultural resource, with supplemental feed and medical attention, as is current practice. Manage to
maintain Banker bloodline, including loaned horses for breeding. This would not change visitor use patterns; marsh would continue to absorb minor grazing impacts. Genetic viability of herd, due to inbreeding, could be a problem.

(2) Continue management practices of herd as a cultural resource; allow introduction of new bloodlines for variance in gene pool. Long-range viability of the herd may be increased; significance of registered Banker breed would diminish. Marsh would continue to absorb limited grazing effects.

(3) Eliminate the horse herd entirely through sale. This would cause the loss of a potentially significant cultural resource, with significant local and general interest. Fence and stable area could be removed.

(4) Continue current management practices pending development of Horse Management Plan. This plan will determine the cultural significance of the Banker breed as well as the number of individuals necessary for genetic diversity and viability. Determine the ecological impacts of grazing and carrying capacity of marsh area. The plan should lead to the management of the herd in a near-natural state within the fenced area; manage herd size for carrying capacity and genetic viability.

(5) Allow horses to free range over the Seashore. This alternative is not considered viable for safety reasons (due to
full speed highway) and the possibility of horse intrusion into the nearby village.

11.4 Recommended Course of Action

Alternative 4, continue present management program while developing a Horse Management Plan, is recommended. Horse Management Plan, with associated Environmental Assessment, will be an appendix to a revised Resource Management Plan.
12.1 CAHA - N12 - Pollution Abatement

12.2 Statement of Issue or Problem

Increasing development in the villages adjacent to the Seashore increases the threat of pollution to park resources, particularly tidal creeks, estuarine waters and groundwater. Increasing development in eastern North Carolina poses a long-term threat to sound waters and estuarine resources.

The isolated location and climatic conditions combine to reduce the threat to air quality. Test wells and offshore oil exploration expected in the near future pose a moderate threat to Seashore resources. That threat could rise if recoverable resources are discovered.

The Seashore uses a number of potentially hazardous materials (paints, thinners, oils) in small quantities. This use needs to be monitored.

Current Actions

The Seashore has developed an oil or hazardous materials spill plan. A survey of underground storage (gas) tanks was recently completed.

12.3 Alternative Actions and Their Probable Impacts

(1) Continue present efforts to secure data from state on water and air quality.

(2) Conduct assessment of park-wide handling and disposal of hazardous materials. Continue monitoring underground tanks. Update hazardous materials spill plan as needed.

12.4 Recommended Course of Action

Alternatives 1 and 2, continue or establish monitoring programs.
13.1 CAHA - N13 - Public Health

13.2 Statement of Issue or Problem

The report from the 1986 Cape Hatteras Aquatic Resources Advisory Team (see priority No. 1) suggested that the Seashore "seek assistance from public health agencies to determine mosquito vector potential generated by the park's fresh wetlands. This may be helpful should drainage requests be couched in public health issues.

The Seashore, in keeping with NPS policy, does not undertake mosquito control measures, as mosquitos, while a nuisance, are a part of the natural system. Also, control measures are frequently harmful to natural systems. However, the Seashore should have a baseline data of the vector potential to deal with this issue.

A more potentially serious question is the possibility of Lyme disease from ticks within the Seashore. The park should have tick and host populations monitored for the causal spirochetes. Guidance should also be sought from public health agencies of the need to monitor other wildlife host diseases, such as rabies and tularemia.

13.3 Alternative Actions and Their Probable Impacts

(1) Seek analyses for Lyme disease potential, mosquito vector analysis, rabies and tularemia in consultation with public health agencies.

(2) No action.

13.4 Recommended Course of Action

Alternative 1, perform vector potential analyses.
14.1 CAHA - N14 - Integrated Pest Management

14.2 Statement of Issue or Problem

NPS guidelines for pesticide or herbicide use have clearly established that the Service will make every effort to reduce or eliminate the need for introduction of chemical pest controls into parks. Any such use will be based upon sound integrated pest management practices of monitoring, establishing action levels, and seeking alternative treatments.

During the summer of 1982, the Hyde County Health Department threatened to close Ocracoke Campground due to persistent complaints of mosquito bites and welts by campers. Scattered complaints were raised along the Seashore during 1986 (a heavy mosquito season) but generally, the park does not have the mosquito control pressures experienced by other east coast parks. However, Public Health (park priority No. 11) does call for assessing our mosquito vector potential.

The largest pest threat facing the Seashore comes from the gypsy moth. The Seashore has captured male moths in traps supplied by the U. S. Forest Service for a number of years. These moths are believed to originate from egg masses on recreational vehicles from northern states. However, the Agricultural and Public Health Inspection Service (APHIS) has found active infestations on private property outside Buxton Woods and in Southern Shores, 20 miles north of the park. They have treated these with Bacillus thurengensis (B.T.), a biological control, and the release of sterile males.

APHIS trapped moths on a grid system within the county and the park during the summer of 1986. Their trappers placed their trailers (seasonal housing) on NPS trailer pads under an agreement. We will
continue to cooperate with APHIS to monitor gypsy moths. Treatment strategies will consist, most likely, of B.T. and release of sterile males. It is probably just a matter of time until breeding populations are within the park.

Other general pest problems within the park consist of wasps, biting flies, and black widow spiders. The wasps become a problem when they enter structures used as offices or visitor centers. Control comes through blocking entry, where possible, and pyrethrin foggers as needed. The flies are seasonal nuisances that can be avoided by staying inside. Black widow spiders inhabit crawl spaces under houses and maintenance areas; areas may need treatment prior to maintenance work.

Results of Current Action

Pressure will continue for treatment of mosquitos at Ocracoke Campground; however, no proven health hazard exists. Gypsy moths continue to be present in area.

14.3 Alternative Actions and Their Probable Impacts

(1) Continue to monitor gypsy moths; develop action plan in conjunction with APHIS.

(2) Develop IPM plans for wasps, black widow spiders, and biting flies.

(3) No action.

14.4 Recommended Course of Action

Alternatives 1 and 2, develop gypsy moth action plan and other IPM plans as needed.
15.1 CAHA - N15 - Dredge Spoil Management

15.2 Statement of Issue or Problem

The Corps of Engineers notified Dare County in 1976 that the county was responsible for finding a suitable spoil site for Hatteras Inlet, as open water spoil dumping was no longer environmentally acceptable. The county was issued a permit in 1977 for pipeline spoil disposal on the ocean beach at Hatteras Island. The permit was renewed in 1983; dredging occurred again in March 1984. Dredging will be necessary every four to seven years.

Park lands are frequently requested as a dredge spoil sites.

Dredge spoil is extremely valuable bird nesting habitat. The park should work to maximize its potential as wildlife habitat, secondarily as beach nourishment.

15.3 Alternative Actions and Their Probable Impact

(1) Examine each request on a case-by-case basis for spoil disposition.

(2) Seek opportunities for planning with the Corps of Engineers, the state, and county for dredge disposal which would maximize the wildlife benefits of spoil material and secondarily the beach nourishment potential.

15.4 Recommended Course of Action

Alternatives 1 and 2.
16.1 CAHA - N16 - Resource Management Information Management

16.2 Statement of Issue or Problem

Much current information relevant to resource management exists in scattered files or is stored randomly and thus, hard to retrieve. A great need exists to organize information in a useful and retrievable manner.

The resource management office will review all articles in the technical files for relevance and to ensure that the card catalog and articles match. This review will also be used to develop abstracts and subject bibliographies (by project statement titles and geographic location) for all relevant entries. Resource management zones will be established for the Seashore with map overlays and administrative histories of studies, impacts, uses and threats developed for each zone. Park files will be searched and oral interviews conducted to augment this process.

The Seashore has a computer program available for building a bibliography. However, input worksheets have been prepared for only 5% of all articles. This bibliography needs to be completed.

The Resource Management Office has acquired an IBM-PC and should explore its potential for resource management. The park has a computerized shoreline change data base. Other uses should be explored, such as wildlife sightings, water quality data and vegetation data. The park should explore a G.I.S. system (see priority No. 9 for overlays of rare plants, trails, turtle crawls, and fire history.

The park has several files, reports and photographs over 50 years old. These include invaluable information on early park and area
conditions. The park should make archival copies and working copies of these materials and seek professional assistance in conservation of the originals.

16.3 Alternative Actions and Their Probable Impacts

(1) Continue with no greater emphasis on information management; much valuable information will be lost.

(2) Organize management zones for Seashore and geographic subject bibliographies. Develop administrative or impact history for each zone.

(3) Explore uses in Resource Management for IBM-PC.

16.4 Recommended Course of Action

Alternatives 2 and 3 are recommended.
17.1 CAHA - N17 - Campgrounds and Walks

17.2 Statement of Issue or Problem

Observations of rats adjacent to Ocracoke campground occurred in 1982-83. Yellow jackets, wasps and mosquitos frequently annoy visitors. Visitors impact vegetation around campsites.

17.3 Alternative Actions and Their Probable Impacts

(1) Continue current system of complaint followup, but no systematic monitoring of visitor impacts and level of visitor pest problems.

(2) Establish monitoring system for impacts and pests, with action levels.

17.4 Recommended Course of Action

Alternative 2.
Purpose and Need

This Environmental Assessment is intended to allow analysis and evaluation of impacts of recommended resource management actions and alternatives and their cumulative effects. Many of the actions and activities suggested in this plan have previously been approved in either the General Management Plan (1984) or the 1983 Resource Management Plan. Others are categorically excluded from NEPA review under 516 DM Appendix 7.4.

Following are matrices describing resource management project statements, alternatives and probable impacts.
Cumulative Impacts

The proposed resource management actions listed will have no cumulative adverse impacts upon natural resources, wetlands, endangered species, cultural resources or water quality. The proposed actions are largely of a non-manipulative research or monitoring nature, and the aggregate information gained from such activities will bring an improvement in understanding that will greatly benefit park resources.

The manipulative actions mentioned are generally current practices designed for the protection or enhancement of park resources. These practices consist of providing beach access ramps for ORV use and closure of areas to ORV or foot traffic through fencing for vegetation recovery or protection of nesting turtles or birds.

Manipulative projects include the previously approved prescribed burning research program, shrub management and exotic (Phragmites) management. Potential research and monitoring that would be manipulative would be the inventorying of wildlife populations with potential for taking of voucher specimens.

Proposed development of monitoring activities and the information base may lead to the development or updating of specific action plans at a later date, e.g., Fire Management, Seashore Management, ORV Management, Dredge Spoil Plan, and Horse Herd Management; however, there are no activities proposed at this date other than preliminary data gathering. All action plans submitted will be accompanied by an environmental assessment; no further manipulative activities or changes in current activities will occur without an approved action plan.