# Restoring a Forest Legacy at Upper Ouachita National Wildlife Refuge

*A Forestland Restoration Partnership Between the US Fish and Wildlife Service and The Conservation Fund's Go Zero® Program*

Project Design Document

Prepared by:

The Conservation Fund

With contributions from:

United States Fish and Wildlife Service

TerraCarbon LLC

## EXECUTIVE SUMMARY

This Project Design Document is prepared for the Upper Ouachita National Wildlife Refuge Restoration Initiative to meet the standards of the Climate, Community and Biodiversity Alliance. The Upper Ouachita National Wildlife Refuge Restoration Initiative presents a significant opportunity to restore native hardwood forests that will expand wildlife habitat, create new areas for public recreation and trap carbon dioxide.

On behalf of the US Fish and Wildlife Service, The Conservation Fund purchased 3,905 acres of private, marginal agricultural land within the boundary of Upper Ouachita National Wildlife Refuge in northern Louisiana. Using donations from its Go Zero® program, the Fund restored approximately 2,606 acres with native bottomland hardwood seedlings. The restoration took place on both newly acquired private lands as well as lands the Refuge already owned. Over the course of the next two years, the private parcel will be conveyed to the US Fish and Wildlife Service as an addition to the Upper Ouachita National Wildlife Refuge. All of the newly restored native bottomland hardwood forests will be owned and managed by the Service to ensure their long-term protection and stewardship. All carbon accrued from this project shall be withheld from the carbon market and cannot be sold or banked for future offset purposes.

This project has been designed to:

- decrease the effects of climate change via carbon sequestration;
- restore Louisiana's bottomland hardwood forest ecosystem for the benefit of fish and wildlife resources; and
- create long-term community benefits in the form of enhanced habitat for wildlife and improved and expanded recreational lands under the management of the US Fish and Wildlife Service for activities such as hunting, fishing, wildlife photography, wildlife observation, environmental education and environmental interpretation.

The Fund's Go Zero program engages companies, their customers and employees, as well as other organizations and individuals seeking a positive response to two of our nation's most pressing environmental challenges: habitat loss and climate change. In a time when public financing for land conservation and habitat restoration is stretched thin, voluntary contributions are providing new private capital to further the Fund's mission to conserve and restore our nation's land and water legacy for current and future generations. From these Go Zero projects, the nation derives—and will continue to receive for many years into the future—significant public benefits, including cleaner air and water, restored wildlife habitat and enhanced areas for public recreation.

All of the Fund's reforestation-based carbon sequestration activities are conducted with state and federal natural resource agencies, including the US Fish and Wildlife Service. These organizations employ some of the world's top wildlife biologists, foresters and environmental professionals who serve as long-term stewards of the forests once they are restored. In March of 2007, the Fund and the US Fish and Wildlife Service entered into a Memorandum of Understanding (renewed in 2010) that allowed all 553 of the Service's National Wildlife Refuges to benefit from the Fund's Go Zero program, building upon nearly a decade of partnership between the Fund and the US Fish and Wildlife Service to advance the science of carbon sequestration through reforestation.

This project involves the implementation of many of the stewardship and management activities prescribed in the Upper Ouachita NWR Comprehensive Conservation Plan. Comprehensive Conservation Plans are required by each Refuge under the National Wildlife Refuge System Improvement Act of 1997 and detail how each Refuge will achieve objectives consistent with sound principles of fish and wildlife management, conservation, legal mandates and Fish and Wildlife Service policies. The National Environmental Policy Act requires each plan to examine a full range of alternative approaches to Refuge management and to involve the public in selecting the approach best suited to each Refuge's purposes.

The Upper Ouachita National Wildlife Refuge Restoration Initiative also benefits from our partnership with TerraCarbon LLC, an advisory firm specializing in the forestry and land use sector of the carbon markets. TerraCarbon has been contracted by the Fund to plant the Project Area, to measure the baseline conditions and to develop a monitoring plan that enables the Fund to monitor the project’s ongoing carbon gains.

Over the course of the last century we have lost more than 20 million acres of bottomland hardwood forest along the Mississippi Valley, primarily because the land was converted to agriculture. Habitat loss is more pronounced here than in any other area of the United States. Restoring this area is one of The Conservation Fund’s highest priorities, resulting in an abundance of climate, community and habitat benefits for wildlife and people alike.

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## G1. ORIGINAL CONDITIONS IN THE PROJECT AREA

### G1.1 Location and Basic Physical Parameters

The Upper Ouachita National Wildlife Refuge ("Upper Ouachita NWR" or "Refuge") is located in Morehouse and Union Parishes in northeastern Louisiana. The northern boundary of the Refuge lies on the Louisiana-Arkansas state line and the southernmost point on the Refuge is approximately 20 miles north of Monroe, Louisiana, which is the closest major city, as illustrated in Figure 1. The Refuge's current acquisition boundary encompasses 61,633 acres, of which 42,594 acres have been purchased and are owned by the United States Fish and Wildlife Service ("USFWS" or "the Service").

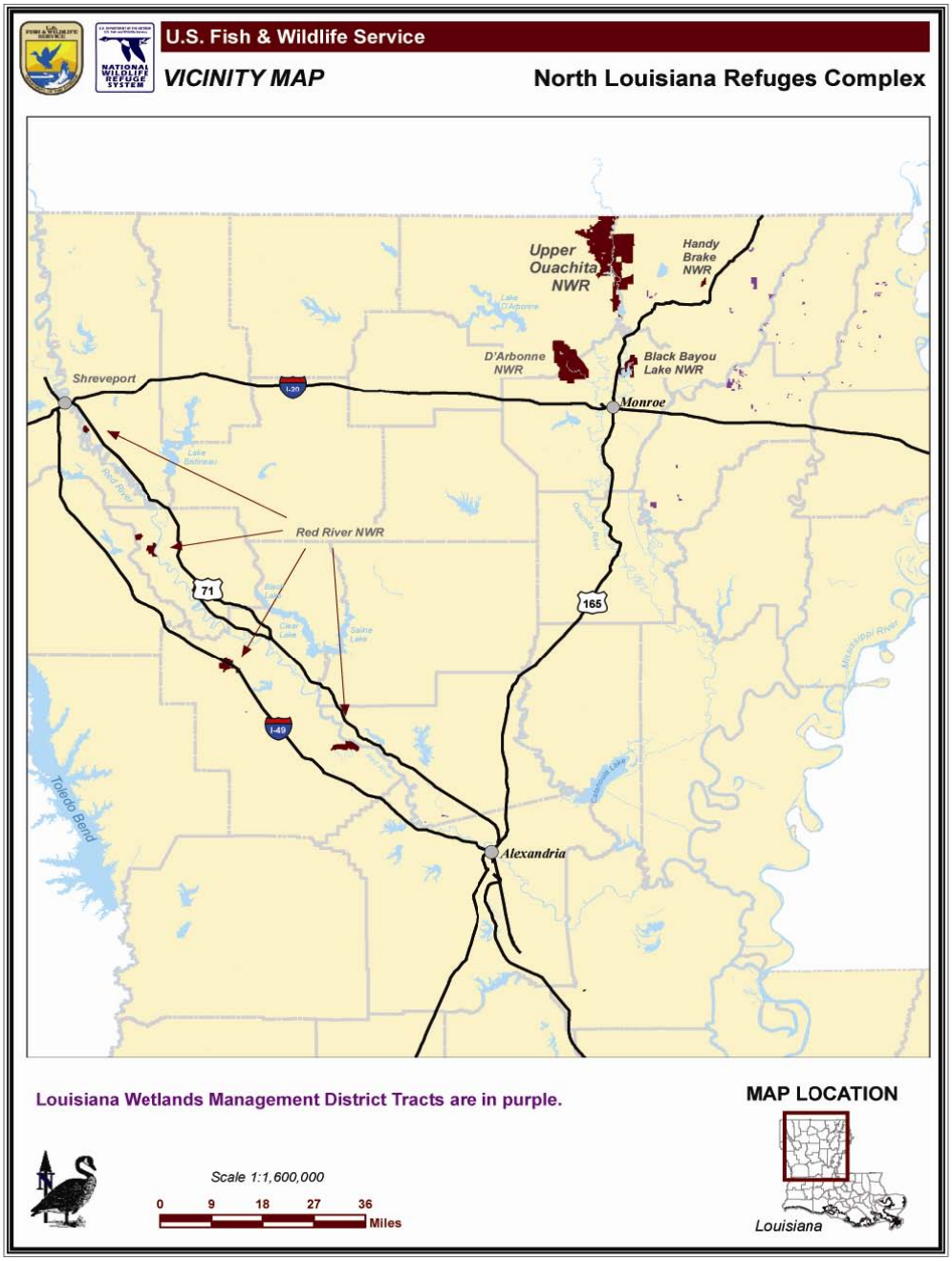



**Figure 1: Location of Upper Ouachita NWR in Louisiana**

### *The Lower Mississippi River Valley*

Upper Ouachita NWR is located in the heart of the Lower Mississippi River Valley, an area which has lost more than 20 million acres of bottomland hardwood forest over the last century. Habitat destruction is more pronounced here than in any other area of the United States. The lush bottomland forests that historically covered this region are now fragmented patches due to conversion for agriculture and flood control projects. The Lower Mississippi River Ecosystem, which includes the alluvial valley of the Mississippi River downstream of its confluence with the Ohio River and the delta plain created by the Mississippi River and its tributaries[1], is shown below in Figure 2.

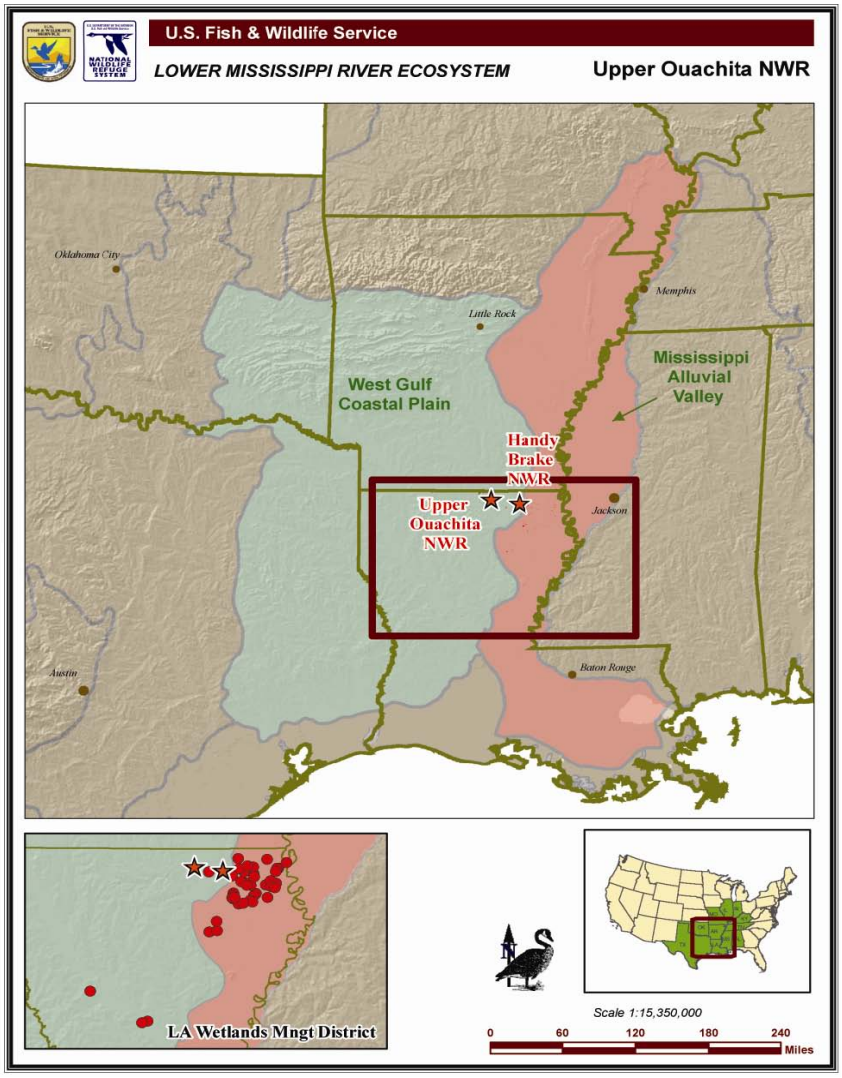



**Figure 2: Upper Ouachita NWR is located in the Lower Mississippi River Ecosystem**

[1] Upper Ouachita NWR Comprehensive Conservation Plan [hereinafter Upper Ouachita NWR CCP], pp 19.

### *The Mollicy Unit*

Upper Ouachita NWR is bisected by the 605-mile-long Ouachita River. The 16,000-acre Mollicy Unit of Upper Ouachita NWR is located on the east side of the River, as detailed in Figure 3, and was historically covered by mature bottomland hardwoods before it was cleared in the 1960s for agricultural uses. All of the restoration activities associated with the Upper Ouachita NWR Restoration Initiative take place on the Mollicy Unit. The addition of The Conservation Fund's acquisition to the Mollicy Unit will bring its total size to approximately 20,000 acres.

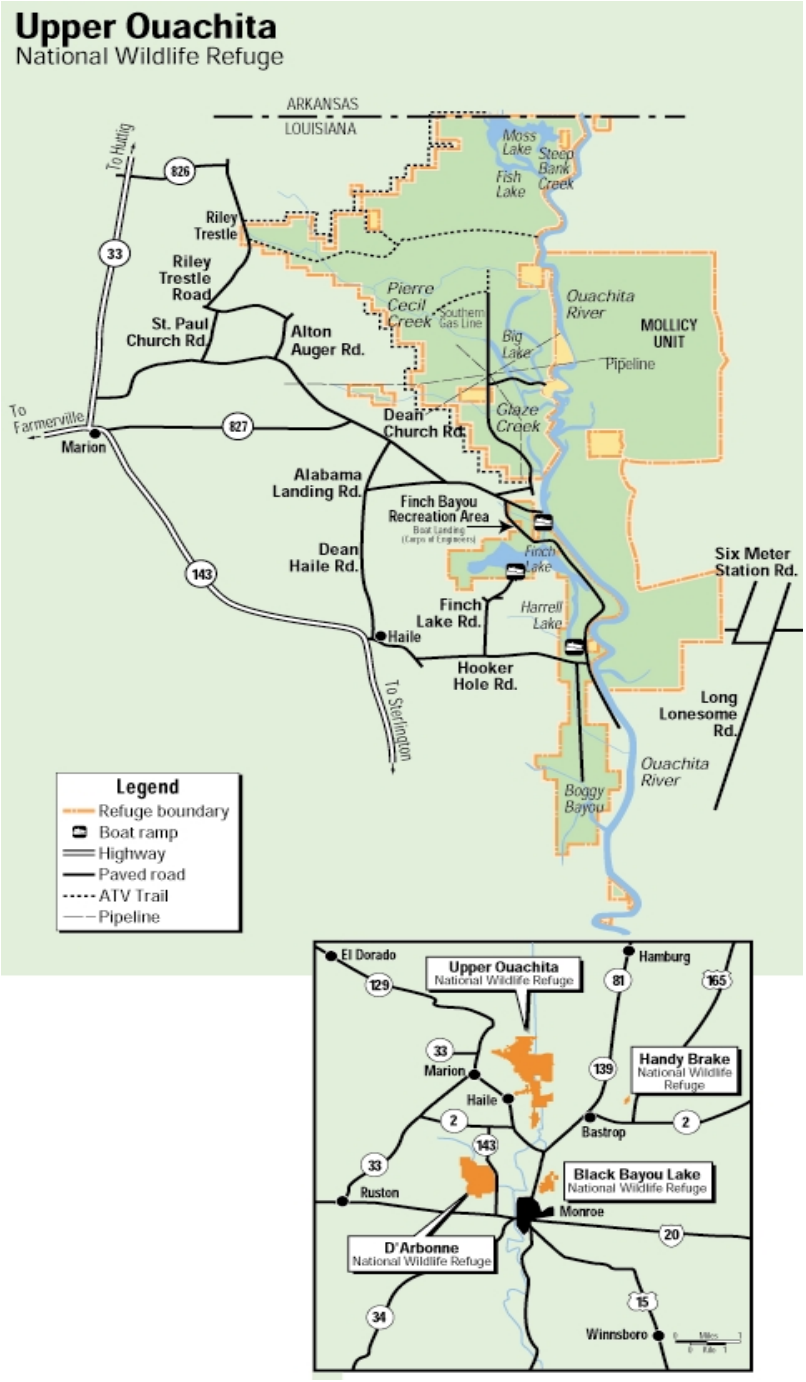


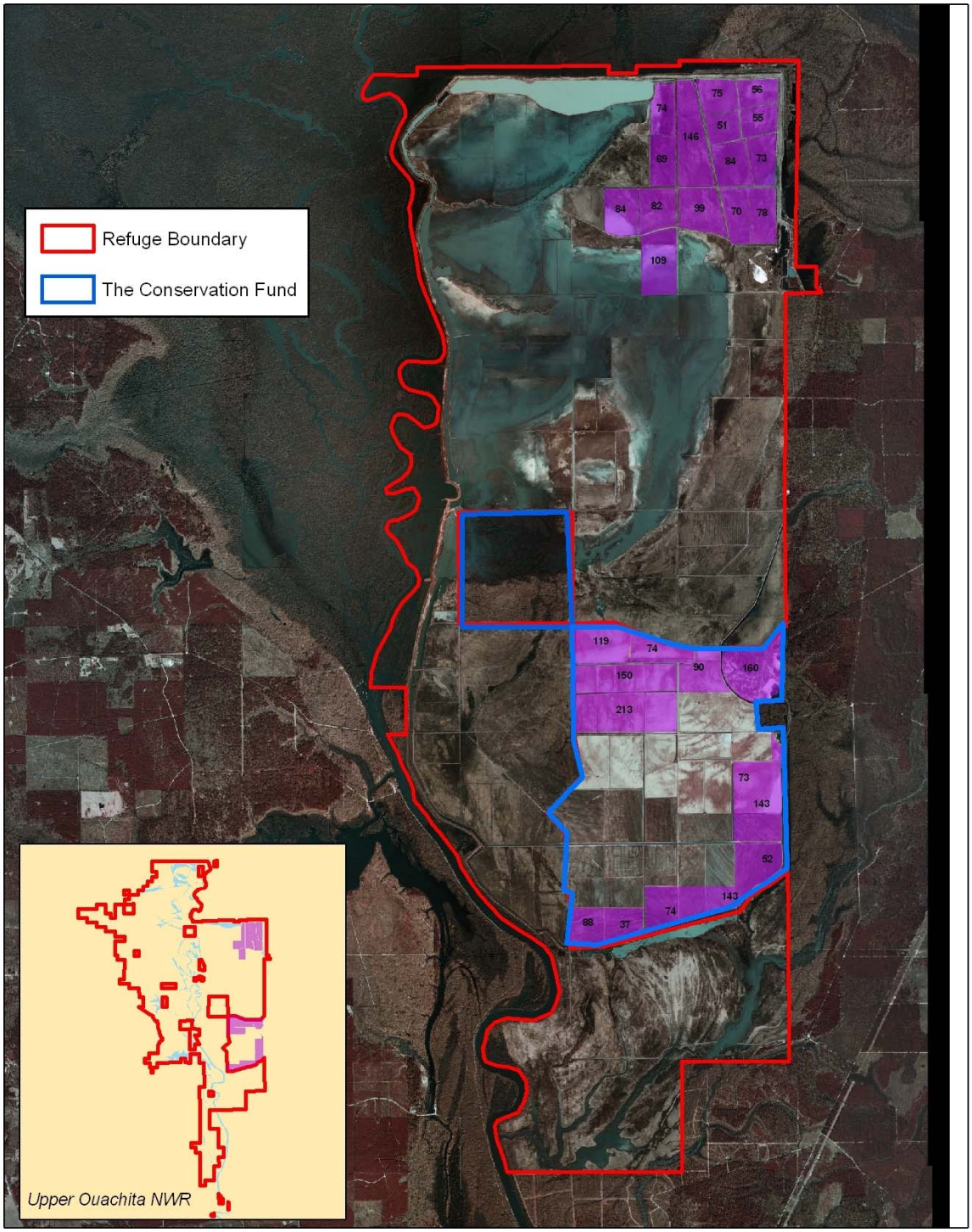

**Figure 3: Map of Upper Ouachita NWR**

### *The Go Zero Tracts*

In December 2010, The Conservation Fund ("the Fund") completed the purchase of the Refuge's largest remaining inholding within the Mollicy Unit -- 3,905 acres of private farmland located within the Upper Ouachita NWR acquisition boundary. Following the acquisition, the Fund worked with the Service to plant 1,402 acres with native bottomland hardwood seedlings (the "Go Zero Acquisition Tracts"). The entire 3,905 acre purchase area will be conveyed to the Service as an addition to Upper Ouachita NWR. In furtherance of the Refuge's habitat goals, Refuge staff will manage the remaining land as moist soil units for migratory birds and waterfowl. Some of the unplanted land will also be in agriculture to provide food for migratory birds and waterfowl.

The Fund also planted with native seedlings 1204 acres of marginally productive agricultural land already owned by the Refuge in the northeastern corner of the Mollicy Unit (the "Go Zero Refuge Tracts"). Altogether, the Fund restored approximately 2,606 acres to bottomland hardwood forest. Collectively, all of the restored parcels together shall be referred to as the Go Zero Tracts; these Go Zero Tracts constitute the Project Area. Figure 4 illustrates the location of the planted Go Zero Tracts within the Mollicy Unit.

Over their lifetime, these newly restored forests are expected to sequester thousands of tons of carbon dioxide equivalent ($CO_2e$) from the atmosphere. In addition to the benefits to biodiversity and climate, restoring these lands to their native habitat will increase their flood water storage capacity and mitigate flooding caused by the Ouachita River. These restored lands will also provide new recreational areas for public enjoyment.




**2011 Go Zero Reforestation within Mollicy Unit of Upper Ouachita NWR**

**Figure 4: The Refuge Tracts (northeast) and Acquisition Tracts (southeast) at Upper Ouachita NWR. Go Zero restoration areas are colored purple.**

### *Climate*

The climate at Upper Ouachita NWR is humid subtropical and characterized by hot, humid summers punctuated by frequent thunderstorms and moderately cool winters. Average daily temperatures normally range between 20 to 70 degrees during winter and 70 to 95 degrees during the summer, and the maximum daily temperature is above 90 degrees about 40 days per year.

### *Geology and Topography*

The Project Area is composed of Recent and Pleistocene-age alluvial soils in the floodplain of the Ouachita River, and characterized by ridge and swale topography. The Recent alluvium can generally be found within a mile of the current river channel, and water and organic content are high in the swales and lower in the ridges. The majority of the Refuge consists of older Pleistocene-age deposits known as the Deweyville Terrace formation (a broad depositional pattern recognized along the major drainages across much of the western Gulf plains), and can be found farther away from the river bed.[2]

**Figure 5: Ouachita River watershed**

### *Soils and Hydrology*

Upper Ouachita NWR consists of many different soil associations. The soils on the Refuge's Mollicy Unit consist of poorly drained soils in the Perry-Portland, Litro-Haggerty and Groom-Wrightsville associations.[3] These soils are well-suited to woodlands that are tolerant of seasonal wetness, such as bottomland hardwoods.

The Ouachita River, which bisects Upper Ouachita NWR, is the central physical feature on the Refuge. The River, which has been designated a Louisiana Natural Scenic River, originates in the Ouachita Mountains of west-central Arkansas, as illustrated in Figure 5, and flows through northeastern Louisiana and then joins the Tensas River which eventually empties into the Red River. The River, which is slow moving and muddy in northern Louisiana, has a drainage basin of 10,825 miles at the Refuge. Rainfall in the Ouachita Basin upstream from the Refuge may produce river stage differences as great as 30 feet, causing various portions of the Refuge to be flooded, depending upon river stage.

When the native forests were cleared and soybeans were planted at the Mollicy Unit in the late 1960s, a large levee was constructed along the Ouachita River to protect some of the cropland from flooding. The levee broke several times over the years but was often repaired by various landowners to prevent flooding at all but the highest river stages.

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[2] Upper Ouachita NWR CCP, pp. 26

[3] Upper Ouachita NWR CCP, pp. 29

In 2009, USFWS, in partnership with The Nature Conservancy, planned to permanently breach the levee to restore the natural hydrology of the River. Together with the Army Corps of Engineers, the partners aimed to restore the connection between the Ouachita River and its floodplain which is critical to the long-term health of the nearby forests and to the fish and other aquatic life in the Ouachita River. However, on May 23, 2009, after an extremely wet spring, the Ouachita River rose above flood stage and spilled over several low spots on the levee separating the river and a portion of its floodplain. The levee failed at two locations and water rushed into the Mollicy unit, flooding the entire 16,000 acres. Due to its depressional topography, water accumulated inside the basin and multiple stands of trees that had been planted in the last decade were submerged for several weeks, causing damage and tree mortality.

Although the natural breaches in 2009 delayed efforts to permanently breach the levee, the levee project is now almost completed. The Service and The Nature Conservancy have executed four more breaches as part of the largest floodplain restoration project in the nation. The four breach sites were specifically chosen by the Service to restore hydraulic function to the Mollicy Unit floodplain.

**Figure 6:** Mollicy Unit of Upper Ouachita National Wildlife Refuge on the left. Healthy bottomland hardwood forest on the right. Image also details the levee (left) and Ouachita River (right). Photograph courtesy of US Fish and Wildlife Service.

Breaching the levee will increase the biological integrity of the Refuge by allowing a more historic hydrological regime. Thousands of acres have now become available for fish spawning habitat, and more habitat will be available to wading birds and waterfowl. The Go Zero trees should thrive in a natural flooding cycle and will have a much higher rate of survival than past plantings on the Mollicy Unit. As a result of this restoration effort and the breeching of the levee, water quality in the Ouachita River will improve as the restored forest filters out an estimated 200 tons of excess nutrients such as nitrogen and other fertilizers each year. In addition, the project will increase flood storage capacity and reduce public safety concerns for the downstream community of Monroe during catastrophic flood events.

### G1.2 Vegetation

The Mollicy Unit and the surrounding lands were previously covered in the mature bottomland hardwood forest that was characteristic of the Lower Mississippi Valley. Due to soaring soybean prices in the late 1960s, the Mollicy Unit was cleared for row crop agriculture, and the area was known as Mollicy Farms. When the Go Zero Acquisition Tracts were acquired by The Conservation Fund in 2010, rice was being cultivated on the Tracts. The final rice harvest took place in September 2010.

Before the restoration, the Go Zero Refuge Tracts were previously under row crop agriculture or managed for annual grasses such as millet, sprangletop and other species that produce large amounts of seed – primarily to provide a good source for wintering and migrating waterfowl. However, these Tracts were poor agricultural lands because of their low elevation, making them more likely to flood.

As a result of the Upper Ouachita NWR Restoration Initiative, in winter 2010 the Tracts were planted with a mix of native bottomland hardwood species selected by the Service including nuttall oak, overcup oak, willow oak, cypress, green ash, tupelo gum, bitter pecan, red maple, hackberry, persimmon, sweet gum, water oak, cedar elm, sweet pecan, and cherrybark oak.

### G1.3 Project Boundaries of the Project Area and the Project Zone

The Project Area consists of both the Go Zero Refuge Tracts and the Go Zero Acquisition Tracts. The locations and boundaries of these parcels are shown in Figure 4 in Section G1.1. The total Project Area is 2606.2 acres.

The Project Zone, which is defined as the Project Area and the land within the boundaries of the adjacent communities potentially affected by the project, is comprised of Morehouse, Union and Ouachita Parishes in northern Louisiana. The Refuge is located in Morehouse and Union Parishes, and Ouachita Parish is directly south of the Refuge and the location of the City of Monroe, which is the closest metropolitan area to the Refuge. The location of the Refuge and its relative position within northern Louisiana is shown in Figure 1 in G1.1.

### G1.4 Current Carbon Stocks at the Project Area

The climate change mitigation and adaptation benefits of reforestation projects are widely recognized. Land use change—especially deforestation—is a significant component of increasing atmospheric $CO_2$ levels and a cause of global warming.[4] Thus, restoring native forests represents a natural way to reduce these effects and combat climate change.

In order to quantify the carbon sequestration rates for the project, the Fund worked with TerraCarbon to develop a baseline, measure and model anticipated carbon accrual and develop a carbon monitoring plan. The monitoring plan conforms to the IPCC's 2006 Guidelines for National GHG Inventories for Agriculture, Forestry, and Other Land Use. Over the life of the project, carbon sequestration estimates of live tree biomass will be derived from direct measurements on permanent plots, while estimates of dead wood, forest litter, and soil carbon will be derived from the default estimates applicable to bottomland hardwood species in this region of the US. The cumulative sequestration of the Upper Ouachita NWR Restoration Initiative is estimated at 328 metric tons of CO2 equivalent per acre (i.e., 361 short tons per acre) over 100 years.

Pre-project carbon stocks (i.e., on the lands prior to reforestation) are considered to be minimal. Carbon stocks in woody biomass were zero since there was no woody biomass present in the Project Area prior to planting. Non-woody (herbaceous) biomass is neglected and assumed to be equal in the baseline scenario and in the "with-project" scenario. The only significant pre-existing carbon stock at the project site is in soil

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[4] IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

organic matter. The project monitoring protocol applies default estimates for soil carbon accrual that reflect expected changes as the forest matures.

### G1.5 Communities Located in the Project Zone

Upper Ouachita NWR spans across Union Parish and Morehouse Parish in northeastern Louisiana, a primarily rural and sparsely populated area. The northern boundary of both Parishes is the Arkansas state line. The population for Union Parish is 22,584 and the population for Morehouse Parish is 28,223, according to 2009 census estimates. Monroe, the eighth largest city in Louisiana, is the closest metropolitan area, about 25 miles south of the Refuge in Ouachita Parish, which has a population of 151,502 people.

Together, Union, Morehouse and Ouachita Parishes comprise the Project Zone. Morehouse, Union, and Ouachita Parishes have lower median household incomes than the state's population as a whole. Morehouse and Union Parishes also have lower educational levels, but Ouachita Parish, home of the University of Louisiana at Monroe, has significantly higher levels of college graduates than the other areas. The following table shows the relative diversity, income and educational levels in the Project Zone as compared to the State of Louisiana and the United States

**Table 1: Income, Diversity and Education Levels in the Project Zone**[5]

| | Non-White Population (2009 Census) | Median Household Income (2008) | High School Graduates (persons age 25+) (2000 Census) | Bachelor's degree or higher (persons age 25+) (2000 Census) |
|---|---|---|---|---|
| United States | 20.4% | $52,029 | 80.4% | 24.4% |
| Louisiana | 35.4% | $43,635 | 74.8% | 18.7% |
| Morehouse Parish | 45.5% | $32,168 | 66.6% | 9.7% |
| Union Parish | 28.1% | $35,624 | 71.7% | 11.8% |
| Ouachita Parish | 37.1% | $39,056 | 78.6% | 22.7% |

[5] All data obtained from the United States Census Bureau, available at: http://quickfacts.census.gov/qfd/states/22000.html

**Figure 7: Bald eagles on Upper Ouachita NWR's Mollicy Unit.**
**Photograph courtesy of US Fish and Wildlife Service**

## G1.6 Current Land Use and Land Tenure in the Project Zone

Upper Ouachita NWR was established in November 1978 as a sanctuary for migratory birds and for the conservation of our nation's wetlands. In 1977, Pennzoil Producing Company, a major landowner in the Ouachita River area, began to sell its holdings. When the Service learned that Pennzoil was willing to sell most of its acreage in this area, an environmental assessment was prepared and the USFWS purchased 20,834 acres from Pennzoil. Only the surface rights to the land were acquired, with Pennzoil reserving in perpetuity all oil and gas deposits found under the land. The Mollicy Unit, which totals 16,191 acres, was purchased from one private landowner in parcels from 1997-1999. As noted in G1.1, the addition of The Conservation Fund's acquisition to the Mollicy Unit will bring its total size to approximately 20,000 acres. A title search is underway to determine who owns the mineral rights on the Mollicy Unit.

Current land use in the Project Zone is mainly for agriculture and timber. Union Parish is mostly timber company land that produces loblolly pine, whereas Morehouse Parish is primarily agricultural land. There are also residential areas, and Monroe is a small metropolitan area. In addition, the Project Zone contains three other National Wildlife Refuges, and several state-managed wildlife areas. There are no ongoing disputes or unresolved conflicts over land tenure in the Project Zone.

## G1.7 Current Biodiversity in the Project Zone

As noted above, the Project Zone, comprised of Morehouse, Union and Ouachita Parishes, contains four National Wildlife Refuges. In addition to Upper Ouachita NWR, the Project Zone also contains Handy Brake NWR, Black Bayou Lake NWR, and D'Arbonne NWR, which – along with Upper Ouachita NWR - are all part of the Northern Louisiana Refuge Complex.

All of the Refuges in the Northern Louisiana Refuge Complex provide incredibly important habitat for migratory as well as resident waterfowl, shorebirds and neo-tropical non-game birds. Birds commonly found on the Refuge include ducks (including mallard, green and blue winged teal, pintail, black duck, gadwall, wood duck, widgeon and ring-neck), Mississippi kite, hawks, woodpeckers, several species of warblers, vireos, hummingbird, eastern wild turkey, owl and bald eagle. In particular, Upper Ouachita NWR provides excellent wintering habitat for tens of thousands of ducks and geese. Mallard, mottled ducks, gadwall, American widgeon, green-winged teal, blue-winged teal, northern shoveler, northern pintail, wood duck, hooded merganser, ring-necked duck, canvasback, and lesser scarp, snow goose, and white-fronted goose are all among the species that commonly use Upper Ouachita NWR for wintering habitat. The Refuge, particularly the Mollicy Unit, also provides quality wading bird habitat for species including the great blue heron, great egret, snowy egret, cattle egret, little blue heron, white ibis, green heron, yellow and black-crowned night-heron and American bittern. Many bald eagles are seen on the Refuge, particularly during winter at the Mollicy Unit.

Neotropical migratory birds also use Upper Ouachita NWR habitat. The most abundant species on the Mollicy Unit are dickcissels, red-winged blackbirds and eastern meadowlarks. However, as succession takes place on the reforested areas, bird species composition will change. In ten years, yellow-breasted chat, indigo bunting, orchard oriole, white-eyed vireo, common yellowthroat, and blue grosbeak will be found on the Refuge. And while not on the Refuge now, in fifty years the restoration should draw species like the cerulean warbler and Acadian flycatcher.

The federally endangered red-cockaded woodpecker (RCW) is found at Upper Ouachita NWR in the pine stands on the western side of the Refuge. There is currently one active group of RCWs on the Refuge and one of the densest populations of RCWs in northern Louisiana is found just outside the Refuge on adjacent land within the Project Zone. Groups of RCWs are also found within D'Arbonne NWR.

Bats, including Rafinesque's big-eared bat and southeastern myotis, are found at Upper Ouachita NWR. Rafinesque's big-eared bat is the least studied bat in the eastern United States and is a federally designated species of concern. Both species of bats are associated with riparian areas near bottomland hardwood forests and both have seen population declines. The forest restoration will provide much needed additional habitat for both species.

Upper Ouachita NWR is home to approximately 46 mammals, including river otter, opossum, coyote, gray fox, red fox, bobcat and both eastern cottontail and swamp rabbit. The white-tailed deer is the only big game on the Refuge. Louisiana black bear sightings have been much more common on the Refuge in recent years due to their reintroduction at Felsenthal NWR in southern Arkansas. A contiguous block of bottomland hardwood forest exists from the northern end of Upper Ouachita NWR to the southern end of Felsenthal NWR. Bears being moved to Felsenthal NWR naturally disperse and wander onto Upper Ouachita NWR,[6] and it is not uncommon for a black bear to den on the Refuge. The Refuge expects the bear population to grow as the Service seeks to acquire and protect land that will eventually connect Upper Ouachita NWR and Felsenthal NWR.

The Ouachita River and its tributaries provide habitat for many species of freshwater fish, including bluegill, redear sunfish, longear sunfish, white and black crappie, and largemouth, yellow and white bass. One of the major benefits of the hydrological restoration at Upper Ouachita NWR is providing thousands of acres of fish spawning habitat. When the river floods the Mollicy Unit during the spring season, the forests—both young and old—will provide structure and cover for the fish. The federally endangered pink mucket, a freshwater mussel, has been collected in bayous within Morehouse Parish.

Over seventy species of reptiles and amphibians occur within the Project Zone. American alligators are not common at Upper Ouachita NWR but are found at D'Arbonne NWR.

## G1.8 High Conservation Values within the Project Zone

### *a. Protected Areas*

The Project Zone, comprised of Morehouse, Union and Ouachita Parishes, contains several "protected areas" as defined by the IUCN Protected Area Management Categories. Upper Ouachita NWR qualifies as a Category II Protected Area. As a National Wildlife Refuge, it is managed mainly for

[6] Upper Ouachita NWR CCP, pp. 48

ecosystem protection and fish and wildlife oriented recreation. The Refuge also meets the description of a Category IV Protected Area, which is an area managed to ensure the maintenance of habitats and to meet the requirements of specific species. Upper Ouachita NWR is managed to provide habitat for migratory birds and waterfowl. The western pine stands on the Refuge are managed for the protection and survival of the red-cockaded woodpecker.

As noted above, there are three other Refuges in the Project Zone that also qualify as Category II and IV Protected Areas.

### *b. Threatened Species*

There are several threatened species found within the Project Zone. The red-cockaded woodpecker, which is designated as vulnerable on the IUCN Red List and as endangered under the federal Endangered Species Act (ESA), is found on the Refuge. Currently, there is one active group of RCWs on Upper Ouachita NWR, and many other groups throughout the Project Zone. The pink mucket, a freshwater mussel, which is listed as endangered under both the IUCN Red List and ESA, was collected in Bayou Bartholomew in Morehouse Parish. Also found within the Project Zone – as noted above in section G1.7 -- is the iconic Louisiana black bear, which is listed as threatened under the ESA. Table 2 below shows the status of the threatened species within the Project Zone under both the IUCN and the federal laws of the United States. Because the IUCN listing is compiled on a global scale, and thus has a broader approach than the U.S. federal ratings and the Endangered Species Act, their designations do not always align.

**Table 2: Endangered or Threatened Species in the Project Zone**

| Common Name | Species Name | US Federal Rating | IUCN Rating |
|---|---|---|---|
| Red-cockaded Woodpecker | *Picoides borealis* | Endangered | Vulnerable |
| Louisiana Black Bear | *Ursus americanus luteolus* | Threatened | Least Concern |
| Pink Mucket | *Lampsilis abrupt* | Endangered | Endangered |
| Bald Eagle | *Haliaeetus leucocephalus* | Delisted | Least Concern |
| Pondberry | *Lindera melissifolia* | Endangered | - |
| Alligator Snapping Turtle | *Macrochelys temminckii* | - | Vulnerable |

### *c. Endemic species*

The Louisiana black bear, which is a sub-species of the American black bear, is endemic to the Lower Mississippi Valley region. Currently, the bear's entire global range is restricted to several Parishes in Louisiana. Bears can also occasionally be found in eastern Texas, southern Arkansas and southern Mississippi.

### *d. Significant concentrations of a species*

The Project Zone is located within the Mississippi Flyway, one of the four major North American bird migration routes. Thus, the Project Zone supports significant concentrations of migratory birds and waterfowl.

## G1.8.2 Landscape-level populations

As noted above, the Project Zone is located within the Mississippi Flyway, one of the four major North American migration routes, and provides habitat for a significant population of migratory birds and waterfowl including mallards, mottled duck, gadwall, American widgeon, green-winged teal, blue-winged teal, northern shoveler, northern pintail, and wood duck. Wading and marsh birds including the great blue heron, great egret, snowy egret, cattle egret, little blue heron, white ibis, green heron, and yellow and black-crowned night-heron are regularly observed in the Project Zone. Many migratory songbirds are also found in this area. Viable populations of these bird species exist in natural patterns of distribution and abundance within the Project Zone.

**Figure 8: Ducks in flight over Upper Ouachita NWR. Photograph courtesy of US Fish and Wildlife Service.**

## G1.8.3 Threatened Ecosystems

Two centuries ago the Lower Mississippi River Valley contained over 25 million acres of bottomland hardwood forest, and the Project Zone was covered by this lush forest ecosystem. Today, only a small fraction of forests remain, mostly as isolated patches in a sea of agriculture. Efforts are now being made to restore bottomland hardwoods across the Project Zone and throughout much of the Lower Mississippi River Valley. The Refuges within the Project Zone were established, in part, to safeguard key components of this threatened ecosystem.

## G1.8.4 Ecosystem Services

Bottomland hardwood habitats within the Project Zone support a rich diversity of plants and animals and have regionally important functions and values including flood water storage, conveyance, filtration, and cycling of

essential nutrients and minerals. In particular, the reforestation will have a major impact on water quality and flood control. The project will improve water storage capacity during high-water seasons, lessening flooding impacts on downstream communities. And the Ouachita River's water quality should improve as the restored forest filters out excess sediment and nutrients that are washed into the water. Restoring the Project Area to native bottomland hardwood trees will enhance these functions within the Project Zone and beyond.

#### G.1.8.5 Needs of Local Communities

The project takes place across two parcel areas: one is a National Wildlife Refuge within the United States and the second is a private inholding located within the Refuge boundary. In contrast to a remote area in the developing world, Refuge lands typically do not (and, in many cases, are prohibited from) providing food, fuel or medicines to surrounding communities. The surrounding communities in the Project Zone are mostly residential and agricultural lands; the Go Zero Tracts and surrounding lands are not fundamental to the needs of local communities in terms of providing food, fuel and medicines. Therefore, the Project Zone does not rise to the level of an HCV under this criterion.

#### G.1.8.6 Cultural Identity of Communities

The Upper Ouachita NWR Restoration Initiative will highlight the Refuge's role in the community and within northern Louisiana as a place for local residents to appreciate their natural surroundings and celebrate the outdoors through events like an annual youth turkey hunt. Besides being important to regional culture, hunting and fishing are also economically important to local businesses, both directly, as the local population spends money on these activities, and indirectly, as an attraction that draws sportsmen from outside the community.

Upper Ouachita NWR serves an essential community function by protecting and restoring the Project Zone's ecological resources, both by providing habitat for a diversity of plant and wildlife species and by serving as a place where people can go to enjoy these resources, either through observation or through hunting and fishing. However, the Refuge does not rise to the level of cultural or religious significance that would qualify it as a High Conservation Value within the Project Zone. The neighboring communities and protected outdoor areas, including the other National Wildlife Refuges within the Zone, also do not qualify.

## G2. BASELINE PROJECTIONS

### G2.1 Land Use Without Project

If the Fund did not implement the Upper Ouachita NWR Restoration Initiative, the Go Zero Tracts would have continued to be used for agricultural purposes. The Refuge Tracts would have been used to provide food for waterfowl as USFWS did not have the funds necessary to restore the land to its native bottomland hardwood state on its own -- the annual budget allocation for the Refuge did not include funding necessary for the Service to accomplish a restoration project of this scale. The Acquisition Tracts would have remained as private farmland and would have continued being used for growing rice or other crops.

### G2.2 Additionality

In accordance with the Fund's planting principles, all of the Fund's reforestation-based carbon sequestration projects would not have occurred in the absence of financing through the carbon market. As stated above, the annual budget for Upper Ouachita NWR was insufficient for the Service to accomplish the acquisition and the subsequent restoration. Without the Go Zero project, both the Refuge and Acquisition Tracts would have

remained in agricultural use as the Refuge did not have the funding necessary to purchase and/or restore these areas.

### G2.3 Future Carbon Stocks Without Project

Carbon stock changes without the Upper Ouachita NWR Restoration Initiative would be of limited size and significance. The carbon capture associated with agricultural plants is zero as they are essentially at steady state, grown and harvested every year. Additionally, no deadwood and litter would be expected to accumulate. The soil carbon stocks would be expected to remain constant or decrease further with continued agriculture and tillage.

### G2.4 Local Communities and Ecosystems Without Project

The restoration will help reduce the flooding impacts of the Ouachita River, which have previously caused damage to downstream communities. Restoration of the Tracts increases the land's water storage capacity and will minimize flooding downstream. The River's water quality will also improve as the restored forest filters out some of the excess nutrients that are washed into the water, such as agricultural fertilizers. In the absence of the project, the soil would continue to be farmed, and soil, nutrient, and chemical inputs associated with agriculture would feed into the River. Erosion will be reduced due to new forest establishment, which will replenish both soil carbon and soil nutrients. The soil quality of the Tracts will be healthier due to increased diversity of plant life and biomass accumulation associated with forest regeneration.

In addition, the project creates more public recreation lands for the neighboring communities. Without the Go Zero project, the Acquisition Tracts would have remained as private cropland, or possibly sold to another individual for private farming or development. They would have been closed to any public recreational use. Once the restored land is conveyed to Upper Ouachita NWR, however, local residents can use it for activities like wildlife photography and observation. The Refuge Tracts, which were previously closed to hunting, will now be open to hunting and other wildlife-dependent recreation. The restoration actions not only benefit the Tracts themselves, but also improve the neighboring land by closing forest gaps and restoring forest connectivity. The overall quality of the Refuge will be improved and more easily enjoyed by local residents.

### G2.5 Biodiversity Without Project

Without the project, all of the Tracts would remain in agricultural production, which would have an adverse impact on biodiversity. Forest fragmentation leads to diminished bird nesting success, increased predation and increased brood parasitism. Without the project, many bird species would suffer from the effects of fragmentation leading to a decline in species richness. Forest fragmentation is also detrimental to the Louisiana black bear and other species which need large contiguous blocks of forest to meet their survival needs.

## G3. PROJECT DESIGN AND GOALS

### G3.1 Project Scope and Summary of Goals

The scope of the Upper Ouachita NWR Restoration Initiative includes restoring approximately 2606 acres of land to its native forest habitat by planting it with tree species indigenous to the area.

The three primary goals of the project are:

- Decrease the effects of climate change via carbon sequestration
- Restore the Lower Mississippi Valley bottomland hardwood forest ecosystem and its biodiversity for the benefit of fish and wildlife resources
- Create long-term community benefits in the form of recreational lands under the management of USFWS for hunting, fishing, wildlife photography, wildlife observation, environmental education and environmental interpretation.

## G3.2 Description of Project Activities

Major project activities associated with the Upper Ouachita NWR Restoration Initiative include: site preparation and planting of native trees, survival checking, and carbon monitoring, all described in further detail below. As noted previously, the Fund has contracted with TerraCarbon to provide planting and survival monitoring for this project. In addition, project activities include setting up monitoring plans for tracking appropriate community and biodiversity variables (described in sections CM3.1 and B3.1 respectively). These activities will be undertaken by the Fund in conjunction with its partners.

- ***Site Preparation and Planting***

  The Go Zero Tracts were planted between December 17, 2010 and January 19, 2011. Before planting took place, TerraCarbon worked with Upper Ouachita NWR staff to assess site preparation needs and determine the native species composition for the Tracts. Parcels were categorized by elevation into areas above and below 69 feet above sea level (ASL). Those areas below 69 feet ASL were planted with a higher composition of species tolerant to sustained flooding, including tupelo gum and cypress trees.


**Figure 9: Seedlings being loaded into the planting bin at Upper Ouachita NWR**

  Seedlings were purchased and planted by Bradshaw Trees under the guidance of TerraCarbon foresters. TerraCarbon foresters, who were on site at all times to oversee the planting, directed crews during planting and ensured that seedlings and planting were in conformance with specified quality standards.

  Seedlings were machine planted approximately every 12 feet in planting rows that were spaced 12 feet apart. Planting was undertaken with tractors that pulled a planter bin with a metal wheel that ripped a narrow slit in the soil approximately 12-16 inches deep, seedlings were placed in these slits, and the soil was then sealed shut by inverted wheels on the end of the planter bin.

  Oust was applied during planting of the Acquisition Tracts to prevent weeds from growing and outcompeting the new seedlings; on these Tracts, Oust was applied minimally, covering only a 30 inch band across each planting row. Oust was not applied on the Refuge Tracts as the moist soil unit that was previously there had not been subject to heavy fertilizer, and in these areas, weeds

are less of a concern as low cover grass often remains. This grass will not compete with the seedlings and instead will act to shade the soil and help retain moisture.

- ***Survival Plots and Assessment***

  Twenty-eight (28) survival plots were established across the project area after planting. Plots consist of 100 flagged trees across 4 to 5 planting rows about 20 to 25 trees deep. Plots were allocated throughout the planting area to represent the range of soil types on the Tracts.

  A one-year survival assessment will be performed in the Fall of 2011. Stem counts will be tallied to determine if there has been a widespread failure (less than 60% survival) and if so, the related causes.

- ***Carbon Monitoring***

  The activities associated with baseline development and the long-term carbon monitoring plans for the project are discussed in Section CL3.

### G3.3 Project Location

The Project Area consists of 2606.2 acres of land that is or will become part of Upper Ouachita NWR. The Refuge is located within Union and Morehouse Parishes in northern Louisiana and these Parishes, along with Ouachita Parish, comprise the Project Zone. The location of Upper Ouachita NWR and the Parishes that comprise the Project Zone are shown in Figure 1 in Section G1.1.

### G3.4 Project Timeframe

The Fund planted all of the Go Zero Tracts with a mix of native bottomland hardwood trees beginning in December 2010. TerraCarbon will perform a survival assessment one year following the planting. Under a Memorandum of Understanding ("MOU") (see Exhibit A) between the Fund and USFWS, USFWS will provide long-term management of the trees and the land. The accounting period for the carbon accrued on the Go Zero Tracts is 100 years.

### G3.5 Risks to Climate, Community and Biodiversity Benefits

For each Go Zero project, the Fund works with the nation's leading public natural resource agencies and non-governmental organizations to ensure that trees are planted in protected areas that have long-term management plans to ensure accuracy and certainty of carbon sequestration and reduce any risks to the expected climate, community and biodiversity benefits of a project. Project areas with high risk of loss, such as from fire or drought, often do not qualify.

Careful risk assessments were made before choosing to restore the Go Zero Tracts at Upper Ouachita NWR; this land was selected for restoration for several reasons. The Tracts are located in a wetland ecosystem, which reduces risk of drought and also minimizes risk of fire. The risk of damage from hurricanes is also fairly low because the Tracts are located in the northern part of the state; wind and rain damage from past hurricanes in Louisiana, including Hurricane Katrina, was mainly confined to coastal areas. By planting Tracts in different locations throughout the Mollicy Unit, the Go Zero project design has dispersed the risk of damage, and large numbers of trees are unlikely to be affected should a storm occur.

In addition, the risks associated with flooding should now be greatly alleviated since the USFWS recently breached the levee surrounding the Mollicy Unit in four strategic locations to allow the Ouachita River access to its former floodplain. Breaching the levee will increase the biological integrity of the forest by allowing a more historic hydrological regime, and the young planted trees will thrive in a natural flooding cycle. Restoring the natural floodplain at Upper Ouachita should greatly decrease the duration of future flood events and therefore decrease the stress on newly planted trees.

The possibility of any unanticipated risk is mitigated by a buffer pool of 10% of the total carbon available that will not be marketed as part of the project. It is anticipated that this buffer will be large enough to account for any impacts that might reduce the total carbon accumulation generated by this project

### G3.6 Maintenance of High Conservation Values

The National Wildlife Refuge System Improvement Act of 1997 requires each Refuge to develop a Comprehensive Conservation Plan ("CCP") for achieving Refuge objectives consistent with sound principles of fish and wildlife management, conservation, legal mandates, and USFWS policies. Management activities are then selected based on their efficacy in accomplishing Refuge objectives. CCPs are reviewed annually, and management activities are modified whenever the annual review or other monitoring indicates that the CCP needs to be changed to achieve the goals or purposes of the Refuge. The CCP process is designed to generate reliable feedback to help guide management decisions on the Go Zero Tracts and maintain the high conservation values that exist within the Project Zone, including protection and management of endangered or threatened species, management of numerous bird habitat zones, management of ecosystem services and contribution to cultural identity of the community.

The Upper Ouachita CCP specifically lists increasing the bottomland hardwood acreage on the Refuge as one of its habitat objectives and notes that one of the Refuge's goals "is to restore, enhance, manage, and maintain healthy bottomland hardwood[s]…to foster the ecological integrity of the Lower Mississippi River Ecosystem." [7] The Service's careful and comprehensive planning will allow the Refuge to maintain high conservation values at Upper Ouachita NWR.

The careful monitoring of the bottomland hardwood resources will also ensure that the newly planted forests are providing necessary ecosystem services, such as flood water storage and filtration of sediments and contaminants and cycling of essential nutrients and minerals.

### G3.7 Measures Taken to Enhance Benefits Beyond Project Lifetime

For each Go Zero project, the Fund works with the nation's leading public natural resource agencies, such as USFWS, to ensure that trees are planted in protected areas that have long-term management plans to ensure accuracy and certainty of carbon sequestration. Preserving and maintaining forestland is consistent with the Service's mission of conserving, protecting and enhancing fish, wildlife, and plants and their habitats for the continuing benefit of the American people. In 2007, the Fund and the USFWS signed a Memorandum of Understanding (which was recently renewed for another five years), that allows all National Wildlife Refuges to benefit from Go Zero restoration projects. In this MOU, the Service agrees to provide long-term protection and management of Go Zero projects under natural conditions and according to best wildlife and habitat

[7] Upper Ouachita NWR CCP, pp. 87.

management practices. The MOU is strengthened by the Service's commitment to incorporate the Go Zero Tracts into each Refuge's CCP, as stated in a letter from Cynthia Dohner, the USFWS Southeast Regional Director (see Exhibit B). Incorporation into the CCP will outline long-term management plans for the Tracts. To help supplement these management activities, the Fund makes a one-time payment to the USFWS for each Go Zero acre it restores. These funds ensure the Service will have the ability to steward the project over time.

### G3.8 Stakeholder Involvement

The Fund works with an array of public and private partners to engage project donors, select and evaluate a project location, conduct site preparation, secure and plant the appropriate seedlings, monitor and measure the carbon accrued over time and facilitate the long-term use of the property (for the community and for wildlife).

The Upper Ouachita NWR Restoration Initiative defined these partners, or stakeholders, as those parties who 1) own the Go Zero Tracts ("the landowner"), 2) owned the land prior to its restoration ("the seller"), 3) were directly involved with site selection, acquisition, planting, biological monitoring, carbon monitoring or long-term management ("project implementers"), 4) donated to support the project (the "donors") and/or 5) are members of local groups who use Upper Ouachita NWR ("community members").

The Fund facilitated and implemented the restoration project, and also currently owns the Acquisition Tracts. The restoration of the land was made possible, in part, by the Fund's donors. The trees were planted by TerraCarbon, and TerraCarbon, the Fund and USFWS will monitor their survival. USFWS owns the Refuge Tracts and is the entity responsible for the long-term management of the forestland on all Tracts. Although the previous landowner, who is one of the largest private landowners in the state, will no longer be able to farm on the Go Zero Acquisition Tracts, he will retain the ability for two years to farm 1700 acres of land purchased and currently owned by the Fund that will eventually be used by the Service as moist soil units (which neighbor the Acquisition Tracts). Once USFWS takes over the 1700 acres, the farmer will still be able to farm those acres on a co-op basis (he will leave a percentage of his crops as food for waterfowl).

Local community members are listed stakeholders and have also been important participants in the process. The Ouachita River Valley Association, which promotes projects that enhance the welfare of the people in the Ouachita River Basin, wrote a letter on behalf of the Fund advocating strong support for the implementation of the project. The Ouachita River Foundation also wrote in support of the Fund's work (see both letters attached as Exhibit C). These letters reflect the community's support for Upper Ouachita NWR as an important public resource that should be protected and expanded.

Although the Refuge does not have its own Friends group, outreach and education are conducted through Black Bayou Lake NWR, which is in the same Refuge Complex and has a large and active Friends group. The Friends of Black Bayou, Inc. group, which was named the top Refuge Friends group in 2004, is a non-profit community organization that brings together supporters of the Refuge system. A public outreach coordinator for the Complex is stationed at Black Bayou Lake NWR and helps manage events. For example, a college group from the University of Louisiana recently toured Upper Ouachita NWR as part of the curriculum of its game birds management class.

**Figure 10: The Fund, USFWS and TerraCarbon teams at the September 2010 consultation meeting**

All of the stakeholders described above have various roles in project development and implementation. The Service is involved in all decision making, including tree species selection, site preparation and long-term management decisions for the Go Zero Tracts. TerraCarbon is also actively involved in the decision process, and has offered guidance to the Fund and USFWS on planting methods and timing. USFWS, TerraCarbon, and the Fund have been in frequent contact to discuss all aspects of the project. In September 2010, Fund staff met with the Upper Ouachita NWR refuge manager and wildlife biologist and TerraCarbon's director and forester at Upper Ouachita NWR. The team toured through all of the prospective planting areas, and discussed issues related to site preparation, planting timelines, soil conditions, long-term management and public use. The team also discussed the CCB Standards and implementation of the project in accordance with the standards.

The stakeholders and their roles are listed in Table 3 below.

**Table 3: Upper Ouachita NWR Restoration Initiative Stakeholders**

| NAME OF STAKEHOLDER | CONTACT INFORMATION | ROLE | RATIONALE | PROJECT PHASE |
|---|---|---|---|---|
| The Conservation Fund | Go Zero Operations Manager,<br>703-525-6300 | Project Implementer/ Temporary Project Landowner | Manage and finance restoration and planting of the Go Zero Tracts | Project development and project implementation |
| The Conservation Fund donors | Confidential | Donors | Financial support of the project | Donations used to support project development and implementation |
| US Fish and Wildlife Service | Refuge Manager<br>318-726-4222 | Project Implementer/ Landowner | Involved with project planning and implementation; landowner and long-term steward of the forestland | Project development, implementation and long-term project management |
| TerraCarbon/ TerraCarbon Contractors | TerraCarbon Managing Director<br>309-693-9303 | Project Implementer | Involved with project planning and implementation, including site assessment, planting, survival checking and the carbon monitoring plan | Project development, implementation and monitoring |
| Prior landowner | Confidential | Prior Landowner | Impacted by acquisition and restoration | Project implementation |
| Community members | Various | Project Area User | Impacted by project implementation | Project implementation |

As the project evolves over time, the project proponents will continue to engage these stakeholder groups. As stated above, the Fund has engaged in public relations activities targeting local news outlets to help increase project awareness. The planting and restoration activities at Upper Ouachita NWR were featured in many

community newspapers (see Exhibit D). The project was highlighted in an editorial in the Monroe News-Star as one that would "improve the quality of life" in Monroe and West Monroe by having a "major impact on water quality and flood control." Celebration and dedication ceremonies with stakeholders will also be conducted.

### G3.9 Participation in CCBA Comment Period

USFWS and the Fund will take numerous steps to communicate and publicize the Climate, Community and Biodiversity Alliance ("CCBA") project during the public comment period. This Project Design Document ("PDD") will be made available on the CCBA website and is open to comments from the public. The PDD will also be available on the Refuge's website and in hard copy at the Upper Ouachita Refuge office**,** ensuring that project documentation is available near the project site and available to local residents who do not have access to the Internet. In addition, all key documentation and information regarding the Upper Ouachita NWR Restoration Initiative will be available on the Fund's website. These various methods will allow many Refuge users, including hunters, bird watchers, and other nature enthusiasts, to learn about the project and also allow the Refuge staff an opportunity to consult with these groups about project developments.

### G3.10 Conflict Resolution Tools

Grievances related to project planning and implementation should be filtered through the Refuge staff because the project is being implemented on federally owned or managed lands. The USFWS has a detailed appeals process that can be utilized by anyone who is adversely affected by any decision of the Refuge manager. If an individual disagrees with a Refuge decision, he or she has thirty days to appeal to the area manager, and shall be notified in writing within 30 days of the area manager's decision to further appeal in writing to the appropriate regional director. The regional director's decision will be considered the final decision, and the appellant shall be provided an opportunity for oral presentation before the area manager or regional director within the respective thirty day appeal periods. In this way, the area manager and regional manager will function as mediators to resolve any conflicts.

Although the Fund will own the Acquisition Tracts until they are conveyed to the Service, the Service will manage the Tracts while the Fund owns them in accordance with a lease agreement between the Service and the Fund.[8] The lease agreement allows the Service to perform all work necessary for the management and protection of the area.

Grievances related to the project are not anticipated. A large portion of the Project Area is already owned by the federal government and the project is implementing actions already approved in the CCP. Local community members, including local citizens and representatives from organizations and agencies, have already been engaged in the Refuge CCP process. Public input to the development of the CCP was initiated through a notice of intent published in the Federal Register, and also sought through two open house meetings held in Marion and Bastrop, Louisiana, which were publicized by press releases in local papers.[9] Members of the public attended these scoping meetings, and were able to register any concerns they had regarding the

[8] The original agreement was between the Service and the previous landowner, and it was assigned to the Fund when the Fund purchased the land.

[9] Upper Ouachita NWR CCP, pp 63.

development of the CCP. As noted above, community groups are strong supporters of the Refuge, as evidenced by the letters from the Ouachita River Valley Association and Ouachita River Foundation.

### G3.11 Project Financial Support

The Upper Ouachita NWR Restoration Initiative is made possible by donations to the Fund's Go Zero program. Before the project was initiated, a budget was developed to ensure that the donations would cover all of the costs of the project, including design, implementation, and long term monitoring.

## G4. MANAGEMENT CAPACITY

### G4.1 Project Proponent

The management responsibilities of the Upper Ouachita NWR Restoration Initiative are split between the Fund and USFWS. As described in G3.2, the Fund has also contracted with TerraCarbon to provide planting and monitoring services. Descriptions of each organization's experience and responsibilities are detailed below.

The National Wildlife Refuge System, managed by the USFWS, is the world's premier system of public lands and waters, set aside to conserve America's fish, wildlife and plants. The Refuge System has grown to more than 158 million acres, including 553 refuges and 38 wetland districts. Refuge management is the core business of the Service, and management of the restored Go Zero Tracts will be the Service's responsibility.

The Conservation Fund is one of the nation's foremost environmental nonprofits dedicated to protecting America's most important landscapes and waterways for future generations. Since its founding in 1985, the Fund has helped its partners safeguard wildlife habitat, working farms and forests, community greenspace, and historic sites totaling nearly 7 million acres nationwide. The Fund is responsible for project coordination and implementation of this reforestation project. The Go Zero program has completed multiple forest carbon projects of this kind and scale in the past, including four reforestation projects validated at the gold level under the Climate, Community and Biodiversity standards.

The Fund has partnered with TerraCarbon to provide planting and monitoring services for this project--TerraCarbon professionals have decades of experience working with federal, state, non-profit and other business partners to provide programs combining state-of-the-art carbon sequestration science and restoration of ecologically damaged ecosystems.

## G4.2 Management Capacity and Expertise

The scale of the Upper Ouachita NWR Restoration Initiative is well within the management capacity of the Fund, USFWS and TerraCarbon. All of these organizations have a great deal of previous experience managing and monitoring forest carbon projects. The Fund and the Service have previously worked together and successfully implemented multiple restoration projects of this kind (including projects at Red River NWR, Marais des Cygnes NWR, Mingo NWR, Grand Cote NWR and Lake Ophelia NWR) and have the skills and experience necessary to carry out the Upper Ouachita NWR Restoration Initiative.

The Fund is a national leader in developing and implementing forest carbon projects. The Fund's carbon sequestration programs, including, but not limited to Go Zero, have helped to restore 23,000 acres by planting seven million trees, which will capture an estimated eight million tons of carbon dioxide equivalent from the atmosphere over their lifetime. In addition, the Fund owns 40,000 acres of redwoods and Douglas fir forests in Mendocino County, CA and manages these forests as sustainable working forests, benefiting both the environment and the local economy. All 40,000 acres have been registered with the Climate Action Reserve and produce verified carbon emission reductions. The Fund is dedicated to the development of forest carbon partnerships and long-term oversight of projects.

The employees of TerraCarbon, and their contractors, have the skills and knowledge needed for packaging and storing seedlings, planting seedlings, soil sampling, and tree survival analysis. They also possess expertise on the science of carbon sequestration in conjunction with restoration projects.

The USFWS team possesses the skills and the authority needed for biodiversity monitoring and long term habitat monitoring and the ability to maintain the Tracts as forestland. In addition, USFWS has the skill set needed to monitor certain community variables such as public use of the Refuge.


**Figure 11: The FWS team surveying the Go Zero Tracts before planting**

## G4.3 Capacity Building

This project will increase knowledge transfer across the public and private sectors regarding the science of carbon sequestration via reforestation. USFWS employees at both the regional and national levels are increasingly interested in leveraging the private dollars that result from these carbon sequestration projects as a way to facilitate acquisition and restoration of public lands. USFWS employees have started exchanging lessons learned and best management practices for carbon sequestration projects, allowing for the successful replication of projects in other communities. This is particularly true in Region 4 (the Southeast Region), where carbon sequestration projects were first initiated under the Region's leadership, and where carbon sequestration has provided a huge opportunity for Refuges to accomplish their reforestation goals. Members of the Go Zero project team have been instrumental in introducing the concepts developed in the Southeast to other USFWS regions.

Recently, the USFWS has drafted a Climate Change Strategic Plan to guide their climate change work and is conducting stakeholder workshops to discuss possible approaches to addressing climate change. The workshops aim to expand terrestrial carbon techniques and to compile and share scientifically sound approaches, standards and guidelines for terrestrial sequestration activities.

### G4.4 Community Employment Opportunities

The Upper Ouachita NWR Restoration Initiative was not designed to create new long-term employment opportunities. The Go Zero Tracts are within the Refuge and managed by existing Refuge staff. The Service will be in charge of managing the lands as forestland according to the provisions set forth by the MOU. If new employment positions are created through this project, they will be within USFWS. As a federal agency, USFWS must comply with all federal Equal Employment Opportunity laws. Individuals will not be denied opportunities in employment because of their race, sex, age, religion, color, national origin, physical or mental disability or any other factors not properly relevant to employment.

The Upper Ouachita NWR Restoration Initiative will create short-term employment opportunities – primarily during the planting and restoration phases. TerraCarbon uses independent contractors to provide tree planting services for the project. TerraCarbon does not discriminate with respect to race, creed or gender in employment or contractor opportunity.

#### *Inclusion of Women*

While federal laws are in place to protect the ability of all groups to participate in the project, women have been instrumental in project implementation. For example, women make up a significant percentage of the Fund's Go Zero staff and the Refuge biologist at Upper Ouachita NWR is female.

### G4.5 Workers' Rights

Employees of USFWS are protected by federal labor and employment laws. Fund employees are also protected by applicable state and federal laws, and by the rights and policies described in the Fund Employee Manual. TerraCarbon's employees are also protected by federal and state labor and employment laws, and the rights described in the employment agreements of each one; the rights of the employees of TerraCarbon and its subcontractors to workers compensation are backed by workers' compensation insurance in amounts not less than state-required minimums.

A list of all laws applicable to Upper Ouachita NWR is attached as Exhibit E. They are further elaborated upon in Section G5.1.

### G4.6 Worker Safety

The long-term management of the Go Zero project presents few, if any, worker safety risks. However, there are some inherent safety risks involved with the actual planting of the Tracts. TerraCarbon, which contracts out most of its tree planting services provided to clients, has two TerraCarbon staff foresters who oversee and participate in field operations; they are both Registered Foresters and Certified Wildlife Biologists with over 55 years of combined experience with state and federal conservation agencies prior to joining TerraCarbon.

The main requirements of TerraCarbon staff foresters and contractors with respect to field safety are:

- Demonstrated experience in agriculture and/or forestry work including ATV use. Completion of an ATV safety course is preferred but not mandatory (current staff foresters have completed such). TerraCarbon provides a copy of the US Fish and Wildlife Service's "Four Wheel All Terrain Vehicle Training Guide" to its staff foresters and requires them to use safety goggles and gloves at all times when riding ATVs and to have two helmets on the premises (with use recommended at all times).
- At least two persons must be present on a project site at all times during planting (no solo work or visits).
- Vehicles (trucks and ATVs) used in travel and field operations by TerraCarbon staff foresters must be regularly maintained and kept in good working order.
- TerraCarbon contractors are supervised in the field by TerraCarbon staff foresters and/or USFWS refuge personnel during field operations.

There is no specified penalty for failure to comply but executive company management stresses safety in regular communication with employees and contractors.

The "planter bin" on the machine planter used by TerraCarbon contractors—where a worker sits and inserts the tree seedlings into the ground—is encased such that sticks and field debris cannot reach it. Cameras in the tractor allow the tractor driver to see the planting bin at all times, and communication is possible between planter and driver. It is the same machine used by timber companies for tree plantation planting. TerraCarbon contractors have been engaged in planting operations for many years, including for government agencies overseeing the Conservation Reserve and Wetland Reserve tree planting programs.

The Occupational Safety and Health Administration (OSHA) and the Service require health and safety training for all USFWS employees.[10] USFWS safety policy is designed to minimize any risks to worker safety, including requiring Refuge personnel to undertake an ATV safety course.

### G4.7 Financial Health of Implementing Organization

USFWS is a financially stable agency within the United States government, funded through federal appropriations, and does not pose a financial risk to the longevity of the Upper Ouachita NWR Restoration Initiative.

The Fund leverages conservation dollars from our public and private partners, saving taxpayers more than $1 billion in land purchase costs to date on lands valued in excess of $3.6 billion. The Fund puts an average of 97 percent of its budget directly into conservation programs and just 1 percent into fundraising. The Fund is recognized annually as one of the nation's top environmental organizations by two charity watchdog organizations, American Institute of Philanthropy and Charity Navigator.

The Fund's work is made possible with generous support from individuals, foundations, corporations and government agencies. Its commitment to accountability and donor transparency remains a cornerstone of its

[10] Additional information on USFWS Safety Program Management is available at: http://www.fws.gov/policy/240fw1.html

operations. Copies of the Fund's 2009 Consolidated Audit and 2009 990 Tax Return can be found at: http://www.conservationfund.org/who_we_are/financials

## G5. LEGAL STATUS AND PROPERTY RIGHTS

### G5.1 Compliance with National and Local Laws

A full list of relevant legal mandates and compliance requirements is included in the Upper Ouachita NWR CCP as Appendix C, and also attached to this document as Exhibit E. Descriptions of significant legislation are elaborated upon below.

***National Wildlife Refuge System Improvement Act***

In 1997, the National Wildlife Refuge System Improvement Act established a clear legislative mission of wildlife conservation for the refuge system and actions were initiated that same year to comply with the directive of this new legislation. This Act required CCPs to be completed for all refuges, with full public involvement, to help guide the management of each refuge.

***National Environmental Policy Act***

The National Environmental Policy Act ("NEPA") requires the disclosure of the environmental impacts of any major federal action significantly affecting the quality of the human environment. NEPA requires each CCP to examine a full range of alternative approaches to refuge management and to involve the public in selecting the approach best suited to each Refuge's purposes. Actions recommended in the CCP must be vetted under the NEPA process, which includes review of environmental and historical impacts (per the National Historic Preservation Act). Because restoration of bottomland hardwoods is a recommended action in the CCP, it has already been approved under the NEPA process and does not need to be evaluated again.

***Labor Law***

Our contracts indicate that our partners, including TerraCarbon, have complied with national, state and local labor laws.

### G5.2 Approval from Appropriate Authorities

***Memorandum of Understanding***

On March 30, 2007, the Fund and USFWS signed a MOU pursuant to the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-667e and the Fish and Wildlife Act of 1956, 16 U.S.C. §§ 742a – 742j. The Coordination Act authorizes the Service to "provide assistance to, and cooperate with, Federal, State, and public or private agencies and organizations in the development, protection, rearing, and stocking of all species of wildlife, resources thereof, and their habitat. ..." 16 U.S.C. § 661. The goal of the MOU is to create private/public partnerships as a way to generate support for the restoration and conservation of native habitats. Under the MOU, the Fund agrees to—among other things—seek donations from individuals, corporations and other organizations to support Go Zero habitat restoration projects on National Wildlife Refuges across the country. USFWS agrees to—among other things—be responsible for oversight and approval of habitat restoration activities on the ground and provide long-term management of these lands under natural conditions, and according to best wildlife and habitat management practices. Because the partnership between the USFWS

and the Fund has been so successful, the MOU was renewed on October 1, 2010 for an additional five years. The renewed MOU is attached as Exhibit A.

### G5.3 Free, Prior, and Informed Consent

The Go Zero Project will not encroach uninvited on government property, private property or community property. The Fund owns 1402 acres of the Project Area, purchased from a private willing seller, and will retain title to these lands until they are conveyed to USFWS. The remainder of the project lands are already owned by the federal government as part of the National Wildlife Refuge System, and the MOU between USFWS and the Fund allows Go Zero projects to take place on any Refuge within the United Sates.

### G5.4 Involuntary Relocations

The Upper Ouachita NWR Restoration Initiative does not require the involuntary relocation of people or activities. The Fund purchased the Acquisition Tracts from a willing seller; the Refuge Tracts were already owned by the Service.

### G5.5 Illegal Activities

There are no anticipated illegal activities that could affect the project. The project is being implemented on a National Wildlife Refuge, which is protected and patrolled by Refuge law enforcement officers. Activities on the Refuge must comply with all federal laws. While there is always a small possibility of illegal activity such as unlawful hunting, logging, or reckless destruction, law enforcement vigilance by the Refuge makes this improbable. Although the Fund will own the Acquisition Tracts until their conveyance to the Service, an agreement between USFWS and the Fund allows the Upper Ouachita NWR staff to manage and conduct enforcement on these lands during this time.

### G5.6 Carbon Rights

The Go Zero program was created as a voluntary, philanthropic approach to offsetting the annual carbon dioxide emitted by a specific activity, business, organization or individual. All carbon accrued by Go Zero projects is withheld from the regulated carbon markets and cannot be banked for future offset purposes, traded, or sold by Go Zero donors in the future. The MOU between the Service and the Fund makes clear that the goal of the Go Zero program and partnership is to generate support for forest restoration projects without generating carbon sequestration credits that can be sold or traded. In a letter to The Conservation Fund, Cynthia Dohner, USFWS Southeast Regional Director, reiterated that any carbon offsets generated as a result of Go Zero projects on the Refuge would be retired and not traded in the future (see Exhibit B).

# CLIMATE SECTION

## CL1. NET POSITIVE CLIMATE IMPACTS

### CL1.1 Net Change in Carbon Stocks

TerraCarbon has been contracted by the Fund to plant the Project Area, to measure the baseline conditions and to install the initial set of monitoring plots. In 2007, a consortium of leaders in forest science and carbon project development, including representatives from TerraCarbon, amassed the most comprehensive dataset of bottomland hardwood stands yet assembled for the Lower Mississippi River Valley (LMV), drawing on 540 biomass plot measurements, and produced the most reliable predictive model to date. The findings were published in the peer reviewed journal *Wetlands* (Shoch et al, 2009) (attached as Exhibit F).

This most recent research is specific to the LMV, which stretches along both sides of the Mississippi River in Louisiana. As illustrated in Figure 2, Upper Ouachita NWR is on the periphery of this region and USFWS and TerraCarbon have agreed that the bottomland hardwood tree species, soils and growth patterns at Upper Ouachita NWR are similar to those in the LMV. In fact, the study included data from the Upper Ouachita NWR. Due to these ecological similarities, the model will be applied to the Upper Ouachita NWR Restoration Initiative.

The predictive model, illustrated in Table 4 and Figure 12 below, combines the new empirical live tree biomass data from Shoch et al. with modeled data for minor pools (e.g., dead wood, understory and soil carbon) applicable to the South Central region of the US for oak-cypress (predominant bottomland species) derived from Smith et al, 2006 (and used by the USDOE 1605(b) voluntary GHG reporting program). The results of this research are the basis of the predictions of future stocks on reforestation projects in the LMV and will serve as a guide for the carbon projections for the Upper Ouachita NWR Restoration Initiative.

**Table 4: Tabular data of projected carbon curve over 100 year period of LMV bottomland hardwood forest. (Courtesy David Shoch, TerraCarbon LLC)**

| Shoch et al, 2009 | | Smith et al, 2006 | | | (metric) | (short tons) |
|---|---|---|---|---|---|---|
| **Stand age** | **Live tree Biomass, tC/ha** | **Soil, tC/ha** | **Dead Wood and Understory, tC/ha** | **TOTAL, tC/ha** | **t CO2-e/ac** | **t $CO_2$-e/ac** |
| 0 | 0.8 | 0 | 0.0 | 0.8 | 1 | 1.4 |
| 5 | 4.8 | 0.1 | 1.9 | 6.8 | 10 | 11.2 |
| 10 | 14.4 | 0.5 | 5.0 | 19.9 | 30 | 32.6 |
| 15 | 29.8 | 1.1 | 7.6 | 38.5 | 57 | 63.0 |
| 20 | 49.3 | 1.9 | 9.4 | 60.6 | 90 | 99.0 |
| 25 | 70.4 | 2.9 | 10.9 | 84.2 | 125 | 137.6 |
| 30 | 90.9 | 4 | 12.1 | 107.0 | 159 | 175.0 |
| 35 | 109.6 | 5.1 | 13.3 | 128.0 | 190 | 209.3 |
| 40 | 125.7 | 6.2 | 14.6 | 146.5 | 217 | 239.5 |
| 45 | 139.1 | 7.3 | 15.5 | 161.9 | 240 | 264.7 |
| 50 | 149.9 | 8.3 | 16.6 | 174.8 | 259 | 285.8 |
| 55 | 158.5 | 9.2 | 17.6 | 185.3 | 275 | 302.9 |
| 60 | 165.2 | 10.1 | 18.4 | 193.7 | 287 | 316.7 |
| 65 | 170.3 | 10.7 | 19.4 | 200.4 | 297 | 327.8 |
| 70 | 174.3 | 11.3 | 20.2 | 205.8 | 305 | 336.6 |
| 75 | 177.4 | 11.8 | 21.0 | 210.2 | 312 | 343.7 |
| 80 | 179.7 | 12.2 | 21.6 | 213.5 | 317 | 349.1 |
| 85 | 181.4 | 12.4 | 22.4 | 216.2 | 321 | 353.5 |
| 90 | 182.7 | 12.7 | 23.2 | 218.6 | 324 | 357.5 |
| 95 | 183.7 | 13 | 23.2 | 219.9 | 326 | 359.6 |
| 100 | 184.5 | 13.3 | 23.2 | 221.0 | 328 | 361.3 |

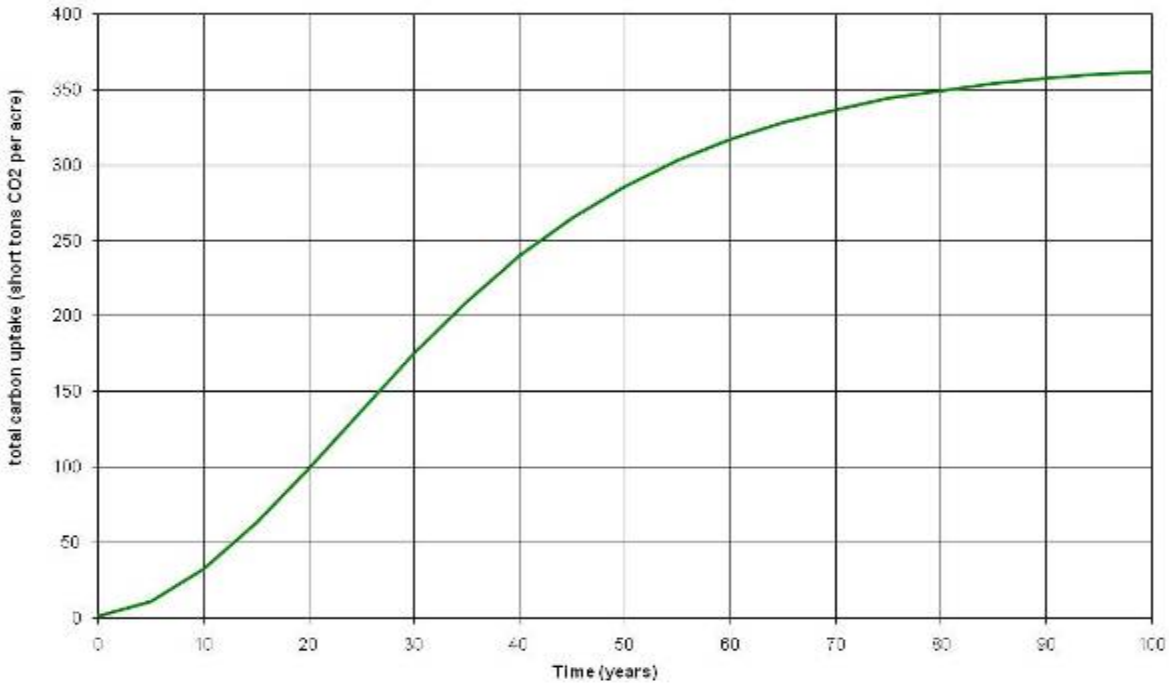


**Figure 12: Predictive Model for carbon sequestration in bottomland hardwoods in the LMV**

Beginning 5 years after planting, direct measurements of live tree biomass in the Project Area will be undertaken to assess the change in carbon stocks over time rather than relying on the model. Measurements will occur every 5 years after the initial measurement. Minor pools will be estimated using the Smith et al (2006) study as their contribution to the overall carbon stocks is relatively insignificant.

### *Monitoring Plan and Compliance with the IPCC Good Practice Guidelines*

The Fund will monitor and measure carbon stocks on the Project Area based on the carbon monitoring plan developed by TerraCarbon. This carbon measurement and monitoring plan for bottomland reforestation projects in the Lower Mississippi Valley follows general principles of carbon accounting provided in Chapter 4 (AFOLU; Agriculture, Forestry and Other Land-use) of the IPCC 2006 Guidelines for National Greenhouse Gas Inventories and IPCC Good Practice Guidance (IPCC GPG 2003), specifically Chapter 4.3 Guidance for Projects.

Over the life of the project, carbon stock and stock change estimates for live tree biomass will be derived from direct measurements taken throughout the Project Area, without reliance on default emission factors, and thus satisfies the IPCC Tier 3 highest level of accuracy criteria. Dead wood, forest floor litter, and soil carbon stock changes, which represent a smaller proportion of forest biomass, will be estimated on the basis of U.S. South Central region oak-gum-cypress afforestation default estimates of accrual, (Smith et al. 2006[11], Table B49),

[11]Smith, J.E., L.S. Heath, K.E. Skog, and R.A. Birdsey. 2006. Methods for calculating forest ecosystem and harvested carbon with standard estimates for forest types of the United States. USDA Forest Service, Northeastern Research Station. Newtown Square, PA, USA. General Technical Report NE-343.

also used by the U.S. D.O.E. 1605(b) voluntary reporting program, and conforming with IPCC Tier 2 level reporting. Absence of baseline stocks of woody biomass is confirmed by on-the-ground observations and aerial photo documentation.

In further conformance with IPCC guidance regarding explicit quantification of uncertainties and reducing uncertainties, the Fund's monitoring plan is designed to quantify and control for uncertainty in estimates by employing optimum sampling intensity and unbiased allocation of measurement plots to produce estimates with a known level of confidence.

Finally, per IPCC 2006GL guidance, the Fund's monitoring plan includes a Quality Assurance/Quality Control (QA/QC) plan to control for errors in sampling and data analysis. This QA/QC plan provides documentation and consistency in data archiving thus permitting efficient third-party auditing and evaluation against measurement and quantification standards over the life of monitoring. The Fund maintains a database of GIS coverages detailing parcel boundaries and plot locations, and raw field measurements and analyses permitting independent review of source data over the life of the project.

### CL1.2 Net Change in Non-CO2 gases

Non-$CO_2$ gases are not expected to account for more than a 5% increase or decrease of the Upper Ouachita NWR Restoration Initiative's overall greenhouse gas ("GHG") impact and are not considered significant because of multiple factors. Plantings were not done on organic soils (where methane emissions might be expected), no fertilizers (nitrogen or otherwise) were used, and soil disturbance was minimal. No advance site preparation was undertaken. The Go Zero Tracts were planted by a machine in which a mechanized tool called a "foot" opened a planting slit 12-16 inches deep, which simultaneously loosened the soil for better moisture retention and created a hole for the seedling, resulting in disturbance to <10% of the surface area. A special wheel then tightened up the surface soil around the seedling. Our expectation is that there should be no long-term non-CO2 GHG emissions associated with machine planting.

### CL1.3 Other GHG Emissions from Project Activities

Emissions generated by tractors during planting were monitored and will be deducted from the final project sequestration estimates. As explained above, soil disturbance in planting was minimal. Any short term emissions from the soil carbon pool resulting from planting activities are expected to be quickly recovered by incorporation of new soil organic matter from forest growth.

### CL1.4 Positive Net Climate Impact

The climate model predicts a net climate impact of 259 metric tons of CO2 equivalent per acre (i.e., 286 short tons per acre) at year 50, and 328 metric tons of CO2 equivalent per acre (i.e., 361 short tons per acre) at year 100. The annualized average for the first 50 years is 5.2 metric tons of CO2 equivalent per acre per year (i.e., 5.7 short tons of CO2 equivalent per acre per year). As stated above, any emissions from fossil fuel combustion generated during planting will be subtracted from this total.

### CL1.5 Avoidance of Double Counting

All of the carbon dioxide benefits generated by the Upper Ouachita NWR Restoration Initiative will be withheld from regulated greenhouse gas markets and will be retired. Once tons have been allocated to a particular site, they are retired and made unavailable to other buyers. The Fund uses an online database system to track all

offset tons and their disbursement to buyers. This system is kept on secure servers at Fund headquarters. In addition, all Go Zero contracts and marketing materials state that all carbon accrued by Go Zero projects is withheld from the carbon market and cannot be banked for future offset purposes, traded, or sold by Go Zero donors in the future.

## CL2. OFFSITE CLIMATE IMPACTS ("Leakage")

### CL2.1 Types of Leakage

Leakage due to this project is not expected to occur. According to a white paper published by the Offset Quality Initiative, reforestation and afforestation projects are less likely to be affected by potential leakage impacts than other carbon projects.[12] In this case, the primary concern is that because lands were taken out of agricultural production and restored to trees, the farmer who previously used the land may clear healthy forests to create more viable agricultural lands offsite. However, the individual who previously farmed on the Tracts has confirmed that he will not clear any forested lands as a result of this project. He will be moving his operations to other existing farmlands, including the moist soil unit that will be developed on the Acquisition Tracts by the Refuge. His actions are representative of an overall trend; cropland use in the region as a whole has been declining since 1950.[13] In fact, there is no evidence of forest clearing for agriculture in the region on any appreciable scale in the past decade. Therefore, no activity shifting leakage should be expected as a result of this project.

### CL2.2 Mitigation of Negative Offsite Impacts

Because no offsite impacts attributable to project leakage are anticipated, no direct actions will be necessary to mitigate their effects.

### CL2.3 Net Effect of Climate Impacts

The Fund does not expect any leakage to occur; therefore, no adjustment was made to the Net Climate Impact figures seen in CL1.4

### CL2.4 Non-CO2 GHGs

The Fund does not expect there to be any non-$CO_2$ offsite effects.

## CL3. CLIMATE IMPACT MONITORING

### CL3.1 Monitoring Plan

***Background***

The carbon monitoring plan that covers the Upper Ouachita NWR Restoration Initiative was developed in 2011 by TerraCarbon at the direction of the Fund with the objective of establishing a quantitative basis for monitoring

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[12] Ensuring Offset Quality: Integrating High Quality Greenhouse Gas Offsets into North American Cap-and-Trade Policy. July, 2008. The Offset Quality Initiative. Available: http://www.offsetqualityinitiative.org/index.html

[13] Brown, D. G., K. M. Johnson, et al. (2005). "Rural Land-Use Trends in the Coterminous United States, 1950-2000." Ecological Applications **15**(6): 1851-1863.

carbon stock changes over time on Go Zero reforestation sites. The plan involves direct measurements of carbon stocks and carbon stock changes in live tree biomass, and default estimates for carbon stock changes in minor pools including dead wood, litter, and soil. For direct measurements of live tree biomass, the current plan uses a stratified sampling design that treats each refuge as a distinct stratum in a broader population when allocating samples and calculating estimates of carbon stocks and their uncertainty. The plan was explicitly designed to meet the requirements found in the CCB Project Design Standards. The refuges included in this plan are:

1. Grand Cote and Lake Ophelia National Wildlife Refuge
2. Marais des Cygnes National Wildlife Refuge
3. Mingo National Wildlife Refuge
4. Red River National Wildlife Refuge
5. Trinity River National Wildlife Refuge
6. Upper Ouachita National Wildlife Refuge

***Sampling Design***

*Refuge/Project Level Monitoring*: The Fund's monitoring plan uses a stratified random sampling design to estimate carbon stocks and carbon stock changes as well as the uncertainty of these estimates. The monitoring plan delineates strata based on planting location. Each reforestation project at each planting location is considered a distinct strata and a random sample of carbon stock measurements for each strata is taken. Plots have been randomly placed throughout each stratum to estimate strata means and totals. Samples across all strata in combination serve to estimate carbon sequestration at the Go Zero program level and uncertainty; the strata level estimates can also be disaggregated to assess carbon stocks at the project or site level.

*Sample Size*: Based on data from representative stands, sample sizes in each strata have been calculated using a Neyman allocation approach. This approach first calculates the total number of sample plots across the full Go Zero program using 1/10$^{th}$ acre fixed area plots with an expected standard deviation for each strata and targeting a 10% allowable error at the 95% confidence level. Sample plots are then allocated to each strata based on variability of the strata and the area of the strata.

*Sample Plot Allocation*: Once the sample size of for each stratum is calculated as described above, these plots are randomly placed within the strata using the "Create Random Points" tool within ArcGIS.

***Methodology for on-site Measurements***

The Fund's Go Zero monitoring plan includes a comprehensive Standard Operating Procedure that details how live tree biomass will be sampled, measured, and estimated in subsequent years.

*Baseline Carbon Stocks*: Land use history for each Project Area is documented by The Fund in partnership with TerraCarbon and National Wildlife Refuge staff. Non-forest baseline site conditions are verified by analysis of satellite imagery, aerial photos, USGS National Land Cover Dataset and/or other available and appropriate imagery. Where necessary, tract boundaries are redrawn to exclude any pre-existing tree cover.

Digital photos are taken on-site prior to planting to further document baseline conditions and verify the absence of pre-existing woody biomass.

*Subsequent Monitoring*: The Fund will implement the Go Zero monitoring plan (see Section CL1.1) for estimating carbon accrual for the project beginning 5 years after the planting. Future monitoring will be coordinated by The Fund with its project partners and will follow operating procedures outlined in the monitoring plan.

***Quality Assurance/Quality Control***

The Fund will maintain a database of raw field measurements and analyses, and GIS coverages detailing parcel boundaries and plot locations, to permit independent review of source data over the life of the project. In addition, the monitoring plan includes specific Quality Assurance/ Quality Control measures to control errors in sampling and data analysis, and to provide documentation and consistency in data archiving. This enables efficient third-party auditing and evaluation against measurement and quantification standards.

***Leakage Monitoring***

As stated in CL2.2, the farmer will not clear any forested land for farming.

**CL3.2 Monitoring Plan Development**

As described above, the Fund will use the Go Zero Monitoring Plan prepared by TerraCarbon as the basis for future monitoring of the Upper Ouachita NWR Restoration Initiative.

## CM1. NET POSITIVE COMMUNITY IMPACTS

### CM1.1 Community Benefits

The Go Zero Refuge Tracts were previously agricultural lands with minimal public recreation value, and the Go Zero Acquisition Tracts were privately owned farmland with no public access. However, now that these lands are restored with native forest, they can be enjoyed by the entire public and especially residents in the surrounding communities. The restored Tracts will improve the quality of recreational opportunities available including hunting, wildlife photography and observation, and environmental education and interpretation. The Refuge Tracts, which were previously closed to hunting, will now be open to the public for hunting and will become new lands that are open for public use. The Acquisition Tracts will be used as a waterfowl sanctuary and will be closed to hunting, but open to the public in spring and summer for wildlife viewing and photography.


**Figure 13: The Go Zero project will open up new lands to hunting for local residents. Photograph courtesy of US Fish and Wildlife Service**

Community events will also be improved. Each year the Refuge hosts numerous community events such as the annual youth turkey hunt. The turkey hunt is held in March every year for 10 selected youth (drawn via lottery from a pool of 100 applicants). The quality of this event at Upper Ouachita NWR will be improved due to the Tracts' restoration, which will lead to expanded and improved forest and habitat conditions.

Hunting is also very important to the local community from an economic perspective. For example, Louisiana ranks 3rd in the nation in waterfowl hunting participation. In 2006, waterfowl hunters spent $43.1 million on waterfowl hunting trips and equipment and helped support 1,101 jobs that are related to waterfowl hunting, which produced $24.3 million in salaries and wages, creating a ripple effect of $62.2 million dollars.[14] Increasing recreational opportunities, such as waterfowl hunting, to Louisiana residents offers significant economic benefits to communities located near Refuges, such as those in the Project Zone.

The Go Zero project's positive community impact will be measured by monitoring the community use of the Go Zero Tracts over time. The surrounding community will be able to use the land for a variety of activities like those described above, including hunting, bird watching and special activity days. Although increase in use will

[14] Economic Impact of Waterfowl Hunting in Louisiana, available at: http://www.associatedcontent.com/article/1586142/economic_impact_of_waterfowl_hunting.html?cat=3

likely be modest at first, it is anticipated that visitor use days will be positively correlated with the Tracts' stand development. As the stands develop into mature bottomland hardwood forest, activities such as bird watching, photography and hunting are expected to increase, and a rise in activity levels should lead to corresponding increases in overall fitness, health and well-being amongst community members. Figure 14 below illustrates the predicted increase in community use that can be expected as a result of the Go Zero project.

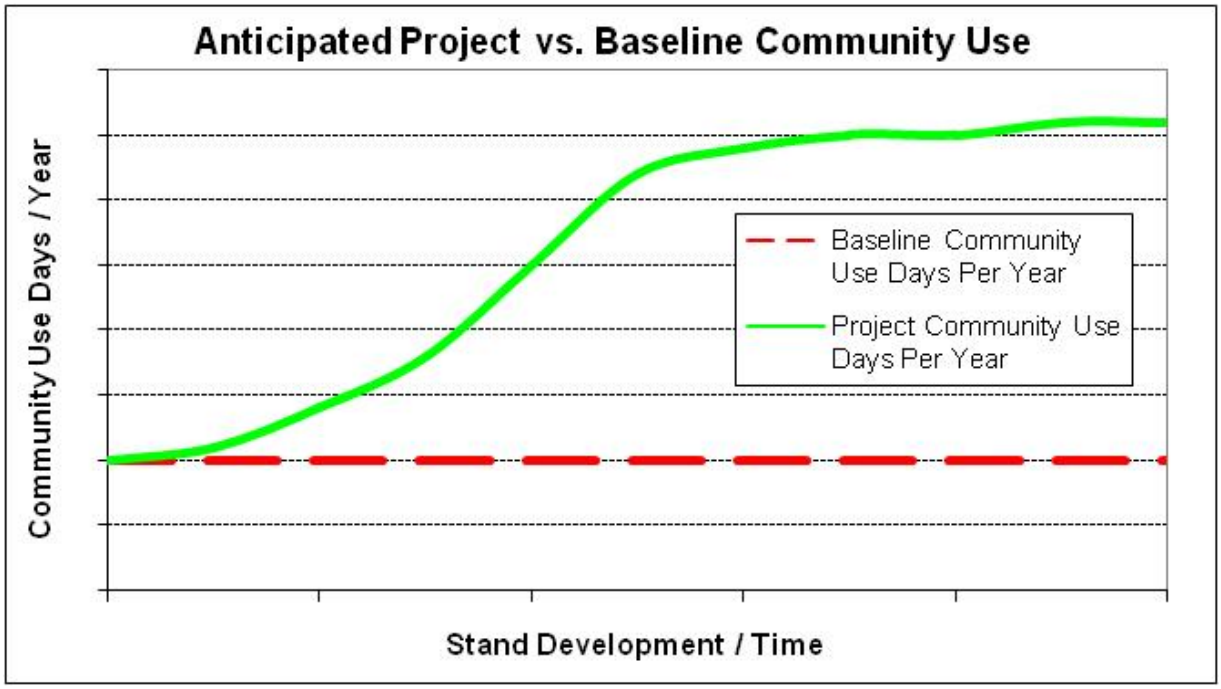


**Figure 14: Anticipated Project vs. Baseline Community Use Over Time**

As illustrated by Figure 14, the Upper Ouachita NWR Restoration Initiative is expected to generate an increasingly positive community impact over time. In the absence of the project, the Go Zero Refuge Tracts would have remained closed to hunting and recreation, and the Acquisition Tracts would have remained private farmland with no public access. Therefore, the net community impact of the project can be considered positive.

### CM1.2 Impact on High Conservation Values

High Conservation Values relating to community well-being have been identified under criteria G1.8.4 – Critical Ecosystem Services. The bottomland hardwoods at Upper Ouachita NWR provide important ecosystem functions for the communities within the Project Zone, particularly flood water storage and filtration. These functions will not be negatively impacted by the project. To the contrary, planting more bottomland hardwood trees will only enhance these functions, as the additional trees will allow for greater flood control and benefit the neighboring communities that suffer from flooding impacts. The Ouachita River's water quality should also improve as the restored forest filters more excess nutrients that are washed into the water, such as agricultural fertilizers. In addition, removing acreage from farming and planting new forest cover will reduce erosion and agricultural inputs and fertilizers in the groundwater that pollute the River.

## CM2. OFFSITE STAKEHOLDER IMPACTS

### CM2.1 Potential Negative Offsite Impacts

There are no potential negative stakeholder impacts from restoring the Go Zero Tracts at Upper Ouachita NWR. The private individual who sold the Acquisition Tracts to the Refuge, who is one of the largest landowners in Louisiana, will still be able to farm a portion of this land (the moist soil units) for the next two years under an agreement between the landowner and the Fund. Once the land is conveyed to the Service, the private farmer will still be able to remain as the co-op farmer on the moist soil units, leaving a percentage of the food unharvested to remain as food for waterfowl.

### CM2.2 Mitigation of Negative Impacts

There are no anticipated negative impacts caused by the restoration of the Go Zero Tracts. As stated above, no jobs will be lost due to the project.

### CM2.3 Net Stakeholder Impacts

As stated above in CM2.1, there are no anticipated negative stakeholder impacts caused by the restoration of the Go Zero Tracts. Restoring the Tracts to native forest confers many benefits on the surrounding community, such as reducing flooding impacts, as described in CM1.1. Thus, the net effect on the community is very positive.

## CM3. COMMUNITY IMPACT MONITORING

### CM3.1 Monitoring Plan

The Complex staff will monitor the community benefits generated by the Upper Ouachita NWR Restoration Initiative, as described in CM1.1, with specific attention paid to the anticipated rise in community use of the Go Zero Tracts. As the seedlings develop into a mature bottomland hardwood forest, public activity on the Tracts, including hunting, birding, and photography is expected to increase as illustrated in Figure 15 below. As described in CM1.1, some of the Go Zero Tracts will be open to hunting, and hunting conditions will be especially improved once the lands are restored. The Acquisition Tracts, which were previously private farmland, will be open to wildlife viewing and photography. Community use of the Tracts (and the entire Refuge) for public recreation and enjoyment is a significant benefit of the Go Zero project and, therefore, an appropriate variable for community impact monitoring.

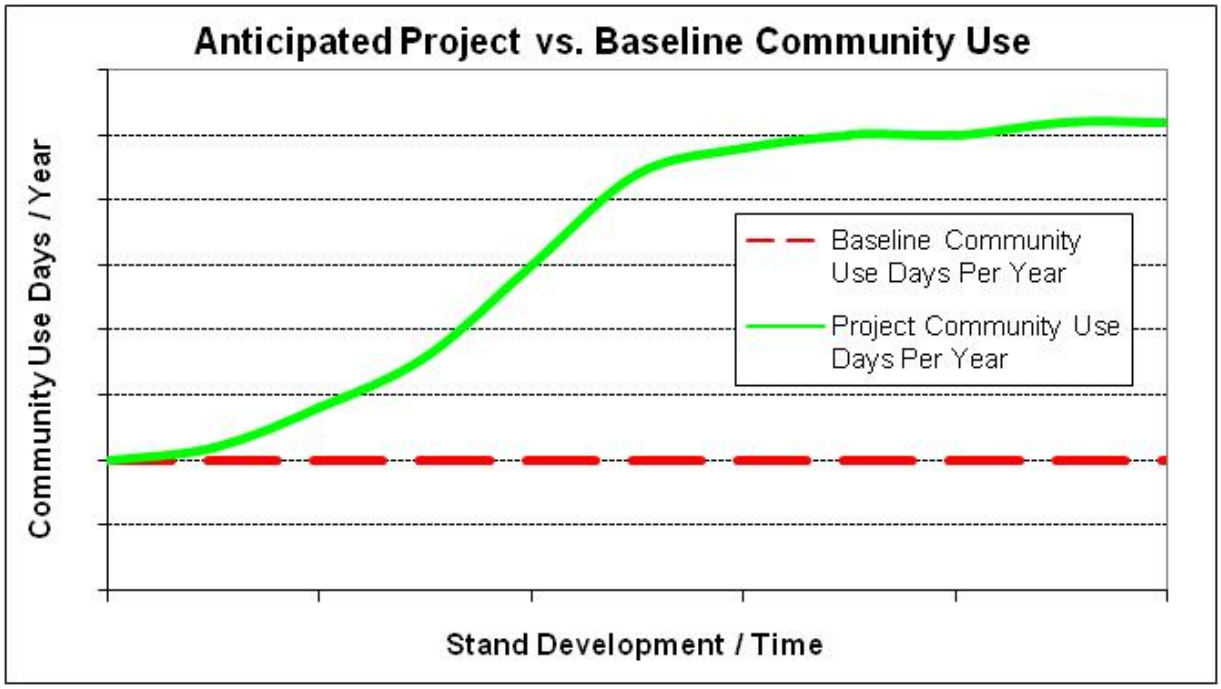


**Figure 15: Anticipated Project vs. Baseline Community Use Over Time**

Upper Ouachita NWR already monitors visitors to the Refuge by patrolling the Refuge and tracking usage trends. The North Louisiana Refuge Complex has a full time law enforcement officer that visually monitors each Refuge and tracks visitor use. Refuge staff will continue utilizing this method to monitor increases in use specifically on the Go Zero Tracts. Results will be recorded and tabulated on a periodic basis.

At this time, there are no community variables at risk of being negatively impacted by the project as stated above in CM2.1 and CM2.2. If certain community variables become problematic over time, the grievance process is in place to notify USFWS of any potential problems.

### CM3.2 High Conservation Value Monitoring Plan

As noted in CM1.2, High Conservation Values relating to community well-being were only identified under criteria G1.8.4 – Critical Ecosystem Services. The bottomland hardwood forests located within the Project Zone provide these ecosystem services by allowing for greater floodwater storage, slowing run-off and reducing erosion and agricultural inputs into the Ouachita River. As long as bottomland hardwood forest cover is maintained, these trees should continue performing these important community functions. The new forests located at Upper Ouachita NWR will be stewarded by Refuge staff and managed in accordance with practices specifically laid out in the Refuge's CCP. The new forests that were planted as part of the Project Area will also be monitored by TerraCarbon, with survival checks performed after the first year to confirm that target tree density is well-established. They will be subsequently monitored by the Fund and its partners in accordance with the Fund's monitoring plan.

### CM3.3 Community Impact Monitoring Implementation

The Refuge has outlined a plan to monitor the community impacts of the Upper Ouachita NWR Restoration Initiative in CM3.1. The Fund and Upper Ouachita NWR staff are committed to developing and fine-tuning the plan and will publish an updated plan within twelve months of validation against the CCBA standards.

## B1. NET POSITIVE BIODIVERSITY IMPACTS

### B1.1 Biodiversity Impacts

The Upper Ouachita NWR Restoration Initiative will restore key parcels within the Refuge and adjacent to Refuge lands, and will have significant positive effects on biodiversity and the wildlife that depend on bottomland hardwood forests. Upper Ouachita NWR was established, in part, to conserve and protect migratory birds, but the bare Go Zero Tracts could not support a large variety of birdlife, particularly neotropical migratory birds, because these species require habitat that includes complex vertical and horizontal structure for nesting or foraging. The avian species most adversely affected by forest fragmentation include those that are area-sensitive (i.e. dependent on large continuous blocks of hardwood forest); those that depend on forest interiors; those that have special habitat requirements, such as mature forests or a particular food source; and those that require good water quality. One of the Refuge's goals is to improve the management of bottomland hardwood forests to increase the potential for nesting habitat of priority neotropical songbirds such as the hooded warbler, Kentucky warbler, northern parula, Swainson's warbler, wood thrush, and prothonotary warbler species.[15] These species need the benefits of large forested blocks to sustain their existence.

The newly planted forests will develop the complex habitat necessary for successful breeding, nesting and overall survival of these neotropical migrant bird species. Research on avian colonization has shown that bird species richness rises as bottomland hardwood forests age due to an increase in a forest's structural complexity.[16] Species such as the yellow-breasted chat, indigo bunting, common yellowthroat and blue grosbeak will benefit from the new early successional forestland habitat. As the trees grow, the restored forests should draw species such as the Cerulean warbler and Acadian flycatcher. The new forests will also minimize the threats to many species posed by the brown-headed cowbird—a brood parasite which thrives in open habitat—by reducing forest fragmentation. Figure 17 below illustrates the anticipated increase in bird species richness as a result of the Go Zero project.

**Figure 16: Indigo bunting will benefit from the new larger forested blocks provided by the Go Zero project.**
**Photograph courtesy of US Fish and Wildlife Service.**

[15] Upper Ouachita CCP, pp. 108

[16] Wilson, R.R. and D.J. Twedt. 2005. Bottomland Hardwood Establishment and Avian Colonization of Reforested Sites in the Mississippi Alluvial Valley. Pages 341-352 *in* L.H. Frederickson, S.L. King and R.M. Kaminski, editors, Ecology and Management of Bottomland Hardwood Systems: The State of Our Understanding. University of Missouri-Columbia. Gaylord Memorial Laboratory Special Publication No. 10, Puxico.

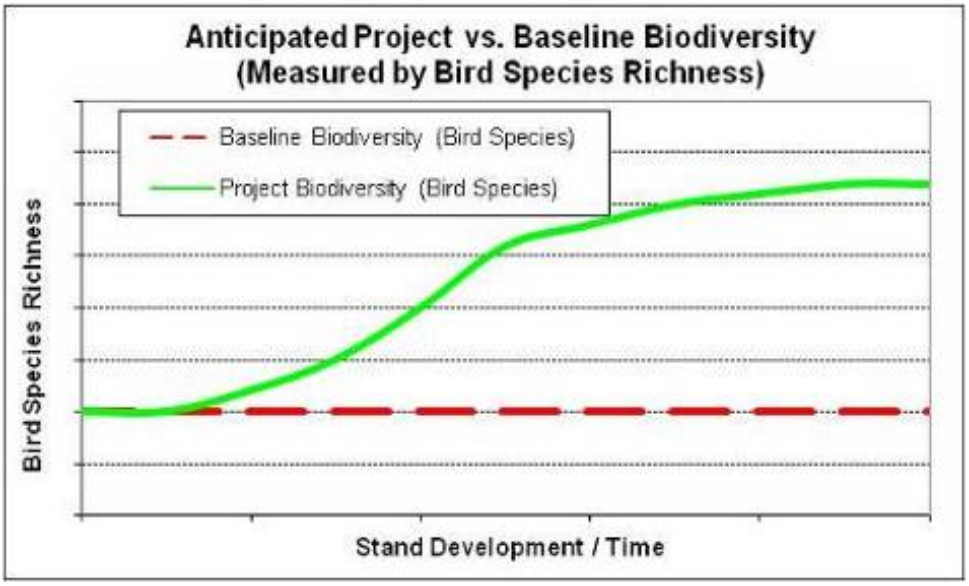


**Figure 17: Anticipated Project vs. Baseline Biodiversity Over Time**

Without the project, the land would remain in agricultural production, which would have an adverse impact on biodiversity. Habitat fragmentation negatively impacts species migration, breeding and overall survival rates; fragmentation due to land conversion has led to the decline of many avian species.[17] Larger, more connected areas of natural habitat—including that made possible by the Go Zero restoration—will benefit the many species that rely on bottomland hardwoods at Upper Ouachita NWR, including the hooded warbler, prothonotary warbler, Acadian flycatcher and northern parula. Therefore, the net biodiversity impact of the Go Zero project, in comparison to the "without project" scenario, is expected to be positive.

### B1.2 Impact on High Conservation Values

As outlined in G1.8, the Project Zone contains many High Conservation Values (HCVs), including IUCN Protected Areas (Category II and Category IV), threatened species (red-cockaded woodpecker, Louisiana black bear), endemic species (Louisiana black bear), significant species concentrations (migratory birds and waterfowl), landscape level populations (migratory birds and waterfowl) and threatened ecosystems (bottomland hardwood forest). None of these HCVs will be negatively impacted by the project. To the contrary, the project will only enhance these values. Below is a description of the benefits to the HCVs:

a. All of the National Wildlife Refuges within the Project Zone qualify as Category II Protected Areas. As National Wildlife Refuges, these areas are managed mainly for ecosystem protection and recreation, and were created, in part, to safeguard bottomland hardwood forest ecosystems. Planting additional bottomland hardwood forests at Upper Ouachita NWR will only highlight the importance of protecting this dwindling resource. The Refuges also qualify as Category IV Protected Areas because they are managed to ensure the maintenance of habitats of specific species. The additional bottomland hardwoods will expand these habitat areas for animals such as the Louisiana black bear and migratory birds.

[17] Twedt, D.J., R. R. Wilson, Management of Bottomland Hardwood Forests for Birds. Proceedings of 2007 Louisiana Natural Resources Symposium, *available at:* http://www.lmvjv.org/research.htm

b. As stated in B3.1, certain species found within the Project Zone need large blocks of bottomland hardwood forest to maintain their existence. The new forests planted as part of the project will help create larger, more contiguous blocks of forest cover.

As described more fully in GL3.1, the red-cockaded woodpecker is found within the Project Zone, and specifically on Upper Ouachita NWR. Reducing competition amongst species that use the RCW cavities, such as the flying squirrel, by creating new forest habitat will help the recovery of the woodpecker.

The Louisiana black bear is also found within the Project Zone including at Upper Ouachita NWR. Increasing numbers of bears are utilizing Upper Ouachita NWR and the USFWS expects the bear population to grow, as Refuge staff aim to connect the Upper Ouachita NWR population with the black bear population at Felsenthal NWR in southern Arkansas. Louisiana black bears require relatively large areas of contiguous forested habitat to meet their survival needs, and reforesting parcels at Upper Ouachita NWR will help create more viable habitat to facilitate bear movement and survival.

**Figure 18: The Louisiana Black Bear will benefit from larger areas of contiguous forest. Photograph courtesy of US Fish and Wildlife Service.**

c. The Louisiana Black Bear is endemic to the area. See above for description.

d. During migratory season, the Project Zone supports significant concentrations of birds and waterfowl, and many birds also use the resources with the Project Zone year round. Our Project Area within Upper Ouachita NWR will provide enhanced habitat for many bird species, particularly those that prefer forest interiors and habitat with increased structural complexity.

2. As stated above, the Project Zone, which is located in the Mississippi Flyway, supports large populations of bird species. By some estimates, more than 40% of the birds that seasonally migrate in North America do so via the Mississippi Flyway. These birds will benefit from the new forests in the Project Area.

3. The Project Zone contains a bottomland hardwood forest ecosystem, which – after years of clearing and draining for timber and agricultural use – is now threatened. However, project activities will enhance the ecosystem by restoring both public and private agricultural lands with new bottomland hardwood trees.

### B1.3 Species Used by the Project

The Go Zero Tracts were planted with native bottomland hardwood forest species carefully chosen by USFWS staff and designed to restore the fully functioning natural systems of Upper Ouachita NWR. Tree species include nuttall oak, overcup oak, willow oak, cypress, green ash, tupelo gum, bitter pecan, red maple, hackberry, persimmon, sweet gum, water oak, cedar elm, sweet pecan, and cherrybark oak. Those areas

below 69 feet ASL were planted with a higher composition of species tolerant to sustained flooding, including tupelo gum and cypress trees.

### B1.4 Exotic Species in the Project Area

In accordance with Go Zero's planting principles, only native species were used for the Upper Ouachita NWR Restoration Initiative.

### B1.5 Genetically Modified Organisms

The Conservation Fund contracted with TerraCarbon to coordinate the tree planting for the project and TerraCarbon's foresters worked with Bradshaw Tree Inc., a professional tree planting service, to order the appropriate seedlings, package and store the seedlings, and plant the seedlings on the Go Zero Tracts. The seedlings used for the Upper Ouachita NWR Restoration Initiative were ordered from SuperTree Seedlings. The nursery has confirmed in writing that no genetically altered seedlings were sold to Bradshaw Tree Inc. for use in the Go Zero project.

## B2. OFFSITE BIODIVERSITY IMPACTS

### B2.1 Potential Negative Offsite Biodiversity Impacts

Biodiversity offsite will only benefit from these newly restored parcels because the negative effects associated with fragmented forestlands should decrease. All positive biodiversity impacts associated with the Go Zero Tracts are extended offsite to adjacent lands.

### B2.2 Mitigation Plans

N/A

### B2.3 Evaluation of Potential Negative Offsite Biodiversity Impacts

The net effect of the restoration of the Go Zero Tracts on biodiversity will be highly positive on both the Go Zero Tracts and on Upper Ouachita NWR and the surrounding region as a whole.

## B3. NET POSITIVE BIODIVERSITY IMPACTS

### B3.1 Biodiversity Monitoring

As noted in section B1.1, the Upper Ouachita NWR Restoration Initiative is expected to have a significant positive impact on the richness and variety of bird species found on the Tracts due to the increased habitat area, greater habitat complexity, and greater habitat connectivity provided by the newly planted bottomland hardwood forest. As stated in B1.1, a positive correlation between stand development and species richness is anticipated as illustrated in Figure 17 in B1.1.

In order to monitor the changes in bird species richness over time, the Refuge will utilize bird point counts. Point counts on the Go Zero Tracts will be conducted every 3-5 years by the Refuge biologist. Refuge point count results from years prior to project establishment will serve as a baseline for comparison.

The CCP for Upper Ouachita NWR is reviewed and revised according to changes in ecological conditions and augmented by additional management plans that address specific strategies in support of Refuge goals. The results of the point counts will be considered when devising and implementing management plans for the Refuge.

### B3.2 High Conservation Values

As detailed in G1.8 and B1.2, the Project Zone contains numerous High Conservation Values related to globally, nationally, or regionally significant biodiversity. The Upper Ouachita NWR Restoration Initiative will maintain, and in many cases, enhance these HCVs (as described in B1.2). The below list outlines how the effectiveness of measures used to maintain or enhance these HCVs will be monitored over time.

1a. Upper Ouachita is an IUCN Protected Area (Category II and Category IV). The Refuge is managed under USFWS rules and policies and the management plans set forth in the CCPs. The Refuge will continue to be monitored under these plans and policies.

1b. The red-cockaded woodpecker occurs at Upper Ouachita NWR and on other lands within the Project Zone. RCW habitat on the Refuge (and on all Refuges within the Project Zone) is managed according to the Service's RCW Recovery Plan.

Upper Ouachita NWR has been identified as essential migration and wintering habitat for waterfowl and migratory birds. Point surveys, described in B3.1, will be used to monitor the impact of the project on these avian communities.

The Black Bear Conservation Coalition (BBCC)[18] is a group of federal, state, and private partners in Mississippi, Louisiana, Arkansas and East Texas that is dedicated to restoring the Louisiana black bear to suitable habitat. The Service is a partner with the BBCC, and Upper Ouachita NWR supports management guidelines that produce good bear habitat.

1c. Endemic species – see Louisiana Black Bear above.

1d. Upper Ouachita NWR is an essential migration and wintering habitat for waterfowl and migratory birds. Point surveys, described in B3.1, will be used to monitor the impact of the project on these avian communities.

2. Point surveys, as described in B3.1, will be used to monitor changes in the avian communities.

3. As stated above, the Refuge is managed to protect bottomland hardwood habitat. The Refuge's CCP outlines plans to manage and monitor this threatened landscape. Any impacts will be noted as part of daily Refuge management activities.

### B3.3 Monitoring Plan Implementation

The Refuge has outlined a plan in Section B3.1 to monitor the biodiversity impact of the Upper Ouachita NWR Restoration Initiative. The Fund and Refuge staff are committed to developing and fine-tuning the plan and will publish an updated plan within twelve months of validation against the CCBA standards.

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[18] The mission of the Black Bear Conservation Coalition is to promote the restoration of the Louisiana black bear in its historic range, through education, research, and habitat management. More information available at: http://www.bbcc.org/Default.aspx

## GL3. EXCEPTIONAL BIODIVERSITY BENEFITS

### GL3.1.1 Vulnerability

According to the CCBA vulnerability criteria, a globally threatened species - that is endangered or vulnerable according to the IUCN Red List - must occur within the Project Zone. Designated by the IUCN Red List as vulnerable[19] and by the federal Endangered Species Act as endangered,[20] the red-cockaded woodpecker (*Picoides borealis*) is found within the Upper Ouachita Restoration Initiative's Project Zone. At least 30 individuals or 10 pairs are found at Upper Ouachita NWR and on nearby lands within the Zone.[21] The 16,000 acres directly east of the Go Zero Tracts, which was previously a wildlife management area but is now in private ownership, is home to one of the largest concentrations of RCWs in northern Louisiana.

**Figure 19: The federally engendered red-cockaded woodpecker makes its home in the pine stands at Upper Ouachita NWR.**
**Photograph courtesy of US Fish and Wildlife Service.**

The red-cockaded woodpecker (RCW) is a small black and white bird distinguished by a large black cap and nape that encircle large white cheek patches. The bird gets its name from the small red streak -- called a cockade -- found on each side of a male's black cap, which is rarely visible except during breeding season or periods of territorial defense. RCWs are found exclusively in southeastern pine forests that are at least 75 years old. Today is it estimated that there about 4,700 groups of RCWs, or about 11,000 birds, from Florida to Virginia and west to the eastern edges of Texas and Oklahoma, representing about 1% of the woodpecker's original population. Although they were historically found in New Jersey, Maryland and Missouri, RCWs are extirpated in these states.

The species' decline is attributable to the destruction of the longleaf pine ecosystem in the South, which covered an estimated 90 million acres before European settlement. Development, agriculture and widespread commercial

[19] The International Union for Conservation of Nature Red List can be found at: http://www.iucnredlist.org/apps/redlist/details/141715/0

[20] http://www.fws.gov/rcwrecovery/rcw.html

[21] There is one pair on Upper Ouachita NWR and at least 30 pairs on the land east of the Refuge.

timber harvesting, along with aggressive control of forest fires, which historically maintained the open pinelands that RCWs require, have wiped out most of the South's long leaf pine forests and put a stop to the regular burning necessary to maintain most healthy pines. Approximately 98 percent of red-cockaded woodpecker habitat has been lost in the past 100 years.

RCWs have been listed as endangered under the Endangered Species Act since 1970, and have long been the focus of conservation efforts. Because the RCW is the only woodpecker that excavates cavities exclusively in living pine trees, the woodpeckers play a vital role in southern pine forests, as many other birds and small mammals depend on these cavities. USFWS estimates that up to 27 other birds and small mammals, including southern flying squirrels, redbellied woodpeckers, redheaded woodpeckers, eastern bluebirds, brown-headed nuthatches, and great crested flycatchers, use these cavities for either roosting or nesting, making RCWs a keystone species for southern old-growth pine forests.[22] These cavities are a valued resource for many species and competition occurs for their use.

Although RCWs do not use bottomland hardwood forest as habitat, the Upper Ouachita NWR Restoration Initiative will benefit RCWs by creating additional habitat for their competitors. For example, the flying squirrel – which competes with the woodpecker for use of the woodpeckers' own cavity site – will also utilize cavities in bottomland hardwood species. By restoring the hardwoods, the Restoration Initiative is creating additional habitat for the squirrels which will relieve competition in the western pine forest on the Refuge.

[22] http://www.fws.gov/rcwrecovery/rcw.html

## CONCLUSION

The Upper Ouachita NWR Restoration Initiative is a unique opportunity to restore native bottomland hardwood forests in the Lower Mississippi Valley and help mitigate climate change while conferring community and biodiversity benefits to the northern Louisiana region.  In addition to sequestering carbon dioxide from the atmosphere, the Go Zero project will restore fragmented habitat, improve the water quality of the Ouachita River, alleviate flooding in downstream communities, and improve and enlarge public recreation areas for all to enjoy.