Longleaf Forests and Rivers Business Plan

National Fish and Wildlife Foundation

August 2018 (Updated 2023) – August 2028

Purpose of a Business Plan

The purpose of a NFWF business plan is to provide a concise multi-year blueprint of the strategies and resources required to achieve the desired conservation outcomes by the end of the plan. This plan incorporates the views of federal, state, academic, and organizational experts consulted during its development and is intended to complement existing efforts in the larger conservation community.

NFWF implements these strategies to generate a measurable conservation impact in a landscape, and NFWF uses progress towards species goals as a measure that healthy, functioning habitat has been restored and that threats can be managed. Although the landscape-scale conservation need is typically greater than the investment from a single business plan, NFWF monitors species response to interventions within the business plan's focal areas to demonstrate that the conservation strategies *can* move the needle on its goals, thus building the case for larger investments in the strategies.

Acknowledgements

NFWF gratefully acknowledges the time and content expertise provided by individuals and organizations who contributed significantly to NFWF's original 2018 business plan and this revised version of the business plan. Although the plan does not necessarily represent each of their specific views, particular thanks go to*:*

Stuart McGregor, Pat O'Neil (Alabama Geological Survey); Paul Johnson, Steve Rider, Ericha Shelton-Nix (Alabama Department of Conservation and Natural Resources); Jason Carlee, Steve Krotzer (Alabama Power); James Godwin, Joe Jenkins (Auburn University – Alabama Natural Heritage Program); Kellie Johnston (Cawaco Resource, Conservation and Development Council); Justin Johnson (Eglin Air Force Base); Deborah Burr (Florida Fish and Wildlife Conservation Commission); Brett Albanese, Anakela Escobar, Matt Elliott, Jason Wisniewski (Georgia Department of Natural Resources); Steve Golladay (J.W. Jones Ecological Research Center); Stephen Bontekoe (Limestone Valley Resource Conservation and Development Council); Vernon Compton, Lisa Lord (Longleaf Alliance); Tom Dailey, Tom Franklin (National Bobwhite Conservation Initiative); Matt Aresco (Nokuse Plantation); Todd Ewing, Brena Jones (North Carolina Wildlife Resources Commission); Will Dillman, Andrew Grosse, Anna Smith (South Carolina Department of Natural Resources); Jessica Graham (Southeast Aquatic Resources Partnership); Jim Cox (Tall Timbers Research Station); Bernie Kuhajda (Tennessee Aquarium Conservation Institute); Sara Gottlieb, Alexandria Lamle, Katie Owens (The Nature Conservancy); Mary Freeman (U.S. Geological Survey); Ralph Costa (retired), Robin Goodloe, Mike Harris, Matt Hinderliter, Roger Holt, Adam Kaeser, Will McDearman, Bill Pearson (U.S. Fish Wildlife Service); Sheryl Bryan, Leigh McDougal, John Moran (U. S. Forest Service); Phillip Bumpers, Seth Wenger (University of Georgia - River Basin Center).

Cover photo credits: *Longleaf Savannah on Green Swamp Preserve, North Carolina* (The Nature Conservancy); *Conasauga River, Georgia* (U.S. Fish and Wildlife Service); *Northern bobwhite quail* (iStock photo); *Alabama shiner*; *Gopher tortoise* (iStock photo)

Conservation Need

This business plan addresses two habitat types critical to the fish, wildlife and people that rely on these systems: longleaf pine forests and freshwater habitats.

The southeastern United States contains some of the most biologically diverse and economically important forest and freshwater systems in the world. Relatively untouched by the last ice age, the diversity of habitats in the region supports 92 percent of the bird species, 57 percent of the mammal species and 58 percent of the reptile and amphibian species in the U.S. (Hanson et al., 2010). Longleaf forests in particular host a rich suite of plant and animal species, rivaling tropical rainforests (ALRI, 2009). Similarly, southeastern streams and rivers support nearly two-thirds of the freshwater fish species found in the United States, with more than a quarter of this region's freshwater species found nowhere else in the world (Elkins et al., 2016).

These natural resources have long been, and continue to serve as, critical drivers for the southeastern economy. Southeastern forests supply 63 percent of the total timber volume harvested in the U.S. and 19 percent of the global pulp and paper supply, with 1,400 primary wood processing mills employing more than 100,000 workers (Oswalt et al., 2014). Southeastern rivers that once powered textile mills and industry now provide irrigation for a multi-billion-dollar agricultural economy, drinking water for millions of residents, and numerous water-based recreational opportunities. These factors contribute to a strong working lands context for much of the work within this Plan.

At the same time, this economic dependence on natural resources created strain on the species within. Since the 1600s humans have been altering the southeastern landscape, including clearing forested lands for agriculture and urban development; converting native forests to off-site[1] species allowing more intensive timber management; constraining natural processes, such as fire; and altering rivers and streams through impoundments, ditching and irrigation. It is estimated that at least 40 percent of pre-European settlement forest acreage was converted to other uses (Wear and Greis, 2002). Looking to the future, an additional 23 million acres of southern forests is projected to be lost by 2060 (Wear and Greis, 2013).

Longleaf Pine

Longleaf pine ecosystems support a host of unique wildlife species that rely on both forest canopy and its associated understory. Range-wide, twenty-nine species of animals and plants, including the red-cockaded woodpecker (RCW), gopher tortoise[2] and Cooley's meadowrue are listed as federally threatened or endangered due to the decline of longleaf forests (ALRI, 2009). Within the longleaf system, overall health and variations in habitat structure and age are well represented by different suites of dependent species. For example, the RCW is dependent upon a mature canopy cover and serves as an ideal indicator species for late successional or "maintenance class" longleaf stands.

[1] Off-site refers to plant species growing on a site with conditions under which they would not naturally occur. For example, loblolly pine planted on a site with conditions (soils, etc.) better suited for longleaf pine.

[2] As of the 2023 business plan update, the gopher tortoise is federally listed within the western portion of its range (LA, MS, and west of the Mobile and Tombigbee Rivers in AL) and is not federally listed in the eastern portion of its range (east of the Mobile and Tombigbee Rivers in AL, GA, and southeastern SC).

Likewise, the presence of gopher tortoise, northern bobwhite quail and Bachman's sparrow are helpful indicators for successful restoration of early successional as well as mature open pine/grassland savanna habitat. These species require open understory maintained by fire and respond to regular fire treatments.

Longleaf pine forests once covered more than 90 million acres across the southern United States, stretching from the Atlantic Coastal Plain in Virginia to the West Gulf Coastal Plain of east Texas. Longleaf forests now occupy approximately five percent of their historical range, with much remaining high quality longleaf habitat found on National Forests, Department of Defense installations and other public lands. As the vast majority of the longleaf range falls under private ownership, engaging private landowners in longleaf restoration and management is critical to restore the ecosystem at a landscape scale.

Aside from urban development and conversion to other land uses, fire suppression provides a significant threat. This ecosystem is closely fire-adapted: fire implementation on a two- to three-year rotation reduces competition from hardwoods and promotes the growth of fire-adapted understory vegetation, which contributes greatly to the overall diversity of the ecosystem.

Rivers & Streams - Aquatic Habitat

The southeastern U.S. harbors a diversity of aquatic species unparalleled in the nation. Nearly two-thirds of U.S. fish species, over 90% of U.S. mussel species and almost half of the world's crayfish species call the rivers and streams of this region home (Elkins et al., 2016).

However, land use changes, habitat fragmentation, declines in water quality and availability, and invasive species introductions have greatly impacted these species. Over the last 60 years, population growth in the Southeast was nearly 40 percent greater than the rest of the country (Badger, 2014), with the urban and suburban footprint now projected to double or triple by 2060 (Terando et al., 2014). The Environmental Protection Agency's 2008-2009 National Rivers and Streams Assessment reported that the health of over half of the rivers and streams in the Southern Appalachians and 69 percent of those in the Coastal Plains ecoregions of the southern U.S. are in poor biological condition (EPA, 2016). Notably, at-risk aquatic species numbers in this region are increasing and greater than anywhere else in the United States, rising 125% in the past 20 years alone, creating strong demand for action from business and conservationist interests alike.

Background

NFWF has invested in both longleaf pine forest restoration and freshwater aquatic habitat conservation in the southeastern U.S. for more than two decades.

Longleaf Pine

In 2003, NFWF partnered with Southern Company to launch the Longleaf Legacy partnership. This initiative funded longleaf pine restoration within Southern Company's traditional operating area, which encompassed Alabama, Georgia, the Florida panhandle, and southeast Mississippi. In 2012, added support from the United States Department of Agriculture's (USDA) Forest Service (USFS), USDA Natural Resources Conservation Service (NRCS), U.S. Department of Defense (DOD), U.S. Fish and Wildlife Service (USFWS), and International Paper's Forestland Stewards Partnership allowed Longleaf Legacy to

evolve into the Longleaf Landscape Stewardship Fund (LLSF). New attention and funding partners in recent years (such as Altria, Cargill, One-Tree Planted, and the Bezos Earth Fund) is allowing NFWF to scale up work across the landscape and set the stage for bigger outcomes.

Rivers & Streams - Aquatic Conservation

NFWF's Southeast Native Bass Initiative supported $1.4 million in native bass conservation from 2010-2017. The program worked with Texas Parks and Wildlife on Guadalupe bass and the Southeast Aquatic Resources Partnership on redeye and shoal bass. Upon the completion of that work, partners expressed interest in extending the scope of southeastern freshwater work and addressing a broader suite of aquatic species. Aquatic systems across the region host hundreds of at-risk species, with many candidates or petitioned species under the Endangered Species Act (ESA). In 2016, NFWF funded the University of Georgia River Basin Center and Tennessee Aquarium Conservation Institute to provide a science-based, systematic assessment of watersheds critical to southeast aquatic conservation (Southeastern Aquatic Biodiversity Strategy, Elkins et al., 2016). The aquatics portion of this business plan is informed by that assessment and builds on NFWF's previous investments to conserve the tremendous natural heritage within the waters of the Southeast.

Current Conservation Context

Longleaf Pine

The current LLSF program is built in large part around the larger longleaf community's goals as outlined in the *Range-wide Conservation Plan for Longleaf Pine* (Range-wide Plan) by the America's Longleaf Restoration Initiative (ALRI). The ALRI is a collaborative effort of multiple public and private sector partners and its plan sets an overarching goal of restoring 8 million acres of longleaf pine by 2025, of which at least half should be targeted within "Significant Geographic Areas" (SGA)[3].

In addition, the ALRI plan states that 3 million of the 8 million acres should be in a "maintain" condition class – an optimal forest canopy and understory structure that can be sustained through appropriate fire management, and will support a suite of plant and animal species representative of a healthy longleaf pine ecosystem. The ALRI plan further stresses that local partnerships (referred to as Local Implementation Teams or LITs) should be formed to assess, inventory and prioritize local needs within the SGAs and develop collaborative partnerships to implement longleaf restoration and enhancement priorities.

To reach the 8-million-acre goal, ALRI estimates that at least 150,000 acres of longleaf pine must be planted annually. Between 2018-2021, ALRI partners reported planting approximately 134,000 acres per year on average, short of the annual goal. Partners cite several factors limiting longleaf plantings including insufficient seedling supply, variable quality of longleaf seedlings due to lack of a tree improvement program, and high establishment costs compared to other pine species. Barriers to advancing existing longleaf pine stands to an optimal habitat structure include economic uncertainty and a lack of market-oriented incentives for landowners to implement uneven aged management regimes and manage for longer harvest rotations.

[3] SGAs are core areas, typically anchored by public lands, such as national forests, state forests, or military installations, where longleaf pine currently exists and around which coordinated efforts are being developed to further restore, enhance, protect, and connect longleaf pine on an ecosystem level.

To date, NFWF has utilized the ALRI plan as a roadmap for investments through the LLSF, including direct support for longleaf establishment and enhancement, building the technical capacity of local partners to deliver Farm Bill and other financial assistance programs, and "standing up" LITs to implement restoration at a landscape-scale. Concurrent with updates to the business plan, ALRI partners are also updating the Range-wide Plan, which is nearing the end of its fifteen-year implementation period. This Plan will continue to support these strategies and the goals of the ALRI plan, while better defining NFWF's role in that effort and refining our focus to achieve measurable ecological and wildlife outcomes. This business plan will also support strategies to address planting barriers mentioned above, including investments in seedling nursery and orchard capacity, seed collection and tree improvement, as well as projects to pilot market-oriented incentives, such as ecosystem service payments to reduce economic barriers and enable landowners to manage for multiple outcomes.

Rivers & Streams - Aquatic Habitat

While a variety of planning efforts have been initiated in recent decades at the state or watershed scale to address and prioritize freshwater aquatic species and habitat restoration and protection, a singular, region-wide effort similar to America's Longleaf Restoration Initiative for priority setting and funding has not yet developed. NFWF has supported partner efforts to draw attention to the issue. One of the few definitive sources of information was developed over the past few years when the University of Georgia River Basin Center and the Tennessee Aquarium approached NFWF to fund a first-ever region wide freshwater assessment. Delivered in 2016, the resulting work now serves as a guide for freshwater aquatics work broadly across the region.

That assessment, combined with State Wildlife Action Plans and NFWF's previous work on southeastern bass species have helped inform this Plan. NFWF proposes a role in bringing together public and private partners to leverage resources and coordinate and prioritize conservation actions to maximize outcomes for freshwater species in targeted watersheds.

NFWF's engagement with partners and past experience working with private landowners to implement voluntary conservation actions, while concurrently enhancing and coordinating the necessary capacity to implement these actions, will be key to improving the status and sustainability of freshwater species. By targeting priority tributaries within focal watersheds, tools and approaches can be demonstrated that can then be replicated in systems across the region.

Conservation Outcomes

The overarching vision for the Longleaf Forest and Rivers Business Plan is to **restore and conserve wildlife habitat in longleaf pine forests and freshwater aquatic ecosystems to improve populations of the species dependent on these systems.** This business plan takes a multi-species approach to improve and sustain longleaf pine and freshwater habitats in targeted geographies across the Southeast over the next 10 years. The plan's geographic footprint encompasses the historical longleaf pine range, as well as priority watersheds within the southeastern U.S. that flow through the longleaf pine range.[4]

Longleaf Pine Habitat

This plan includes four focal species as indicators of ecosystem health within longleaf pine habitat. Business plan goals for these species are listed in Table 1 and focal areas are shown in Figure 1. Longleaf habitat investments will primarily be targeted within the Significant Geographic Areas (SGAs) defined as priority areas for longleaf pine restoration and management in the America's Longleaf Restoration Initiative *Range-wide Conservation Plan for Longleaf Pine*. Support will go to seventeen Local Implementation Teams (LITs) located across the historical longleaf pine range (as depicted in Figure 1). The LIT boundaries are typically centered on the SGAs, but not all. Strategic investments outside of the LITs may also be made to support landscape-scale habitat connectivity between LITs or to advance specific habitat and species restoration priorities.

Table 1. Longleaf habitat: Focal species goals

Species	10-yr Business Plan Goals
Red-cockaded woodpecker	Increase the number of breeding groups of red-cockaded woodpeckers by 160 across 2-3 recovery units and support populations.[5]
	Translocate 200 pairs of red-cockaded woodpeckers.
Gopher tortoise	Contribute to the establishment of 26 populations that have at least 250 tortoises to support meeting minimum viable population criteria.[6]
	Translocate 10,000 individual gopher tortoises.
Northern bobwhite quail	Near-term, support development of population goals on two bobwhite quail focal areas. Once identified, support implementation work towards achieving those population goals.
Bachman's sparrow	Sustain 25,000 acres of habitat occupied.[7]

[4] An interactive digital map of this business plan is available at: Longleaf Business Plan (arcgis.com)

[5] The number of additional breeding groups needed to achieve population size criteria within targeted recovery and supporting populations which will contribute to downlisting per the Recovery Plan for the Red-cockaded Woodpecker (USFWS, 2003).

[6] Populations of at least 250 tortoises at a density of no less than 0.4 tortoises per hectare will be considered on a trajectory to meet all other minimum viable population criteria as defined by the Gopher Tortoise Council.

[7] Bachman's sparrow is an excellent indicator of a fire managed, open pine ecosystem, often preferring longleaf pine and associated groundcover. This acreage target was established by selecting local implementation teams with fire capacity and historical averages of acres of prescribed fire implemented by these teams annually.

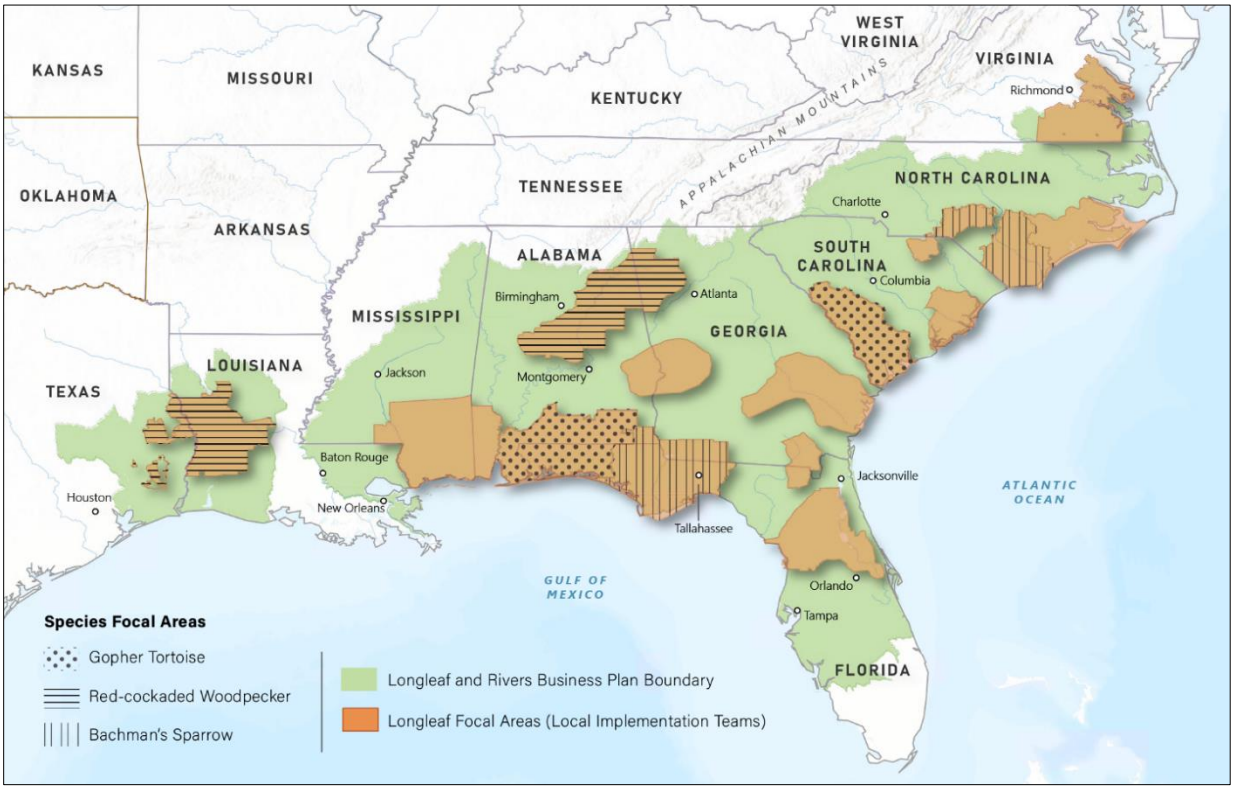

Figure 1. Map of longleaf priority areas.

Aquatic Habitats

This business plan includes several focal species[8] as indicators of ecosystem health in southeast aquatic habitats. Goals for these species are in Table 2 and focal areas are shown in Figure 2. Investments in aquatic habitat and species conservation will be targeted in the Conasauga (Holly Creek), Middle Coosa (Big Canoe Creek), and Locust Fork watersheds within the Alabama-Mobile-Tombigbee river basin (Figure 2). These watersheds were selected based on their conservation need as determined by the Southeastern Aquatic Biodiversity Strategy, conservation partner input, and State Wildlife Action Plans. Other criteria included the ability to implement strategies and measure species response within the plan timeframe.

Table 2. Aquatic habitats: Focal species goals

Species	10-yr Business Plan Goals
Endemic Fishes	Increase in relative abundance and prevent extirpation of focal endemic fishes[9] in the Conasauga watershed.
	Increase the number of spawning sites occupied by trispot darter in the Middle Coosa watershed.
Villosa mussels	Stock and re-establish mussels at 2 sites in the Conasauga River watershed.

[8] Appendix A identifies action items for two prospective aquatic species for which we currently have insufficient information to include as focal species in this business plan.

[9] The focal endemic fishes are Alabama shiner, banded sculpin, blue shiner, bridled darter, Coosa darter, Coosa shiner, Greenbreast darter, tricolor shiner and trispot darter.

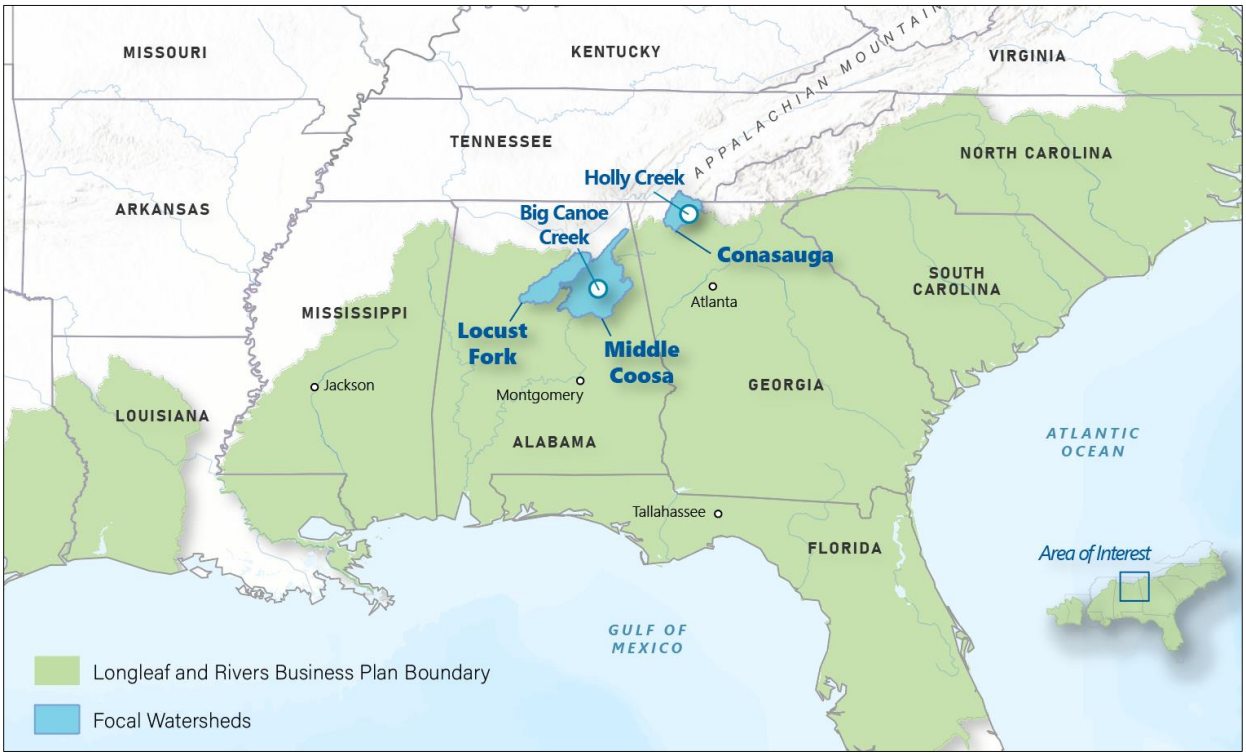

Figure 2. Map of aquatic priority areas.

Implementation Plan

The following outlined implementation strategies are known to improve the region's terrestrial and freshwater species and will be funded by NFWF to support the goals and outcomes described in this Plan. The results chain in Figure 3 provides a model for how the collective strategies are predicted to contribute to the identified conservation outcomes.

Strategy 1: Longleaf Forest Ecosystem Restoration and Enhancement

1.1 Longleaf Restoration – Restore longleaf pine in targeted areas that expand upon core blocks of existing longleaf pine and create corridors between existing blocks of longleaf to promote wildlife dispersal and expansion. For the purposes of this Business Plan, restoration refers to the establishment of new longleaf dominant forest stands (> or = 50% longleaf canopy).

Longleaf Plantings: Strategies that may be employed to establish new longleaf pine dominant stands on public and private lands include site preparation (herbicide, site preparation burn, etc.) and planting of longleaf pine seedlings. Preference will be given to projects that establish longleaf in targeted areas adjacent to or in close proximity to existing longleaf already under appropriate management, such as a two-to-three-year prescribed fire rotation, which will maximize wildlife habitat value and connectivity. Planting longleaf on sites that have experienced minimal soil disturbance and include native groundcover is preferred.

Address Barriers to Longleaf Planting: Strategies that address barriers to advancing longleaf pine planting, including but not limited to seed collection, processing, and storage; seedling propagation, improvement, and production; planting workforce development; and monitoring planting survival and growth.

1.2 Longleaf Enhancement and Maintenance – Enhance and maintain existing longleaf pine forests to improve forest habitat structure and understory condition.

Prescribed Burning: Prescribed burning, ideally on a two-to-three-year rotation, is needed to restore and maintain understory characteristics for representative species and regulate competition from other species. A suite of strategies will be needed to address these outcomes on a landscape scale, with capacity being one of the most critical needs. Strategies may include the development and support for burning capacity (crews, contractors, training, equipment, etc.), outreach to key constituencies to build and maintain support for burning, financial assistance to offset the costs associated with burning, and the purchase of liability insurance.

Herbicidal/Mechanical Treatments/Thinnings: Where prescribed fire is not sufficient or practical for achieving longleaf ecosystem enhancement and maintenance, additional strategies may be considered that will move existing longleaf stands to a condition where future burning is feasible and optimal wildlife habitat structure is achieved. Specific activities may include mechanical or herbicide treatments to reduce mid-story or invasive species competition or supplementing existing groundcover with plantings to improve habitat condition and manage fuel loads to

levels necessary to safely and effectively carry prescribed fire. Thinning of existing stands to achieve a basal area and overall habitat structure preferred by wildlife such as red-cockaded woodpecker, gopher tortoise, Northern bobwhite quail and Bachman's sparrow may also be supported.

1.3 Longleaf Conservation – Protect high quality existing longleaf habitat or sites identified for strategic longleaf habitat restoration.

Conservation Easements and Fee-Simple Acquisitions: Support high leverage, targeted conservation easement or fee simple transactions that protect the highest quality intact existing habitat, or strategic sites that are identified for longleaf habitat restoration. Support may include covering transactional costs or direct investment in the purchase. Conservation projects should be included as a part of a broader project to also restore and/or enhance longleaf pine habitat.

1.4 Species-Specific Restoration and Management – Implement strategies to benefit focal species representative of a healthy longleaf pine ecosystem. Actions under this strategy are in addition to habitat restoration and management.

Captive Care Reintroduction and Translocation: In addition to habitat restoration and management, some wildlife species, such as red-cockaded woodpecker and gopher tortoise may require additional strategies to expand and sustain populations. Factors such as limited dispersal distances and habitat proximity to source populations are constraints for both red-cockaded woodpecker and gopher tortoise. Gopher tortoise populations are also impacted by low reproduction rates and predation of eggs and young, which limit recruitment and migration to restored habitat.

In certain instances, captive care reintroduction and translocation activities may be needed for red-cockaded woodpecker and gopher tortoise, such as captive breeding (gopher tortoise), translocation (red-cockaded woodpecker and gopher tortoise), nest-cavity installation (red-cockaded woodpecker), predator control and monitoring (red-cockaded woodpecker and gopher tortoise). Support for similar strategies that address needs of additional species, including, but not limited to indigo snake, pine snake and gopher frog, may also be considered.

1.5 Capacity and Outreach – Strategic coordination and effective communication between longleaf practitioners and landowners helps information reach appropriate audiences, reduces duplicative outreach and restoration efforts, and ensures that limited resources are directed to the highest priority areas and restoration needs. Across the historic longleaf range, LITs facilitate coordination at the state and local levels. Seventeen LITs have been established to date with the potential for more teams to be developed during the Business Plan timeframe. However, additional capacity is needed to support outreach and restoration objectives identified in the Plan.

Outreach to Key Constituencies: Support capacity for outreach, education, training, technical assistance and implementation of practices to increase longleaf restoration and enhancement on private and public lands. Where appropriate, opportunities to leverage capacity to increase participation in Farm Bill and other financial assistance programs to restore and enhance

longleaf pine on private lands will be given priority. Engagement with the general public to increase awareness of and support for longleaf pine restoration, such as fire festivals and other events that reduce opposition to prescribed burning, may be considered.

Local Implementation Team Coordination: Support coordination, information sharing and administration of local implementation teams within SGAs to facilitate the development and refinement of geospatial targeting of restoration and enhancement activities and track and measure progress.

1.6 Planning and Research – Additional information and tools are needed to support longleaf pine restoration, especially on private lands, where landowners are considering financial and regulatory implications.

Regulatory Assurance Tools: Support the implementation of existing regulatory assurance mechanisms, such as Safe Harbor and Candidate Conservation Agreement with Assurances, as well as the development of additional tools that provide landowners with regulatory predictability or assurance.

Development of Improved Longleaf Growth and Yield Models and other strategies to increase the market competitiveness of longleaf pine: Support the development of improved longleaf growth and yield models that provide landowners with financial information needed to determine profitability potential or opportunity cost associated with establishing and managing longleaf pine. Fund pilot projects to expand market opportunities for longleaf pine, such as ecosystem service payments.

Strategy 2: Southeast Aquatic Habitat Restoration and Enhancement

2.1 Agricultural and Forestry Best Management Practices – Support agricultural and forestry practices that reduce nutrient and sediment runoff from the land. These practices may include, but are not limited to, livestock fencing, riparian buffers and vegetative buffers around agricultural ditches, rotational grazing, reducing nutrient inputs, and restoring streambanks impacted by erosion. Where appropriate, opportunities to leverage funding through the Farm Bill and other programs to renew or enter into new cost-share contracts will be given priority.

2.2 Improve stream crossings – Restore connectivity for fish passage and reduce sedimentation by removing or retrofitting stream barriers and stream crossings (culverts, concrete fords). Preference will be given to projects that remove or retrofit high priority barriers or crossings within watersheds where barrier/crossing surveys and/or assessments are being developed or have been completed with an emphasis on lower cost/high gain methods in locations known to fragment habitat for priority species.

2.3 Stream Restoration and Enhancement – In some areas within a watershed, streambank erosion or loss of riparian or instream habitat may have a large impact on aquatic species and may not otherwise be addressed through agricultural or forestry best management practices. In these areas, restore wetland, streambank, and instream habitat to support key functions of the watershed and improve native aquatic species populations. Projects will be prioritized to maximize cost efficiency and conservation outcomes for the target species.

2.4 Species-Specific Restoration and Management – Restore and manage for focal species representative of a healthy aquatic ecosystem. Actions under this strategy are in addition to habitat restoration and management.

Captive Care and Re-establishment:
Mussel species that have declined in aquatic systems are slow to respond once habitat conditions are improved due to their life cycle. In areas of the Conasauga River watershed of suitable water quality, species of *Villosa* mussels will be stocked in order to enhance their existing populations and restore the ecosystem at a faster rate than through water quality improvements alone.

2.5 Capacity and Outreach – Capacity on-the-ground for working with private landowners will be key for implementing the strategies for aquatic habitat restoration and enhancement as well as ensuring resources are being directed within a landscape in the most effective manner.

Outreach to Key Constituencies: Support needed capacity to conduct outreach to private landowners to increase awareness of conservation need, appropriate practices and available cost-share programs to improve water quality or connectivity. This will also include providing technical assistance to develop management plans and guidance on best management practice implementation; and the coordination of stakeholders within the watershed to share information and build consensus around priorities for targeting activities to most effectively and efficiently achieve outcomes.

2.6 Assessment, Prioritization and Planning – Under limited circumstances where more information is necessary in order to target strategies and investments, the following assessment and prioritization activities will be implemented:

Watershed Assessment: Coordinate stakeholders to identify subwatersheds in the Locust Fork watershed where water quality efforts should be targeted based on ability to address main factors impacting water quality, likelihood of a species response and existing capacity.

Barrier Assessment and Prioritization: In watersheds where barriers to habitat connectivity are a main factor impacting targeted species and a recent prioritization for barrier removal or enhancement does not exist, support the assessment of barriers and crossings in order to identify which should receive highest priority for removal or retrofitting. Emphasis will be placed on lowest cost/highest gain opportunities and identifying willing landowners.

Species Assessment: Invest in species monitoring and survey of focal endemic fishes in Conasauga and prospective species in Locust Fork watersheds.

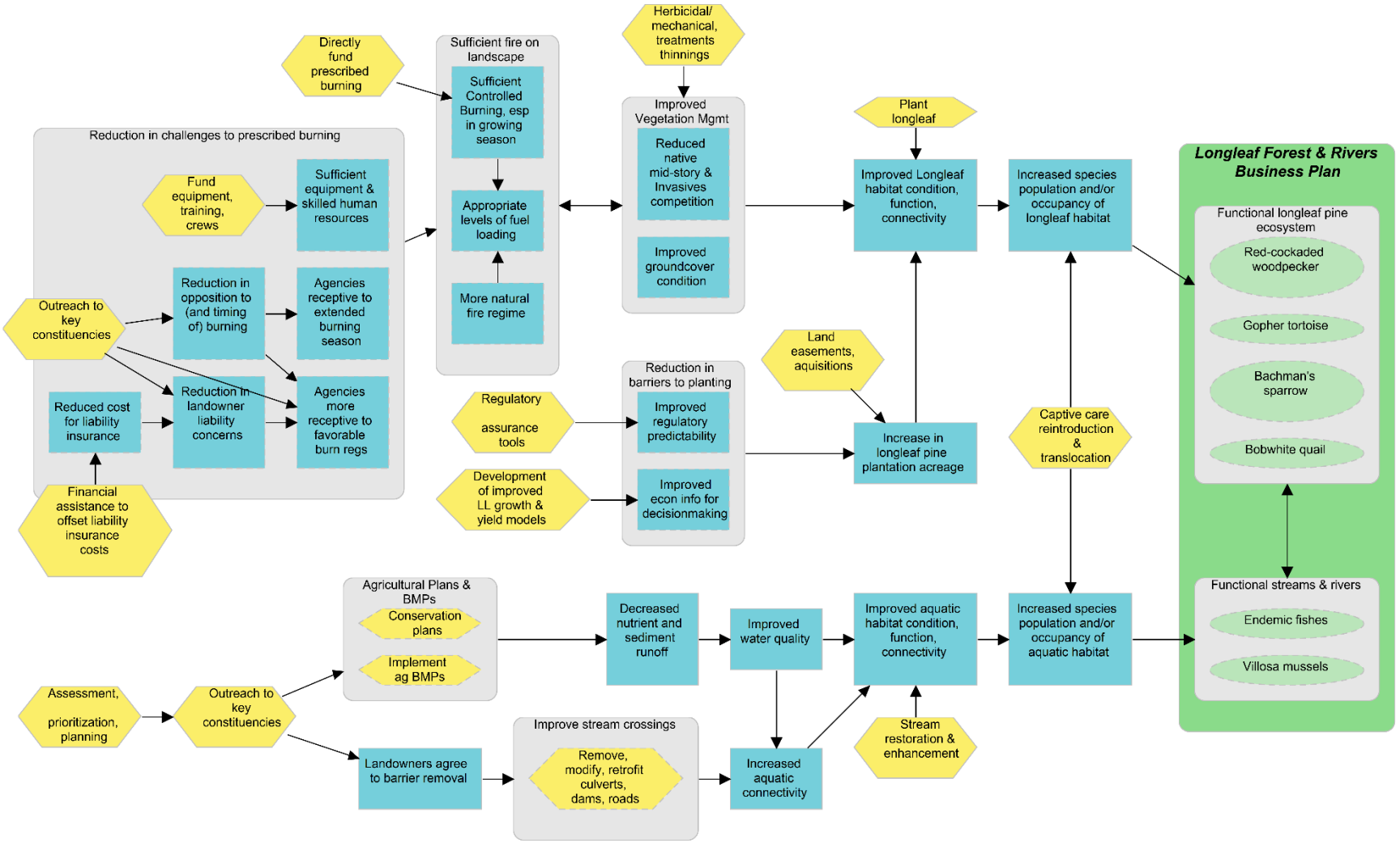

Figure 3. Results chain depicting the relationship of various strategies (yellow hexagons) within the business plan to each other, to the intermediate results (blue boxes) and ultimately to an increase in the target species (green ovals).

Risk Assessment

Risk is an uncertain event or condition which, if it occurs, could negatively affect a plan's outcomes. NFWF assessed seven risk categories to determine the extent to which they could impede progress towards the strategies and goals for the Longleaf Forests and Rivers Business Plan during the next 10 years. Table 3 lists the primary risks to success and the strategies that NFWF will implement to minimize or avoid those risks, where possible.

NFWF also considers the long-term sustainability of the outcomes achieved (i.e., up to 10 years after closure of the plan). To support long-term sustainability, NFWF engages in the following best practices:

- **Leverage Partnerships:** Where possible, NFWF will leverage capacity at state and federal agencies where long-term monitoring and maintenance is factored into operating budgets or required as a condition of receiving targeted state or federal funding, often tied to the recovery of at-risk or federally listed species. In the longleaf landscape, NFWF is working with the local implementation teams to develop local strategic plans which will help further prioritize their efforts and diversity funding streams to sustain outcomes.
- **Build Landowner Support and Capacity:** NFWF funds projects that engage with landowners and local communities to build sustained support and capacity for conservation activities.

Table 3. Business plan risk assessment summary

Category	Score	Risk Factors	Mitigating Strategies
Economic	Moderate	Economics of forest and row-crop agriculture, including lack of definitive information on the profitability of longleaf pine, can be a disincentive for conservation activities.	NFWF is funding projects (e.g., a growth and yield model) to better understand the profitability of longleaf.
Environ-mental	Low	Invasives (e.g., cogongrass, climbing fern) can threaten the longleaf ecosystem. Storm events can lead to high water volume, sedimentation, or oil spills.	Invasives are being managed using mechanical and chemical treatments.
Financial	Moderate	Longleaf partners need to identify funding from other sources to support prescribed burns long term.	NFWF will leverage capacity at state and federal agencies for long-term monitoring and maintenance, as noted above.
Institutional	Low	Institutional support exists for plan strategies, but many implementation organizations are working at the limits of their capacity.	NFWF funds capacity for implementing strategies and achieving the goals.
Regulatory	Low	ESA candidate species (e.g., gopher frog) could create a disincentive for continuing longleaf pine conservation activities.	Plan activities and Safe Harbor Agreements have positively influenced past listing decisions for gopher tortoise (Oct. 2022) and RCW (pending), reducing this risk.
Scientific	Low	There is scientific uncertainty about the cause of declining mussel populations.	NFWF is funding species & habitat surveys to understand population declines.
Social	Moderate	A large percent of plan strategies are implemented on private lands, for which landowner support is necessary.	The business plan continues to invest in outreach to landowners for implementation of conservation activities.

Monitoring & Evaluating Performance

Performance of the Longleaf Forest and Rivers Business Plan will be assessed at both project and program scales. At the project scale, **individual grants** will be required to track relevant strategy and habitat metrics from Table 4 to demonstrate progress on project activities and to report out on them in their interim and final programmatic reports.

Table 4. Business plan metrics from individual grants.

Strategy	Outcome	Metrics	Baseline (2018)	Goal (2028)
Longleaf Habitat[10]				
Strategy 1. Longleaf Restoration	Establish new acres of longleaf habitat	# of acres established	0	375,000
Strategy 2. Longleaf Enhancement and Maintenance	Enhance and maintain existing longleaf pine habitat (excluding prescribed fire)	# of acres enhanced	0	300,000
	Enhance and maintain existing longleaf pine habitat with prescribed fire	# of acres burned	0	4,500,000
Strategy 3. Longleaf Conservation	Protect high priority existing longleaf habitat or sites identified for longleaf restoration	# of acres conserved	0	50,000
Strategy 4. Species-Specific Restoration & Management	Increase the number of breeding groups of red-cockaded woodpeckers	# of pairs translocated	0	200
	Increase the number of gopher tortoises	# of tortoises translocated	0	10,000
Strategy 5. Capacity and Outreach	Engage private landowners through outreach and technical assistance to implement conservation practices	# of landowners engaged	0	50,000
		# of landowners taking action	0	5,000
Aquatic Habitat				
Strategy 1. Agricultural and Forestry BMPs	Adoption of voluntary agricultural Best Management Practices	# of acres of BMPs for nutrient and sediment reduction	0	10,000
Strategy 2. Improve Stream Crossings	Enhance aquatic connectivity in Conasauga and restore access to spawning habitats in Middle Coosa	# of stream miles opened	0	15
		# of passage barriers rectified	0	10
Strategy 3. Stream Restoration & Enhancement	Streambank stabilization to enhance aquatic habitats	# of stream miles restored	0	5
		Lbs of sediment prevented from entering system annually	0	3,000,000

[10] NFWF had funded longleaf pine restoration for many years prior to the development of this business plan and had made a significant contribution to the broader restoration effort. However, for the purposes of this plan, which is forward-looking, the baseline value for longleaf metrics is set as zero.

Strategy 4. Species-Specific Restoration & Management	Captive rearing of Villosa mussels to restock at Holly Creek (Tributary of Conasauga River)	# of sites restocked	0	2
		# of individuals translocated/restocked	0	1,500
Strategy 5. Capacity and Outreach	Build capacity and conduct outreach to educate and increase awareness of conservation needs	# of people reached	0	500
Strategy 6. Assessment, Prioritization and Planning	Prioritize subwatersheds within Locust Fork (tributary of the Black Warrior River)	Detailed action plan by coalition of partners	0	2

At the program scale, **species outcomes** from Table 5 will be monitored through targeted grants to key monitoring partners, existing external data sources, and/or aggregated data from grant projects, as appropriate. Priorities for monitoring grants will be included in annual RFPs under this plan. Where possible, monitoring efforts will be coordinated across species.

Table 5. Business plan metrics for species outcomes.

Species	Outcome	Metrics	Baseline (2018)	Goal (2028)
Longleaf Habitat				
Red-cockaded woodpecker	Increase the number of breeding groups of red-cockaded woodpeckers	# of breeding groups established in recovery populations to help meet downlisting size objectives	0 breeding groups	160 breeding groups
Gopher tortoise	Contribute to the establishment of new minimum viable populations (MVP)	# of populations with at least 250 tortoises to support meeting MVP criteria[11]	0	26
Bobwhite quail	Establish two National Bobwhite Conservation Initiative focal areas within the historical longleaf pine range and develop goals	# of focal areas with population goals	2 focal areas	4 focal areas
Bachman's sparrow	Maintain occupied habitat	# of acres of occupied habitat maintained	0	25,000
Aquatic Habitat				
Endemic Fishes (GA, AL)	Increase relative abundance of focal endemic fish	% increase of relative abundance	0	>15%
	Prevent extirpation of endemic fishes through improved habitat and agricultural BMPs	# of focal endemic species	9	9
	Increase number of spawning sites of trispot darter in Middle Coosa	# of new spawning sites	0	5
Villosa mussels (GA)	Stock and re-establish mussels to Holly Creek (tributary of the Conasauga River) along with WQ improvements to enhance survival	# of sites with at least 35% survival	0	2

[11] Populations of at least 250 tortoises at a density of no less than 0.4 tortoises per hectare will be considered on a trajectory to meet all other minimum viable population criteria as defined by the Gopher Tortoise Council.

Budget

The following budget shows the estimated costs to implement the business plan activities (Table 6). NFWF will have to raise funds to meet these costs; therefore, this budget reflects NFWF's anticipated engagement over the business plan period of performance and is *not* an annual or even cumulative commitment by NFWF to invest. This budget assumes that current activities funded by others will, at a minimum, continue.

Table 6. Budget for the Longleaf Forest and Rivers Business Plan.

BUDGET CATEGORY	Yrs 1-5	Yrs 6-10	Total
Strategy 1. Longleaf Forest Ecosystem Restoration and Enhancement			
1.1 Longleaf Restoration	$5,400,000	$33,400,000	$38,800,000
1.2 Longleaf Enhancement and Maintenance	$10,600,000	$27,900,000	$38,500,000
1.3 Longleaf Conservation	$500,000	$2,000,000	$2,500,000
1.4 Longleaf Species-Specific Restoration and Management	$1,500,000	$1,500,000	$3,000,000
1.5 Longleaf Capacity and Outreach (Incorporated in previous line items)	-	-	-
1.6 Longleaf Planning and Research	$300,000	$1,500,000	$1,800,000
1.7 Monitoring	$1,500,000	$1,600,000	$3,100,000
Strategy 2. Southeast Aquatic Habitat Restoration and Enhancement			
2.1 Agricultural and Forestry Best Management Practices	$1,900,000	$2,800,000	$4,700,000
2.2 Improve Stream Crossings	$800,000	$1,180,000	$1,980,000
2.3 Restore and Enhance Riparian and In-stream Habitat	$200,000	$550,000	$750,000
2.4 Aquatic Species-Specific Restoration and Management	$100,000	$190,000	$290,000
2.5 Aquatic Capacity and Outreach (Incorporated in previous line items)	-	-	-
2.6 Assessment, Prioritization and Planning	$300,000	-	$300,000
2.7 Monitoring	$200,000	$280,000	$480,000
Other			
Program Assessment and Evaluation	$0	$500,000	$500,000
TOTAL BUDGET	**$23,300,000**	**$73,400,000**	**$96,700,000**

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Appendix A. Prospective Species

The following prospective focal species require additional information and/or investment before NFWF can include them as species with measurable conservation goals in a future Longleaf Forest and Rivers business plan (Table 7).

Table 7. Planned Actions for Prospective Aquatic Species

Prospective Species	Planned Actions
Black Warrior waterdog	Invest in species monitoring and surveying in Locust Fork watershed (e.g., traps, snorkeling, eDNA) to determine species occupancy and distribution range. Research on species habitat use and response to water quality changes including nutrient and sediment loads in tributaries.
Flattened musk turtle	

Appendix B. Carbon Co-Benefits

Although NFWF business plans are aimed at achieving habitat and species goals, NFWF is committed to understanding the broader impacts of these investments in conservation. Specifically, NFWF has begun measuring other environmental and social co-benefits from business plan investments, including carbon benefits.

NFWF estimates the activities funded through the life of this business plan will result in no net carbon benefit due to the emissions associated with prescribed burning. NFWF produced this estimate using open-source datasets, various scientific reports, and IPCC guidelines. NFWF estimates the carbon benefit not to claim any formal carbon credits, but rather to demonstrate the co-benefits that accrue from our business plan's conservation investments for fish, wildlife, and habitats.