DRAFT ENVIRONMENTAL ASSESSMENT
FOR
PROPOSED REPLACEMENT OF THE REGULATIONS FOR THE NONESSENTIAL EXPERIMENTAL POPULATION OF RED WOLVES IN NORTHEASTERN NORTH CAROLINA

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CHAPTER 1: INTRODUCTION, PURPOSE AND NEED FOR ACTION

The Department of the Interior, United States Fish and Wildlife Service (USFWS, we, the Service) proposes to address the regulations under section 10(j) of the Endangered Species Act (ESA), which provides for the designation of experimental populations of listed species. Our current 10(j) regulations for the experimental non-essential population of red wolves (*Canis rufus*) in northeastern North Carolina (50 CFR 17.84(c)) were promulgated in 1995. In this draft Environmental Assessment (EA), prepared pursuant to the National Environmental Policy Act (NEPA) of 1969, we analyze the environmental consequences of a range of alternatives, including the Proposed Action and No Action alternative. The final action taken by the Service may be one of the alternatives analyzed herein, or may be derived from elements of the alternatives. The action would be implemented through rule-making under section 10(j) of the ESA.

The Service prepared EAs in conjunction with the initial promulgation of the red wolf section 10(j) regulations and subsequent revisions thereto. In each case, the Service concluded the NEPA process with a finding of no significant impact. We have determined that an EA is the appropriate means of evaluating the effects of the currently proposed action on the human environment because EAs have previously been prepared for such actions.

The Service published an advanced notice of proposed rule-making and notice of intent to prepare a NEPA document on May 23, 2017 (82 FR 23518). This established an early and open process for determining the scope of the issues to be addressed in the NEPA document through soliciting public comments. The scoping public comment period opened with the publishing of the notice of intent and ended on July 24, 2017. During the 60-day comment period, The Service received a total of 12,279 comments. This number includes verbal and written comments submitted in person at two public meetings and online through regulations.gov.

About 90 people attended the two public meetings held on June 6, 2017, at Mattamuskeet High School in Swan Quarter, NC and June 8, 2017, at the Coastal North Carolina National Wildlife Refuges Visitor Center in Manteo, NC. At these events, Service personnel provided an overview of the process for writing a new rule and the public visited with Service personnel and discussed different aspects of red wolf recovery. The public input received in response to the notice and scoping meetings has been reviewed, is incorporated throughout this EA, where appropriate, and was specifically used to help craft the range of alternatives being analyzed.

INTRODUCTION

The Service has been engaged in efforts to conserve and recover the red wolf for over four decades. The primary statute governing the Red Wolf Recovery Program is the ESA. The species was declared extinct in the wild in 1980. The Recovery Program encompasses captive breeding, reintroduction, and all related activities designed to further the conservation of the red wolf. The Red Wolf Species Status Assessment (USFWS 2018a) and the most current Species Status Review (USFWS 2018b) provide a description of the red wolf, a history of red wolf recovery efforts, and the current status of the species. This information is incorporated by reference into this document and will not be restated.

The ESA and regulations at 50 CFR Part 17.81 describe the requirements for establishing experimental populations. The first key requirement in designating an experimental population is that the Service must determine that doing so would further the conservation of the species while considering any possible adverse effects on extant populations of the species as a result of removal of individuals, eggs, or propagules for introduction elsewhere. Because the red wolf was declared extinct in the wild the only extant population is the captive population maintained by a collection of committed partners that manage this population consistent with an established Species Survival Plan (SSP) designed to ensure the captive population remains genetically diverse and robust. Without a secure captive population the Service cannot remove individuals from the captive population to establish experimental populations.

In 1986, a final rule to introduce red wolves onto Alligator River National Wildlife Refuge (NWR), Dare County, North Carolina, was published in the Federal Register (51 FR 41790). Alligator River NWR was chosen due to the absence of coyotes, lack of major livestock operations, and availability of suitable prey species. With the final rule in place, implementation of the reintroduction began. The red wolf experimental population on Alligator River NWR was determined to be a nonessential experimental population (NEP) under section 10(j) of the ESA because the species was not considered to be at risk of extinction due to the existence and full protection of a captive population that at the time consisted of approximately 80 animals. In 1991, a final rule was published in the Federal Register (56 FR 56325) to add Pocosin Lakes NWR and reintroduce red wolves into the Great Smoky Mountains National Park (GSMNP), establishing a second NEP.

The red wolf 10(j) rule was modified again in 1995 (60 FR 18940) to revise and clarify the incidental take provisions and apply those provisions to both reintroduced populations; revise the livestock owner take provisions and apply them to both reintroduced populations; add harassment and take provisions for red wolves on private property; revise and clarify the vaccination and recapture provisions; and apply the same taking (including harassment) provisions to red wolves outside the experimental population areas. These are the regulations that currently govern management of the red wolves in the five counties of eastern North Carolina (50 CFR 17.84(c)). A notice of termination of the red wolf reintroduction project in the GSMNP was published in the Federal Register on October 8, 1998 (63 FR 54151) due to extremely low pup survival and the inability of the red wolves to establish home ranges within the Park.

PREVIOUS ENVIRONMENTAL REVIEW

In 1986 an EA titled Alligator River Refuge: A Red Wolf Reintroduction Proposal, Dare County, North Carolina and Finding of No Significant Impact were prepared by the Service. The Finding allowed the proposed Experimental Population Designation and reintroduction of red wolves to the Alligator River NWR to be implemented.

REINTRODUCTION EFFORTS

Island Sites

The first reintroduction experiment took place in 1976, when a wild caught pair of red wolves was released onto Bulls Island at Cape Romain NWR in South Carolina. The pair was released into an acclimation pen for 40 days and then released on the island for nine days before being recaptured (USFWS 1990). The purpose of the release was to test management and public information approaches. Another pair was released on the island, first into a pen for six months, fed local prey species, and then released onto Cape Romain NWR. They remained for eight months and were recaptured based on the original purpose of the experiments – to gain data to inform the reintroduction effort (USFWS 1990).

In January 1989, the Service released a pair of red wolves on Horn Island, Mississippi in order to gain information on management techniques, the biology of red wolves, and to study predator-prey relationships. The island appeared to be an excellent place to rear and study red wolves as they adapted to the habitat and roamed large portions of the island. However, a series of incidents and deaths created challenges and shortfalls in the study. Study efforts on Horn Island ended in 1998.

In 1990, the Service implemented an island propagation site on St. Vincent NWR (an island off the Gulf Coast of Florida) to aid in the recovery of the red wolf. The role of this site toward recovery of the red wolf is to propagate pups in a somewhat controlled, but natural environment that would provide them "wild experience" as juveniles for the purpose of being released into experimental populations, such as the North Carolina NEP (NC NEP). Today, the St. Vincent Island site is active and currently supports one red wolf pair. However, Cape Romain NWR continues to be a part of the red wolf SSP and currently houses four captive red wolves at the Sewee Center for education and outreach purposes.

Great Smoky Mountains National Park

On November 12, 1991, the Service, in cooperation with the National Park Service, experimentally released a single family group (two adults, two pups) of red wolves in the GSMNP, Tennessee. This release was designed to assess the feasibility of establishing a self-sustaining red wolf population on National Park Service lands and surrounding U.S. Forest Service property. The initial experimental release ended in September 1992, and proved the feasibility of reintroducing red wolves in the Park. A total of 37 red wolves were released into the Park from 1992 through 1996. Of the 37 released red wolves, 26 later died or were recaptured after straying onto private lands outside the Park. Of the 30 wild-born pups from seven litters, only two pups removed from the wild at 6 months of age are known to have survived. As a result of low prey availability, extremely low pup survival, disease, and the inability of red wolves to maintain stable territories within the Park, the Service and the National Park Service announced a joint decision to end the reintroduction effort in the Park on October 8, 1998 (63 FR 54151).

Northeastern North Carolina

In 1986, a final rule to introduce red wolves onto the Refuge was published in the Federal Register (51 FR 41790). Dare, Tyrrell, Hyde and Washington counties were also included within the experimental population area. The rule specified that 8 to 12 red wolves would initially be released on the Refuge. It further specified that released red wolves would be maintained on the Refuge and the Dare County Bombing Range, and that red wolves that left these federal lands would be captured and returned. Alligator River NWR was chosen due to the absence of coyotes at the time, lack of livestock operations, and availability of prey species.

On September 14, 1987, the Service released four male-female pairs onto the Refuge. From September 14, 1987 through September 30, 1992, 42 red wolves were released on 15 occasions. At least 22 red wolves were born in the wild during the first five years of this reintroduction effort. A review of the first five years to reestablish red wolves in the NC NEP area was included in the revision of the special rule published on April 13, 1995 (60 FR 18940).

As stated in the five-year program evaluation (60 FR 18940), by almost every measure, the first five years of the reintroduction proved successful and generated benefits that extended beyond the immediate preservation of red wolves to positively affect larger conservation efforts, and other imperiled species. Several conclusions were reached during this time period, the first being the successful re-establishment of a population of red wolves was possible in a controlled manner and that land use restrictions are not necessary. However, it was also obvious that the original reintroduction area, restricted to the approximately 250,000 acres within the Alligator River NWR and the Dare County Bombing Range, was too small to support more than 30 red wolves. Red wolves frequently left the NWR and established territories on adjacent private lands.

In 1991, the geographic boundary of the NEP was expanded to include the Pocosin Lakes NWR in North Carolina with an area covering approximately 112,000 acres (56 FR 56325). The 10(j) rule was last revised in 1995 (60 FR 18940). The Service amended the special rule for the nonessential experimental populations of red wolves in North Carolina and Tennessee to: revise and clarify the incidental take provision; revise the livestock owner take provision; add harassment and take provisions for red wolves on private property; revise and clarify the vaccination and recapture provision; and apply the same taking (including harassment) provisions to red wolves outside the experimental population area, except for reporting requirements. The current NC NEP, encompasses 1.7 million acres in five counties (Beaufort, Dare, Hyde, Tyrrell, and Washington) on the Albemarle Peninsula and includes federal, state, and private lands (Figure 1).

Today, the NC NEP is the only known population of red wolves in the wild. All other individuals of this species are found in captive facilities around the country that are part of the Red Wolf Species Survival Plan (SSP or captive population), including the one remaining island propagation site at St. Vincent NWR.

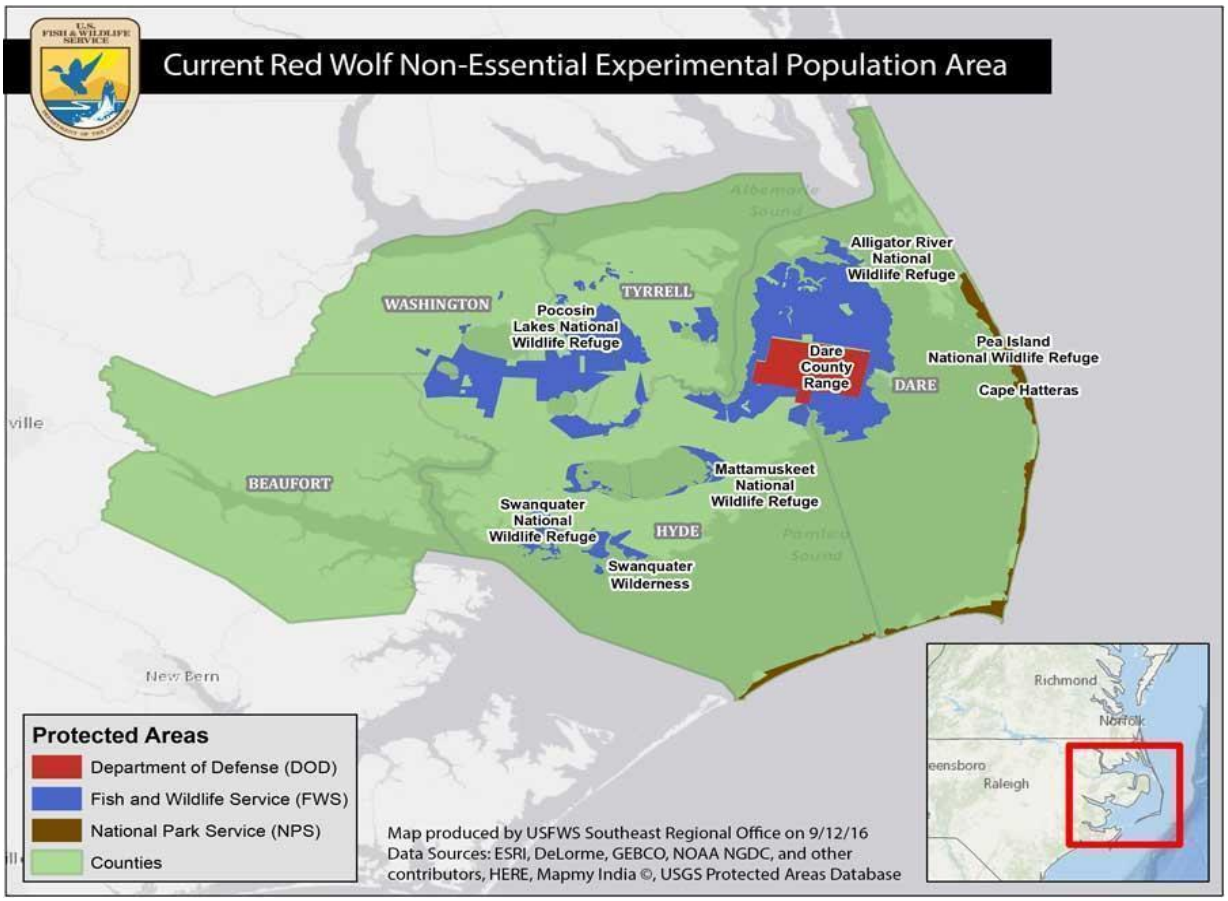

Figure 1. Geographic boundaries for the current nonessential experimental population of the red wolf.

FACTORS AFFECTING RED WOLF CONSERVATION

This section of the EA focuses on human intolerance and coyote interactions. Aggressive predator control efforts and habitat modification are believed to be primary factors that drove red wolves from nearly all of their historic range to the brink of extinction by the late 1960s. The second factor is the ability of different canid (members of the genus *Canis* including wolves, coyotes, jackals, and domestic dogs) species to interbreed. Once human persecution had driven red wolf populations to very low levels, hybridization between red wolves and coyotes threatened to compromise the remaining red wolf genome. It was this threat that led to the decision to remove the last remaining known red wolves from the wild and establish a captive population. Following the first red wolf releases in 1986 the red wolf population on the Albemarle Peninsula grew steadily. However, by the mid-1990s the range of the coyote had expanded across the eastern United States and into eastern North Carolina. As coyotes became established in the experimental population area hybridization between red wolves and coyotes began to occur (Kelly et al. 1999). By 1999, this was once again recognized as an existential threat to the red wolf in the wild.

Managing Hybridization

Conservation of the red wolf gene pool and associated genetic fitness are primary concerns of the Red Wolf Recovery Program and SSP (USFWS 1990). The red wolf captive breeding program began with 14 founders. With very small populations, survival can be affected by genetic drift (random loss of genetic diversity) and inbreeding depression (i.e., increased genetic homozygosity and subsequent expression of deleterious genes). These concerns are compounded by the threat to red wolves posed by hybridization between red wolves and coyotes.

The Red Wolf Recovery Plan (USFWS 1990) set a target for gene diversity to be retained at 80 – 85 percent over 150 years. This target was based on an evaluation that indicated a population consisting of 320 captive animals and 220 wild animals could maintain this level of the genetic diversity from the founding population of 14 animals (USFWS 1990). The more recent Red Wolf Population Viability Assessment (PVA) (Faust et al., 2016; Simonis et al. 2017) used data collected throughout the history of the red wolf recovery effort to model the genetic health and viability of the species under a wide variety of potential management scenarios. Under all the potential management scenarios modeled in the Red Wolf PVA the median gene diversity was predicted to be greater than 80 percent at Year 2140 (Simonis et al. 2017). Based on these data, the Service can conclude that with no changes to current management the captive population is at increased risk of declining genetic variability. Therefore, the Service recommends addressing this risk not only through the active population management within the SSP but also by increasing breeding and the number of captive animals to ensure genetic diversity is maintained and long-term viability achieved. As such, the Service is considering a goal of expanding the captive population to at least 400 animals and 52 breeding pairs. However, this goal will continue to be refined as new information becomes available and recovery targets are identified.

The Red Wolf Adaptive Management Work Plan (RWAMWP) (Kelly 2000, Rabon et al. 2013) was developed to: (1) reduce interbreeding between red wolves and coyotes to a level that does not threaten the long term genetic integrity of the red wolf in the wild; and (2) build and maintain the wild red wolf population from east to west in the NC NEP area. The Service incorporated much of the RWAMWP recommendations as standard operating procedures for our management strategies from 2000 to 2014. Therefore, formalizing continued use of the RWAMWP is part of the proposed 10(j) alternatives.

The RWAMWP work plan employed techniques designed to use coyotes and hybrids as "placeholders" by sterilizing hormonally-intact animals via vasectomy and tubal ligation, and then releasing the sterile animals back into their territory (Bromley and Gese 2001). "Placeholder" coyotes would not interbreed with wild red wolves, and they exclude other coyotes or hybrids from the territory they hold. Early models (Hedrick 2001) and subsequent field experience and research (Gese et al. 2015, Gese and Terletzky 2015) also showed that sterile hybrids can function as effective "placeholders" until they are replaced by wild red wolves.

Under RWAMWP, the Service delineated geographic zones within the existing NC NEP boundary with a gradient on the level of red wolf management among the zones. The NC NEP was split into three separate management zones of: Zone 1 - Preclusion Zone; Zone 2 - Transition Zone; and, Zone 3 - Dispersal Zone. In general, management efforts are most focused

on Zone 1, followed by Zone 2 and then Zone 3 as time and resources allowed. The goal of the framework is designed to control hybridization between red wolves and coyotes, while efforts to restore red wolves continue.

In general, the management strategies for the three geographic zones adopted many of the monitoring activities that had occurred throughout the history of the reintroduction and incorporated additional measures as follows:

Zone 1 - Preclusion Zone: The objective is to actively promote and maintain red wolf/red wolf pairs and prevent hybridization by:

- Euthanizing coyotes, except when needed as sterilized placeholders outside of red wolf territories or for temporary sterilized coyotes to prevent hybridization.
- Monitoring hybridization events;
- Euthanizing all hybrids;

Zone 2 - Transition Zone: The objective is to work toward red wolf/red wolf pairs and reduce the chance of hybridization by:

- Using sterilization of coyotes paired with red wolves to prevent hybridization, primarily where red wolf pairs cannot be formed due to the lack of available red wolves or due to limited management resources;
- Opportunistically removing coyote and hybrid litters.

Zone 3 - Dispersal Zone: The objective is to monitor and record red wolf pair formations and red wolf territories, particularly newly created territories by:

- Monitoring and recording displacement and/or mortality of any radio-collared coyotes;
- Sterilizing coyotes in this zone when they are found to be paired with a red wolf to prevent hybridization;
- Opportunistically removing hybrid litters.

Simulation modeling by Fredrickson and Hedrick (2006) confirmed that the sterilization method used is effective, but also emphasized long-term reproductive barriers are important, especially assortative mating and red wolf challenges to coyotes or hybrids.

Implementation of the RWAMWP is deemed necessary to effectively establish and maintain a red wolf population. The red wolf is considered a conservation-reliant species (Carroll et al. 2014; USFWS 2016). Whether or to what extent the measures identified in the RWAMWP must be sustained in perpetuity, or if a red wolf population can eventually achieve a state of health where some or all of the RWAMWP measures are no longer needed, is unclear.

Managing Red Wolf-Human Interactions

As stated above, the other primary threat to the survival and recovery of the red wolf in the wild is human intolerance of wolves. The Service's 1986 10(j) regulations attempted to foster tolerance of red wolves and red wolf recovery efforts by maintaining red wolves on federal lands. Red wolves began to leave the Alligator River NWR and occupy private lands within a few months of reintroduction efforts. As a result of this, the Service entered into agreements with private landowners and added the Pocosin Lakes NWR as part of the reintroduction area in

1991. The Service's 1995 revisions to the regulations attempted to promote coexistence with red wolves and cooperation with red wolf management practices through a system whereby the Service would remove red wolves from lands where they were not welcome or provide take authorization.

In the mid-2000s, interest in coyote control began to rise throughout North Carolina. According to data from the North Carolina Wildlife Resources Commission (NCWRC) (2012), the harvest of coyotes by trappers in North Carolina Coastal Plain counties increased dramatically from 2 coyotes during the 2003-2004 trapping season to 1,100 in the 2010-2011 season. Since then, the NCWRC biannual Furbearer Management Newsletters indicate that number has increased to 2,773 coyotes taken by trappers during the 2015-2016 trapping season. Similarly, hunters took an estimated 4,045 coyotes in the Coastal Plain counties during the 2007-2008 hunting season (the first year such statistics were collected in North Carolina) compared to an estimated 10,261 coyotes taken during the 2010-2011 season. According to information in the NCWRC Draft Coyote Management Plan (2018), these numbers have since fluctuated, increasing to more than 20,000 during the 2015-2016 hunting season, then dropping to around 11,000 during the 2016-2017 hunting season.

As more landowners pursued lethal control of coyotes the Service began to observe an increase in human-related red wolf mortality, which resulted in a leveling off or slight reduction in the overall red wolf NC NEP population (Hinton et al. 2017b), and a noticeable reduction in the number of breeding pairs and reproductive output. See Table 1 for the estimated number of red wolf breeding pairs and litters produced in the NC NEP per year over the last 11 years. 2006-2007 and 2016-2017.

Table 1. Estimated number of breeding pairs and litters produced per breeding season (USFWS, unpublished data).

Breeding Season	Breeding Pairs	Litters Produced
2006-2007	20	11
2007-2008	18	11
2008-2009	15	11
2009-2010	15	9
2010-2011	16	10
2011-2012	17	9
2012-2013	13	7
2013-2014	8	5

2014-2015	6	2
2015-2016	4	1
2016-2017	4	2

In order of effect from greatest to least, sources of red wolf mortality include gunshot, vehicle collision, health-related causes, intraspecific strife, private trapping, management actions, suspected illegal activity and poison (Figure 2; Hinton et al. 2017b). The proportion of mortality attributed to anthropogenic causes and specifically gunshot mortality has increased significantly over time (Hinton et al. 2017b). Based on an analysis of all known red wolf mortalities between 2000 and 2013, Hinton et al. (2017b) determined that 42 percent of all identified causes of death were as a result of gunshots and the annual proportion of red wolf deaths caused by gunshot increased from approximately 25 percent to 60 percent during that time frame. Gunshot mortalities of red wolves, particularly of part of a breeding pair, are directly related to increases in red wolf breeding pair disbandment, disruption of established wolf packs and facilitation of coyote encroachment and potential hybridization (Sparkman et al. 2011, Bohling and Waits 2015, Hinton et al. 2015) leading to population decline within the NC NEP (Hinton et al. 2017b).

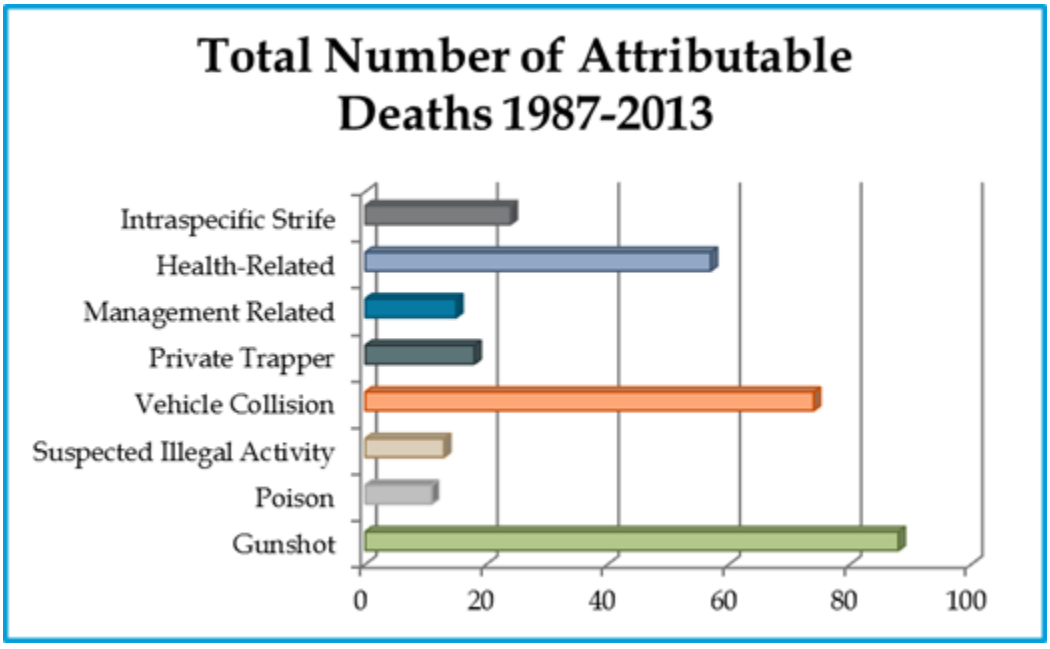

Figure 2. Mortality sources of red wolves in the NC NEP from 1987-2013 (Adapted from Hinton et al. 2017b).

Recent research has revealed a complex dynamic between coyote introgression and anthropogenic mortality in the NC NEP on the Albemarle Peninsula. Based on the analysis of all known red wolf breeding and hybridization events from 2001 to 2013, there were over four times the number of red wolf litters compared with hybrid litters, and over half of the hybridization events occurred after one or more breeders was lost from a stable breeding pair.

In 2012, in response to growing concern about the expanding coyote population and growing interest in expanded coyote harvest opportunities, the NCWRC revised its coyote hunting regulations to include night hunting. This prompted litigation from a number of non-governmental organizations who contended that expanding coyote hunting within the NC NEP area would result in increased take of red wolves in violation of the ESA. In May 2014, the Court issued a preliminary injunction prohibiting coyote hunting in the NC NEP area. In November 2014, a settlement agreement was reached among the parties which allowed coyote hunting during daylight hours only, with requirements to obtain a permit and report any harvest to the NCWRC.

The litigation against the NCWRC and resulting injunction and settlement prompted a substantial backlash against red wolf conservation efforts in the NC NEP area and is considered a turning point to the conservation of the species (WMI 2014). In addition, as described by the Office of the Inspector General (OIG) Investigative 2016 Report on the Red Wolf Recovery Program, the program released more wolves than it originally proposed in a Federal Register notice, and acted contrary to its rules by releasing wolves onto private lands. They also found that the Service accurately reported historical mortality data of the wolves, although they noted inconsistent interpretations of how Program staff classified and recorded certain types of mortalities. Last, they found that the FWS accurately recorded the cause of death as suspected gunshot for a wolf that died in September 2014, and that no employee was deemed culpable for the wolf's death (DOI 2016). As a result, many landowners that had previously cooperated with the Service began to deny access to their properties, impeding our ability to implement RWAMWP management actions. Many landowners also began to request removal of red wolves from their property and/or sought authorization from the Service to take red wolves. Additionally, the growing level of discontent over red wolf management efforts brought increased scrutiny on Service management of the NC NEP.

In 2014, the Service contracted with the Wildlife Management Institute (WMI) to conduct a review of the reintroduction effort with an emphasis on the science, management practices and human dimensions underlying the effort. The review (WMI 2014) produced many findings, the most relevant of which was that "decisions made at the local level, although made with the best intentions and with the program's success in mind, did not always comply with the rules established for the reintroduction program." (WMI 2014).

After the USFWS reviewed the WMI and OIG reports, we decided to bring management of the NC NEP back in compliance with the 1995 rule. Specific examples of misalignment between the language of our 10(j) rules and management actions include the release of animals from captivity into the wild beyond the 12 originally evaluated. Also, prior to 2014, the Service did not fully implement the provisions of the 1995 rule that allowed take of red wolves from private property after Service attempts to remove the red wolves were abandoned.

The Service convened a new Red Wolf Recovery Team to further evaluate options for advancing red wolf conservation. The Recovery Team produced a report of its findings in 2016 (USFWS 2016). After evaluating the findings of the Recovery Team and WMI's review, as well as other information, the Service announced that it would refocus red wolf recovery efforts on expanding the captive population, preparing a species status assessment (SSA) and 5-year review,

reconsidering management of the wild population in Northeastern North Carolina, and investigating establishing other wild populations. The SSA and 5-year review were published on April 24, 2018.

Many perceived the Service's announcement and the discussion to begin issuing take authorizations pursuant to 50 CFR 17.84(a)(4)(v) as a move away from efforts to recover the red wolf. Accordingly, several non-governmental organizations filed a lawsuit against the Service claiming we were in violation of the Endangered Species Act and other federal statutes. That litigation is still pending. In the process of adjudicating the case, the federal court issued a preliminary injunction that has barred the Service from implementing certain provisions of our red wolf section 10(j) regulations. Specifically, pending final adjudication of the case the Service is barred from issuing take authorization of red wolves by private landowners under section 50 CFR 17.84(c)(4)(v) of our regulations, or from removing red wolves from private lands upon the request of a landowner under 50 CFR 17.84(c)(10).

Population counts for collared red wolves in the wild indicate a current known population of 24 animals, with an estimated total population ranging from 30-35 animals and three to four breeding pairs. There is always a difference between the known and estimated populations since young wolves are too small to carry collars, and lack of access to private lands that may contain new litters.

Other Potential Conflicts

Historically, the red wolf like all wolves was believed to be a killer of livestock and a threat to local game populations, despite lack of data to support such a belief. To date, the reintroduced population of red wolves in Northeastern North Carolina has been responsible for seven confirmed livestock and pet depredations since 1987. In each case, private landowners were offered compensation for their losses, though some declined. It is reasonable to assume that not every red wolf depredation on livestock has been documented. However, given the intense monitoring that has occurred since reintroduction and the likely outcry by affected private landowners if depredations were occurring regularly, the number of actual depredations is unlikely to be substantially higher. It is also worth noting that there have been no documented depredations on larger livestock species, such as cattle.

Species found to be responsible for depredation incidents investigated as potential red wolf depredations include domestic dogs, coyotes, fox, bear and raccoon. Domestic dogs were found to be responsible for nearly 60 percent of all depredations responded to in which a culprit could be identified.

PURPOSE AND NEED FOR THE PROPOSED ACTION

With this 10(j) revision we intend to implement a number of administrative changes to the red wolf section of the 10(j) regulations. These include, clarifying the status of the island propagation sites. Three island propagation sites were identified in the existing regulations, and red wolves on these islands were identified as endangered, but we believe the text could more

clearly explain why they were not included under the 10(j) designation. Moreover, only one of the island propagation sites is currently used (i.e., Saint Vincent NWR). The Horn Island site (at Gulf Islands National Seashore) receives too many public visitors for it to be an effective island propagation site for endangered red wolves, and Bull Island is too close to the mainland to provide for effective containment of red wolves. No red wolves remain on these islands; so we intend to eliminate references to Horn Island and Bull Island in the rule. We will also clarify that the GSMNP NEP no longer exists.

Purpose:

Write a rule for the NC NEP to further the conservation of the red wolf by optimizing use of available recovery resources.

Need:

Assess and ensure effectiveness of the NC NEP as it relates to the broader red wolf recovery program including population growth in captivity and the wild.

We are proposing the replacement of the regulations established for the NC NEP of the red wolf, as codified in the 1995 Final Rule (50 CFR 17.84(c)), with a new rule. Upon final publication of the replacement rule, the existing rule would become null and void. The replacement of the 1995 Final Rule is necessary, because the current regulations lack the needed flexibility to adapt to the arrival and proliferation of coyotes in the NC NEP which adversely affected the NC NEP in the following ways:

- Decreased the probability of persistence of the wild population;
- Created conflict with State efforts to manage coyote populations and precluded active participation by landowners, and State and local officials in canid management;
- Increased costs, which had limited our ability to pursue broader recovery efforts.

In order to achieve our purpose and need, the selected preferred alternative would:

- Be clear to the public and garner public support.
- Reconcile red wolf and coyote management practices.
- Implement the RWAWP.

CHAPTER 2: ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

This section describes the alternatives considered in this evaluation for management of the NC NEP that could satisfy the purpose and need described in Section 1. Alternative 1 is the No Action alternative. Alternative 2 is to publish a new rule that would explicitly authorize the suite of management actions identified in the RWAMWP, and modify the approved means of taking red wolves within the NC NEP area. Alternative 3 is to publish a new 10(j) notice to establish the NC NEP management area to Alligator River NWR and the Dare County Bombing Range, and eliminate take prohibitions on non-federal lands. Alternative 4 is to publish a new rule to discontinue the NC NEP project entirely. In conjunction with any action alternative that would necessitate publication of a new 10(j) rule, we would make a number of administrative and other changes, which are described later.

ELEMENTS COMMON TO ALTERNATIVE 2 AND ALTERNATIVE 3

Both alternatives would continue a NC NEP. Administratively, we would propose to remove references to the GSMNP NEP from the regulations, and rename the Alligator River NEP as the NC NEP (North Carolina Nonessential Experimental Population). Also, the current regulations refer to three island propagation sites; St. Vincent NWR, Bulls Island and Horn Island. The current regulations correctly indicate that these sites are not NEP sites. However, only the St. Vincent NWR site is currently used or likely to be used in the future. Bulls Island is not sufficiently separated by water from the mainland to effectively contain red wolves, and Horn Island site receives too many public visitors for it to be an effective island propagation site. As such, the new rule would include St. Vincent NWR as a captive population and would continue to serve as an island propagation site for the release of red wolves into the current or any future designated NEPs. We would propose to remove any references to Bulls Island and Horn Island from the regulations.

Alternatives 2 and 3 would each seek to achieve the above-stated objective of increasing movement of red wolves between the captive and wild populations by authorizing the release of up to five animals per year into the NC NEP. Additionally, Alternatives 2 and 3 would each seek to increase reproductive output of the NC NEP by authorizing those aspects of the RWAMWP that minimize interbreeding between red wolves and coyotes, such as deployment of placeholders and removal of hybrids. Further, each alternative would seek to achieve the objective of reducing human-related red wolf mortality by fostering increased landowner cooperation.

Alternatives 2 and 3 would not contain prohibitions related to non-lethal harassment of red wolves within the NC NEP area provided the red wolves are not being purposely attracted, tracked, searched out or chased. This is intended to allow people who inadvertently encounter red wolves within the NC NEP to attempt to scare the animal away should they feel the need. Such harassment of red wolves must be opportunistic and not physically injurious, and reported immediately to the Service.

The Service, designated state agency, or personnel authorized by the Service, could take red wolves in the NC NEP in a manner consistent with a Service-approved management plan. In addition, take of red wolves on federal lands could occur in accordance with issued biological opinions, conference opinions or valid scientific recovery permit (section 10(a)(1)(B) of the ESA) issued by the Service.

Population Management

Currently red wolves are widely dispersed throughout the NC NEP area (Figure 3). This sparse distribution increases the risk of hybridization as young animals dispersing from natal territories are far more likely to encounter coyotes than red wolves. Additionally, several red wolves currently occupy private lands to which the Service does not have access. In some instances, it may be necessary to move captured animals into the captive population. All captive red wolves

are currently housed in SSP facilities or at captive facilities on Alligator River and Pocosin Lakes NWRs. We would work with existing SSP facilities, and other partner organizations, adding capacity sufficient to accommodate animals removed from the NC NEP while meeting the SSP objectives, should it become necessary.

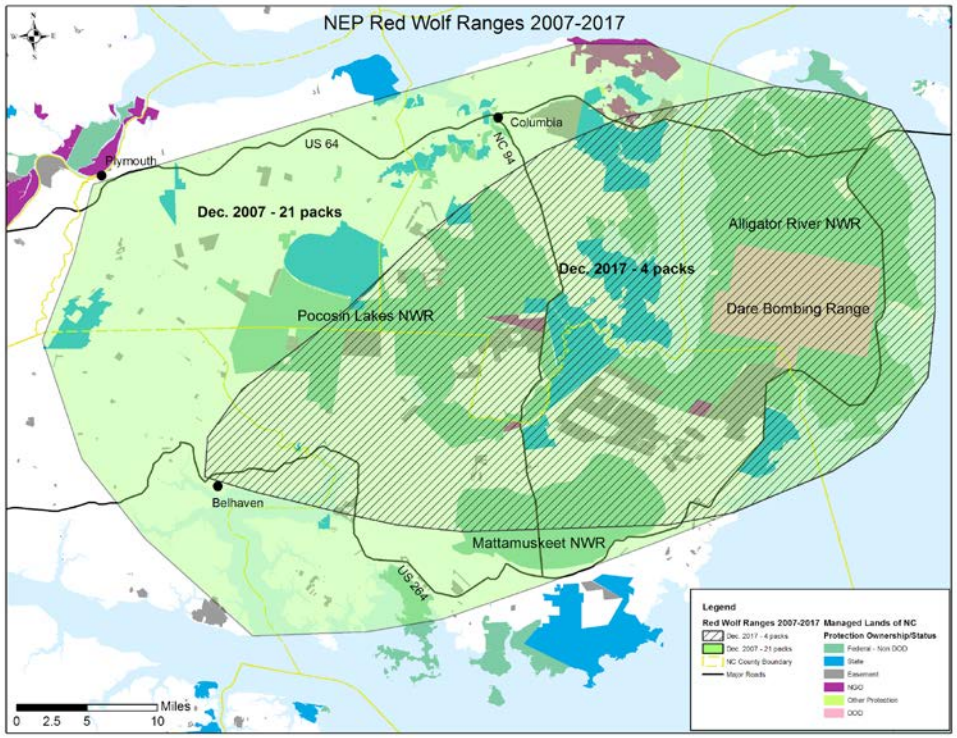

Figure 3. Comparison or red wolf pack numbers and geographic range between 2007 and 2017.

Public Engagement and Outreach

Red wolf conservation efforts in the NC NEP area have suffered from the lack of a sustained public engagement process. Developing and implementing effective processes to inform and engage the public, local and state governments, and other partners in red wolf conservation decisions are essential to the future success of such efforts regardless of where they may be implemented. Public engagement and outreach needs to be conducted early and often to multiple user groups with feedback to determine its success. The Service needs to provide accurate and up-to-date information to the public regarding the Red Wolf Recovery Program and to answer ever evolving questions.

It is important to view the ecological issues and the social issues regarding canid management as an interconnected system as opposed to separate issues. The available information suggests that partial solutions such as outreach, education, or financial incentives, would be largely ineffective by themselves to achieve sustainable red wolf recovery because they do not address deeper issues underscoring historical recovery efforts (Serenari et al. 2018).

Science

Much has been learned about red wolves throughout the history of the NC NEP effort. Retaining and working to grow the NC NEP affords opportunities for further learning, and careful consideration to the design and implementation of studies aimed at providing further insight into

red wolf and coyote management and inter-species interactions, predator-prey relationships, and human dimensions. Of particular importance would be the design and implementation of studies aimed at examining the degree to which the red wolf is a conservation-reliant species and its implications for recovery and management, as well as further research into human attitudes toward canids and canid management and the efficacy of measures intended to foster coexistence.

Language in the 2018 Federal budget bill directed the Service to initiate various management actions related to the red wolf. The relevant language is:

> The Service's Science program is directed to initiate a study not later than 90 days after the date of enactment of this Act, through a qualified independent entity such as the Smithsonian Institution, to determine whether or not animals currently classified as red wolves and Mexican gray wolves are taxonomically valid species and subspecies designations, respectively. The study shall include publication of a scientific literature review, including genetic research, not later than one year after the date of enactment of this Act and, if the literature is inconclusive, shall include any additional necessary research and publication not later than three years after the date of enactment of this Act. In the meantime, the Service's Recovery program is reminded of its legal mandate to cooperate to the maximum extent practicable with the States, especially when there has been conflict between species and private property owners. As such, the Service is directed to continue working closely with the North Carolina Wildlife Resources Commission on management of red wolves in fiscal year 2018.

Process for Periodic Review of Project Success or Failure

The Service's goal with this reintroduction effort is to further the conservation of the species. Our regulations at 50 CFR 17.81(c)(4) require provision of a process for periodic review and evaluation of the success or failure of an experimental population and the effect of the release on the conservation and recovery of the species.

ALTERNATIVE 1 - NO ACTION (MAINTAIN CURRENT MANAGEMENT)

Under this Alternative the NC NEP would be managed under the Service's existing rules (50 CFR 17.84(c)) and procedures, with the same or similar level of resources, subject to annual appropriations. The current program procedures include fitting adult red wolves with VHF and/or GPS devices for tracking and monitoring purposes. Red wolves are managed on federal lands and private lands pursuant to written agreements with cooperating landowners[1]. Management includes locating dens with litters, determining parentage of pups (red wolf, coyote or hybrid); removing hybrid animals from the population; drawing blood from young red wolves

[1] The USFWS has not always relied on written agreements with landowners in the past. This has been the explicit policy of the Agency since 2014, and is therefore considered part of the No Action Alternative.

for genetic analysis, and pit-tagging each pup for future identification. Trapping occurs mostly in the winter to allow for young of the year animals to be fitted with collars, replacement of old or malfunctioning collars on adult animals, and verification of animals of unknown status. Animals are also provided with veterinary services (e.g., immunization, vaccination, treatment for injury or disease) as needed.

Red wolves would be removed from private lands (when possible) where they are not wanted pursuant to landowner requests. Red wolves removed from private lands are released into the wild as soon as possible unless health or behavioral issues preclude release. If efforts to remove red wolves are considered abandoned, landowners can be provided written authorization to use lethal means to remove red wolves from their property[2].

This alternative does not include implementation of the RWAMWP as described in Chapter 1, as the current regulations pre-date the RWAMWP and as such RWAMWP management actions are not explicitly addressed in the current regulations. Therefore, this alternative would not authorize additional releases of red wolves from the captive population. This alternative includes the additional involvement of the NCWRC per the 2013 interagency agreement.

Summary of Alternative 1

- NC NEP remains the five county area (Beaufort, Dare, Hyde, Tyrrell, Washington).
- No use of the RWAMWP management measures.
- Manage red wolves on private lands with voluntary written landowner agreements.
- Red wolves removed from private land pursuant to landowner requests.
- Authorized take limited to protection of oneself or others from potential harm, protection of livestock or pets in immediate danger and unintentional take.
- No land use restrictions on private land.

ALTERNATIVE 2 – AUTHORIZE RED WOLF ADAPTIVE MANAGEMENT WORK PLAN AND ALTER PROVISIONS OF TAKE OF RED WOLVES THROUGHOUT FIVE COUNTY NC NEP AREA (BEAUFORT, DARE, HYDE, TYRRELL AND WASHINGTON)

The NC NEP area would continue to encompass all of Beaufort, Dare, Hyde, Tyrrell and Washington counties. Under this Alternative, the Service would publish a new rule for the NC NEP regulations to explicitly incorporate the RWAMWP, and modify the provisions for management of red wolves on private lands, including the take provisions in order to reduce human-caused mortality (e.g, gunshot, poisoning, and trapping) of red wolves.

[2] The Service is currently enjoined from implementing those portions of our rules that allow us to remove red wolves from private lands upon landowner request or that allow for the authorization of take by landowners after Service efforts to remove red wolves from private lands have been abandoned. Alternative 1 assumes that the injunction is lifted and the rules are implemented as written at 50 CFR 17.84(c).

Under this alternative management activities identified in the RWAMWP would be explicitly authorized. Specifically, the release of up to five red wolves per year from the captive population, including the St. Vincent NWR island propagation site, into the NC NEP would be authorized. This alternative would also authorize those aspects of the RWAMWP that could result in take of red wolves related to management of hybridization such as establishing breeding pairs, removing non-red wolf mates from mixed pairs and deployment of placeholder animals.

Management of red wolves on private lands would only occur subject to voluntary written landowner agreements that would specify the management practices and terms of access by Service and NCWRC personnel that are acceptable to the landowner. This would include the potential release of red wolves or relocating red wolves from other locations within the NC NEP area. Given the importance of private lands to red wolf conservation range-wide, development of effective means to foster State and landowner cooperation is imperative.

Under this alternative we would clarify the means and circumstances under which red wolves could be taken within the NC NEP area, and implement rule changes to reduce the potential for illegal human-caused mortality (e.g., gunshot, poisoning and trapping).

Under this alternative, the Service would no longer remove red wolves from private lands upon request and would not authorize landowners within the NC NEP to lethally take red wolves except as provided below. Published regulations would continue to allow any person to take red wolves by lethal or non-lethal means provided the take is in defense of one's own life or the lives of others, although this provision has not been documented as ever having been necessary.

Any private landowner, or an individual with the landowner's permission, could also take a red wolf on their property within the NC NEP when the red wolf is involved in a depredation, provided that freshly wounded or killed livestock or pets are present and that evidence exists that the animal was killed by a red wolf, and provided that such take is reported immediately to the Service. The Service, NCWRC, or other Service-authorized agencies, would confirm cases of red wolf depredation on domestic and livestock animals. It is, however, worth noting that confirmed depredation on livestock by red wolves within the NC NEP has been limited to seven incidents since the program's inception approximately 30 years ago.

In addition, the take provision would allow for the take of a red wolf by any person if the take is unintentional and occurs while engaging in an otherwise lawful activity. However, hunters and other shooters have the critical responsibility to know and properly identify their target before shooting, thus shooting a collared red wolf as a result of mistaking it for another species would not be considered unintentional take. Take by poisoning would also be considered intentional take. In all cases, the take of a red wolf would be required to be reported to the Service immediately. If a person within the NC NEP shoots, wounds, kills, traps, captures or collects an animal that is potentially a red wolf, that individual would be required to immediately report it to the Service or designated State agency.

The Service Office of Law Enforcement would investigate each take of a red wolf, and may refer the take of a red wolf contrary to the rule to the appropriate authorities for prosecution. In cases not prosecuted, the Service would reserve the right to administer civil penalties in accordance with Section 11 of the ESA for unauthorized lethal take of a red wolf within the NC NEP.

Summary of Alternative 2

- NC NEP remains in the five county area (Beaufort, Dare, Hyde, Tyrrell, Washington)
- Implementation of the RWAMWP management measures.
- Focus on partnering with willing private landowners on red wolf management off federal lands, using voluntary landowner agreements..
- Authorized take limited to protection of oneself or others from potential harm, protection of livestock or pets in immediate danger and unintentional take.
- Potential fine for unauthorized lethal take.
- No land use restrictions on private land.

ALTERNATIVE 3 (PREFERRED ALTERNATIVE) – FEDERAL LANDS FOCUSED NC NEP MANAGED TO FUNCTION AS A PROPAGATION SITE FOR FUTURE NEPS

Under this Alternative, the Service would publish a new rule to change the scope and management of the NC NEP. The NC NEP area would include only Alligator River NWR and the Dare County Bombing Range, the same management area as in the original 1986 rule. A small group (one or two packs likely consisting of less than 15 animals) would be maintained on Alligator River NWR and the Dare County Bombing Range. The red wolves in this NC NEP would be managed consistent with the recommendations in Alternative 2 with the exception of the take provisions, which would be limited to incidental take associated with management practices and in defense of human life. The primary role of this population relative to conservation of the species would be to provide a source of red wolves that are raised in and adapted to natural conditions for the purpose of facilitating future reintroductions. Management of this population will also be guided by the RWAMWP.

It is anticipated that some red wolves would leave the NWR and Bombing Range on a fairly regular basis. To address this, the regulations would specify no take prohibitions for red wolves on private lands. As such, there would be no need for provisions for removal of red wolves from private lands and no procedures for requesting authorization to take red wolves on private lands, because such take would be explicitly permissible under the regulations. Similar to the current rule, the rules would require only that the Service be notified within 24 hours regarding the take of any collared animals outside of the NC NEP geography and that the collars be returned to the Service.

Limiting the designated NC NEP management area to federal lands should also eliminate conflicts between State-authorized management of coyotes outside this area. Serenari et al. (2018) noted that the development of effective means to foster State and landowner cooperation is imperative.

Summary of Alternative 3

- The geographic scope of NC NEP management area would be Alligator River National Wildlife Refuge and Dare County Bombing Range.
- Eliminates conflicts between coyote and red wolf
- Implementation of the RWAMWP strategy.
- No prohibitions on take of red wolf off of Federal lands.
- No land use restrictions on private land.

ALTERNATIVE 4 - TERMINATE THE NC NEP

Under this Alternative, the Service would discontinue reintroduction efforts in the NC NEP and red wolves would be reduced to a captive population. Under this alternative all efforts to sustain the red wolf populations in the NC NEP area would be suspended. The Service would try to capture animals of high value for incorporation into the captive population. If collared animals cannot be recaptured, the Service would continue monitoring of the existing radio collared animals. It is difficult to determine how long it would take for red wolves to no longer inhabit the area. The Service would continue to monitor the area for evidence of red wolf presence, maintaining the NC NEP until no wolves are present in order to maintain landowner protections against take provisions. At that point, we would publish a notice in the Federal Register removing the NC NEP designation from the area when it determined with reasonable certainty that red wolves no longer occurred in the NC NEP area.

CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter outlines the affected environment then goes on to detail the environmental consequences (i.e., effects or impacts) that may occur from implementation of the different alternatives.

ANALYSIS AREA OVERVIEW

The red wolf is found within the North Carolina counties of Beaufort, Dare, Hyde, Tyrrell, and Washington (Figure 4). These five counties lie in the northeastern part of the state with Albemarle Sound to the north, the Outer Banks to the east, and Pamlico Sound to the south. These counties are largely rural with the exception of the Outer Bank portions of Dare and Hyde Counties, which are heavily developed with seasonal housing. No red wolves occur on the Outer Banks.

ANALYSIS METHODS

This chapter provides an analysis of the environmental impacts of the alternatives considered in more detail. Per NEPA guidance, the level and depth of the analysis will focus on what is needed to determine whether there are significant environmental effects from the proposed alternatives. NEPA also directs us to focus on a full and fair discussion of significant issues, and eliminate from detailed analysis issues that are not significant. Additionally, the Council on Environmental Quality (40 CFR 1502.2) directs that effects be discussed in proportion to their significance. Consequently, some issues require a more detailed analysis and discussion, while other issues may not because the associated effects are at a level that is inconsequential.

Figure 4. North Carolina counties in the current red wolf non-essential experimental population area.

Previous NEPA documents have addressed and analyzed the reintroduction of an experimental population of red wolves into the NC NEP and led to the 1995 Final Rule, which the Service currently operates under. This environmental assessment will focus on proposed changes and incorporate relevant new information and research findings pertinent to the proposed alternatives.

SPECIFIC RESOURCE AREAS TO BE EVALUATED

The following resources will not be evaluated in detail in this EA, not because they are unimportant to the people of the Albemarle Peninsula, but because it is unlikely that impacts to these resources would occur as a result of implementation of any of the proposed alternatives:

- Aesthetics/Visual Resources – No construction or other changes to the human built or natural environment are proposed.
- Air Quality – No stationary or permanent sources of air pollutant emissions would be introduced within the NC.
- Cultural/Historic Resources – No ground disturbing activities are proposed and the nature of the proposed alternatives under consideration make it highly unlikely that adverse impacts to cultural/historic resources would occur.
- Climate Change – No stationary or permanent sources of greenhouse gas emissions would be introduced within the NC NEP and there would be no direct or indirect effects on climate change as a result of the proposed alternatives.
- Community Services – The proposed alternatives would not directly or indirectly affect services such as police, fire and ambulance within the NC NEP.
- Geology/Soils – No construction or ground disturbing activities are proposed.
- Noise – No stationary or permanent sources of noise would occur.

- Resident Population – No changes in the neighborhood makeup, or alteration of demographic within the NC NEP would occur as a result of the proposed alternatives.
- Solid/Hazardous Waste – No solid/hazardous waste would be introduced. Transportation/Parking – No changes to regional transportation systems would occur.
- Utilities – No changes to the use of utilities would occur.
- Water Resources – No changes to water resources would occur.

RESOURCES ANALYZED IN MORE DETAIL

Biological Resources

Red Wolf

Habitat Relationships

Red wolves are habitat generalists that do not appear to rely on specific habitat types to survive and likely utilized a wide variety of habitat types throughout their historic range (Kelly et al. 2004). Preferred habitats were those providing adequate prey densities and enough habitat security to establish den sites to successfully raise pups.

Affected Environment

There are currently 221 red wolves in captivity across all SSP facilities, including two facilities with captive red wolves within the NC NEP that are not currently part of the captive breeding program. The known population of wild red wolves is currently 24 radio-collared individuals with an estimated overall population of between 30 to 35 red wolves within the NC NEP.

Environmental Consequences

Methodology

Potential effects on the red wolf population and recovery from the proposed alternatives are evaluated based on the best available science of how the different management scenarios would be expected to affect red wolves.

Alternative 1

Direct, Indirect and Cumulative Effects

Under Alternative 1, the designated NC NEP would continue to encompass all of Beaufort, Dare, Hyde, Tyrrell and Washington Counties. Management actions would continue to follow the 1995 10(j) rule as written. Under this current management, and as indicated Scenario A in the PVA (Faust et al. 2016; Figure 5), the wild red wolf population would likely continue to decrease and would likely become extirpated within between 8 and 40 years. Due to red wolf mortality since the publication of the PVA, resulting in a more rapid decrease in the wild red wolf population greater than projected in Scenario A, the assumption is extirpation in the wild would occur in a shorter time frame than originally predicted. The level of take on red wolves would be expected to stay roughly the same as a proportion of the population as it has for the last decade or so. The level of management effort would also be expected to stay roughly the same with respect to population monitoring and assisting landowners with red wolves on private property. However, there would be an expected increase in the level of hybridization as the red wolf population decreased and there were less red wolf mates available to form breeding pairs, along with no increase in coyote management (e.g. sterilized placeholders) and no management efforts to counteract these effects. Human tolerance of red wolves would also be expected to remain the

same since there would be no change with respect to the coyote management and red wolf management conflicts on private lands, and no landowner incentives in place to try and enter into additional agreements with private landowners.

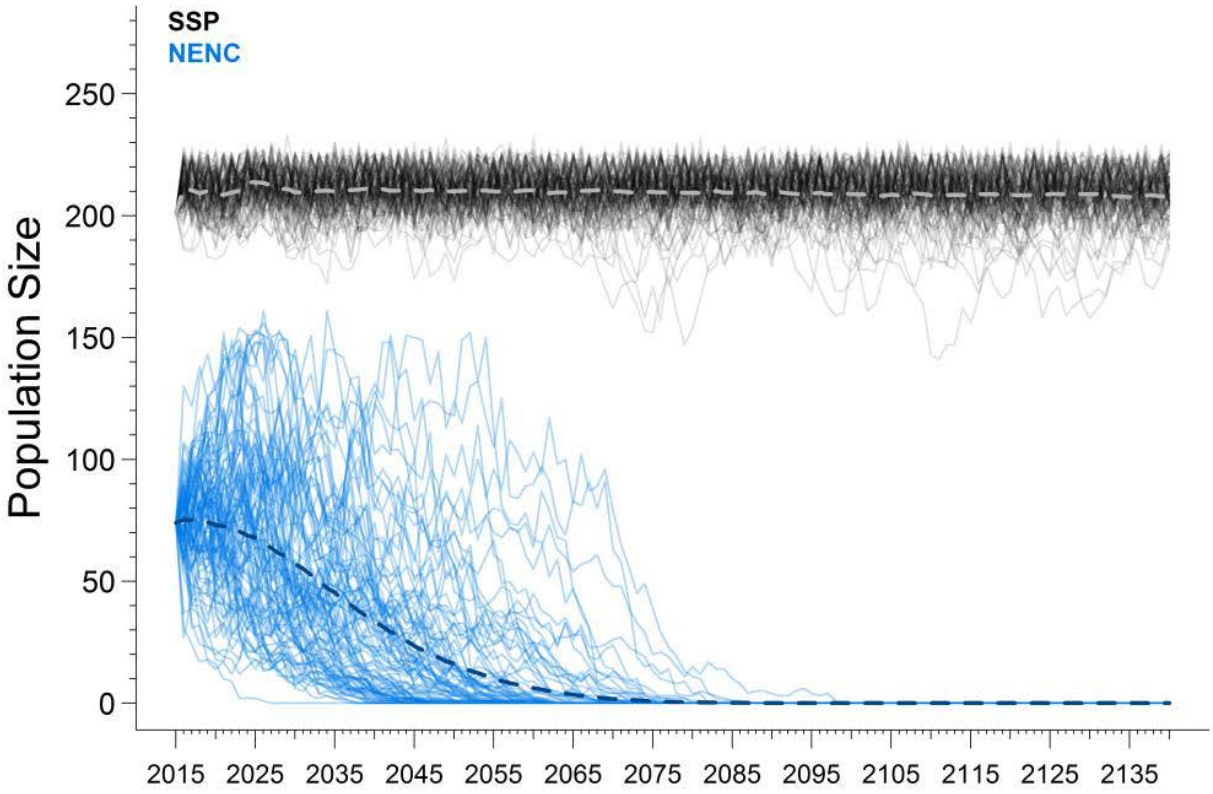

Figure 5. Baseline model results for SSP and NENC (Northeastern North Carolina) populations for a sample 100 model iterations. Dashed lines represent the mean population trajectory across 1000 model iterations (Faust et al. 2016).

Effects Common to Alternative 2 and Alternative 3

Direct, Indirect and Cumulative Effects

These two alternatives would alter the scope and management of the NC NEP with the objective of furthering the conservation of the species in the wild by fostering human-red wolf coexistence. Under each of these alternatives, the key components of the RWAMWP (e.g., releases from the SSP, use of placeholder animals, active monitoring) would be authorized, along with new measures to address State and landowner concerns. One key element would be to ensure the presence of red wolves does not interfere with coyote hunting or trapping efforts. Steps would be taken in cooperation with the State to minimize loss of red wolves due to mistaken identity. Examples could include marking as many red wolves as possible with high visibility collars such that hunters would be able to more readily distinguish coyotes from red wolves.

The initial steps in transitioning from the existing condition to either of these two alternatives would be similar. Currently, there are approximately four packs of red wolves, three of which are on private lands. These packs and other lone animals are spread over a wide area, (much of

which we do not have access to), creating high potential for hybridization with limited ability for management. Under either alternative, red wolves on private land may be removed with owner permission, or remain but no longer have any take prohibitions.

Alternative 2

Direct, Indirect and Cumulative Effects

Under this alternative the designated NC NEP would continue to encompass all of Beaufort, Dare, Hyde, Tyrrell and Washington Counties. The Service would resume implementation of the RWAMWP over the entire NC NEP area. This alternative also includes modifications to the take provisions in the regulations such that the Service would no longer remove red wolves from private lands without cause and would not issue take authorizations except in defense of life or property. For the purposes of this evaluation the Service projected the potential effects of this alternative on red wolves based on two sets of assumptions. Under the first set of assumptions (High Landowner Cooperation) the Service assumes we are able to implement this alternative as written over the entire NC NEP area. In that case, we assume the Service would have a high degree of access to private lands and be able to locate dens, find and remove hybrids, deploy sterilized placeholders. These actions would increase red wolf breeding success. Additionally, we would be able to conduct releases from the captive population where needed, which would further help build the red wolf population. It is further assumed that the more limited provisions for take of red wolves under this alternative and the potential for greater enforcement would reduce red wolf mortality rates. If this were to happen, the population would be expected to grow consistent with PVA Scenario W (Figure 5), which modeled increased breeding, releases from captivity and reduced human-related mortality.

The effects of Alternative 2 can also be assessed under a second set of assumptions (Low Landowner Cooperation). This assumes that elimination of the take provisions would harden the sentiments of many landowners against the Program; thereby limiting Service access to private lands. Were this to happen our ability to implement the RWAMWP (find dens, deploy placeholders, release animals) would be compromised. At some point lack of landowner cooperation compromises our ability to implement the RWAMWP sufficient to bend the population trajectory downward, as we would be limited in our ability to improve breeding rates, release animals where needed or limit human-related mortality over much of the 5-county area. With very limited landowner support, we predict that we would only be able to implement the RWAMWP on federal lands and scattered parcels of private lands with agreements. In sum the population trajectory under this Alternative (with the Low Landowner Cooperation assumptions including very low landowner support) would most likely be slightly better than estimated under PVA Scenario Z (Figure 6). Though far from optimal, it does represent an improvement over Alternative 1.

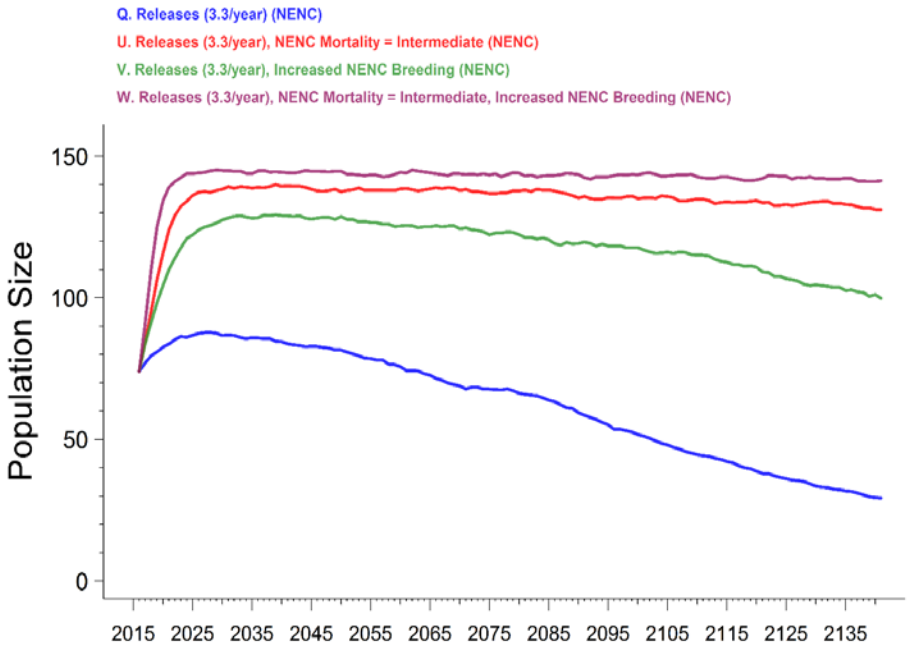

Figure 5. Model results for the NC population under various scenarios (Faust et al. 2016).

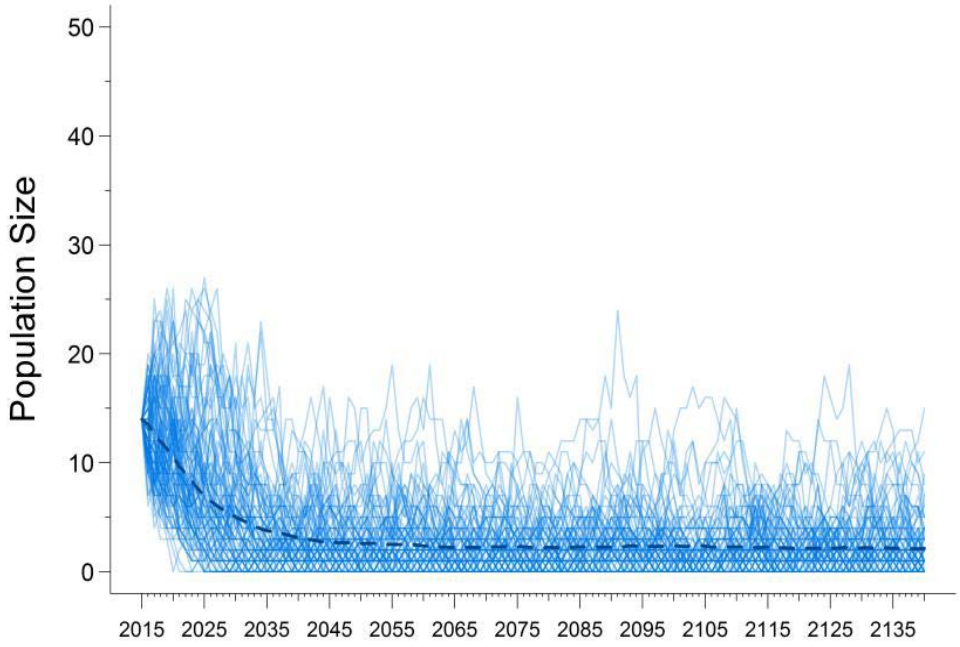

Figure 6. Scenario Z model results for NC population for a sample of 100 model iterations (Faust et al. 2016).

Conversely, with modest support from landowners we could experience modest growth. Essentially, the expected result of implementing this alternative with modest to fair landowner support would be a population that behaves close to the estimates provided in PVA Scenario V (Figure 6); though slightly to somewhat lower. With the available information it is difficult to predict which set of assumptions are most reasonable relative to Alternative 2.

The potential benefits of Alternative 2 to red wolves increase with increasing landowner support. The prospects for fostering such support would be increased if implementation of this alternative included a robust set of landowner incentives and resulted in an increase in the ability of private landowners to control coyotes, thus reducing conflicts with red wolf management.

Alternative 3

Direct, Indirect and Cumulative Effects

Under Alternative 3, the effects on red wolves would be a reduction in geographic scope and focus on maintaining wild reared offspring for future reintroductions. The size of the Federal lands available on the Alligator River NWR and the Dare County Bombing Range can support a relatively small number of red wolves likely equal to approximately two packs or family groups and around no more than 15-20 individuals.

The red wolf population would only be actively managed on Federal lands and red wolves off Federal lands would no longer be legally protected. The loss of protections for red wolves off of federal lands would also potentially lead to an increase in human-caused mortality, both from misidentification by landowners who are no longer concerned about needing to properly distinguish between coyotes and red wolves, and from individuals that would like to keep the red wolf population at low or non-existent levels.

Hybridization would be expected to decrease within the area of focused management on Federal lands because management efforts could more efficiently focus on the removal and/or sterilization of coyotes. Human tolerance could potentially increase with a reduction in the NC NEP boundary, eliminated take prohibitions on private land and the development of private landowner incentives. We expect the red wolf population under this alternative to perform as well or slightly worse than under Alternative 2 in the immediate future.

An important distinction between Alternative 2 and Alternative 3 would be that under Alternative 2 the NEP would cover the five county area while under Alternative 3 it would be reduced to only Federal lands.

Alternative 4

Direct, Indirect and Cumulative Effects

Under Alternative 4, due to the suspension or termination of the red wolf reintroduction effort in North Carolina, there would eventually be a no wild red wolves. Many of our SSP partner facilities are invested in the red wolf because of the wild recovery effort. Their role in restoring a species that has been declared extinct in the wild inspires them to devote funding and resources to red wolf conservation that could easily be directed to other species. Absent the reintroduction narrative, support within the SSP may wane making it much more difficult to maintain the species in captivity. Currently, the member facilities of the SSP contribute over $400,000 to red wolf conservation annually. There is also currently no availability of space within the SSP to house additional red wolves if attempts are made to capture high value red wolves from the NC NEP for incorporation into the captive population.

The various alternatives are compared in Table 2 below.

Table 2. Comparison of alternatives with existing condition for important factors.

Potential Effects as Compared to Existing Condition	Alternative 1 - Current Management	Alternative 2 - 5 County NC NEP with Adaptive Management	Alternative 3 - Federal Lands Focused with Adaptive Management	Alternative 4 - Terminate the NC NEP
NC NEP Red Wolf Population in the Near Term	-	+	-	-
Survival (Take and Other Mortality)	=	+	+	-
Level of FWS Management Effort	=	+	-	-
Likelihood of Hybridization	+	-	-	-
Human Tolerance	=	+	+	-

Key *= indicates there would not be an expected change from the existing condition*
- indicates an expected decrease from the existing condition
+ indicates an expected increase over the existing condition

Conclusion

Alternative 4 would have the greatest impact on the red wolf population with a management decision to terminate the program and the loss of the wild red wolf NC NEP. Alternative 1 would ultimately be similar and would be expected to lead to the extirpation of red wolves from the NC NE within 40 years due to management limitations (e.g. no implementation of RWAMWP or additional red wolf releases into the population). It is more difficult to predict the long term outcome of Alternative 2 which is strongly affected by the level of public cooperation (high, medium and low) by way of private landowner agreements, and the level of support likely to be received under each is somewhat nebulous. Alternative 2 could lead to a decrease in human-caused mortality as increased protection measures were put in place, leading to higher population growth. Conversely, additional protection measures could erode potential cooperation of landowners unless substantial incentives could be implemented. Alternative 3 would be expected to lead to a decrease in the red wolf population since there would be no take prohibitions off Federal lands.

Under assumptions of low public support in the near term, Alternative 2 would likely sustain a larger red wolf population than Alternatives 3 and Alternative 4 because it would maintain a wild red wolf population on the landscape at levels greater than the existing condition (Alternative 1) Over the long term, whether Alternative 2 or Alternative 3 ultimately would produce the greatest benefits to red wolves depends on establishing and maintaining high public support.

Coyotes

Habitat Relationships

Coyotes (*Canis latrans*) are one of the most adaptable mammals in North America and can survive in just about any environment providing an adequate food source is present. Due to their ability to be highly adaptable in both their behavior and diet, they can utilize habitats ranging from forests and meadows, to agricultural fields, suburban areas and urban areas. Agriculture fields and forested areas with respect to coyote habitat use in northeastern North Carolina are similar to other coyote studies in the northeast U.S. and indicate a general preference for open, treeless environments by coyotes (Richer et al. 2002, Gosselink et al. 2003, Van Deelen and Gosselink 2006).

Studies in North Carolina have documented a wide range of foods used by coyotes, including rabbit, white-tailed deer, rodents, human sources (e.g. crops, garbage), vegetation and invertebrates (Schrecengost et al., 2008, Dellinger et al. 2011, McVey et al. 2013, Cherry et al. 2016). Research indicates that rabbits are the dominant prey in the diets of coyotes while white-tailed deer are preyed upon more seasonally, primarily fawns or vulnerable individuals in winter (Litvaitis and Shaw 1980, Hinton et al. 2017a).

Affected Environment

Prior to the 1800s, coyotes occupied the prairies, deserts and grasslands of central North America and Mexico. Reduced competition through the removal of other large predators (e.g. gray wolves, red wolves, cougars), large-scale habitat changes including the creation of fields, trails and roads, along with new food sources such as crops allowed for the expansion of the coyote's range throughout the United States (NCWRC 2018). In the Southeast, natural range expansion of coyotes in the region appears to have been supplemented by illegal importations for hunting (Hill et al. 1987).

The first documented coyotes in North Carolina were in 1988 in the far western portions of the state, but through natural expansion and illegal releases coyotes were found throughout the state by 2005 (NCWRC 2018). The coyote is now abundant throughout the 100 counties in North Carolina, and is managed as nongame with no closed season or bag limit (NCWRC 2018). By the early 1990s coyotes had expanded their range into the Albemarle Peninsula (AP), which is situated in the northeast coastal plain region of NC (Hinton et al. 2012, Phillips et al. 2003). Although coyotes are present on Alligator River NWR, the carnivore is not native to the refuge (USFWS 2008). In recent years as coyotes have increased their population, they have begun to make use of the Outer Banks.

In 2014, a court issued a preliminary injunction (*RWC v. NCWRC 2014*) prohibiting coyote hunting within the five county NC NEP based on a lawsuit filed against NCWRC by a number of

non-governmental organizations with concerns over coyote hunting, particularly at night, because it posed a potential increase in red wolf mortality. Based on a settlement agreement reached later that same year, the State regulations regarding coyote hunting differs in the five county NC NEP area than in the rest of the State. Within the NC NEP, a NCWRC permit is required to take coyotes by hunting on private lands, but there are no bag limits. Coyote hunting is not allowed at night, but trapping may occur at night. Coyote home ranges are typically less than approximately 20 square miles, as compared to red wolves with home ranges up to 70 square miles (Hinton 2014). Large areas with low road densities appear to be preferred by red wolves and coyotes occupying these areas have a higher likelihood of being displaced by red wolves than in areas of high human activity/development (Gese and Terletzky 2015).

Environmental Consequences

Methodology

Potential effects on coyote from the proposed alternatives are evaluated based on the best available science of how red wolf population changes under the different management scenarios of the alternatives would potentially affect coyote population numbers and the indirect effects of that. Effects related to hybridization are discussed in the red wolf section.

Effects Common to Alternative 1, Alternative 2 and Alternative 3

Direct, Indirect and Cumulative Effects

Interactions between coyotes and red wolves, and the effects of those interactions, particularly for the purposes of this analysis with respect to the coyote population, are complex and difficult to predict because the result of red wolf-coyote interactions have completely divergent potential outcomes ranging from being lethal for the coyote to the creation of pair-bonding under certain less than ideal conditions (Hinton 2014).

The types of potential effects on coyotes would be the same under all alternatives. However, there would be expected to be lower coyote numbers within active red wolf territories. As discussed previously, coyote numbers in those localized areas would decrease both from competition for resources with red wolves standpoint and from direct displacement. Based on model predictions for Alternative 1 showing a decreasing red wolf population over time, eventually there would likely be an expected increase in coyotes on the refuge and across the AP. Alternative 2 would be expected to result in the lowest population of coyote as the population of red wolves increases and remains present throughout the NC NEP area, while Alternative 4 would likely result in the highest population of coyotes over the long term between these alternatives.

Alternative 1

Direct, Indirect and Cumulative Effects

Initially there would be no direct or indirect effects expected from the continuation of the existing red wolf management. However, based on a projected population decline of red wolves under this alternative and the associated elimination of red wolf territories, there would be an expected increase in the population of coyotes on the Albemarle Peninsula over time. However, due to the existing low population of red wolves and other factors affecting coyotes, the effect from this alternative on the coyote population would likely not be substantial.

Alternative 2

Direct, Indirect and Cumulative Effects

Under this alternative there is a range of potential outcomes with respect to the red wolf population depending on the level of public support (high, medium, low) and subsequently any impact that would have on the coyote population and indirectly on the population of prey species. Although this alternative would not be expected to substantial impact the coyote population, in general the higher the red wolf population the lower the coyote population, particularly within active red wolf territories.

Alternative 3

Direct, Indirect and Cumulative Effects

The effects of Alternative 3 on coyotes would be in increase in the number of coyotes in the area.

Alternative 4

Direct, Indirect and Cumulative Effects

The effects from Alternative 4 mirror the effects discussed in Alternative 1, although the decline in the red wolf population would be expected to occur more rapidly under this alternative, by design.

Conclusion

Coyotes would not be reduced substantially by the presence of red wolves under any of the alternatives because of the ability of coyotes to thrive in a variety of habitats and situations. Even targeted lethal control of coyotes by humans is not successful at eliminating coyotes from the landscape (NCWRC 2012). Although the presence of red wolves would be expected to have some level of impacts on the coyote population and indirectly coyote prey species, particularly within active red wolf territories, there would continue to be a thriving coyote population throughout the AP.

Consequently, the effect of any of the alternatives would be expected to have a ***less than significant*** impact on coyote.

White-tailed Deer

Habitat relationships

White-tailed deer are very adaptable and prolific and thrive in a variety of habitat types. They like creek and river bottoms, oak ridges, pine forests, farmlands, or any other type of habitat that offers food, water and cover. They are tolerant of disturbances, such as agriculture and forestry practices, and often prefer areas modified by these activities if an adequate arrangement of cover and forage is available. White-tailed deer feed mainly on green leaves, succulent plants, tender woody vegetation, grasses, berries, acorns and agricultural crops.

Affected Environment

The white-tailed deer population in North Carolina has made a dramatic turnaround. White-tailed deer were plentiful when European settlers first arrived, but were hunted extensively for their meat and hides with no thought of conservation or management. Within 100 years, white-tailed deer were threatened with extirpation in North Carolina, including the Albemarle Peninsula, much like the rest of the United States. It is estimated that 10,000 white-tailed deer inhabited the State in 1900, which was considered very low. North Carolina's major efforts to restore the state's white-tailed deer resource took place in the 1940s through the 1970s (NCWRC 2017). White-tailed deer populations today have risen to approximately one million in North Carolina (NCWRC 2017) (Figure 8).

More people hunt white-tailed deer than any other game species in North Carolina and hunting for this game species is permitted on Alligator River NWR and Dare County Bombing Range during State hunting seasons. When properly managed, hunting does not hurt white-tailed deer populations and is a helpful management tool for keeping them from becoming overpopulated (NCWRC 2017). Before European settlers arrived, white-tailed deer populations were controlled by year-round hunting by Native Americans and large predators like cougars and red wolves (NCWRC 2017). Without some control, white-tailed deer populations grow larger than their habitat can support, causing mass starvation and disease in their herds, as well as severe crop depredation and overgrazing of habitat (NCWRC 2017).

Based on that information, NCWRC data shows the antlered buck harvest has declined 33.5 percent over the past 10 years (2007 through 2016) in the five Albemarle Peninsula counties (Figure 8; Shaw 2017, pers. comm.). However, this decline is not unique to those five counties. Over the same time period NCWRC has observed a 22.8 percent decline in antlered buck harvest in the Eastern Deer Season (about the eastern half the state), and a 41.8 percent decline in NCWRC District 1, where 4 of the 5 counties on the Albemarle Peninsula are located (Shaw 2017, pers. comm.)(Figure 9).

In eastern North Carolina, the primary food source of red wolves appears to be white-tailed deer, marsh rabbit, raccoons and small rodents (Phillips et al. 2003, McVey et al. 2013). McVey et al. (2013) found that white-tailed deer were the only prey species consumed by red wolves throughout the year. Dellinger et al. (2011) analyzed scat of six red wolf packs within the NC NEP over a two year period to explore variation in prey species during pup-rearing. Approximately 66 percent of prey biomass consumed for the six packs consisted of adult white-tailed deer and fawns (Dellinger et al. 2011). Coyotes do prey on white-tailed deer, but mostly seasonally on young fawns and to a lesser extent in winter (Litvaits 1980, Hinton et al 2017a). Coyote predation on adult white-tailed deer has been documented (Chitwood et al. 2014), but it is uncommon (Schrecengost et al. 2008, Vanglider 2008, Kilgo et al. 2010). Hunter harvest remains the primary source of adult mortality for white-tailed deer in hunted populations (DeYoung 2011).

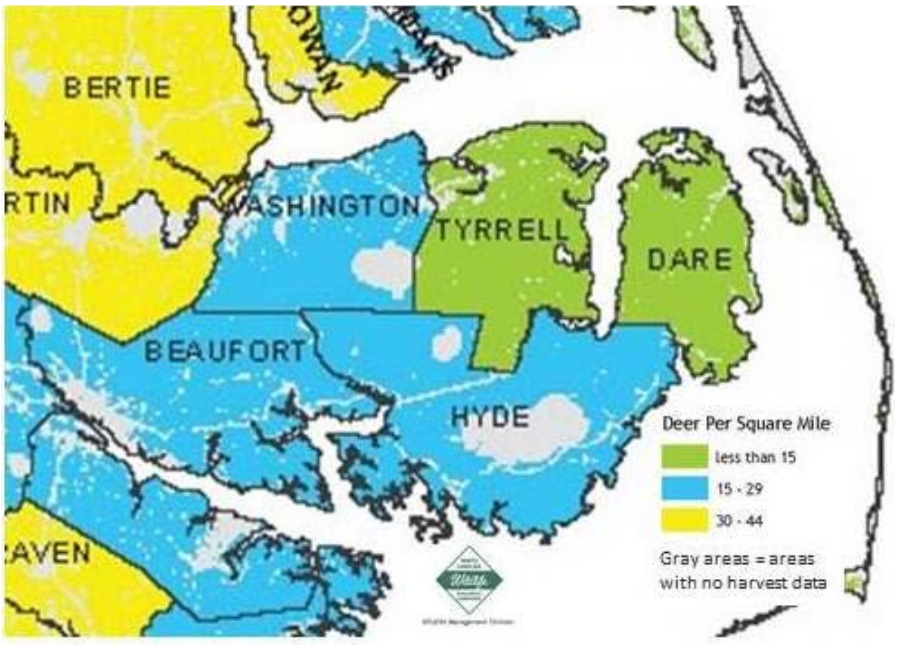

Figure 8. NCWRC density maps are intended to provide a rough baseline for the average white-tailed deer density in each county. The county white-tailed deer density numbers are derived from a combination of statewide estimated harvest, county-based reported antlered buck harvest, and a statewide Downing population reconstruction estimate. They should not be viewed as a direct population estimate or to assess population trends over time.

Although red wolves routinely prey on white-tailed deer as part of their diet, there has been no direct evidence that red wolf predation is a significant cause of decline in white-tailed deer numbers on a population level. To the contrary, long-term maintenance of home ranges requires red wolves to defend a finite area and consume resources (e.g. white-tailed deer) at a rate low enough to allow prey populations to persist (Gese and Terletzky 2015). Red wolves will prey on fawns during certain times of the year, but for the remainder of the year they primarily prey on adult white-tailed deer (Dellinger et al. 2011). Anecdotal evidence based on the field examination of red wolf kills within the NC NEP suggests adult white-tailed deer selected as prey are typically diseased, old, physically compromised or otherwise vulnerable individuals. As a result, red wolves may contribute to the overall health of white-tailed deer populations. Balanced ecosystems with its full suite of prey species and its top predator (e.g. red wolves) in place under which the ecosystem evolved are more likely to maintain healthy prey populations.

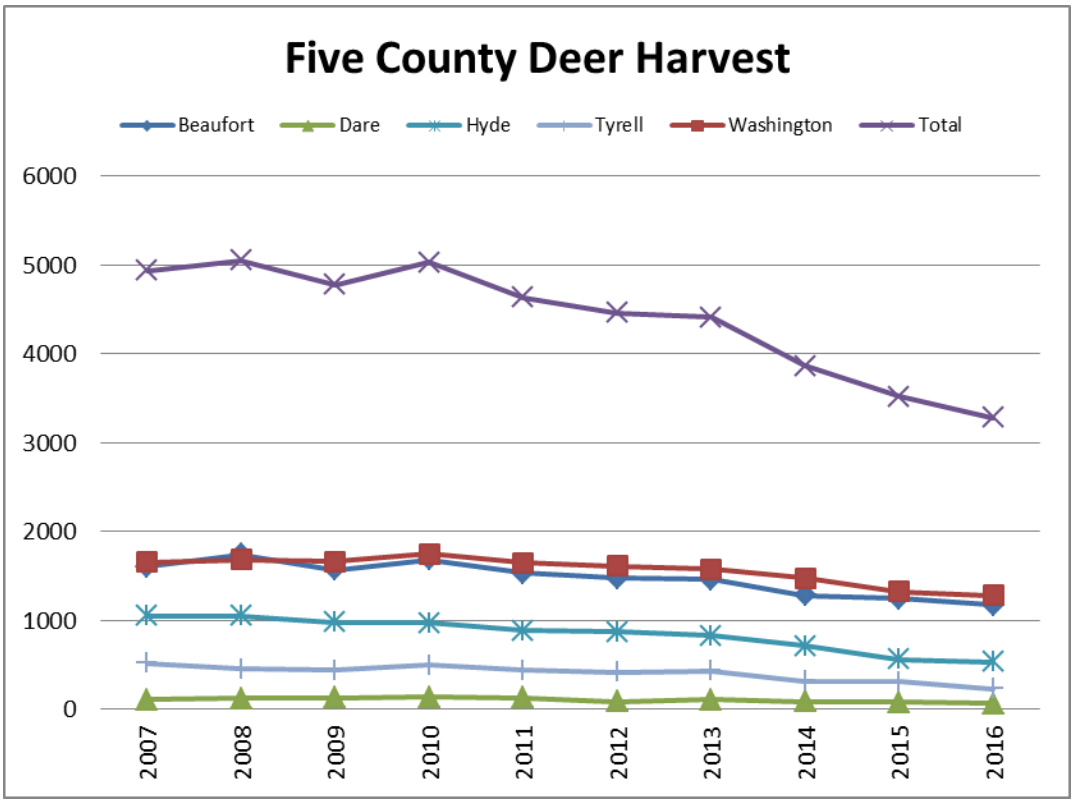

Figure 9. White-tailed deer population trends for the five country NC NEP area based on NCWRC's reported antlered buck harvest (NCWRC Data).

Environmental Consequences

Methodology

Potential effects on white-tailed deer from the proposed alternatives are evaluated based on the best available science of how red wolf population changes under the different management scenarios in the alternatives would potentially affect white-tailed deer population numbers.

Effects Common to Alternative 1, Alternative 2 and Alternative 3

Direct, Indirect and Cumulative Effects

As discussed in the *Affected Environment* section, there are many factors affecting the population size of white-tailed deer within the NC NEP with red wolf predation likely being an additive impact rather than a major influence, particularly under the current low population numbers of red wolves. There would be no direct effect to habitat for white-tailed deer under any of these alternatives.

Alternative 1

Direct, Indirect and Cumulative Effects

Based on a projected population decline in red wolves under this alternative, there would be an expected slight increase in the population of white-tailed deer on the Albemarle Peninsula over time. However, due to the existing low population of red wolves and the many additional factors influencing white-tailed deer numbers, the effect from this alternative on white-tailed deer would

be minimal, especially over time if the red wolf population continues to decline until none remain on the landscape, as projected.

Alternative 2

Direct, Indirect and Cumulative Effects

This alternative represents a range of potential outcomes depending on the level of public cooperation (high, medium, low) achieved based on the establishment of landowner incentives and increased public outreach activities. For the purposes of analyzing this alternative with for effects to white-tailed deer, the analysis will assume high public cooperation as it represents the largest potential change from the existing condition (e.g. Alternative 1) with respect to the projected red wolf population. The implementation of Alternative 2 with high public cooperation would be expected to result in an increase in the red wolf population over time while occupying more of the NC NEP.

This alternative could result in the largest decrease in the white-tailed deer population as predation from a growing red wolf population increased. However, some of the increase in red wolf predation would be offset by a decrease in coyote predation on white-tailed deer, particularly during the fawning season and winter, as red wolves return to occupying a larger portion of the NC NEP and actively defend territories resulting in the displacement of coyotes.

Alternative 3

Direct, Indirect and Cumulative Effects

The effects of Alternative 3 on white-tailed deer are somewhat difficult to determine as red wolf numbers under this alternative would be expected to decrease. However the current red wolf population consists of only a few packs and with this alternative we anticipate the federal lands supporting around two packs. As such, there will likely be little change in deer populations.

Alternative 4

Direct, Indirect and Cumulative Effects

Once the red wolf population decreased to the point that they were no longer on the landscape, this alternative would clearly result in no direct impacts on the white-tailed deer population from red wolves. Alternative 4 would be expected to result in the highest population of white-tailed deer due to the elimination of red wolves as a predator.

Conclusion

Based on the above analysis, there would be varying degrees of effects to white-tailed deer under the proposed alternatives, but all within a relatively moderate range of impacts as the red wolf numbers fluctuate. None of the proposed alternatives would be expected to result in a substantial change in the white-tailed deer population. Consequently, the effect of any of the alternatives would be expected to have a ***less than significant*** impact on white-tailed deer.

Game Species

A variety of game species use the diverse habitats within the five county NC NEP area. Common game species include: bear, bobcat, coyote, eastern cottontail, squirrel, beaver, raccoon, fox, skunk, opossum, deer, turkey, woodcock, snipe, mallard, dove, and quail. Red wolves are also known to consume raccoons, rabbits and other small mammals though there are

no data to indicate that red wolf predation has affected populations of these or other game species in the NC NEP area.

Land Use

Land use refers to the management and use of land by people. The attributes of land use included general use patterns, land ownership, land management plans and special use areas. Land uses are typically directly related to the lands' resources (e.g. topography, vegetation, access and other resources) and land ownership.

Affected Environment

Habitat that provides the necessary components to support red wolves (e.g. adequate prey base, enough habitat security to successfully den) can be found on across all types land ownership (e.g. Federal, State, private) within the five county NC NEP.

However, due to the AP being within the NC NEP for red wolves, State hunting regulations require more restrictive coyote hunting regulations in the five counties than anywhere else in North Carolina. Individuals hunting coyote in this area must obtain a NCWRC permit regardless of the land ownership of where they intend to hunt and they must report all take of coyotes to NCWRC. In addition, it is the only area of the state where it is unlawful to hunt coyotes at night due to the potential for misidentifying a red wolf as a coyote.

Federal Lands

U.S. Fish and Wildlife Service, National Wildlife Refuges

There are four National Wildlife Refuges within the NC NEP area, Alligator River NWR, which lies predominantly in Dare County, Pocosin Lakes NWR, within Washington, Hyde and Tyrrell Counties, and Swanquarter NWR and Mattamuskeet NWR in Hyde County. Alligator River NWR and Pocosin Lakes NWR are part of the larger North Carolina Coastal Plain National Wildlife Refuge Complex. Mattamuskeet NWR and Swanquarter NWR are part of the larger Mattamuskeet, Swanquarter, Cedar Island National Wildlife Refuge Complex.

Department of Defense, Dare County Bombing Range

Dare County Bombing Range established in 1965, encompasses approximately 46,619 acres within Dare and Hyde counties. About 4,388 acres of the facility are maintained as two separate impact areas (Air Force and Navy). Most of the Range is on the mainland part of the Dare County peninsula and is surrounded by Alligator River National Wildlife Refuge. Dare County Bombing Range is not adjacent to any major body of water although the western boundary lies within a mile of Alligator River and the eastern boundary lies within a mile of Stumpy Point Bay, which connects to Pamlico Sound. The impact areas are used for basic weapons delivery training. The remaining acreage is used as a safety buffer and consists of roads and forested wetland.

Remotely located in eastern North Carolina, Dare County Bombing Range is the primary training range for F-15E aircraft crews from Seymour Johnson Air Force Base and the primary backyard range for F/A-18 squadrons operating out of Naval Air Station Oceana. The range is an electronic combat, day-night, and air-to-ground training site critical to both installations and Army and Navy special operations teams (including SEALs). Together, the Air Force and Navy

are working to protect land near and under special use airspace, military training routes, and bombing run flight tracks near this important range.

Natural resource management on Dare County Bombing Range is guided by the 2015 Final Integrated Natural Resources Management Plan (INRMP) for Dare County Range. Easements acquired with The Nature Conservancy will prevent incompatible uses such as wind energy development in areas near the range identified by range and air installation compatible use zone studies. The protected land includes forested wetlands, which are important for numerous species such as the red-cockaded woodpecker, red wolf and area-sensitive songbirds. Keeping the range isolated and in its natural state ensures that special operations teams can continue their weapons training and Joint Tactical Air Control exercises. Buffering the range also allows the military to expand on current training capabilities, with Navy SEALs planning future riverine training and the Air Force developing a military operations in urban terrain target area, similar training that prepared fighter crews for close air support missions in Afghanistan. Sustaining these capabilities is only possible through partnership with The Nature Conservancy to protect Dare County's significant undeveloped wetlands and forest landscape (DOD Air Force, undated).

State Lands

State Parks

There are two state parks in the five county NC NEP in areas potentially utilized by red wolves. Pettigrew State Park is a North Carolina State Park in Tyrrell and Washington Counties, North Carolina.

Goose Creek State Park is a North Carolina state park near Washington, Beaufort County, North Carolina. It covers 1,672 acres just off of Pamlico Sound, in North Carolina's Coastal Plain.

State Gamelands

The North Carolina Wildlife Resources Commission manages over 2 million acres of game lands for the conservation of wildlife species and to provide public access for hunting, fishing, trapping, and other outdoor recreational opportunities. There are 11 State managed gamelands within the five county NC NEP in areas where red wolves would potentially be present. These are Alligator River, Buchridge, Dare, Gull Rock, J. Morgan Futch, Lantern Acres, New Lake, Pungo River, Texas Plantation, Van Swamp and Voice of America.

Private Land

Private land is generally owned by individuals, corporations, or groups of individuals and in population centers often consists of a complex pattern of ownership. There would not be expected effects to the use of non-Federal lands for their existing principal uses (e.g. timber production, agriculture, private residences) because there would be no new or additional economic or regulatory restrictions imposed upon non-Federal entities or private landowners due to the presence of the red wolf.

Agriculture

Agriculture is an important industry in the NC NEP counties. Agricultural land coverage ranges between 26 to 41 percent of the counties total land area. According to the latest Agricultural Census, the total market value of products sold ranged between $59.5 million to $121.6 million (excluding Dare County). Crop commodities represented the overall majority of total sales. Agriculture fields comprised approximately 30 percent of the land cover and commercial pine plantations 15 percent (Hinton et al. 2017a). Corn, cotton, soybeans and winter wheat are the primary agricultural crops (McKerrow et al. 2006).

Environmental Consequences

Methodology

Effects are evaluated based on the best available information on how the proposed red wolf proposed management changes under the different alternatives would affect the management and use of Federal lands and non-Federal lands within the AP. It is worth noting that any decision regarding the coyote hunting restrictions in the five county area is not under the purview or authority of the Service and resides with the State of North Carolina. The assumptions made in the analysis are based on what would expected to be the State's likely response with regard to those hunting restrictions under the different alternatives.

Effects Common to Alternative 1, Alternative 2 and Alternative 3

Direct, Indirect and Cumulative Effects

Federal Lands

There would be no change to the management of any Federal lands (National Wildlife Refuges or Dare County Bombing Range) under the implementation of any of these alternatives for the protection, conservation or recovery of red wolves. In addition, none of these alternatives would impact the traditional uses of Alligator River NWR, Pocosin NWR, Mattamuskeet NWR or Swanquarter NWR. With the exception of the area surrounding the captive red wolf facility on Alligator River NWR, no areas are proposed for closure or land use restrictions within the NC NEP.

Non-Federal Land

None of these alternatives would involve land use restrictions on any non-federal lands (State, local or private) or any restrictions on the types of activities conducted on those lands, with the exception of the State-regulated restrictions on coyote hunting within the five counties. However, the level of protections received by red wolves on non-Federal lands would vary based on the alternative.

Alternative 1

Direct, Indirect and Cumulative Effects

No additional effects would be expected beyond those discussed in the Effects Common section for Federal lands or non-Federal lands. Red wolves would continue to be protected off of Alligator River NWR and the Dare County Bombing Range, so State-regulated restrictions on coyote hunting in the five county area are likely to remain in effect.

Alternative 2

Direct, Indirect and Cumulative Effects

No additional effects would be expected beyond those discussed in the Effects Common section for Federal lands or non-Federal lands. Red wolves would continue to be protected off of Alligator River NWR and the Dare County Bombing Range, so State-regulated restrictions on coyote hunting in the five county area are likely to remain in effect.

Alternative 3

Direct, Indirect and Cumulative Effects

Federal Lands

After implementation of this alternative, there would likely be a reduction, potentially to zero, in the number of red wolves present on Pocosin NWR, Mattamuskeet NWR and Swanquarter NWR due to the loss of protection for red wolves and an expected initial decline in the red wolf population as management of red wolves was scaled back to Alligator River NWR and the Dare County Bombing Range.

Non-Federal Lands

Under this alternative there would be a loss of protection for red wolves and lethal take would be authorized if they present on the landscape outside of Alligator River NWR and the Dare County Bombing Range. Consequently, it would be expected that the State would revised their coyote hunting regulations to mirror the regulations for the rest of the state, which would allow for coyote hunting at night and without a permit, thereby removing the one current land use restriction related to red wolves on non-Federal lands in the AP.

Alternative 4

Direct, Indirect and Cumulative Effects

Federal Lands

Under this alternative, the termination of the NC NEP and the ultimate elimination of red wolves in the wild would alter the management of the four refuges affected and the Dare County Bombing Range.

Non-Federal Lands

Under this alternative, there would no longer be red wolves on the landscape and therefore there would no longer be a concern of hunters misidentifying red wolves as coyotes. As a result, the State-regulated restrictions on coyote hunting would be removed allowing for coyote hunting without a permit and at night, thereby removing the one current land use restriction related to red wolves on non-Federal lands in the AP.

Conclusion

There would not be any expected effects on land use of non-Federal lands for their principal uses (e.g. timber production, agriculture, private residences) because there would be no new or additional economic or regulatory restrictions imposed upon State, non-Federal entities or private landowners due to the presence of red wolves. Land use restrictions as a result of red wolf

presence and management within the five county NC NEP are limited to one closure area and a State-regulated restriction on coyote hunting at night. Under Alternative 1 and Alternative 2 the coyote hunting restriction would be likely to remain, while under Alternative 3 and Alternative 4 they would be expected to be removed. The closure area for captive red wolves would remain under all alternatives, except Alternative 4.

Alternative 4 represents the least restrictive alternative with respect to land use, while Alternative 1 and Alternative 2 represent the most restrictive, although there are very limited restrictions related to red wolf management under any of the alternatives. Consequently, the effect of any of the alternatives would be expected to have a ***less than significant*** impact on land use.

Economic Activity

Three main economic activities have been previously identified as being potentially impacted by the management alternative or were issues raised by the public as a concern during scoping. These activities are:

- Livestock depredations;
- Recreational hunting success rates; and
- Tourist visitation to the region to view red wolves in the wild.

Livestock

The potential for livestock depredations has been raised as a concern by some private landowners within the NC NEP. The 2012 Census of Agriculture reported there were 1,800 head of cattle and 49,000 hogs and pigs throughout the five-county area (the census withheld some information for privacy concerns). While no studies were identified that considered the actual effect that red wolf reintroduction has had on depredation or animal behavior, the Service is aware of seven depredation incidents over the 30 year lifetime of the reintroduction effort. Of those seven depredations, five were livestock. These depredations took place between 1997 and 2015 and were comprised of goats, chickens, and a hog. Private landowners affected by red wolf livestock depredations were able receive restitution for their losses, though some declined.

Given the relatively low number of known depredations over the lifetime of the red wolf reintroduction program, the absence of directly relevant studies, and the differences in grazing practices and oversight between western and eastern operations, we do not expect there would be significant impacts from livestock depredation for Alternative 3, the preferred alternative. Under this alternative, red wolves would be actively managed on the Alligator River NWR and the Dare County Bombing Range.

Under Alternative 2, the Service would be allowed to more actively manage red wolves throughout the existing NC NEP and could release up to five additional red wolves per year. If these red wolves survived, along with the remainder of the existing population, the overall red wolf population could increase, thus leading to a greater chance of depredation. Based on the low level of depredations documented, even at the height of the introduced red wolf population numbers (e.g. 2005-2007), the number of depredations would not be expected to be substantial.

Under Alternative 1, red wolf populations are expected to continue to decline and are projected to go extinct within 40 years. Under Alternative 4, the red wolf population would decline by design until there was no longer a wild population within the NC NEP.

Recreational Hunting

During the 2017 white-tailed deer hunting season, the state reported a total harvest of 5,583 white-tailed deer taken from the five county area (NCWRC 2018a). According to the North Carolina Wildlife Resource Commission, the reported harvest in 2017 was less than the recent three year average of 6,050. Over the previous three years, the harvest ranged from a low of 5,517 to a high of 6,731 white-tailed deer. Table 3 shows the total number of white-tailed deer harvested for select years for the five county area. In general, harvest levels rose between the years 2000 and 2010/2011 before declining. The most recent harvests are generally less than that first reported in 2000. It is of interest to note that the number of white-tailed deer harvested within the NC NEP rose during the same time period that the population of red wolves increased and that even with a precipitous decline in the red wolf population over the last several years, white-tailed deer harvest has declined.

Reporting Year	Beaufort	Dare	Hyde	Tyrrell	Washington
2000	2,692	77	1,947	954	1,430
2005-2006	2,374	124	1,987	839	1,247
2010-2011	3,344	239	2,451	1,175	1,745
2014-2015	2,681	149	1,653	755	1,472
2017-2018	2,562	133	1,074	574	1,240
Percent Change 2000 – 2017/2018	-4.8%	72.7%	-44.8%	-39.8%	-13.3%

Table 3. Reported White-Tailed Deer Harvest, Select Years (NCWRC 2018a).

Because Alternatives 1 and 4 would result in a reduction in the red wolf population, it stands to reason that their impact on the white-tailed deer population would also decline. However, in the absence of red wolves, the coyote population would be expected to increase and affect white-tailed deer, particularly fawns. As a result, any increase in white-tailed deer hunting opportunities would likely be minimal and localized. It is possible that under Alternative 2, which envisions under ideal circumstances an increase in the red wolf population over time that

their effect on the white-tailed deer population could increase. Although given the small number of red wolves anticipated along with the large number of white-tailed deer in the area, the impact is expected to be minimal. Under Alternative 3, the preferred alternative, red wolves would only be managed on a small area of federal land, thus their effect on the white-tailed deer population in the five county area would decline as well.

Tourism

It is thought by many conservation-oriented organizations that a successful reintroduction of red wolves would result in a positive economic benefit to the communities due to an increase in visitation to the area. When gray wolves were reintroduced into the Yellowstone ecosystem, the park experienced an increase in gray wolf-oriented ecotourism. These tourists spent their money in local communities during their stay at lodging and dining facilities, and spent additional money on trip-related expenses.

In contrast, the habitat and flat terrain that the red wolves have been reintroduced into is much more woody and dense compared to the Lamar Valley. Refuge and public roads typically lack grand vistas with great sightlines, which would increase the opportunity to see a red wolf. During winter, sightlines are somewhat improved due to open areas in the farmed fields of the refuge and public lands affording more potential red wolf viewing opportunities, such as the ones photographed in late 2017 (Figure 10).

Figure 10. Red wolves on Alligator River NWR. Photos taken by refuge visitor Robert Ondrish in late 2017.

A 2005 study conducted for the Defenders of Wildlife looked at the potential economic opportunity that could be created through ecotourism via red wolf reintroduction (Lash and Black 2005). This study found that county residents were interested in economic growth for their area; protecting the natural beauty and rural setting of their counties; providing job opportunities for youth; preserving the historical, quaint, small-town look and feel; and having a distinct town area, some residential development areas and a predominantly rural farm setting (Lash and Black 2005). This study also found that tourists to the Outer Banks were interested in

day or short-trips to natural or wilderness areas to view wildlife and nature. They found that these tourists would be willing to stay for dinners, shop, and experience other local tourists' activities should they make the trip. Local, regional and national organizations have expressed interest in promoting ecotourism of northeastern North Carolina with the presence of red wolves, the only wolf species endemic to the United States and currently the only wild population, the cornerstone of that tourism.

The North Carolina Coastal Plain National Wildlife Refuge Complex includes Alligator River NWR and Pocosin NWR within the NC NEP area potentially occupied by red wolves. The Complex has a large visitor center located in Manteo, NC with multiple exhibits and programs related to red wolves. Red wolf howling tours are a popular activity on Alligator River NWR offered by the Service. Pocosin NWR also has a visitor center with red wolf displays and educational materials in Columbia, NC. The Red Wolf Health Care and Education Center located nearby provides visitors the opportunity to see a captive pair of red wolves as well as provides red wolf-related outreach and educational programs. Visitation to the Refuge Complex was approximately 1.7 million in 2016.

Under Alternatives 1 and 4, where the red wolf population is expected to decline and eventually disappear, it is doubtful that any meaningful ecotourism industry would continue to develop or be sustained. Under Alternative 3, the red wolf would be managed only on federal lands. These lands may provide unique viewing opportunities as the last place to see red wolves in the wild, but because they would be able to support a limited number of red wolves, viewing instances would be expected to be limited. Under Alternative 2, the red wolf population could potentially expand as it allows for a small number of new red wolves to be introduced each year and for the Service to work with willing landowners to provide habitat. Viewing opportunities could potentially increase and larger landowners could potentially capitalize on these opportunities. To date, though, there is insufficient data to predict the extent to which an ecotourism industry would develop and to what degree for Alternatives 2 and 3.

Conclusion

The greatest potential for a negative impact on the local economy would be under Alternative 4 with a termination of the red wolf program, or under Alternative 1 if the population goes extinct as projected, due to the associated loss of any ecotourism potential to the area based on their presence. Additional hunting opportunities under Alternatives 1 and 4 would be very limited and localized as the coyote population increased to fill the void. Based on the information known to date and the expectations associated with each of the alternatives as described above for the resources analyzed, the impact from any of the alternatives would be ***less than significant*** on economic activity.

Human Health and Safety

Affected Environment

Intolerance of wolves led to their extermination in northern and central Europe. Red wolves were likely one of the first carnivores the early settlers encountered when they arrived on the Atlantic coast, which meant red wolves were also quick to be persecuted. Habitat loss coupled

with persecution, including government supported eradication campaigns, reduced the red wolf population to about 100 individuals by the mid-20th century. In the 1970s, the Service removed the last remaining red wolves from eastern Texas and western Louisiana to try and save the species in captivity. Declared extinct in the wild in 1980, the Service began to focus conservation efforts on creating a captive population from which to restore red wolves to their historic range in the future. A reintroduction site was identified and efforts to restore red wolves to the wild began with the release of four mated pairs at Alligator River NWR in northeastern North Carolina in 1987.

A recent survey conducted for the North Carolina Wildlife Resources Commission evaluated the perspectives of Albemarle Peninsula residents on coyote and red wolf management (Serenari 2018). The survey found AP residents to be relatively split in their support for red wolf recovery and willingness to support the presence of wild red wolves on the AP. Regarding their concern for potential consequences of red wolf encounters, there was some concern by AP residents over the potential of a pet or child being attacked or the spread of rabies. There was generally less concern over regular presence of red wolves, risk of a face-to-face encounter and damage to property. The vast majority of survey respondents indicated that red wolves do not cause them any problems (Serenari 2018).

Environmental Consequences

Human Safety

During the 30 year recovery effort, red wolves living in the wild in the NC NEP have proven to be shy, reclusive animals that prefer to avoid human contact. There have been no reported instances of aggression or threatening behavior towards people. There have been no reported human injuries from a red wolf attempting to defend itself and no incidents of predatory behavior toward humans from red wolves. Direct conflicts with humans have been limited to a handful of confirmed cases of depredation on pets and livestock, or property damage during the history of the program. While any wild animal can be dangerous if cornered, threatened or overly habituated to humans, there is no evidence that red wolves pose an unusual risk to humans. Virtually all of the cultural and historical fears of red wolves retained by residents have proven to be unfounded.

Human Health

Red wolves are subject to diseases that affect all canines, including domestic dogs, coyotes and foxes. All released, translocated and handled red wolves are administered vaccine against the full spectrum of canine diseases including rabies, distemper, canine parvovirus, and infectious canine hepatitis viruses, and, when possible, are dewormed for intestinal and external parasites. Captive red wolves receive annual booster shots. Wild-born animals are vaccinated opportunistically whenever captured for other reasons such as radio-collaring. Given these precautions, the red wolves in the NC NEP population are less likely to carry disease than other wild canids and are not likely to transmit parasites or disease-causing pathogens that are not already carried by other canids. Because of the comparatively (to other populations of wildlife, including other canids such as coyote and fox) small size of the experimental population of red

wolves, the active management and routine monitoring and the vaccination protocol, the red wolf's contribution to the overall parasite or pathogen load in the NC NEP is minimal. There is no reason to anticipate an increase in the risk of disease transmission to humans in the NC NEP as a result of the experimental population of red wolves, even with an increase in the population.

Conclusion

Based on the 30 year history of the program with respect to direct threats to humans and disease transmission associated with the reintroduced red wolf population, along with their general avoidance of humans, there would not be expected to be the development of human health and safety issues beyond the current extremely low level even with potential red wolf population increases associated with Alternatives 2. Consequently, the effect of any of the alternatives would be expected to have a ***less than significant*** impact on human health and safety.

Environmental Justice

Executive Order 12898 (EO 12898), February 11, 1994 codified into federal law a decades old social movement. The EO mandates that 'disproportionately high and adverse' effects on population groups of concern be identified and addressed. Discretion is largely left up to individual bureaus and agencies on how to comply with this EO's need for public involvement and analysis. Similar to NEPA, past work and litigation have served to establish acceptable standards and practice.

There are four types of populations groups of concern for Environmental Justice: minorities, low income, indigenous, and those who principally subsist on fish and wildlife.

Within the analysis area there are no indigenous groups or identified groups that subsist principally on fish and wildlife. Minority population groups are automatically considered a population group of concern if they comprise over 50 percent of the affected area. Populations of minorities and low income people are identified on a county level. Black or African Americans compose 48.9 percent of Washington County, but 28.6 percent of the overall analysis area. The proposed alternatives would not be expected to have measurable effects on minority populations and therefore would not be expected to have any disproportionate high or adverse effects on those populations.

Due to the rural nature of the vast majority of the five counties within the analysis area, the area population tends to be in lower income categories, but no identifiable group of individuals can be considered to have lower income in relation to local averages. The impacts of Alternatives 1, 2 and 3 on human activities in the analysis area are expected to be minimal, and so do not represent any disproportionate high or adverse effects to low-income groups. Consequently, the effect of any of the alternatives would be expected to be ***not significant*** for environmental justice.

SUMMARY OF EFFECTS FOR RESOURCE ANALYZED

Based on the evaluation of the proposed alternatives, none are expected to have significant effects on factors of the human environment such as land use, agriculture, forestry, game populations, human health and safety, transportation or other economic interest. One potential economic impact of Alternative 4 may be a reduction in visitation to Alligator River NWR for members of the public that travel there with the hope of seeing a red wolf in the wild.

The primary effects of the proposed alternatives relate to the potential effects to the red wolf population itself as a result of the different management scenarios and federal expenditures for red wolf conservation. Alternative 4 would be the greatest impact on the red wolf population with the termination of the program, followed by Alternative 1 with a projected extinction in the wild in the NC NEP within 40 years under the current management scenario. Whether Alternative 2 ultimately leads to a larger increase in the red wolf population and which alternative would garner the highest levels of public cooperation along with the lowest human-caused mortality rates, is difficult to predict. Detailed cost estimates, including salaries, are not yet available but the alternatives can be placed in rank order as follows (lowest to highest costs): Termination (Alternative 4), Five County and Federal lands (tie – Alternative 2 and Alternative 3), and No Action (Alternative 1). Under the three change alternatives resource savings would potentially be shifted to the recovery of other species and additional support provided to the captive red wolf population. It is also worth noting that even current management (e.g. Alternative 1 - the No Action Alternative) reflects shifts in recovery resources to other species since 2013.

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