National Fish and Wildlife Foundation

Business Plan: Longleaf Forests and Rivers

August 2018

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Purpose of a Business Plan

The purpose of a National Fish and Wildlife Foundation (NFWF) business plan is to provide a concise blueprint of the strategies and resources required to achieve desired conservation outcomes for a given geography. This plan is meant to establish NFWF's role in larger conservation efforts, as well as invest in areas where gaps might exist so as to support the efforts of the broader conservation community. The strategies discussed in this plan do not represent solely the Foundation's view of the actions necessary to achieve the identified conservation goals, but instead reflect the consult of the many federal, state, academic, and organizational experts contacted during plan development.

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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*); Black Warrior waterdog (*Mark Bailey*); Gopher tortoise (*iStock photo*)*

Background

NFWF has invested in both pine forest restoration and freshwater aquatic habitat conservation for two decades. NFWF and partner interest in conserving these systems continues to increase, necessitating a strategic blueprint to guide future investments that will achieve the greatest benefit to these habitats and associated species of which many are in decline. This Business Plan (Plan) looks to integrate NFWF's role in restoring the longleaf pine ecosystem alongside the freshwater systems tied to major rivers flowing through the Southeast. The Plan, which covers a 10-year timeframe, outlines a comprehensive set of strategies that will benefit both longleaf pine habitat and associated wildlife, as well as riparian and in-stream habitats that support a diversity of fish, mussels, crayfish and other aquatic species. It is organized in two main components: (1) Longleaf forests and (2) Rivers and streams.

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. From 2003-2011, Longleaf Legacy supported the establishment of more than 100,000 acres of new longleaf pine plantings. 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 Stewardship Fund. Longleaf Stewardship Fund investments to date have been guided by the America's Longleaf Restoration Initiative's (ALRI) *Range-wide Conservation Plan for Longleaf Pine* (ALRI Plan), which was adopted in 2009 and set an overarching goal to restore 8 million acres of longleaf pine by 2025. The longleaf pine portion of this Business Plan builds from the ALRI Plan and attempts to strategically position NFWF's role in the context of broader longleaf conservation efforts.

Rivers & Steams - Aquatic Conservation

NFWF's Southeast Native Bass Initiative supported 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. Over that timeframe, the program awarded over $1.4 million. 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. The assessment was based on the richness, endemism, and imperilment of freshwater fish, mussel, and crayfish species (Southeastern Aquatic Biodiversity Strategy, Elkins et al., 2016) and identified some of the most important watershed conservation opportunities in the South.

At the same time, partner interest in extending the scope of southeastern freshwater work and addressing a broader suite of aquatic species grew. Aquatic systems across the region host hundreds of at-risk species, with many currently candidates or petitioned species under the Endangered Species Act (ESA). The Southeast Native Bass Initiative was formally exited in 2017, and, with support from the USFWS and USFS, NFWF launched a new Southeast Aquatics Fund. The aquatics portion of this Business Plan is informed by the Southeastern Aquatic Biodiversity Strategy and builds on NFWF's previous investments to conserve the tremendous natural heritage within the waters of the southeast.

Conservation Need

This 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 support 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, 2002b). 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, gopher tortoise[2] and Cooley's meadow rue 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 red-cockaded woodpecker (RCW) is dependent upon a mature canopy cover and thus serves as an ideal indicator species for late successional or "maintenance class" longleaf stands. Likewise, the presence of gopher tortoise, northern bobwhite quail and Bachman's sparrow are

[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 drafting of this Plan, 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 a candidate for listing in the eastern portion of its range (east of the Mobile and Tombigbee Rivers in AL, GA, and southeastern SC). See range map in Appendices.

helpful indicators for successful restoration of early successional as well as mature open-pine/grassland savannah 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 less than five percent of their historic 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 historic 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 faster growing species such as hardwoods and promotes the growth of fire-adapted understory vegetation, which contributes greatly to the overall diversity of the ecosystem.

Rivers & Steams - 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 (Badger, 2014) greater than the rest of the country, 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.

Current Conservation Context

Longleaf Pine

NFWF began funding longleaf pine habitat restoration in 2003 through the Longleaf Legacy partnership, with investments focused primarily on planting longleaf pine and prescribed burning of existing longleaf habitat on specific properties within the historical longleaf pine range. The program and scale of investments evolved into the current Longleaf Stewardship Fund program in 2012 with the addition of five funding partners and the adoption of the *Range-wide Conservation Plan for Longleaf Pine* by the America's Longleaf Restoration Initiative (ALRI). The ALRI 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 these acres should be in a

[3] The America's Longleaf Restoration Initiative developed the Range-Wide Conservation Plan for Longleaf Pine that identifies core areas, known as Significant Geographic Areas, typically anchored by public lands, such as national

"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 teams (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 date, NFWF has utilized the ALRI Plan as a roadmap for investments through the Longleaf Stewardship Fund, 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. 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.

Rivers & Steams - 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 that could provide a framework for priority setting and funding has not yet developed. NFWF has supported partner efforts to draw attention to the issue. Recently, 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 one 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 targeted 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.

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.

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 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 focuses on a suite of terrestrial and aquatic species that both serve as indicators of healthy longleaf and freshwater habitats and represent the habitat needs of a broader suite of species dependent upon these systems.

Conservation goals listed in Tables 1 and 2 lay out the target species outcomes under this Plan. They reflect anticipated species responses to habitat restoration and management, as well as species-specific strategies. The outcomes factor anticipated funding levels and the scales within which assessment of change over time can occur.

Longleaf 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.[4]
	Translocate 100 pairs of red-cockaded woodpeckers.
Gopher tortoise	Increase the number of gopher tortoise populations from 4 to 6 that have at least 250 tortoises and are on a trajectory to meet all minimum viable population criteria[5].
	Translocate 200 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.[6]
Bachman's sparrow	Sustain 25,000 acres of habitat occupied.[7]

Table 1. Longleaf species goals

[4] 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).

[5] 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.

[6] Following focal area and population goal development (estimated completion in 2021), NFWF will work with partners toward implementation to achieve the population goals, with additional monitoring and analysis of outcomes anticipated in 2025.

[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.

Aquatic Species	
	10-yr Business Plan Goals[8]
Bridled darter	Increase the size of the bridled darter population (# of individuals) in the Conasauga River watershed.
Trispot darter	Increase the number of stream miles occupied by the trispot darter in the Middle Coosa watershed.
	Increase the size of the trispot darter population (# of individuals) in the Conasauga River watershed.
Villosa mussels	Stock and re-establish mussel populations in the Conasauga River watershed.
Black Warrior Waterdog	Expand range of species into appropriate habitat in Locust Fork.
Flattened musk turtle	Expand range of species into appropriate habitat in Locust Fork.

Table 2. Aquatics species goals

[8] Explicit numeric targets for each goal to be benchmarked through baseline population assessment and consultation with experts by December 2019.

Geographic Focus

The Longleaf Forests and Rivers Business Plan geographic footprint encompasses the historical longleaf pine range, as well as priority watersheds within the Southeastern United States that flow through the longleaf pine range.

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*. These SGAs are core areas, typically anchored by significant 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. 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.

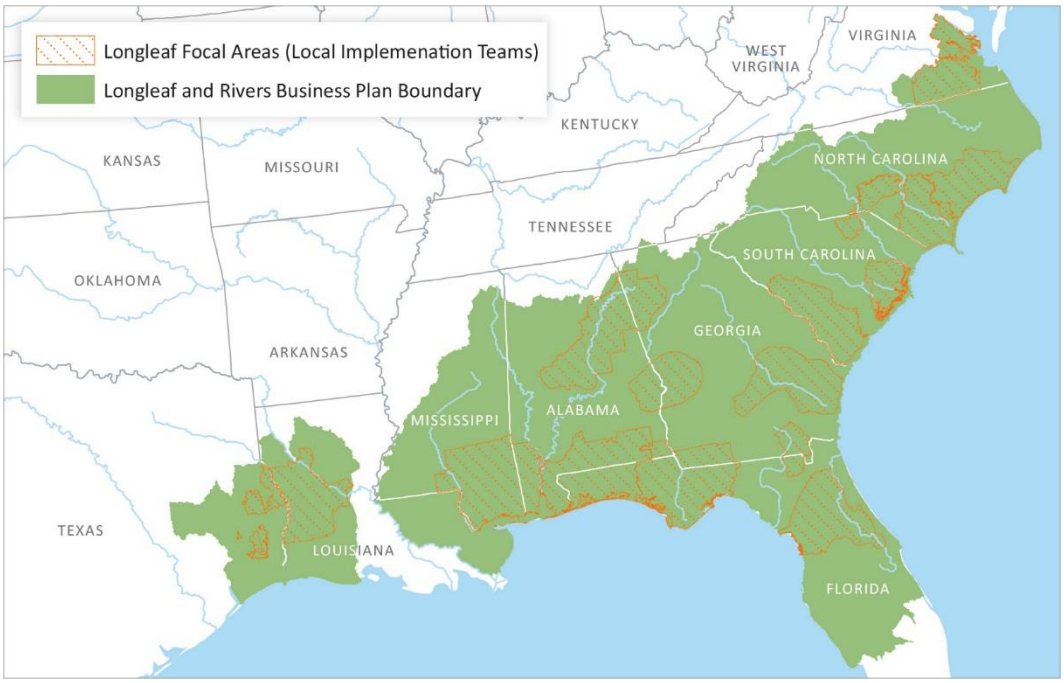

Figure 1. Longleaf focal areas map.

Investments in aquatic habitat and species conservation will be primarily targeted within three watersheds (Figure 2). These watersheds were selected based on their conservation need as demonstrated by the Southeastern Aquatic Biodiversity Strategy and through input from regional and local conservation partners working on these systems. Each also ranked highly within the Southeastern Aquatic Assessment funded by NFWF. State Wildlife Action Plans were consulted and additional criteria included the nature of issues impacting aquatic species in these watersheds and the ability to both address them within the Business Plan timeframe and measure the response of select species that can

serve as indicators for the broader suite of aquatic species within that system.

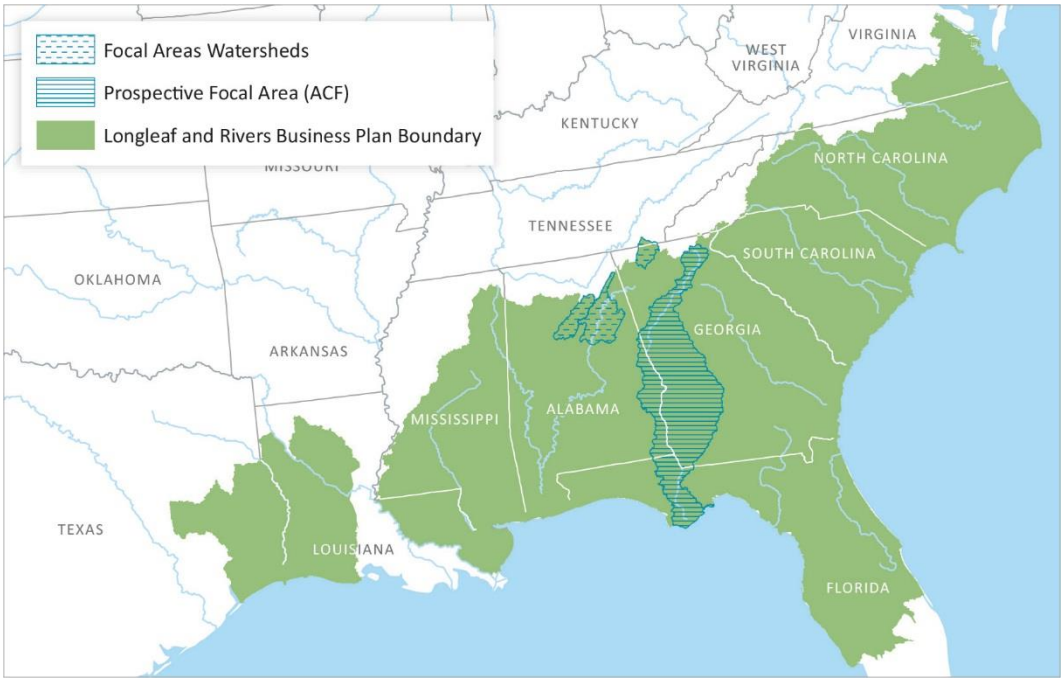

Figure 2. Aquatics focal areas map.

For each watershed, a tributary (or subwatershed) will be the focus of initial investments. These will serve as "proof of concepts," giving us valuable experience in implementing the strategies outlined in this Business Plan that can be replicated and scaled up within the watershed and beyond. The following are the focal areas for the aquatic habitat and species investments:

Major River Basin	Focal Watershed
Alabama-Mobile-Tombigbee	**Conasauga – Holly Creek**
Alabama-Mobile-Tombigbee	**Middle Coosa – Big Canoe Creek**
Alabama-Mobile-Tombigbee	**Locust Fork**

Table 3. Aquatic focal areas.

Prospective areas for aquatic investments

We have also identified a "Prospective Focal Area" where unique conservation opportunities exist but for which there is currently insufficient certainty regarding data, information and funding. One such geography for aquatic species in the Southeast is the watershed composed of the Apalachicola, Chattahoochee, and Flint Rivers, known as the ACF basin. Although the ACF has a high need for aquatic species conservation, it is not currently included as a focal geography in the Business Plan due to the high degree of uncertainty about our ability to achieve gains for species. However, many on-the-ground partners are prompting investment and we do see potential conservation opportunity emerging. In the early years of the Plan, NFWF will seek information on water challenges and opportunities to determine whether to include the ACF, or some portion of it, as a focal geography in the future.

Likewise, another issue area of significant partner interest continues to be around freshwater bass. NFWF recently exited our Southeast Native Bass Initiative where we successfully helped some subspecies of native bass, but discovered significant hurdles for other subspecies which we were unable to overcome. With continued uncertainty around our ability to achieve specific gains for the species we do not set specific goals for bass conservation in this Business Plan, but we acknowledge partner interest and we will be looking to grow and implement bass related work as opportunities arise.

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.

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 in order to 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 increase fuel loads to levels necessary to 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 – Restore and manage for 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, should 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: 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.

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 Restore and Enhance Riparian and In-stream Habitat – In some areas within a watershed, streambank erosion or loss of riparian or in-stream 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: Conduct a comprehensive species survey of the trispot darter in the Middle Coosa watershed to increase understanding of species distribution.

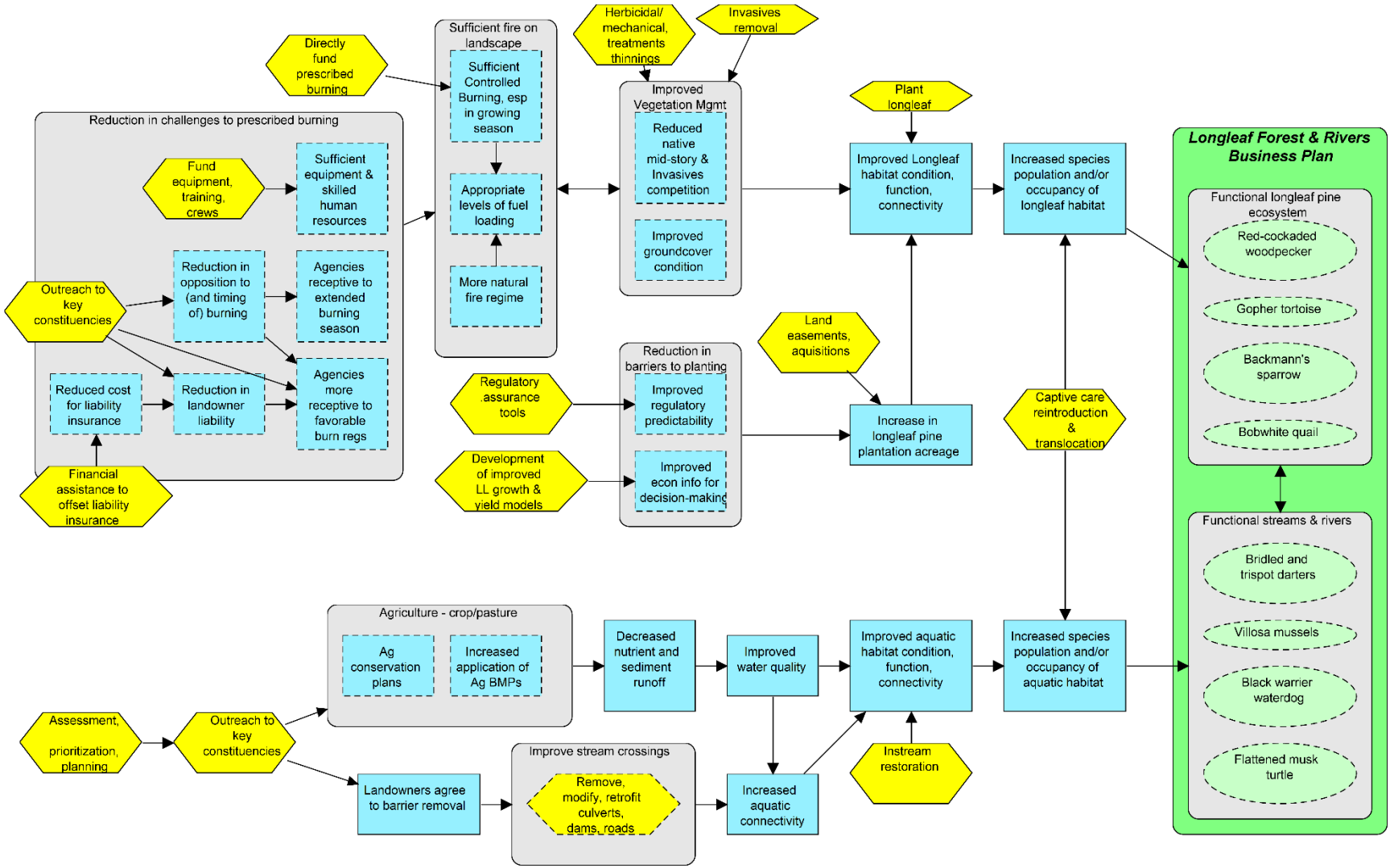

Figure 3. Results chain depicting the relationship of various strategies (yellow hexagons) within the business plan to each other, to the intermediate results (blue boxes) and ultimately to an increase in the target species (green oval).

Risk Assessment

Risk is an uncertain event or condition which, if it occurs, may impact a program's desired outcome. We assessed seven risk event categories to determine the extent to which they could affect progress towards our Business Plan strategies and goals during the next 10 years. Below, we identify the greatest potential risks to success and describe strategies to minimize or avoid those risks, where applicable.

RISK CATEGORY	RATING	RISK DESCRIPTION	MITIGATING STRATEGIES
Regulatory Risks	Low	Endangered Species Act listing of RCW creates disincentives for landowner participation due to concerns about activities being restricted. Aquatic species already listed or being considered and strategies are unlikely to be impeded by regulatory impacts.	Safe Harbor Agreements for RCW have been an effective tool for overcoming this hurdle. NFWF will look to address concerns about additional species by working with USFWS to improve regulatory predictability.
Financial Risks	Moderate	Financial resources needed to achieve longleaf goals are available, stable, and diversified. Longleaf partners need to identify funding from other sources to support prescribed burning long-term. Risk of not raising additional funds for aquatics.	Aquatic goals developed with financial risk in mind.
Environmental Risks	Moderate	Ongoing maintenance is needed to prevent invasive plants from crowding the understory of longleaf pine forests. Extreme storm events can lead to high flow or sedimentation that has an undue impact on species locally.	Invasives being managed using mechanical and chemical treatments, as well as prescribed burns. On aquatic front, since focusing on distinct areas, low odds of occurring, but building out replicability so as not to lose all if event does occur.
Scientific Risks	Low	Sufficient scientific information exists about the threats and conservation actions needed to achieve longleaf goals. Information on aquatic species needs and response is nascent.	Adaptive management built into plan, including testing and expanding a proof of concept. Aquatic goals being built out and will be set based on baseline data being collected.
Social Risks	Moderate	A significant portion of conservation activities (e.g., prescribed burning) must occur on private lands, and are not widely adopted. Pool of potential landowners for aquatic strategies is small, so a few unwilling landowners could pose a risk to success.	Outreach will continue to be important for obtaining necessary support from landowners. Selecting aquatic focal areas with known willing landowners to reduce risk. Could potentially shift tributaries, if needed.
Economic Risks	Moderate	Economic incentives exist to harvest longleaf on short growing rotations could limit achievement of long-term ecological outcomes, especially on land owned by investment companies. Low risk for Aquatic goals, but land conversion could impact.	Cost shares have been effective for engaging many forestland owners but a strategy that aligns with timber companies' business operations is needed to increase their participation.
Institutional Risks	Low	Previous investments have built the capacity of longleaf Local Implementation Teams to sustain activities (e.g., needed for longleaf outcomes to endure). Internal to NFWF, growing number of funding partners is increasing complexity and time needed. Partner capacity may be needed in aquatic focal geographies.	Plan will build capacity in aquatic focal geographies that require it.

Monitoring & Evaluating Performance

Performance of the Longleaf Forests and Rivers program will be assessed at both project and program scales. At the project scale, individual grants will be required to track relevant metrics from Table 4 for demonstrating progress on project activities and outcomes and to report out on them in their interim and final programmatic reports. At the program scale, broader habitat and species outcomes will be monitored through targeted grants, existing external data sources, and/or aggregated data from relevant grant projects, as appropriate. For aquatics species, assessment work will be funded in initial years to establish baseline and goals for measuring progress. NFWF may conduct an internal assessment or commission a third-party evaluation at a future stage of the program to determine program outcomes and adaptively manage. In some cases these course corrections may warrant increased investment; however, it is also possible that NFWF would reduce or eliminate support if periodic evaluation indicates that further investments are unlikely to achieve intended outcomes.

Category	Strategies	Metrics	Baseline (2018)	Goal (2028)	Data source(s)
Longleaf pine habitat[9]	*Establish new acres of longleaf habitat*	*# of acres established*	0	150,000	Grantee
	Enhance and maintain existing longleaf pine habitat (excluding prescribed fire)	*# of acres enhanced*	0	125,000	Grantee
	Enhance and maintain existing longleaf pine habitat with prescribed fire	*# of acres burned*	0	2,725,000	Grantee
	Protect high priority existing longleaf habitat or sites identified for longleaf restoration	*# of acres conserved*	0	10,000	Grantee
	Engage private landowners through outreach and technical assistance to implement conservation practices on their lands	*# of landowners engaged*	0	50,000	Grantee
		# of landowners taking action	0	5,000	Grantee
Red-cockaded woodpecker	*Increase the number of breeding groups of red-cockaded woodpeckers*	*# of breeding groups established*	0 breeding groups	160 breeding groups	Federal and State agencies
		# of pairs translocated	0	100	Grantee
Gopher tortoise	*Increase the number of viable populations*	*# of populations with at least 250 tortoises and on a trajectory to meet all minimum viable population (MVP) criteria*	4 viable populations	6 viable populations	State agencies, grantees
		# of tortoises translocated	0	200	Grantee

[9] NFWF has funded longleaf pine restoration for a number of years prior to the development of this Business Plan and has made a significant contribution to the broader restoration effort. However, for the purposes of this Business Plan, which is forward-looking, the baseline value for longleaf metrics is set as zero.

Bobwhite quail	*Establish two National Bobwhite Conservation Initiative focal areas within the historical longleaf pine range and develop population goals, with a longer-term goal to support progress towards achieving those population goal.*	*# of focal areas with population goals*	2 focal areas	4 focal areas	NBCI, States, LITs/grantees
Bachman's sparrow	*Maintain occupied habitat*	*# of acres of occupied habitat maintained*	0	25,000	LITs/project level reporting by grantees. EBIRD?
Darters (GA, AL)	*Increase the size of darter populations through habitat improvements and the adoption of agricultural BMPs*	*Number of individuals*	*TBD (established by Dec 2019)*	*TBD (goal established by Dec 2019)*	*UGA River Basin Center (NFWF funded)*
	Restore access to spawning habitat for trispot darter by improvements to culverts	*# of stream miles opened*	*0*	*TBD (goal established by Dec 2019)*	*NFWF funded pre- and post- culvert replaced surveys*
Villosa mussels (GA)	*Stock and re-establish population to Holly Creek (tributary of the Conasauga River) along with WQ improvements to enhance survival*	*Metric to be determined following a baseline population assessment by December 2019.*	*TBD (established by Dec 2019)*	*TBD (goal established by Dec 2019)*	*GADNR, with NFWF funding*
Black Warrior waterdog (AL)	*Within Locust Fork (tributary of the Black Warrior River), prioritize subwatersheds in which to focus*	*Detailed action plan by coalition of partners*	*0*	*1*	*NFWF funded core grant*
	Adoption of voluntary agricultural BMPs	*Water quality indicators: Sediment in water column, dissolved 0_2, specific conductance in targeted stream*	*TBD (established by Dec 2019)*	*<115 mg/L solids, >5.5 mg/L dissolved 02, conductance <225 µS per centimeter*	*NFWF funded core grant*
	Expansion of range / sites occupied	*Presence / Absence of individuals at # sites*	*TBD (established by Dec 2019)*	*TBD (goal established by Dec 2019)*	*NFWF funded core grant*
Flattened musk turtle (AL)	*Within Locust Fork (tributary of the Black Warrior River), prioritize subwatersheds in which to focus*	*Detailed action plan by coalition of partners*	*0*	*1*	*NFWF funded core grant*
	Adoption of voluntary agricultural BMPs	*Water quality indicators: Sediment in water column, dissolved 0_2, specific conductance in targeted stream*	*TBD (established by Dec 2019)*	*<115 mg/L solids, >5.5 mg/L dissolved 02, conductance <225 µS per centimeter*	*NFWF funded core grant*
	Expansion of range / sites occupied	*Presence / Absence of individuals at # sites*	*TBD (established by Dec 2019)*	*TBD (goal established by Dec 2019)*	*NFWF funded core grant*

Table 4: Longleaf Pine and Freshwater Aquatics Metrics

Budget

The following budget estimates costs to implement the Business Plan activities. These estimates were derived by evaluating the species goals in relation to the conservation practices outlined in the strategies section. NOTE: 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 it is *not* an annual or even cumulative commitment by NFWF to invest. This budget assumes that most current funded activities will, at a minimum, continue.

BUDGET CATEGORY	Yrs 1-5	Yrs 6-10	Total
Strategy 1. Longleaf Forest Ecosystem Restoration and Enhancement			
1.1 Longleaf Restoration	$5.4M	$5.9M	$11.3M
1.2 Longleaf Enhancement and Maintenance	$10.6M	$11.6M	$22.2M
1.3 Longleaf Conservation	$0.5M	$0.5M	$1.0M
1.4 Longleaf Species-Specific Restoration and Management	$1.5M	$1.5M	$3.0M
1.5 Longleaf Capacity and Outreach (Incorporated in previous line items)	-	-	-
1.6 Longleaf Planning and Research	$0.3M	$0.2M	$0.5M
1.7 Monitoring	$1.5M	$1.6M	$3.1M
Strategy 2. Southeast Aquatic Habitat Restoration and Enhancement			
2.1 Agricultural and Forestry Best Management Practices	$1.9M	$2M	$3.9M
2.2 Improve stream crossings	$0.8M	$0.9M	$1.7M
2.3 Restore and Enhance Riparian and In-stream Habitat	$0.2M	$0.3M	$0.5M
2.4 Aquatic Species-Specific Restoration and Management	$0.1M	$0.1M	$0.2M
2.5 Aquatic Capacity and Outreach (Incorporated in previous line items)	-	-	-
2.6 Assessment, Prioritization and Planning	$0.3M	-	$0.3M
2.7 Monitoring	$0.2M	$0.3M	$0.5M
Other			
Program Assessment and Evaluation	$0	$0.5M	$0.5M
TOTAL BUDGET	**$23.3M**	**$25.4M**	**$48.7M**

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