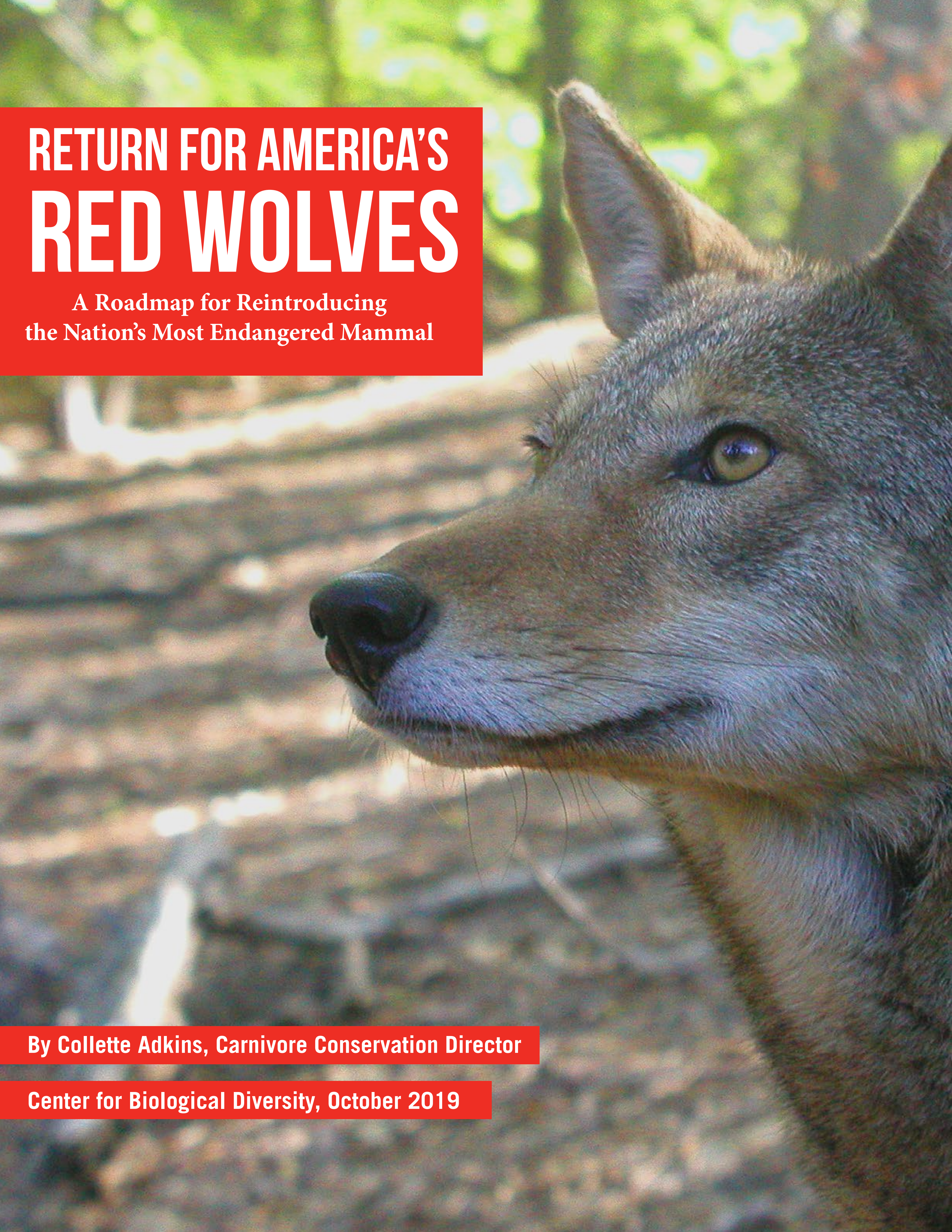
RETURN FOR AMERICA'S RED WOLVES

A Roadmap for Reintroducing the Nation's Most Endangered Mammal



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EXECUTIVE SUMMARY

Red wolves (*Canis rufus*) are among the rarest mammals in the world. Once common throughout the southeastern United States, red wolves have experienced a steep decline, especially over the past decade. Today only 14 known wolves remain in the wild — all of them in North Carolina. Without substantial help, this species could go extinct within the next five years.

For this report we examined the history of red wolf decline and the recovery effort over the past 25 years. Most importantly, we chart out a roadmap for halting the wolf's extinction and fostering a recovery that's achievable and sustainable. Central to a successful recovery will be reintroducing red wolves to select areas of their historic habitat in the Southeast.

Key finding: For reintroduction efforts, we describe approximately 20,000 square miles of potential habitat in five top sites (North Carolina, Florida, Virginia/West Virginia, Arkansas and Alabama) that could support nearly 500 breeding pairs of red wolves.

Each of these areas meet basic requirements for successful reintroductions, including adequate prey base, potential for reproductive isolation from coyotes (to reduce hybridization), connectivity to other possible reintroduction sites, and low human and road densities. All of the proposed reintroduction sites are focused on publicly owned land.

Recommendation: The U.S. Fish and Wildlife Service must move quickly to save this species by a) examining existing science that identifies highly suitable habitat for red wolf reintroduction and b) aggressively pursuing reintroductions in at least two of the recommended areas. Time is running out for red wolves — a new recovery plan that charts this path will be critical to saving this species and fostering a future where they can survive and ultimately thrive.

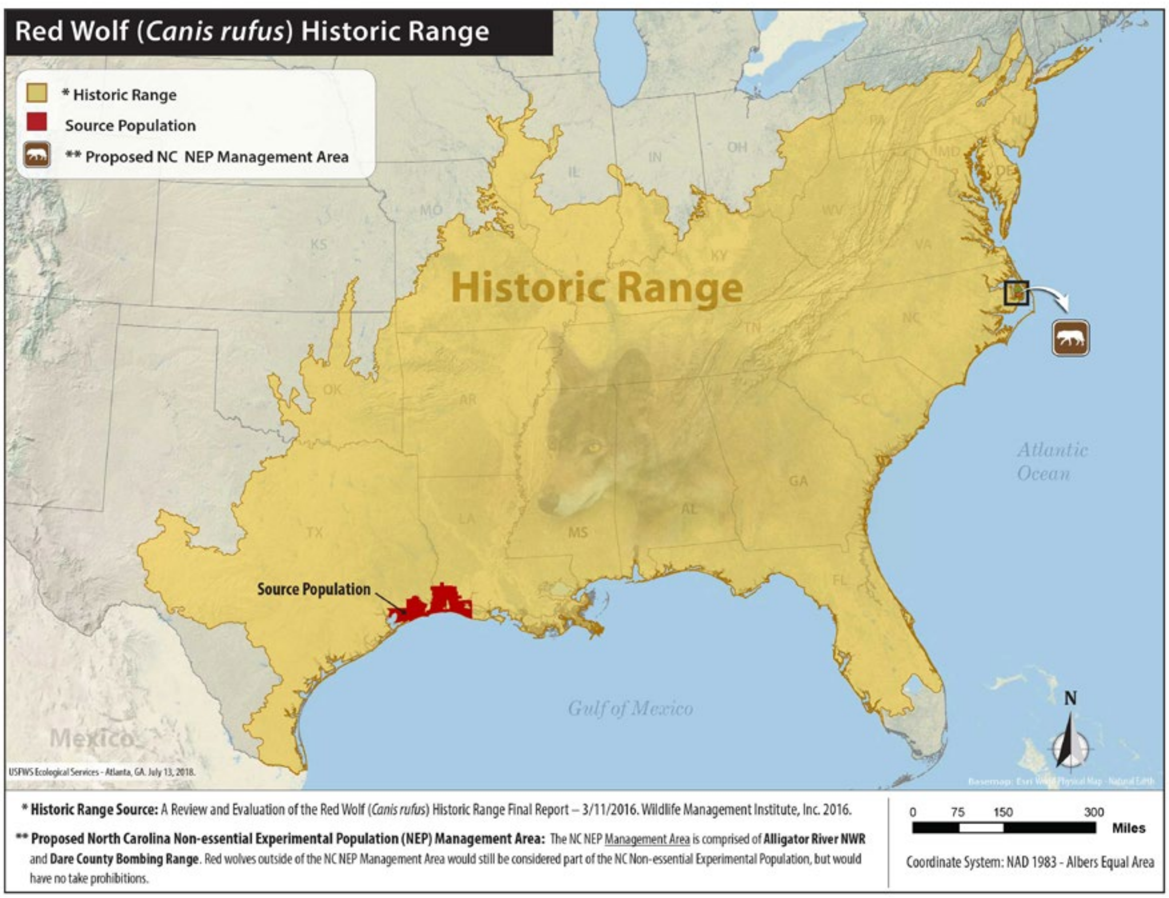

Figure 1. Red wolf historic range. Source: U.S. Fish and Wildlife Service.

A DIFFICULT HISTORY

Red wolves were once common throughout the southeastern United States (see Figure 1; WMI 2016), but most populations were extirpated by the mid-1900s due to eradication programs, hybridization with coyotes, and habitat degradation. Animals from a remnant red wolf population in Louisiana and Texas were removed from the wild for a captive-breeding program, and the wolf was declared extinct in the wild in 1980 (Gilbreath and Henry 1998).

In 1982 the Service designated an experimental population for the species under section 10(j) of the Endangered Species Act, 16. U.S.C. § 1531 et. seq. The captive-breeding program supplied animals for a reintroduction effort in 1987 at the Alligator River National Wildlife Refuge in North Carolina (USFWS 1990). The red wolf recovery area was later expanded to include three national wildlife refuges, a Department of Defense bombing range, state-owned lands, and private property, spanning a total of 1.7 million acres (Hinton et al. 2013).

For its first 25 years, red wolf reintroduction in North Carolina was a considerable success, growing the wild population to more than 120 wolves by 2001 and peaking in 2006 with 130 wolves in 20 packs throughout the recovery area (Faust et al. 2006).

For the past decade or so, however, the wild red wolf population has been drastically declining (Faust et al. 2006). Red wolf numbers began plummeting in the mid-2000s (see Figure 2) when the state of North Carolina loosened regulations on coyote hunting that in turn increased accidental killings of red wolves (e.g. Hinton et al. 2015). Scientists documented a roughly 375 percent increase in red wolf shooting deaths (Bartel and Rabon 2013; USFWS 2016). This increased mortality in turn led to increased hybridization with coyotes (Hinton et al. 2015).

Rather than work to curb these shooting deaths, the Service began to dismantle its red wolf recovery program. In early 2015 the Service stopped sterilizing coyotes (USFWS 2018b) despite evidence that it reduced production of hybrid litters and thereby limited genetic introgression (e.g. Gese and Terletzky 2015). The Service also began removing red wolves from private lands upon landowners' requests and issuing permits authorizing landowners to shoot red wolves (Fears 2018). Finally, the Service announced it was halting all releases of captive red wolves (USFWS 2018b).

The red wolf is now one of the world's most endangered mammals. The species is classified as "critically endangered" by the International Union for Conservation of Nature (Phillips 2018). Last year the Service reported 24 known red wolves in five counties, with an estimated total population in the wild of approximately 30 to 35 individuals (USFWS 2018). Since then the wild red wolf population has dropped down to just 14 known individuals (Madison, J., Asst. Field Supervisor, Red Wolf Recovery Program, pers. comm.).

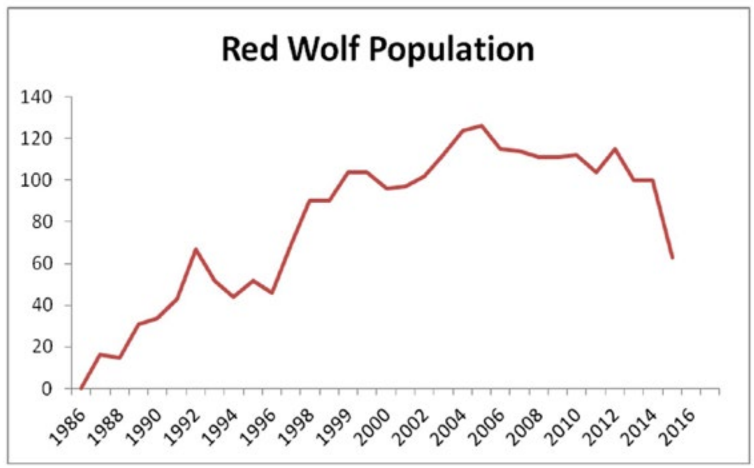

Figure 2. Red wolf population 1986-2016.

THE CASE FOR REINTRODUCTION

Reintroduction of wolves into an area can help restore entire ecosystems, as demonstrated by the success of the reintroduction of wolves to the Greater Yellowstone Ecosystem (e.g. Beschta and Ripple 2016). Scientists there have documented, for example, a reduction of disease in ungulate populations and increased songbird diversity.

Given their broad historic range across the southeastern United States, red wolves cannot be recovered if limited to one site in North Carolina. And dramatic declines of the North Carolina population raise serious concerns about risk of extinction in the wild. Additional red wolf reintroductions would allow for population growth and range expansion.

Reintroductions would facilitate evolutionary processes, such as natural selection, that promote adaptation and population persistence (Bartel and Rabon 2013). Establishment of several populations within dispersal distance of each other would result in exchange of genetic material that will, in turn, increase genetic diversity and reduce inbreeding (Brzeski et al. 2014; USFWS 2007).

Reintroductions are also critically important to the management of disease (Brzeski et al. 2015; Bartel and Rabon 2013). With only a single wild red wolf population, disease has the potential to spread and wipe out that population.

The Service has committed to further red wolf reintroductions. The 1990 Red Wolf Recovery Plan calls for the reintroduction of wolves into at least three areas within the wolves' historic range (USFWS 1990). Since then, in its 2018 five-year status review (USFWS 2018a), for example, the Service reiterated its commitment to identify potential new reintroduction sites within the historical range of the species (see also Dohner 2015, 2016, 2017; USFWS 2018b).

A Wildlife Management Institute report also reaffirmed the need for additional reintroduction (WMI 2014). The report found that "[s]uccessful accomplishment of the current recovery plan objectives will require identification of suitable areas and reintroduction of red wolves to 2 other distinct locations within historic red wolf range" (WMI 2014, p.3).

Despite these commitments the Service has failed to take any concrete steps toward reintroducing red wolves.

TOP SITES FOR POTENTIAL REINTRODUCTION

While much of the southeastern United States has been converted to agricultural fields, timber plantations and urban areas, nearly half of red wolf's historic range still consists of forests, grasslands and other natural areas (Dellinger unpubl.). Public lands make up more than 10 percent of the red wolf's historic range (Dellinger unpubl.).

Scientists have developed criteria for assessing potential reintroduction sites (e.g. Kelly et al. 1999; van Manen et al. 2000; Shaffer 2007; Toivonen 2018; O'Neal 2018). Considerations include (1) reproductive isolation from coyotes; (2) adequate prey base (i.e., white-tailed deer and various small- to medium-sized mammals); (3) minimum space requirements; (4) low human and road densities; and (5) tolerant landowners and supportive institutions. Experience has shown that red wolves can thrive even in human-associated landscapes if protected from shooting and trapping (Dellinger et al. 2013; Hinton 2016).

Red wolf hybridization with coyotes has been one of the greatest concerns associated with reintroduction efforts. Managing coyotes is easier where their densities are lower and where natural barriers exist to prevent reinvasions and dispersal into the reintroduction site (Dellinger unpubl.). Hybridization rates would also likely be lower in large, unfragmented areas with less edge habitat where coyotes thrive (Dellinger unpubl.).

In identifying areas for possible red wolf reintroduction, scientists have focused on large areas that would support several red wolf breeding pairs. For example, Dellinger (unpubl.) restricted his analysis to areas greater than 580 square miles, wherein at least 15 red wolf breeding pairs might be able to persist based on an average home range size of about 38 square miles. That study identified more than 111,000 square miles across the southeastern United States that could potentially support more than 1,700 red wolf breeding pairs (Dellinger unpub.).

In the past decade, numerous studies have examined potential reintroduction sites for red wolves. This report discusses five potential reintroduction sites identified as highly suitable by scientists. The Service should immediately analyze the results of these studies and then pursue reintroduction in at least two additional areas.

Florida

Figure 3. Florida Panhandle and North Central Florida reintroduction sites. Florida Panhandle site centers on the Apalachicola NF with adjacent dispersal sites: Apalachicola River Wildlife and Environmental Area, Tate's Hell State Forest, St. Marks National Wildlife Refuge and Aucilla Wildlife Management Area. The North Central Florida reintroduction site centers on the Osceola NF with the Okefenokee National Wildlife Refuge (GA) to the north.

Scientists have identified multiple locations in Florida for red wolf reintroduction, including in the Panhandle and northern Florida.

Multiple studies on red wolf habitat suitability have highlighted the promise of Apalachicola National Forest (989 miles^2) in the Florida Panhandle (Toivonen 2018; O'Neal 2018). Numerous nearby public lands would provide for dispersal as the population grows, including Apalachicola River Wildlife and Environmental Area, Tate's Hell State Forest, St. Marks National Wildlife Refuge and Aucilla Wildlife Management Area. Because of the high-quality habitat here, scientists have also suggested that the Apalachicola National Forest could be a potential reintroduction site for Florida panthers (Thatcher et al. 2006).

In north-central Florida, the Osceola National Forest (313 miles^2) would also be ideal for reintroduction, especially because of its location adjacent to Okefenokee National Wildlife Refuge (684 miles^2), another large potential reintroduction site just across the border in Georgia (van Manan et al. 2000; O'Neal 2018). With pine flatwoods and cypress-hardwood swamps, the Osceola National Forest also provides habitat for imperiled Florida black bears. The Okefenokee National Wildlife Refuge is nearly entirely undeveloped, containing the large Okefenokee Wilderness (553 miles^2). Its habitats provide for threatened and endangered species like red-cockaded woodpeckers, wood storks, indigo snakes and a wide variety of other wildlife species.

Virginia and West Virginia

Multiple recent studies have identified the Virginias as a prime region for red wolf reintroduction (Dellinger unpubl.; van Manan et al. 2000; Toivonen 2018). Eastern West Virginia and western Virginia contain extensive public lands and low human population density. As such, any reintroduced red wolves would likely have lower chances of human-caused mortality (Dellinger upubl.).

This area contains the Monongahela National Forest (1,439 miles^2) in West Virginia and the contiguous Washington and Jefferson National Forest (2,798 miles^2) across the border in Virginia. These national forests contain several wilderness areas, including Lewis Fork and Ramsey's Draft. Additional areas for range expansion include Shenandoah National Park and the Mount Rogers National Recreation Area in Virginia. The Cherokee National Forest (1,024 miles²) in Tennessee lies to the south, as does the proposed western North Carolina reintroduction site. Given that O'Neal (2018) identified Cherokee National Forest as highly suitable, this region has the capacity for creation of a meta-population connected by dispersal.

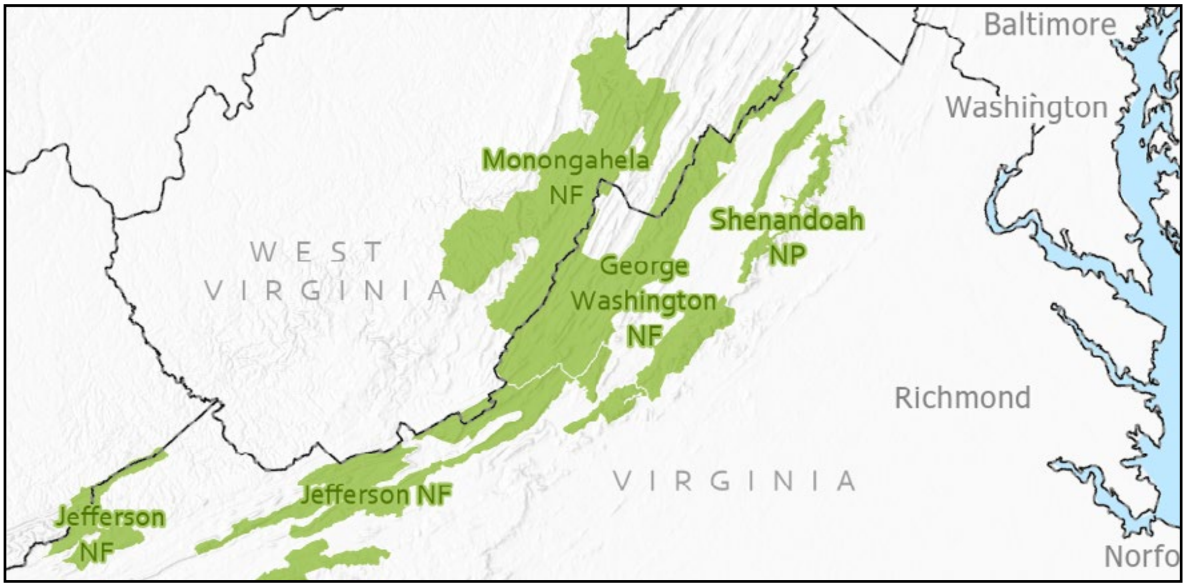

Figure 4. The Virginias reintroduction site: George Washington and Jefferson NF (VI) and Monongahela NF (WV). Adjacent dispersal areas in Mount Rogers National Recreation Area (VI) and Shenandoah National Park (VI), as well as several sites further south.

More than 100 breeding pairs of red wolves could be supported by in this reintroduction area, according to one study (Dellinger unpubl.).

Arkansas

The Ozark National Forest (1,875 miles²) in northwestern Arkansas has enough high-quality red wolf habitat to support approximately 30 breeding pairs (Dellinger unpubl.). Importantly, this region has the potential to grow into a meta-population, with several highly suitable areas within dispersal distance. These dispersal sites include Ouachita National Forest (2,812 miles²) within about 100 miles south (but across Interstate 40) and Mark Twain National Forest (2,344 miles²) to the north, in southern Missouri. Multiple studies identified this region as suitable for red wolf reintroduction (Dellinger unpubl.; van Manen et al. 2000; Toivonen 2018). Scientists have also suggested that the national forest could be a potential reintroduction site for Florida panthers (Thatcher et al. 2006).

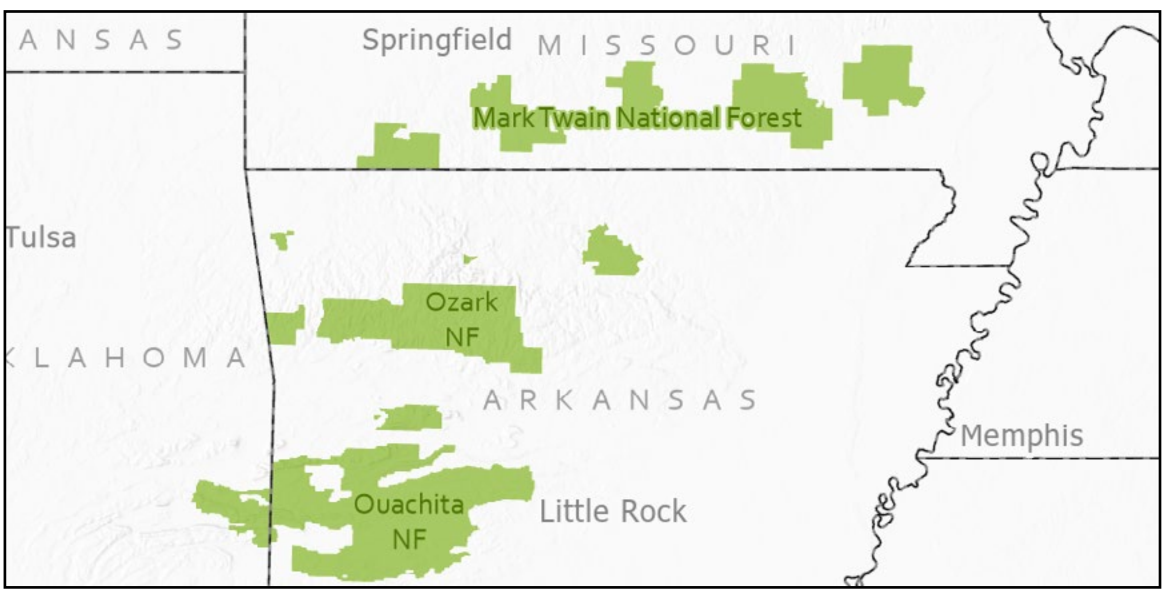

Figure 5. Arkansas reintroduction site: Ozark NF. Sites within dispersal distance: Ouachita NF (AR) and Mark Twain NF (MO).

Experience in North Carolina has proven the importance of public support for reintroduction efforts. Arkansas State University has the red wolf as its mascot and currently supports a captive-breeding population of red wolves. This established public support for red wolves in the state may help in promoting tolerance of wild wolves (Dellinger unpubl.).

The region was home to one of the last wild populations of red wolves (USFWS 1990). Several sources document small populations of red wolves in the Ozark/Ouachita Mountain region of Arkansas in the 1960s (e.g. Bond and Crawley 1968).

North Carolina

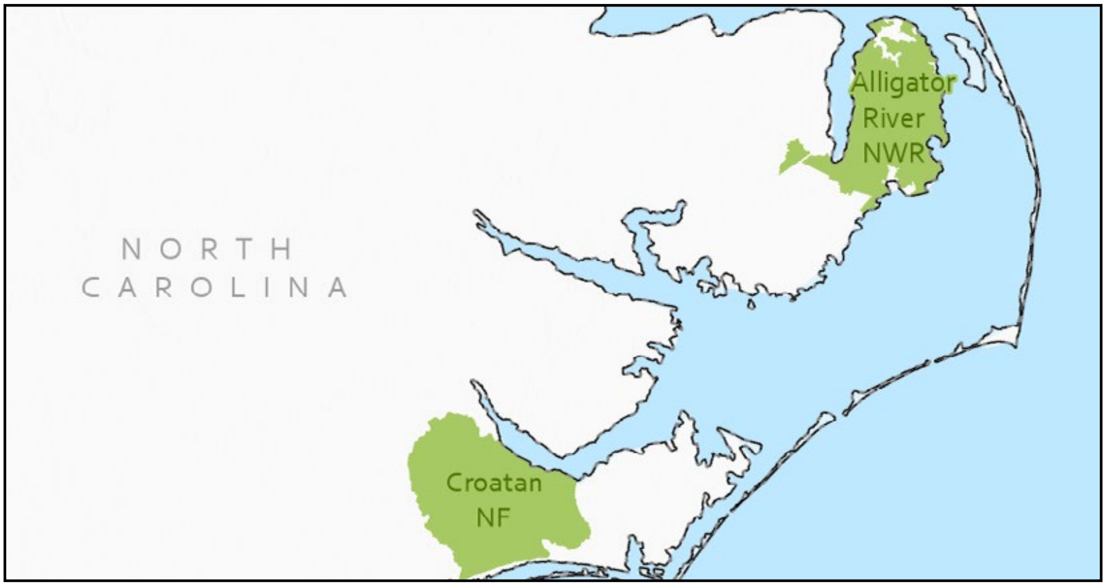

Figure 6. Coastal North Carolina reintroduction site: Croatan NF with Hoffman State Forest just to the west. Current experimental population at Alligator River National Wildlife Refuge to the north.

Not only does North Carolina contain the only remaining wild population of red wolves, it contains two additional prime reintroduction sites: the central coast and the western part of the state (Shaffer 2007; O'Neal 2018; Toivonen 2018).

Several conservation areas in central coastal North Carolina exist just south of the current experimental population in northeastern North Carolina (Shaffer 2007; O'Neal 2018). This area includes Croatan National Forest (250 miles^2) and the Hofmann State Forest (125 miles^2) in Carteret, Craven, Jones and Onslow counties. Farther down along the coast, the Marine Corp base at Camp Lejeune could offer room for population growth. Shaffer (2007) explains that he identified this area because of its low coyote density and the possibility of excluding coyotes given that water bounds much of the area. The proximity to the existing reintroduction site would also allow for exchange of resources (Shaffer 2007). He notes that the swampy landscape conditions may not be ideal for wolves but that these sparsely populated areas might make for less human conflict.

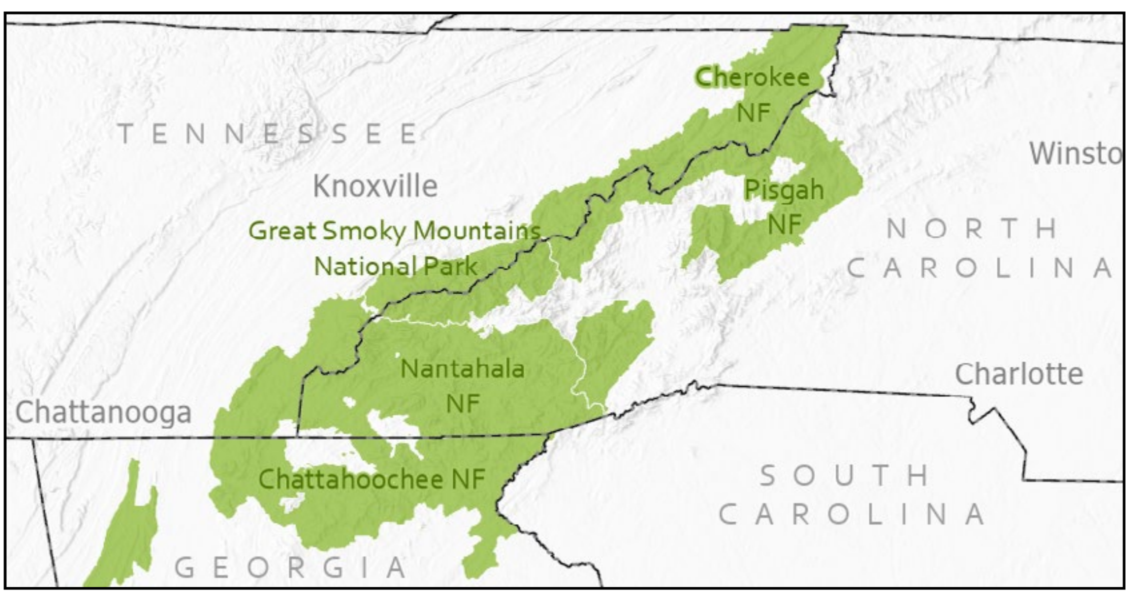

Figure 7. Western North Carolina reintroduction site: Nantahala NF and Pisgah NF. Adjacent dispersal areas: Chattahoochee NF (GA), Great Smoky Mountains National Park (TN) and Cherokee NF (TN).

To the west two national forests combine to create a large swath of habitat for a reintroduced red wolf population. Toivonen (2018) identified the Pisgah National Forest (801 miles^2) and the Nantahala National Forest (830 miles^2) as highly suitable. This area abuts the Cherokee National Forest (1,024 miles^2) to the north in Tennessee. The Chattahoochee National Forest (1,276 miles^2), just to the south in Georgia, is an area identified as highly suitable in another study (O'Neal 2018).

The Nantahala National Forest lies south of the Great Smoky Mountains National Park (816 miles^2) where a previous attempt at red wolf reintroduction failed because of lack of deer in the park's remote, high-elevation terrain (USFWS 2019). In contrast, logging projects on Nantahala National Forest create edge habitat where deer thrive (Ettema 2014).

Alabama

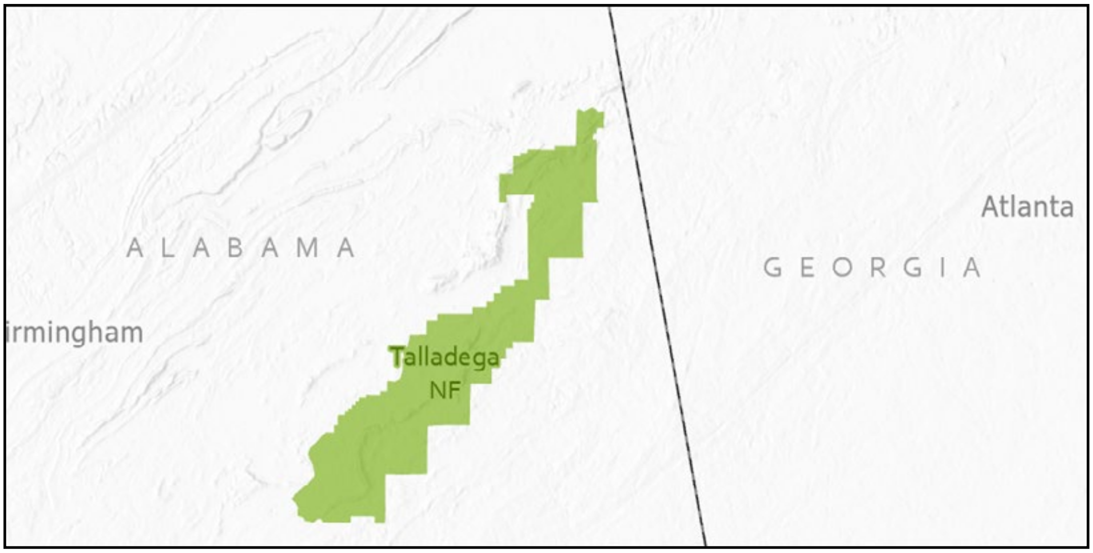

Figure 8. Alabama reintroduction site: Talladega NF.

The Talladega National Forest (613 miles^2) in Alabama ranked highest in terms of proportion of suitable habitat in three models constructed by Toivonen (2018). O'Neal (2018) also identified this area as suitable for red wolf reintroduction. At the southern edge of the Appalachian Mountains, this area contains two high-elevation wilderness areas: Cheaha Wilderness and Dugger Mountain Wilderness.

The southern end of the proposed western North Carolina reintroduction site lies about 100 miles north of the proposed Alabama reintroduction site, close enough for dispersal and genetic exchange if reintroduction occurs at both sites. About 250 miles southwest of Talladega National Forest, the De Soto National Forest (810 miles^2) in Mississippi has also been identified by scientists as a red wolf reintroduction site (Toivonen 2018; O'Neal 2018).

Although once among the most extensively logged and eroded land in Alabama, pine regrowth in the Talladega National Forest now hosts a diverse ecosystem. Several species of rare animals live here, including gopher tortoises, flattened musk turtles and red-cockaded woodpeckers. As such, it is a popular wildlife-watching location, and Cheaha State Park is located within its borders. These visitors would likely support efforts to reintroduce red wolves in the area.

RECOMMENDATION

The U.S. Fish and Wildlife Service must act quickly to save red wolves. Numerous scientific studies demonstrate that highly suitable red wolf habitat remains across the southeastern United States. Guided by current science, the Service should develop a new red wolf recovery plan that evaluates potential reintroduction sites and incorporates the lessons learned from the reintroduction program in North Carolina. After such an evaluation, the Service must take immediate steps to reintroduce wolves to the top sites, using wolves from the captive-breeding program.

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