

FINDING OF NO SIGNIFICANT IMPACT
for the
Introduction of the
Endangered Red Wolf (Canis rufus)
Onto Lands of the Alligator River
National Wildlife Refuge in
Dare County, North Carolina
for the Benefit and Recovery of
the Species

Based on a review and evaluation of the information contained in the supporting references below, I have determined that the proposal to reintroduce the endangered red wolf onto the Alligator River National Wildlife Refuge, Dare County, North Carolina, as an "experimental" nonessential population, will not have a significant effect on the quality of the human environment within the meaning of Section 102(2)(C) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an environmental impact statement on the proposed action is not required.

Supporting References

- (1) U.S. Fish and Wildlife Service: Final Environmental Assessment on the designation and reintroduction of a nonessential experimental population of red wolves.
- (2) U.S. Fish and Wildlife Service: Intra-Service Section 7 Consultation dated April 23, 1986.
- (3) U.S. Fish and Wildlife Service: A Technical Proposal to Reestablish the Red Wolf to Alligator River National Wildlife Refuge, North Carolina.

9/25/86


Regional Director

UNITED STATES FISH AND WILDLIFE SERVICE

ENVIRONMENTAL ACTION MEMORANDUM

With the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA) and other statutes, orders, and policies that protect fish and wildlife resources. I have established the following administrative record and have determined that the action of:

The proposed Experimental Population Designation and reintroduction of red wolves to the Alligator River National Wildlife Refuge.

- is a categorical exclusion as provided by 516 DM 6 Appendix 1. No further documentation will be made (see instructions on back).
- XX- is found not to have significant environmental effects as determined by the attached Environmental Assessment and Finding of No Significant Impact.
- is found to have special environmental conditions as described in the attached Environmental Assessment. The attached Finding of No Significant Impact will not be final nor any actions taken pending a 30-day period for public review [40 CFR 1501.4(e)(2)].
- is found to have significant effects, and therefore a "Notice of Intent" will be published in the Federal Register to prepare an Environmental Impact Statement before the project is considered further.
- is denied because of environmental damage, Service policy, or mandate.
- is an emergency situation. Only those actions necessary to control the immediate impacts of the emergency will be taken. Other related actions remain subject to NEPA review.

Other supporting documents:

A Technical Proposal to Reestablish the Red Wolf on Alligator River National Wildlife Refuge, NC

Environmental Assessment

Finding of No Significant Impact

James M. Williams 9/25/86
Regional Director Date

(1) Marshall P. Jones 9/24/86
Chief, Division of Endangered Species Date

(2) Marshall P. Jones 9/24/86
ARD, Federal Assistance Date
ACTING

(3) _____
EC/REC Date

(4) H. J. Pelt Jr. 24 Sep 86
ARD, Habitat Resources Date

ENVIRONMENTAL ASSESSMENT

Alligator River Refuge: A Red Wolf Reintroduction Proposal

Dare County, North Carolina

Abstract: This final environmental assessment (EA) considers the biological, environmental, and socioeconomic effects of reintroducing the endangered and extinct-in-the-wild red wolf onto lands of the Alligator River National Wildlife Refuge. The impacts of alternative actions and the degree to which each alternative would accomplish the security of this species are examined and evaluated.

The proposed action (Alternative 3) of the U.S. Fish and Wildlife Service, (FWS) envisions a team effort on the part of the FWS and the North Carolina Wildlife Resources Commission (NCWRC). The FWS, however, is prepared to carry out this important task utilizing its own authorities and funding if necessary.

For further information contact: Regional Director
U.S. Fish and Wildlife Service
75 Spring Street, SW.
Atlanta, Georgia 30303

Prepared By

United States Department of the Interior
Fish and Wildlife Service
Southeast Region
Atlanta, Georgia

September 1986

Executive Summary

The FWS proposes to reintroduce the endangered red wolf on lands of the Alligator River National Wildlife Refuge in Dare County, North Carolina. It has been determined that this can best be carried out by designating those six to eight pairs of captive reared red wolves to be released as "experimental" and nonessential under definitions as set forth under authority of Section 10(j) of the Endangered Species Act. The primary purpose of the proposed action is to take the first significant step that would eventually lead to the recovery of this particular species.

As one of the most critically endangered mammals in North America, and perhaps in the world, the red wolf is actually extinct in the wild. Faced with sure extinction, a few remaining animals were taken from the wild during the mid-1970s and placed in a FWS captive breeding program. Since that time the captive breeding program has effectively worked to safeguard this last remnant population and has labored under the assumption that someday the offspring of these wild caught animals could be placed back in the wild.

In 1974 the FWS appointed a Red Wolf Recovery Team to prepare a recovery plan for the species. The final recovery plan was approved July 12, 1982, and was revised, updated, and approved September 18, 1984. In this plan the Recovery Team stated that recovery for the species would "...require the establishment of at least three viable, self-sustaining populations widely distributed across the species' historic range." Obviously of great importance with a project of this nature is to carry out a fully successful initial reintroduction and establishment of that first viable, self-sustaining wild population. Not only would such a success demonstrate the biological feasibility of a wolf reintroduction, but certain social as well as economic unknowns would be more clearly and accurately defined. This knowledge, coupled with experience gained from the initial reintroduction, would hopefully lead to more reintroductions on other Federal lands within the historic range of the species.

The FWS considered the following three alternatives for accomplishing the initial reintroduction of the red wolf: (1) no action, (2) establish island populations, and (3) establish mainland populations. All alternatives were considered in light of the degree of species protection and enhancement offered, the ability to manage the reintroduction site, the environmental consequences, the logistics and costs involved, and the mandates of the Endangered Species Act. The alternatives are briefly described as follows:

Alternative 1, No Action - The FWS would not take any additional action on attempting to reach the recovery goals set forth in the Red Wolf Recovery Plan. In all probability those animals in captivity and their future offspring would be declared "zoo curiosity" specimens since the species is presently extinct in the wild. The welfare of these captive animals would be delegated to the American Association of Zoological Parks and Aquariums (AAZPA).

Alternative 2, Establish Island Populations - The FWS would determine the suitability of a small number of coastal islands along the South Atlantic and Gulf of Mexico. Islands within the national wildlife refuge and national park system would be given preference, and if found suitable a pair or two of red wolves would be released on each island and actively monitored. Resulting offspring would have to be captured at 10 to 12 months of age and relocated to other islands to insure genetic viability of the reintroduced disjunct populations.

Alternative 3, Establish Mainland Populations at Alligator River National Wildlife Refuge (Proposed Action.) - The FWS would select this 120,000 acre refuge, and the adjacent 47,000-acre U.S. Air Force Dare County Bomb Range, for reintroduction of approximately five mated pairs of wolves. This area has been carefully evaluated and found to be biologically suitable for a self-sustaining population. Economic and social conditions also have been found suitable, and the reintroduction would have no significant effect on the human environment. Selected mated pairs of red wolves would be released after acclimation, monitored carefully, and would hopefully become established as a viable, self-sustaining population.

Scoping for this assessment has included several meetings with biologists and environmental planners from other Federal, State, and local agencies to gather data and discuss reasonable alternatives and issues for study and analysis. Additionally, this assessment has been coordinated with the North Carolina Wildlife Resources Commission, and a series of public meetings were held in the Dare County, North Carolina, vicinity to review the alternatives and discuss in detail the reintroduction proposal.

TABLE OF CONTENTS

	<u>Page</u>
Executive Summary.....	i
Table of Contents.....	iii
List of Illustrations.....	
I. PURPOSE OF AND NEED FOR ACTION.....	1
A. Introduction.....	1
B. Background.....	3
C. Other Agencies, Administrations, and Authorities.....	5
1. County.....	5
2. State.....	5
3. Federal.....	6
D. Scoping.....	6
II. THE PROPOSED ACTION AND ALTERNATIVES.....	7
Alternative 1: No Action.....	7
Alternative 2: Establish Island Populations.....	7
Alternative 3: Establish Mainland Population at Alligator River NWR.....	7
III. DESCRIPTION OF THE AFFECTED ENVIRONMENT.....	9
A. Physical Environment.....	9
1. Climate.....	9
2. Geologic Origin.....	9
3. Geology.....	10
4. Soils.....	10
5. Water Resources.....	11

	<u>Page</u>
B. Biological Environment.....	12
1. Vegetation.....	12
2. Wildlife.....	16
C. Human Environment.....	21
1. Cultural Resources.....	21
2. Population Trends and Composition.....	22
3. Sociocultural Systems.....	23
4. Economic Conditions.....	23
5. Public Use.....	23
6. Existing Facilities.....	24
IV. ENVIRONMENTAL CONSEQUENCES.....	25
A. Alternative 1: No Action.....	25
B. Alternative 2: Establish Island Populations.....	25
C. Alternative 3: Establish Mainland Population at Alligator River NWR.....	27
V. LIST OF PREPARERS.....	29

I. PURPOSE OF AND NEED FOR ACTION

A. Introduction

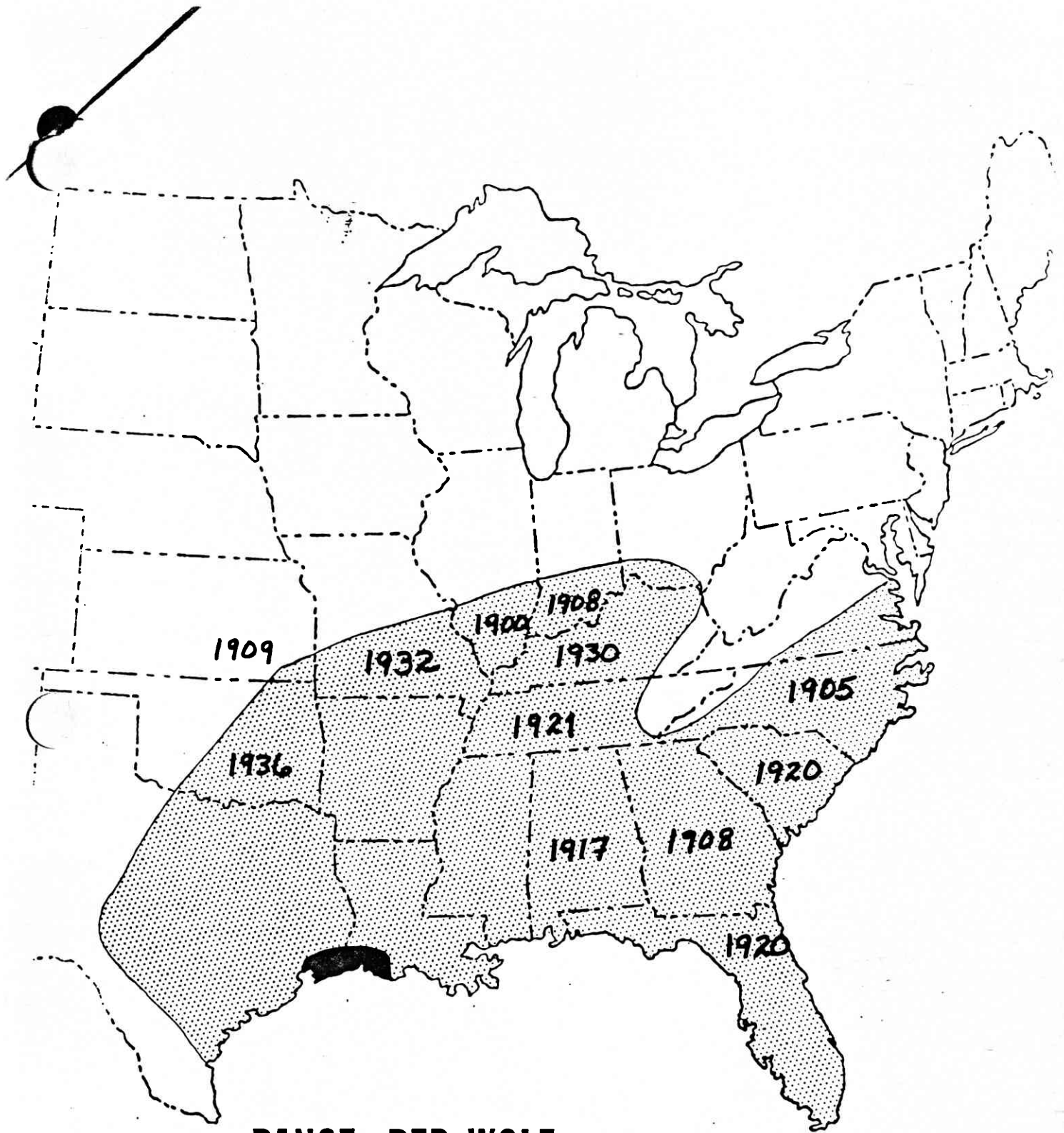
The Fish and Wildlife Service (FWS) appointed a Red Wolf Recovery Team in 1974 and charged the team to prepare a recovery plan for the species. The final recovery plan, approved on July 12, 1982, and revised on September 18, 1984, states that recovery of the red wolf "...will require the establishment of at least three viable, self-sustaining populations widely distributed across the species' historic range. A viable, self-sustaining population is defined here as a population which can be expected to persist in perpetuity. The successful establishment of a minimum of three such populations on lands considered to be 'secure' (national forest lands, national wildlife refuges, etc.) would assure the species' place in our native fauna, even if on a limited scale."

The purpose of the present effort is to determine whether it will be possible to allow the reintroduction of the red wolf into a portion of its historic range from which it has been extirpated for approximately 150 years.

Determination of this reintroduced population as nonessential experimental does not involve the commitment of any resource other than manpower and funds, and no part of this action is irreversible. Because this species is officially designated as "extinct in the wild," its future is presently secured only in captive breeding programs and animals on loan to five zoos in the United States. Those four to six pairs that would be released into the wild would not be considered as "essential" since over 50 animals would remain in secured captive programs.

With increasing human population pressures and consequent urban expansion throughout the southeastern United States, large acreages of land suitable for reintroduction of a predator such as the red wolf are becoming extremely scarce. The successful release of these animals on secured properties such as a National Wildlife Refuge (NWR) would demonstrate the feasibility of such an effort, as well as underscore the public relations value of such introductions to other land management agencies. The longer such an effort is delayed, the more difficult the reality of achieving the recovery goal of three self-sustaining populations becomes. Figure 1 shows the historic range of the red wolf with estimated years in each State when the last reliable wolf record was noted.

The red wolf is certainly one of the most endangered mammals in North America, with a captive population of only 65 or so animals extant, and officially designated as "extinct in the wild." Remnant animals were removed from the wild in the mid-1970s and taken into a captive breeding program to not only perpetuate the



RANGE - RED WOLF

APPROXIMATE HISTORIC RANGE WITH MOST RECENT RANGE
SHOWN DARKER. (ADAPTED FROM NOWAK, 1970)

FIGURE 1

species but also to provide a pool of animals for eventual transplant efforts.

B. Background

Historically, very few wolf relocation projects have been undertaken. In Europe the Bavarian National Park was stocked with wolves taken from captive breeding programs in German zoos. North American wolf relocations have occurred in Alaska and Michigan. In 1960 four timber wolves were released on Coronation Island in southeastern Alaska where they thrived for several years until killed by hunters. In 1974 an experimental effort was made to reestablish the eastern timber wolf in Michigan. Four radio-collared wolves were released in northern Marquette County and within 9 months all had been killed (three by hunters, one by a car). In Minnesota depredating wolves captured near farms have on occasion been translocated from farming areas to remote wilderness areas.

In 1978 a pair of mated red wolves were experimentally released on Bulls Island, a 4,000-acre island that is a component of the Cape Romain NWR near Charleston, South Carolina. This one-year experiment demonstrated that it is feasible to reestablish adult red wolves in selected habitats in the wild.

During the past eight years the recovery team and others interested in the survival of this species have actively sought suitable sites where reintroduction attempts could be made. Various recovery alternatives were reviewed, generally oriented at either island or mainland sites. In 1979 the recovery team focused its attention on an offer by the Tennessee Valley Authority to utilize their 170,000-acre Land Between The Lakes National Recreation Area in Kentucky and Tennessee. Because of opposition to the proposal by livestock interests in both states and the presence of coyotes on the area, as well as opposition from several national environmental groups, the Land Between The Lakes project was dropped in 1984. On March 15, 1984, nearly 120,000 acres of land in Dare and Tyrrell Counties, North Carolina, were donated by the Prudential Insurance Company to the Federal government. These lands, now administered by the FWS as the Alligator River NWR, comprise some of the finest and most diverse wetland ecosystems found in the Mid-Atlantic Region of the United States.

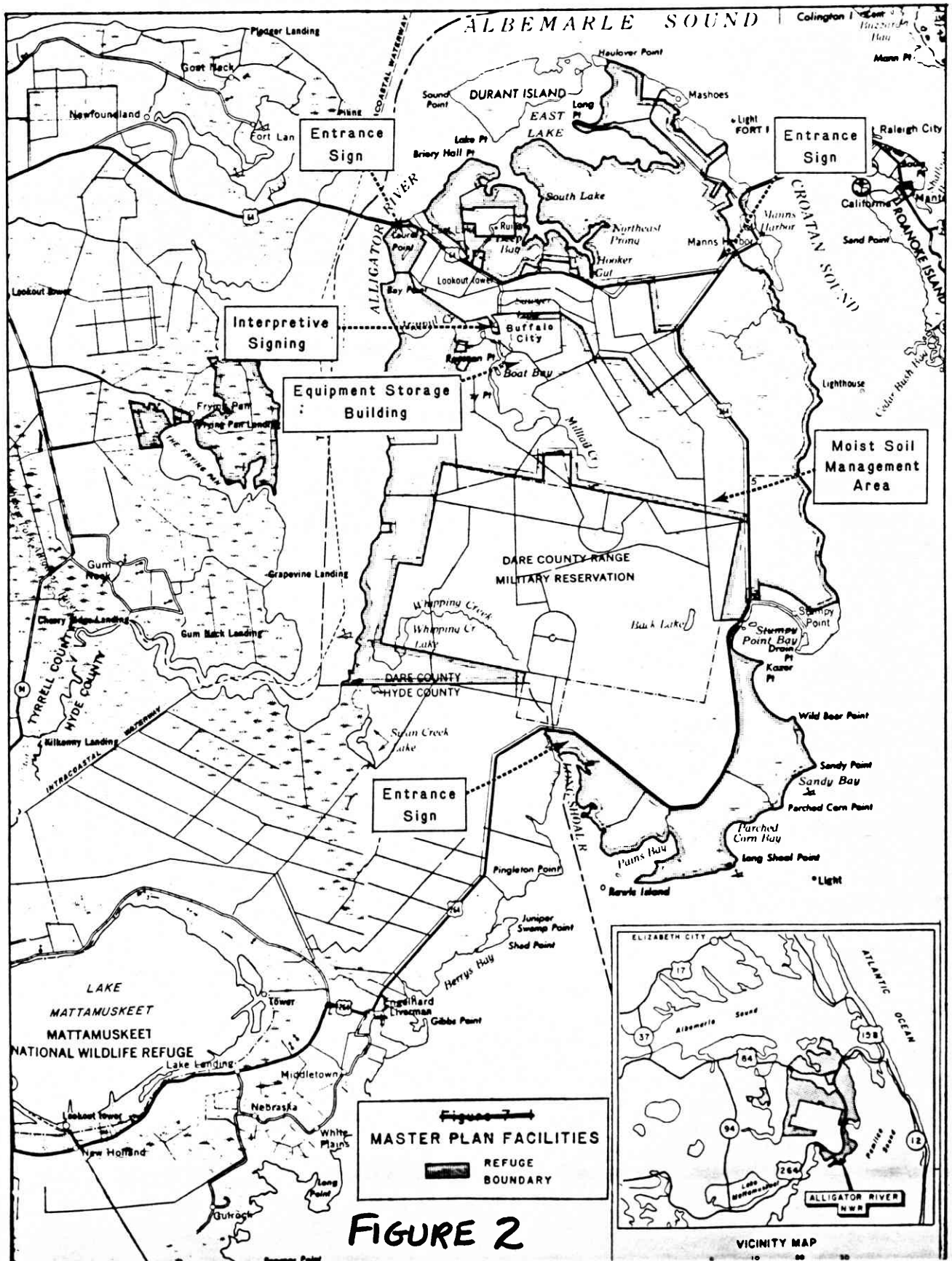
Mainland Dare County is geographically a most unique land form (Figure 2). It is bounded on the east, north, and west by broad, extensive expanses of water made up Albemarle, Croatan, and Pamlico Sounds, and the Alligator River. The 6.5-mile southern boundary of the county is connected to Hyde County. The refuge is an isolated, sparsely settled area with only two paved highways providing all-weather vehicular access. Situated in the southern third of the refuge is the 47,000-acre Dare County Bomb Range, a

ALLIGATOR RIVER NATIONAL WILDLIFE REFUGE

DARE AND TYRRELL COUNTIES, NORTH CAROLINA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



major training facility of the U.S. Navy and U.S. Air Force. Approximately 7,000 acres of agricultural lands are found in the county and these are devoted to soybean and corn production. There are three small communities on the mainland of Dare County. These are Manns Harbor, Stumpy Point, and East Lake. The total human population of mainland Dare County is slightly more than 1,000 inhabitants, most of whom live in Manns Harbor. The majority of the populace is rooted in the ways of the traditional waterman, with considerable commercial fishing and oystering originating in the local communities. Hunting and trapping are also traditional ways of life and both activities are actively pursued.

Master planning for future operation of the Alligator River NWR is nearing completion. The refuge objectives have been developed as follows: (1) protection and preservation of the area's unique wetland habitats and associated wildlife species, (2) endangered species protection and management, (3) management of the refuge black bear population, (4) waterfowl management, (5) protection and management of other wildlife species, and (6) wildlife related public use (consumptive and non-consumptive).

C. Other Agencies, Administrations, and Authorities

The following agencies and authorities have a role in actions pertaining to the Alligator River NWR red wolf reintroduction project:

1. County

Dare County Board of County Commissioners approves zoning and construction activities and is the local governing body of elected officials who are affected by the Alligator River NWR and its programs.

2. State

Department of Agriculture is responsible for all matters regarding crop and livestock production in North Carolina. This agency has a vested interest in the introduction of any exotic or endangered plant or animal species not currently found in the State. This interest centers on potential disease and parasite introduction as well as predatory activities on livestock, etc.

State Museum of Natural History is administered under the Department of Agriculture and is active in non-game and endangered species work in the State, especially in the taxonomy and distribution of native fauna.

Department of Natural Resources and Community Development is responsible for overall development of natural resources within North Carolina.

Wildlife Resources Commission is broadly administered under the Department of Natural Resources but retains considerable autonomy in the areas of research, management, and development activities regarding resident game and non-game endangered species in the State.

3. Federal

U.S. Fish and Wildlife Service administers the national wildlife refuge system and reviews activities that affect fish and wildlife resources on these lands, reviews activities that impact wetlands, and administers the Endangered Species Act.

U.S. Air Force administers lands that comprise the Dare County Bombing Range. This is a major training facility for the U.S. Air Force and U.S. Navy and is situated adjacent to the boundary of the Alligator River NWR.

D. Scoping

Scoping for this assessment has included several meetings with biologists and representatives of several State agencies and conservation organizations in North Carolina. Discussions have centered on alternatives and issues for study and analysis.

II. PROPOSED ACTION AND ALTERNATIVES

The FWS has considered three management strategies for the red wolf have been developed. These three are described as follows:

A. Alternative 1: No Action

Under this alternative the FWS would undertake the following course of action:

1. Make no attempts to reintroduce wolves back into the wild at this time.
2. Continue to support the management of the captive population in Washington.
3. Encourage private institutions to continue maintenance of other captive populations.

B. Alternative 2: Establish Island Populations

Under this alternative the FWS would undertake the following course of action:

1. Select three to five promising islands along the South Atlantic and Gulf Coasts and conduct necessary pre-release studies to determine their suitability for a red wolf release.
2. Seek public support for these reintroductions and conduct hearings.
3. Select animals from the captive breeding program and acclimate one or possibly two pairs (depending on size of the island) for a six-month period. Release animals into the wild.
4. Monitor animals for an extended period of time, concurrently conducting biological surveys to assess impacts the red wolves are having on the island ecosystem.
5. If it is determined that the reintroductions are successful, initiate a program to interchange offspring from one island population to another in a systematic manner to enhance genetic vigor.

C. Alternative 3: Establish Mainland Population at Alligator River NWR (Proposed Action)

Under this alternative, the FWS would undertake the following course of action:

1. Identify optimum habitat areas on Alligator River NWR for red wolf reestablishment and prepare suitable temporary holding facilities on the refuge.
2. Select animals from the captive breeding program, and after a period of "acclimation" on site, release three to five mated pairs into the selected areas on the refuge.
3. Monitor the animals throughout a five-year experimental project period. At any time during this period the project can be canceled and the animals retrieved if unforeseen problems develop.
4. At the end of the five-year period, assess the introduction attempt and determine if the project can continue indefinitely. A positive determination would permit the establishment of a permanent self-sustaining, viable population.

III. DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. Physical Environment

1. Climate

Alligator River NWR and surrounding coastal areas generally receives between 47 to 51 inches of rain per year, although these figures can vary over time. Rainfall during dry years may drop as low as 35 inches and in wet years reach as high as 79 inches. Peaks generally occur in July due to summer thunderstorm activity. The lowest rainfall occurs during the fall, with a secondary low during the spring.

Summers are characterized by hot, humid days, with an average daytime temperature reaching 32° C (90° F) or above in July and August. The freeze-free season in mainland Dare County is from 180 to 220 days long.

Because the refuge lies within 20 miles of the Atlantic Ocean and is itself surrounded by water, it is subjected to a strong coastal sea breeze regime. The prevailing winds are from the south/southwest and have an average speed of 9 to 10 mph; although they can change directions frequently. The highest wind velocities--during north/northwest frontal movements--generally occur in winter, with the lowest velocities occurring during summer. However, isolated thunderstorms, hurricanes, and tornadoes may create winds having major impacts during the summer.

2. Geologic Origin

Alligator River NWR is the product of wetland community development following the Wisconsin Ice Age 15,000 years ago. Prior to this ice age the level of the Atlantic Ocean in the Southeast was 40 to 50 feet higher than at present. During the Wisconsin Ice Age the sea level dropped below the present level and exposed large areas of the continental shelf. As a result, fast-flowing rivers cut through the coastal plain terrace to the Atlantic Ocean. During the next several thousand years, as the ice receded, sea levels gradually rose. During this period it is believed river flows were slowed and organic sediment loads were deposited in the interstream areas as flowing systems shifted to slow-moving systems. Aquatic plants began to grow in these shallow bodies of water, adding to the accumulation of sediment and aquatic debris. Simultaneous with this build-up of organic sediments, a climatic warming trend accompanied the end of the ice age. This warming trend helped to eliminate the cooler climate boreal forests and replace them with swamps, bogs, marshes, and pocosin habitats.

3. Geology

Alligator River NWR lies in the Pamlico Terrace, an extensive low, flat plain east to the Suffolk Scarp, a prehistoric Atlantic Ocean shoreline. The terrace slopes from 10 to 16 feet elevations at the base of the scarp gently eastward to 1 to 2 feet at the end of the land peninsulas. The Suffolk Scarp separates the Pamlico Terrace of the main estuarine region from the higher inland coastal plain around the western-most segment of the Albemarle Sound system.

Brown to black, organic-rich muds predominate in the surrounding sounds, but grade laterally into a thin apron of fine sand in the shallow waters around the perimeter of the estuaries. The sand apron usually occurs landward of the main break in bottom slope at a depth of about 3 feet and extends to the shoreline. The sediments in front of the marshes generally have little sand. They are characterized by high organic contents and contain peat blocks, logs, and stumps.

4. Soils

The soils of pocosins vary from dark surfaced mineral soils to deep organic soils. Soils with a high fiber content and 24 inches or more thick are classified as peat. Peat is formed when leaves, sticks, and other organic debris are submerged in water and decompose slowly. As peat depth increases, nutrient availability generally decreases. The thickest organic soils in large pocosins are usually near the center and support only short vegetation, while thinner organic or non-organic mineral soils near the pocosin's edge support taller vegetation. The pH of pocosin soils is quite acidic, usually ranging from 3.0 to 4.0. This low pH and poor soil aeration also creates an environment which renders both nitrogen and phosphorous less available.

Pocosin soils are poorly drained and have existed for thousands of years. Therefore, much dead material has accumulated to develop top layers formed completely from organic matter. Since this top layer is organic material, it will burn when dry, thus increasing the fire hazard during drought.

In addition to these organic soils, pocosins also contain some mineral soils. These soils, buried by organic soils, were deposited as recent marine sediments and vary from sand to clay. The type of material can change drastically over a short distance, and its character has a strong influence on the physical and chemical properties of the entire soil profile.

5. Water Resources

Water is an important resource on Alligator River NWR, affecting the landscape, fish and wildlife populations, human uses, and management of the refuge. The area is lined with canals throughout and contains several slow-moving creeks and lakes. In addition to these canals, creeks, and lakes, Alligator River NWR is surrounded by three sounds and a river (Figure 2).

The organic soil of the refuge absorbs and retains much of the water. Also, the flat topography of the area causes any water that cannot be absorbed to spread out and move slowly just at the soil's surface in a manner known as sheet flow. As a result, water leaves the area very slowly. Streams draining the refuge usually do not flood, and they will retain good flow even during droughts. This long period of water retention by the organic soil also increases the opportunity for vegetation transpiration. Therefore, much of the area rainfall never reaches the creeks and lakes. Only about 10 percent of the total precipitation is received by the lakes and creeks, and only about 2 percent of the total precipitation flows as a recharge to the ground water reservoir.

a. Sounds

Alligator River NWR is bordered by Albemarle, Croatan, and Pamlico Sounds to the north, east, and south, respectively. These sounds are an important part of North Carolina's extensive estuarine complex. These sounds support a commercial and recreational fishery; provide spawning and nursery habitat for anadromous, estuarine, and freshwater fishes; serve as wintering habitat for migratory waterfowl; and provide foraging habitat for many resident species of birds.

Water quality in Albemarle Sound indicates that the waters are tidal salt waters and are restricted to swimming, boating, fish and wildlife propagation, fishing, and agricultural use. Shell fishing within Albemarle Sound is currently prohibited due to their bacterial content.

b. Rivers, Streams, and Canals

The Alligator River is the only river bordering Alligator River NWR. Streams within the refuge include Milltail Creek, Sandy Ridge Cut, Swan Creek, and Whipping Creek, which drain into Alligator River; and Callaghan and Spencer Creeks which drain into Croatan Sound. Peter Mashoes Creek and Deep Creek are tidal streams which drain into the

Albemarle and Pamlico Sounds, respectively. Numerous man-made canals cut through the refuge as a result of previous agricultural and timbering activities.

Alligator River varies from 10 to 20 feet deep in the central portion to 6 feet or less in nearshore areas. Milltail Creek is 10 to 15 feet deep; East and South Lakes, actually bays, are 3 to 8 feet deep; Milltail Creek Lake averages 6 feet deep; and Whipping Creek Lake average 7 to 9 feet deep. The canals in the refuge range from 2 to 6 feet deep.

The water quality of the entire Alligator River drainage system is classified as fit for use in fish and wildlife propagation, fishing, boating, wading, and agriculture.

c. Lakes

There are six "lakes" within the refuge. East and South Lakes are actually small estuarine bays. Milltail Creek Lake, Sawyer Lake, Whipping Creek Lake, and Laurel Bay Lake all have well-defined natural outlets. Also, all of the lakes, except Laurel Bay Lake, have well-defined natural inlets as well. The sizes of the lakes vary from 35 to 288 acres.

The lakes associated with the refuge's pocosin-dominated wetlands are usually shallow and vary with respect to water quality. The water quality is probably controlled by bottom sediment type with sandy-bottomed lakes having pH nearly neutral and muck-bottomed lakes having an acidic pH and strongly colored water.

B. Biological Environment

1. Vegetation

Alligator River NWR exhibits typical pocosin vegetation, which is a dense growth of shrubs associated with trees. The dominant trees are usually pond pines with some loblolly bays, red bays, and sweet bays. The most common shrubs are titi, honey cup, fetterbush, bitter gallberry, and sweet gallberry growing with vine bamboo-briar. The shrubs and vines often grow so densely that walking through them is almost impossible. Some shrubs which inhabit the refuge are evergreen, but the two most important species--titi and honeycup--are deciduous. Because of various factors, the trees and shrubs change in height, density, and relative species composition from one area to another throughout the refuge. In some areas shrubs are fairly short (2 to 3 feet) and the only trees being a few scattered pond pine that are crooked and stunted. These

shrub-dominated areas are known as short or low pocosins. In other places on the refuge both trees and shrubs are much taller and denser. The forested areas are called tall or high pocosins. The short or low pocosins are usually found over deeper peat deposits.

Very few species are able to adapt to nutrient-poor, acidic, organic soils of the refuge pocosin. However, the number of species is often greatest in the areas with lowest productivity. This diversity is attributed to the fact that openings in the vegetation remain which permit the establishment of such herbaceous species as sphagnum, Virginia chain-fern, sedges, trumpets, red pitcher plant, sundews, cotton grass, beakrush, bladderwort, yellow-eyed grass, hatpins, and broom sedge. These open areas also have shrubs like lambkill, leatherleaf, and huckleberry which are less common in denser areas.

a. Cover or Habitat Types

There are ten cover or habitat types which are found on Alligator River NWR. All ten of these cover types are classified as wetlands based on the vegetation present, the degree of soil saturation, and the hydroperiod. A description of each is as follows:

(1) Bog

The bog community is an approximately 6,000-acre tract in the southeast corner of the refuge. The soil in this area is a very deep peat with extremely poor drainage. This area is practically undisturbed by road building and drainage, probably because of the lack of merchantable timber.

Vegetation within this area is characterized by moisture-tolerant species as a result of the deep peat soils and high water table. Wetter areas of the site contain open water and resemble a freshwater marsh. Sphagnum moss mats are dense and abundant in the herbaceous layer. Other plants present in the herbaceous layer include Virginia chain-fern, sedge, beak rushes, yellow pitcher plant, purple pitcher plant, yellow-eyed grass, hairy cap mosses, southern bog cedar, and sundew.

The shrub layer dominates the overstory vegetation. Clumps of fetterbush, bitter gallberry, wax myrtle, high bush blueberry, cranberry, bayberry,

leatherleaf, red bay, swamp cyrilla, zerobia, and sweet bay predominate. What few pines are present are usually small. The cranberry is at the southern extreme of its range in North Carolina.

(2) Marsh

Marshes on the refuge consist of irregularly-flooded salt marshes and several freshwater marshes. The largest acreage of marsh on the refuge consists of irregularly-flooded salt marshes which occur along the eastern boundary of the refuge adjacent to Croatan Sound. Irregularly-flooded salt marshes are also present along Callaghan and Spencer Creeks and are associated with the mouth of almost every creek emptying into East and South Lakes.

Dominant vegetation with the marshes includes big cordgrass, black needlerush, salt meadow cordgrass, sawgrass, and saltmarsh cordgrass. One may also find cattails, wax myrtle, bulrush, sedges, and spikerushes.

The freshwater marsh area occurs along the fringes of rivers and streams as patches in lakes and as isolated pockets in disturbed areas. Freshwater marshes occur along Milltail Creek and in Milltail Creek. Panic grasses, arrow arum, blue flag, water lily, cattail, and sawgrass are predominate in these marshes. Also present are duckweed, giant duckweed, water-meal, cow-lily, bladderwort, lotus, duck potato, sweet flag, pickerel weed, mock bishops weed, sedges, rushes, water willow, and marsh pennywort.

(3) Shrub Pocosin

This community occurs primarily in the eastern half of the Dare County tract. These areas are characterized by long hydroperiods with scattered stunted pond pines no higher than 35 feet. The shrub layer is the dominant feature of this community. Bitter gallberry and fetterbush dominate this shrub layer with Virginia chain-fern being the most abundant herbaceous plant.

(4) Low Tree Pocosin

Low tree pocosin occurs primarily in the eastern half of the Dare County tract with large areas occurring in the northeastern and southeastern sections of the refuge. This cover type is very similar to the shrub pocosin but contains a few more and slightly larger pond pines. Red bay and loblolly bay also reach above 15 feet in height in these cover types. The average tree height in the area is approximately 21 feet. Fetterbush and bitter gallberry are the dominant shrubs with Virginia chain-fern occurring as the dominant herbaceous plant. Unlike shrub pocosin, neither grasses nor sedges are present.

(5) Medium-high Tree Pocosin

The medium-high tree pocosin community occurs primarily in the eastern half of the refuge although it is more often found further west in the refuge than the shrub or low tree pocosin. The average tree height is 29 feet. Even though the tree canopy is much more closed than in the previously described pocosin communities, there is still a very significant shrub layer. Pond pine and red bay are the dominant canopy species, with fetterbush and red bay making up the dominant shrub types. Except for a small amount of cane, herbaceous cover is lacking.

(6) Cane Pocosin

This cover type occurs in the eastern half of the refuge, primarily northeast of the Navy Bombing Range and south of Grouse and Cedar Roads. Pond pine is the dominant canopy with only small amounts of sweetbay and red maple present. The average height of the overstory trees is 31 feet. The shrub layer is dominated by cane (*Arundinaria*) with bitter gallberry occurring as the most common shrub.

(7) Mixed Pine Hardwood Swamp

Mixed pine hardwoods are found primarily in the western half of the refuge but occur in scattered areas throughout. Red maple, red bay, and black gum are the dominant trees with an average height of 45 feet. The dominant shrubs are fetterbush, bitter gallberry, and red bay. Little or no herbaceous vegetation is present.

(8) Hardwood Swamp

This cover type is found in the western half of the refuge. The dominant trees are red maple, black gum, and red bay. The average height of the trees is 26 feet. Red bay and fetterbush make up the shrub layer. Very little if any herbaceous vegetation is present.

(9) White Cedar Swamp

White cedar swamps are also found in the western half of the refuge, primarily along Milltail Creek and in the southwest corner of the refuge. White cedar predominates, but black gum is also an important species in the area. The average tree height in this area is 52 feet. The shrub layer in these areas is dominated by sweet gallberry and fetterbush. Virginia chain-fern is the only herbaceous plant present in substantial amounts.

(10) Windrows

There are a few windrows present on the refuge which have been pushed up and burned during land clearing. They contain some areas of wood and slash which had not burned or decomposed sufficiently to allow plant growth but other portions are well-vegetated. The dominant shrubs are red maple, sweet pepper bush, and devil's walking stick. Blackberry is also very common. Grasses and forbs are abundant.

2. Wildlife

Alligator River NWR and its surrounding waters support 389 species of resident and migratory fish and wildlife. Of these, 120 species are fish, 165 are birds, 62 are reptiles and amphibians, and 42 are mammals. The refuge supports wildlife species which are important from both a regional and a national standpoint. Its large size and dense vegetation makes the refuge a haven for species which avoid man, such as the black bear. Also, the refuge harbors many species adapted to living in unaltered forests as opposed to disturbed areas such as field edges. Alligator River NWR also lies at or near the northern limit of several terrestrial vertebrate species. Wildlife using the refuge includes a variety of mammals, fish, perching birds, waterfowl, reptiles, and amphibians.

a. Fish

The fisheries on and surrounding Alligator River NWR are diverse and productive. The refuge's interior lakes and streams support species characteristic of blackwater or oligohaline systems. The fish which inhabit the refuge include resident species, migratory species, anadromous species, and one catadromous species.

Resident species such as gar, white and yellow perch, a variety of sunfish, and catfish inhabit the blackwater streams and lakes of the refuge. They also utilize the open water of Alligator River NWR and the sounds for spawning, nursery, and foraging habitat. These resident species provide a large portion of the diet of migratory and anadromous species which are important to both sport and commercial fishermen.

Migratory species use the refuge's estuaries as spawning grounds and its surrounding waters as a nursery area. Alligator River and Milltail Creek are particularly productive in the early spring and summer when they are filled with young fish. Migratory species which use the refuge include Atlantic croaker, spot, Atlantic menhaden, and the southern and summer flounders. Most of these species are commercially harvested elsewhere.

Anadromous species are those which spawn in the refuge's freshwater streams and estuary, inhabit these areas as juveniles, mature offshore, and return to these streams to spawn as adults. Alligator River, Milltail, and Whipping Creeks are used heavily by these species, which include striped bass, alewife, and blueback herring. The mouth of Alligator River serves as an important wintering area for sexually immature female striped bass. This area is important because the Albemarle Sound population does not make coastal migration as do other Atlantic Coast striped bass populations.

b. Birds

Alligator River NWR provides habitat for a wide variety of birds. Because of the refuge's large size, habitat is provided for forest dwelling species as well as marsh dwelling species.

(1) Waterfowl

Although Alligator River NWR does not have large numbers of waterfowl, as do the surrounding refuges, it is used by waterfowl. Refuge waterfowl primarily

use the open river, marsh, edges, and the South Lake area of the refuge. Northern shoveler, brant, scoters, scaup, old squaw, golden eye, and canvasback make use of the surrounding sounds. Species such as black duck, mallard, pintail, Canada geese, and tundra swans utilize the refuge's marsh areas and the privately owned farm fields within the refuge. Waterfowl breeding on the refuge is limited. Wood ducks are the only breeding waterfowl using the refuge in any numbers. They nest extensively in the swamp forest and in trees along heavily vegetated canal banks.

(2) Breeding Birds

A total of 98 species breed in or near Alligator River NWR. The species which breed on the refuge are characteristic of species which breed and inhabit other coastal plain communities, but Alligator River NWR differs noticeably from other coastal plain areas by having more warblers, especially prothonotary and black-throated green warblers; and fewer nuthatches, thrashers, and blue-gray gnat catchers. The refuge is especially rich in woodpecker species. Woodpeckers such as the endangered red-cockaded woodpecker and the large pileated woodpecker inhabit and breed on the refuge.

The red-cockaded woodpecker utilizes the refuge's stand of loblolly and pond pines. They use these trees for nest cavity trees and their forests for foraging habitat. The woodpeckers prefer trees no younger than 30 to 40 years old, alive, and infected with red-heart fungus.

Although great blue herons are present, no breeding colonies have been documented on the refuge. Cattle and great egrets also utilize the refuge but no nests have been documented.

(3) Overwintering Birds

Alligator River NWR contains 39 permanent resident species as well as 34 which are strictly winter residents or visitors. The most common winter species are usually the American robin, myrtle warbler, common grackle, and the red-winged blackbird.

The robins feed heavily on berries of redbay and greenbrier. They usually roost in large concentrations in the Whipping Creek area.

Myrtle warblers utilize the low-shrub pocosins, vegetated canal banks, and forest edges. They feed on bayberry and wax myrtle berries.

Common grackles and red-winged blackbirds overwinter primarily near the private agriculture fields within the refuge. They are also heavily concentrated on the refuge near the East Lake landfill.

Mourning doves and crows winter on the refuge in smaller numbers making use of the farm fields. The American kestrel and the red-tailed hawk prey in the open areas of the refuge, while the northern harrier hunts over the marshes, fields, and low shrub pocosins.

(4) Transient Species

Alligator River NWR lies in the path of the Atlantic Flyway, a major migration route. The refuge provides resting and foraging areas for many migrant species which overwinter farther south. The refuge also provides resting and foraging habitat to nocturnally migrating, diurnally feeding birds. Species which migrate through the refuge during the fall include blue-winged teal; raptors such as the broad-winged hawk, peregrine falcon, and merlin; numerous shorebirds; and a variety of perching birds, such as the western kingbird, bank swallow, veery, Swainson's thrush; yellow, magnolia, Cape May, black-throated blue, blackpool, and palm warblers; bobolink; northern oriole; and rose-breasted grosbeak.

Federally listed endangered birds which use the refuge include the bald eagle, the peregrine falcon, the Kirtland's warbler, and possibly the Bachman's warbler, which may occur as a rare transient on the refuge.

c. Mammals

There are at least 24 species of mammals which inhabit the refuge. The diversity of mammals found on the refuge is intermediate between the low diversities of the barrier islands near the refuge and the high diversity of the Dismal Swamp. Species such as the southeastern shrew,

river otter, long-tailed weasel, raccoon, marsh rabbit, and white-tailed deer are present. Alligator River NWR provides habitat for species like black bear and bobcat which need large tracts of undisturbed land away from man.

(1) Black Bear

Alligator River NWR is one of the few remaining coastal areas in the southeastern United States which harbors a black bear population. In 1975 the black bear was given "special concern" status in North Carolina. Because of the increasing conversion of forested wetlands to farmland in the area, the refuge's population of black bear is especially important. Black bear utilize all of the major cover types on the refuge, and they prefer the diverse and dense habitats located in roadless areas.

(2) White-tailed Deer

Alligator River NWR supports a sizeable white-tailed deer population. Deer are found in huntable numbers in practically all refuge habitats, even the wetter short pocosin areas.

The white-tailed deer is the most sought after game species on the refuge. Hunters make extensive use of the refuge and its roads in pursuit of deer.

(3) Furbearers

Alligator River NWR provides habitat for important furbearing species such as bobcat, otter, mink, gray and red fox, muskrat, and raccoon. Raccoon, muskrat, otter, and mink make extensive use of the canals and streams which run through the refuge. The gray fox does not penetrate very deeply into the unmodified areas of the refuge, but it does make good use of the edges, feeding on small mammals as well as blackberries and other fruits.

The bobcat is a fairly common predator on the refuge. They are not abundant along the edges of pocosin areas and in swamp forests, but they may be found through the refuge because of the presence of the marsh rabbit, the bobcat's main prey.

In addition to the previous mammals mentioned, the refuge supports healthy populations of gray squirrels, marsh rabbits, opossum, and numerous species of small mammals.

(d) Reptiles and Amphibians

Alligator River NWR harbors at least 48 and possibly 50 reptilian and amphibian species. Reptiles are most numerous and diverse around permanent and semi-permanent open water, like creeks, lakes, and canals. They also thrive in disturbed or modified/transitional areas. Some of the species which inhabit the area are the brown, banded, and red belly water snake; common snapping, redbelly and eastern painted turtles; and the southern leopard frog and venomous cottonmouth moccasin also inhabit these areas.

Amphibians make extensive use of the refuge's canals, ditches, and other aquatic areas. They are also concentrated in the small marshes throughout the refuge.

(1) American Alligator

Alligator River NWR is the northern extent of the American alligator's range in North America. This endangered reptile occurs in many of the refuge's marshes and slow-moving streams. They prefer areas where water turbidity is low and water quality is high. Milltail Creek Lake and Whipping Creek usually provide prime alligator habitat. Alligators are also frequently observed in refuge canals.

C. Human Environment

1. Cultural Resources

Alligator River NWR and the surrounding area was first inhabited by native Indians. In 1586 the sounds surrounding the refuge were explored by Sir Walter Raleigh's colonists under the leadership of Ralph Lane. Although the first attempt at English settlement was made on nearby Roanoke Island in 1587, no large settlement by whites was established in the refuge area until a community called Beechlands was established in the late 1700s or early 1800s. The settlement was located on Milltail Creek. Slave labor dug a canal to the Alligator River from Beechlands, and a 5,000-acre tract was planted with corn and tobacco. Cattle also roamed 25,000 acres of reedlands. For reasons uncertain, the settlement disappeared before the Civil War.

In 1885 three lumbermen from Buffalo, New York, purchased 168,000 acres of Dare County's mainland to set up a lumber industry and a camp. This business became known as the Dare Lumber Company, and their settlement was known as Buffalo City.

At its peak, the community contained 50 houses, 2 hotels, a store, a street, and a post office, all located near Milltail Creek. Approximately 600 people were employed in the pulp mill. The Dare Lumber Company eventually went bankrupt. After the land changed owners several times over the years, it eventually was obtained by the West Virginia Pulp and Paper Company. In 1974 the land was sold to Malcom McLean of McLean Industries in a large farming experiment called First Colony Farms. Prudential Life Insurance Company formed a partnership with McLean Industries and formed the Prulean Corporation. In 1984 Prudential Life Insurance Company obtained all of the Prulean Corporation land as well as some of First Colony Farms land and then donated over 118,000 acres of its holdings to the U.S. Fish and Wildlife Service.

To date there have been no documented archeological studies done on the land encompassed by the Alligator River NWR. On nearby Roanoke Island is located the National Park Service Group Headquarters for Cape Hatteras National Seashore, Fort Raleigh National Historic Site, and Wright Brothers National Monument. Also located in Dare County are Jockey's Ridge State Park, the Elizabeth II State Historic Site, the North Carolina Marine Resources Center, Nags Head Woods Ecological Preserve, and Pea Island NWR, which is administered by the Alligator River NWR office.

2. Population Trends and Composition

Most of the area encompassed by the Alligator River NWR falls within the mainland section of Dare County, North Carolina. The county itself is divided by the fact that the barrier island beaches and historic Roanoke Island attract a large number of tourists to the area, while the mainland portion of the county is virtually tourist-free. Visitors coming into the county from the west drive through the refuge; most other visitors are unlikely to realize such an area even exists.

Mainland Dare County's population is somewhat stable in comparison to the island portions of the county. Approximately 1,450 people live on the mainland portions. The total year-round (permanent) population of Dare County in 1985 was approximately 20,000. Summer population peaked at approximately 130,000. Annual population increases for the county are expected to be approximately 5 percent.

Of special significance is the remote character of the mainland portion of Dare County, yet just 65 air miles northward is the expanding urban complex of Norfolk-Virginia Beach, Virginia. Other urban areas within an easy one-day drive are such cities as Raleigh, Durham, Greenville, Elizabeth City, and Wilmington,

North Carolina, as well as Richmond, Virginia, and the Washington, D.C. complex including adjacent communities in Maryland and Virginia.

3. Sociocultural Systems

Until slightly over a decade ago, most of the permanent residents of Dare County were natives. Attitudes toward non-natives were typically suspicious. With the population spurt, migration into the county caused the native to non-native ratio to skew. At this point a majority of the permanent residents are non-native.

The shift in the population make-up has changed the general composition of various factors, including education level and income level. Average family income in 1985 was \$16,000 to \$20,000 per year, which approximately doubles the 1978 figures.

4. Economic Conditions

As the county population grows and tourism becomes greater each year, the economic conditions change. Historically, commercial fishing has been the major source of income for many local families. Today, Dare County's economy is based primarily on the tourist industry. Approximately 50 percent of the basic employment in Dare County can be attributed to the tourist industry.

Agriculture is minimal and confined to the mainland portions of the county (primarily the First Colony Farms area). Minerals are not produced. Marine resources are still important, but many catches from waters off Dare County are landed elsewhere. Commercial fishing has declined in importance with increased employment opportunities in construction, tourism, and government. The National Park Service employs 95 people year-round.

5. Public Use

There are numerous opportunities for recreational, interpretive, and educational activities within the county. These activities are both land and water based, with a number being water oriented. There are several marinas that offer opportunities for recreational boating and sport fishing. Many boat ramps are available for launching private boats; boat rentals and charter trips are also available.

Dare County has often been described as a sportsman's paradise. In addition to fishing, hunting opportunities abound. Historically, deer hunting with dogs has been a popular activity on the refuge.

The majority of organized outdoor recreational, interpretive, and educational activities offered in the county are through Pea Island NWR, the National Park Service, or the North Carolina Marine Resources Center on Roanoke Island.

Visitors flock to the county each year for beachcombing, sunning, surfing, swimming, fishing, boating, sailing, history and nature study, bird watching, attending interpretive programs, photography, watching the surf, or simply loafing on the beach.

On the refuge, primary public use activities include hunting, fishing, and trapping. Also included, but to a much lesser extent, are wildlife observation, photography, and other non-consumptive activities. Again, a historically popular activity is deer hunting with dogs.

6. Existing Facilities

Currently, the North Carolina Wildlife Resources Commission maintains three boating access areas within the boundaries of the refuge. Several other unimproved boat "ramps" are utilized frequently. A network of logging roads with associated bridges, culverts, etc., totalling approximately 60 miles, currently exist also. Two privately owned hunting camps exist on refuge land; the FWS is currently in the process of purchasing these camps. One water control structure has been installed since the land has been in Federal ownership.

IV. ENVIRONMENTAL CONSEQUENCES

This section discusses the impacts of the three alternatives on the environments highlighted in Section III.

A. Alternative 1: No Action

Because this species is extirpated from in the wild, a finding of "no action" obviously would not impact any environment. There would be no ecological or sociological changes to the present situation, in which red wolves play no role in any natural ecosystem. The red wolves presently in captivity and their future offspring would remain as captive animals, maintained for public education purposes and future conservation efforts. The FWS would continue its involvement in red wolf captive breeding programs and would encourage private institutions do the same.

B. Alternative 2: Establish Island Populations

Sites selected for island releases would have to have certain characteristics that reduce unintentional yet direct human/wolf interactions. These include extreme remoteness and limited human ingress. Such island areas would ideally be found within the National Wildlife Refuge System or the National Park System. Communities located in close proximity to these island refuges would be typically separated by water and difficult marsh terrain. The secretive and shy nature of the red wolf, coupled with the potentials of state-of-the-art telemetry and capture collar technology, would make wolf/human conflicts rare occurrences. Based on experiences gained from the Bulls Island/Cape Romain NWR red wolf project in 1978, on-going refuge programs, such as deer hunting on the island, bird watching, etc., would continue without any restriction. Environmental consequences of this alternative action are discussed as follows:

1. Biological Factors

The successful release of four timber wolves on Coronation Island in southeast Alaska in 1960, and the one-year experimental release of a pair of red wolves on Bulls Island/Cape Romain NWR, South Carolina, both offer strong evidence that such releases are biologically feasible. Under this alternative, the FWS would identify those islands within the refuge system or National Park system that offer the greatest promise of long-term success. This particular alternative would require considerable logistic support in light of the four to five disjunct populations involved and eventually would require the trapping and moving of offspring from one island to another to enhance genetic vigor and reduce problems of inbreeding. The absence of feral dogs and

coyotes on these islands is considered highly desirable. An adequate prey base would have to be assured for the stocked wolves and their immediate offspring.

2. Physical Factors

Realistically, there are few islands of the size and remoteness needed for successful execution of this alternative. It is thought that about 10,000 to 15,000 acres are needed by a pair of red wolves to duplicate mainland conditions. While highly variable, this figure assumes an abundant prey base. Therefore, islands of about 20,000 acres in size would be considered as adequate for a project such as this. Islands that have substantial water barriers obviously would be preferred, and ownership by the Federal government or perhaps by the State, are prerequisite requirements. Physical features of suitable islands would require elevations sufficient to avoid inundation during high storm surges, such as during hurricanes. Abundant, year-round fresh water supply is essential.

3. Socioeconomic Factors

a. Public Use

The very nature of islands suitable for a red wolf reintroduction rules out intensive public use. It is anticipated that such uses as public hunting and traditional non-consumptive wildlife uses would not be precluded by the presence of a small red wolf population. The very presence of the wolves in a wild but physically restricted environment will attract public interest and in many cases could become a management factor on the islands. This would emanate from hikers, campers, and wilderness lovers who would travel long distances to chance hearing or even seeing a wild red wolf.

b. Economy

The presence of a small number of endangered red wolves on a number of islands would likely bring added revenues to local communities through enhanced visitor usage. Such wolf-oriented usage would include listening to and/or recording animal sounds, viewing, photographing, sketching, or painting animals, studying animal behavior and relationships, seeking signs of an animal's presence, making casts of wolf tracks, or simply being on an island where wild wolves occur. The proximity of large urban areas throughout the southeast, and the attendant projected growth of these areas, can only serve to heighten public interest and participation in such projects as this alternative.

c. Land Use

Because the islands that would be considered in this alternative are administered as national wildlife refuges or national parks, land usage over the foreseeable future would be compatible with a red wolf reintroduction project.

C. Alternative 3: Establish Mainland Population at Alligator River NWR (Proposed Action)

A consideration of a mainland site for red wolf releases obviously brings certain powerful selective factors into focus that probably would not be identified with offshore islands along southeastern coastal areas. These factors include large acreages, the possible amount and extent of private in-holdings, projected and existing land usages adjacent to the mainland site, accessibility (major highways), and last but not probably most important, the proximity of urban areas and numbers of people living in and adjacent to the site in question. In view of the complexities presented by these factors, emphasis on mainland sites should be early-on directed toward large Federal ownerships, preferably National Wildlife Refuge System and National Park Service lands. Environmental consequences of this alternative action are discussed as follows:

1. Biological Factors

Reintroduction of mated pairs of red wolves into large, unconfined mainland sites would permit the operation of natural selection in a wild ecosystem to shape the genetic makeup of the red wolf population in the long term. This in turn would "control" the resulting population and eventually bring on the genetic heterozygosity that this species desperately needs. Only through this process can a population truly become wild and self-sustaining and thus satisfy the long-range objectives of the recovery plan.

Based on known home range requirements, the establishment of a limited, free-roaming red wolf population would require a minimum land area of about 225 square miles (144,000 acres). The configuration of the area, drainage and topography, distribution and abundance of prey species, and likely travel routes that the animals will utilize will determine more precisely the maximum population that any particular area can sustain. It is thought, however, that an area of 225 square miles could support 20 to 30 animals.

Other biological factors that would have to be considered in a mainland site would be the presence of feral and wild canids. Coyote/red wolf interbreeding became a factor in the eventual demise of that last remaining population of wolves in Louisiana and Texas after the red wolf population structure had been broken down by human take and habitat changes. The absence of coyotes

would be of importance. However, canid experts also agree that once a red wolf population is established, other wild canids, such as coyotes, will honor or "respect" the home range established by respective wolf family groups, diminishing the threat of hybridization.

Abundance of an adequate prey base is obviously critical to a successful reintroduction, whether on islands or on the mainland. Historical large and small mammal surveys and hunter interviews, on-site inspections that include track and scat counts, call surveys, and actual trapping of small mammals on designated survey routes are all techniques that yield valuable information as to prey composition and abundance.

A mainland introduction of red wolves would likely have several positive biological impacts. First, it is reasonable to expect that a managed predator population will produce an improved huntable wildlife community of prey species that are healthier, perhaps somewhat larger animals that are freer of deformities, disease, and parasites. Secondly, studies conducted on the gray wolf strongly indicate that coyotes avoid areas inhabited by a well-developed red wolf population structure.

b. Economy

As could be expected with island populations of red wolves, reintroduced mainland populations would also probably attract wide public attention. This might be enhanced with a mainland site since ease of access and physical size would likely make such attention more visitor-use oriented. The Algonquin Provincial Park, Ontario, Canada, is 182 miles from Ottawa and 160 miles from Toronto, and the gray wolves present in this park serve a major tourist attraction.

Such visitor interest will undoubtedly enhance the economy of communities adjacent to a mainland reintroduction site. This will be reflected in increased revenues for motels, campgrounds, eating facilities, and related businesses. The Algonquin Park data indicates most visitor use occurs during the fall/winter period when wolf howling is most common and traditional visitor usage is minimal.

The red wolf is not expected to enter into commercial production or to compete with any species which are harvested for commercial use. It is not expected to become a game species or to compete with presently taken game species either for a portion of the user day or for a portion of the habitat that supports such species.

c. Land Use

Because the mainland sites that would be considered for a red wolf reintroduction are administered as national wildlife refuges and national parks, land usage over the foreseeable future would be compatible with a red wolf reintroduction project. The presence of the protected red wolf on such lands would not negate on-going, proven land management practices, such as timber harvesting, burning, access and trail development, or public fishing and hunting. It has also been determined that the presence of red wolves on any adjacent Federal lands will not curtail or alter dedicated, on-going usages of those lands [see Section 10(j) of the Endangered Species Act].

V. LIST OF PREPARERS

The following is a presentation of persons who contributed to the preparation of this environmental assessment.

A. Primary Preparers

WARREN T. PARKER, Supervisory Fish and Wildlife Biologist
U.S. Fish and Wildlife Service
Asheville, North Carolina

Mr. Parker began his career with the Fish and Wildlife Service on the Savannah National Wildlife Refuge in 1958. In 1960 he accepted a position as a wildlife biologist in the Vicksburg, Mississippi, River Basin Studies Office; transferred in 1964 to the Tulsa, Oklahoma, River Basin Studies Office; and in 1967 came into the Atlanta Regional Office. There he worked in the Federal Aid program as PR research biologist until 1977 when he came to Asheville, North Carolina, as the Endangered Species Coordinator in the Asheville Area Office. In 1982 he became the Supervisor of the Endangered Species Field Station. His prior work has included extensive studies on deer and waterfowl management projects in the southeastern states. He presently is the Coordinator and overall Project Leader for the red wolf reintroduction program.

Education

1976 - Virginia Polytechnic Institute and State University,
Blacksburg, Virginia
M.S. Wildlife Management

1958 - North Carolina State University, Raleigh, North Carolina
B.S. Wildlife Management

B. Cooperators

Portions of the data presented in this report were taken from the Draft Refuge Master Plan developed for the Alligator River National Wildlife Refuge. The North Carolina Wildlife Resources Commission and the North Carolina Museum of Natural History provided valuable technical assistance.

VI. PRINCIPAL SOURCES OF INFORMATION

- Carley, C.J. and J.L. Mechler. Warren T. Parker, ed. 1983. An experimental reestablishment of red wolves (Canis rufus) on the Tennessee Valley Authority's Land Between the Lakes. USFWS Report. Asheville, North Carolina. 71 pp.
- Clark, Mary K., David S. Lee, and John B. Funderburg, Jr. 1985. The Mammal Fauna of Carolina Bays, Pocosins, and Associated Communities in North Carolina: An Overview. North Carolina State Museum of Natural History. 38 pp.
- Nowak, R.M. 1972. The mysterious wolf of the south. Nat. Hist. 81:51-53. Pp. 74-77.
- Parker, Warren T. 1986. Proposed Reintroduction of the Red Wolf to the Alligator River National Wildlife Refuge. U.S. Fish and Wildlife Service, Asheville, North Carolina. 20 pp.
- Peterson, David W., George R. Abraham, Joe Herring, Mary Anne Young. Warren T. Parker, ed. 1984. Red Wolf Recovery Plan. U.S. Fish and Wildlife Service, Atlanta, Georgia. 37 pp.
- Potter, Eloise F. 1982. A survey of the Vertebrate Fauna of Mainland Dare County, North Carolina. North Carolina Biological Survey. Raleigh, North Carolina. 84 pp.
- U.S. Fish and Wildlife Service. 1986. Draft Master Plan for Alligator River National Wildlife Refuge.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

75 SPRING STREET, S.W.
ATLANTA, GEORGIA 30303

April 23, 1986

MEMORANDUM

TO: Refuge Manager, Alligator River NWR, FWS, Manteo, NC
Endangered Species Field Supervisor, FWS, Asheville, NC

FROM: Regional Director, FWS, Atlanta, GA (AFA/SE)

SUBJECT: Intra-Service Section 7 Consultation, Proposed Red Wolf
Reintroduction, Alligator River NWR, Dare and Tyrrell Counties,
North Carolina (FWS Log No. 4-0-86-022)

This responds to your request of March 13, 1986, for a Section 7 consultation on the subject action relative to the listed red wolf (Canis rufus).

On April 11, 1986, we completed the examination of the above action and reviewed the biological information provided by you along with information available in our files. During the course of this review, Mary Anne Young, Marshall Jones, Bob Cooke, and Gary Henry were contacted.

A review of your project and information obtained indicates that the action proposed involves the reintroduction and reestablishment of the red wolf on Alligator River NWR. Acclimating and releasing up to six mated pairs of animals over a 1-year period with the purpose of developing a self-sustaining population as a first step to enhance the potential for recovery of the species in the wild, and into portions of its historic range.

The species' reproductive vigor in captivity is secured and its survival is biologically assured. However, reestablishment in the wild is the only means by which the red wolf can be preserved as a naturally occurring element of our natural resources. The knowledge and techniques required to accomplish such a task are now available.

Experiments have demonstrated that it is feasible to reestablish adult wild-caught red wolves in selected habitats in the wild. In addition, observations on the species indicate that establishment of captive-reared specimens in wild situations is also feasible. The Alligator River NWR possesses many characteristics that make it a primary candidate for a red wolf reintroduction attempt by providing a large, unconfined mainland site that will allow the establishment of a social structure through natural selection. This should result in a truly wild and self-sustaining population.

No jeopard

FY-87 FIXED COSTS DOCUMENTATION

ENT NAME	ITEM	PP GR	FTE	S A ALLOCATION	LOCATOR-
-----	-----	-- --	---	-----	-----
	DISTRICT 5 TOTALS		0.00	0	0
			0.00	0	
			74.50	2497934	