July 13, 2017

The Apalachicola Project (TAP): Restoring the Apalachicola Bay and Region

Phase 1, Strategy 2: Hydrologic and Ecosystem Restoration for Improved Water Quality

NRDA Proposal to Florida Trustee Implementation Group

EXECUTIVE SUMMARY

This USDA proposal seeks approximately $5.6 million from the *Deepwater Horizon* (DWH) Natural Resource Damage Assessment (NRDA) to support the highly effective partners of the Apalachicola Regional Stewardship Alliance (ARSA) in initiating a long-term, landscape level project in the "Restoration Type: Water Quality" (PDARP/PEIS, Section 5.5.5) to restore water quality of the Apalachicola Bay and the surrounding region following the DWH oil spill. This project uses the Restoration Approaches "Reduce pollution and hydrologic degradation to coastal watersheds" and "Reduce Nutrient Loads to Coastal Wetlands" by implementing a range of hydrologic restoration (wetland restoration) and forestry management activities (prescribed fire and invasive species treatments) throughout the Apalachicola Bay region.

The Apalachicola Bay region is a national biodiversity treasure and provides critical habitat for a wide range of species, including federally endangered Gulf sturgeon. Apalachicola Bay is also home to commercially and culturally important oyster fisheries, which have been particularly vulnerable to higher salinity levels caused by lower freshwater flow levels form the Apalachicola River in recent years (UF, 2013). This project will result in improved freshwater flows into the Apalachicola River and Bay by significantly reducing evapotranspiration from dense vegetation in coastal and nearshore ecosystems through implementation of much needed restoration activities such as prescribed fire (McLaughlin et al. 2013, Cohen et al. 2016).

This project will reduce nutrient and sediment loads entering the Apalachicola River Bay and surrounding waters by restoring vulnerable coastal and nearshore ecosystems that act as a natural filter to surface water flows (PDAR/PEIS, D.2.1). Further, the proposed hydrologic and ecosystem restoration activities will enhance natural ground water recharge over hundreds of thousands of acres throughout the Apalachicola Bay region. This 5 year project will have ecosystem-scale benefits to Gulf Coast aquatic habitats and resources and will benefit the myriad of fish and invertebrate species that depend on Apalachicola Bay for a portion of their life-cycle as well as enhancing recreation opportunities such as wildlife viewing, paddling, and fishing.

The Apalachicola Project (TAP) Phase 1, Strategy 2 is modeled after USDA's successful landscape scale restoration approach and will harness the proven leadership of ARSA (a well-established collaboration comprised of local, state, non-governmental organizations, and federal partners) to coordinate the implementation of high-priority restoration needs in the Apalachicola Bay region. ARSA's Ecosystem Restoration Team (with over a 15 year proven track record) will implement this project on the Apalachicola National Forest, two national wildlife refuges, Tyndall Air Force Base, Flint Rock Preserve (TNC) and multiple coastal state-owned and managed lands. Over 5 years, approximately 423,000 to 685,000 acres will be treated on over

20 different conservation properties managed by federal, state and local government as well as NGOs.

In addition to the multiple water quality benefits mentioned above, this project will provide enhanced community resilience benefits for a number of coastal and near shore communities. These benefits include enhanced flood protection, increased drought tolerance and decreased wildfire risk and reduced storm damage. Further, this project will also help revitalize the economy in the Apalachicola Bay region related to natural resources-dependent recreation and tourism, improved commercial fisheries and the local forest products industry.

Success of this project is likely because ARSA is a well-established, highly functioning collaboration with deep knowledge and expertise in local restoration needs and practices. Since 2005, ARSA has demonstrated accomplishments in all aspects of cooperative land management, including the ability to promote collaborative efforts and secure funding. In addition, this proposal will leverage and expand current grant-funded ARSA projects (e.g. two National Fish and Wildlife Foundation (NFWF) grants and two Florida Fish and Wildlife Conservation Commission (FWC) grants) as well as a pending Stewardship Agreement between USDA (ANF) and TNC. USDA is offering this proposal under the auspices of the DWH NRDA authority.

The Apalachicola Project (TAP) Phase 1, Strategy 2: Hydrologic and Ecosystem Restoration

NRDA PROJECT PROPOSAL

INTRODUCTION AND BACKGROUND

The relatively undeveloped Apalachicola Bay region of the Florida Panhandle is a vast expanse of pine forests, wet savannahs, cypress-tupelo swamps and blackwater streams. The defining feature is the Apalachicola River, formed by the confluence of the Flint and Chattahoochee Rivers where the Florida, Georgia, and Alabama state lines converge (Rains 1993). The Apalachicola River has the largest forested floodplain in Florida, covering approximately 112,000 acres and is up to five miles wide. The Apalachicola River is estimated to account for 35% of the total freshwater discharge from Florida into the Gulf of Mexico which affects both primary and secondary offshore productivity and may influence fish production on some of the Marine Protected Areas in the northeast Gulf (Edmiston 2008). The region's high water table and flat topography cause hydrologic and nutrient flows to fuse the mosaic of wetland and upland ecosystems into a closely unified landscape (Ewel 1990, Ford et al. 2008). Rainfall within the northern Florida river basins slowly seeps through the forests, basin wetlands, and river swamps before being gradually released into the coastal rivers and estuarine habitats of Apalachicola Bay and then on to the Gulf of Mexico. Accordingly, the health of the region's estuarine and marine resources is inextricably tied to the health of the forested habitats from which its waters flow.

During the past century the hydrology of the Apalachicola River Basin was altered dramatically with significant implications for the health and sustainability of the region's estuaries and coastal ecosystems (Alber 2002, Light et al. 2006, Smith 2007). This includes a dramatic reduction in the volume of freshwater discharge from the Apalachicola River due to increased usage throughout the Apalachicola- Chattahoochee-Flint River Basin. In recent years this has significantly impacted commercially and culturally important oyster fisheries, which are vulnerable to higher salinity levels caused by lower freshwater flow levels form the Apalachicola River into the Apalachicola Bay (UF, 2013). Restoring the health of the Apalachicola region's forested ecosystems and stabilizing the timing and delivery of freshwater inflows is therefore critical to the long-term resilience of the Gulf of Mexico and recovering from the damage to water quality caused by the *Deepwater Horizon* (DWH) oil spill. Healthy forests absorb rainfall, refill groundwater aquifers, slow and filter stormwater runoff, reduce floods, and maintain watershed stability and resilience (Riekerk 1989). The critical role of clean freshwater inflow in estuarine health is now widely recognized.

Collectively, the Apalachicola River, the adjacent floodplain, and wetland system as well as the receiving waters of the Apalachicola Bay and estuary are central to the region's status as one of North America's five hotspots for species rarity and richness (figure 1). The bottomland forest of the Apalachicola floodplain is composed of approximately 60 species of trees. Water hickory, sweetgum, overcup oak, green ash, and sugarberry grow in the areas of higher elevation while the lower-elevation areas are dominated by tupelo-cypress swamps.

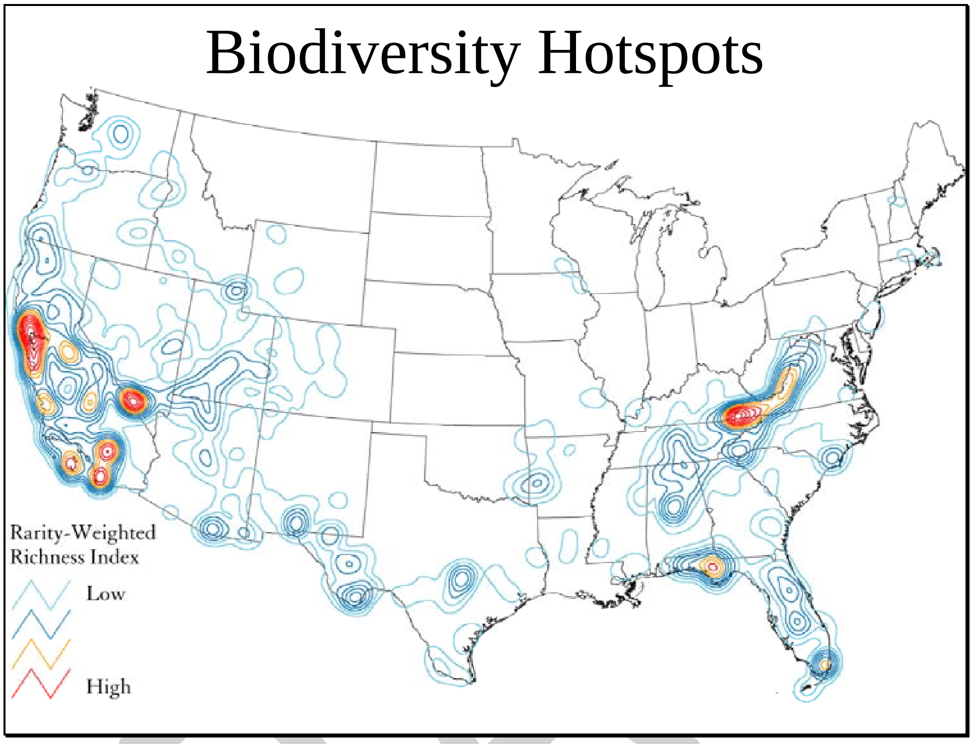

Figure 1. North America's five "hot spots" of species rarity and richness (Stein et al. 2000)

The Apalachicola Bay region extends north from the Florida coastline along the Apalachicola Bay, up the Apalachicola River to the dam at Lake Seminole, and includes the watersheds along the Chipola, New, Ochlockonee, Wakulla and St. Marks rivers and Apalachee Bay, and the St. Andrew-St. Joseph Bays watershed (figure 2).

The Apalachicola River flows into one of the most biologically rich estuaries in the northern hemisphere. The estuary and bays (including East Bay, Apalachicola Bay, St. Vincent Sound, and St. George Sound) are a biological, cultural and, economic treasure that are dependent upon the freshwater inflows from the forested uplands and wetlands upstream (UF 2013, Florida DEP 2014). The magnitude of flow from the river and the natural productivity of the bay make it of great significance to the entire Gulf of Mexico. Some 90% of Florida's oysters, over 10% of the total U.S. harvest, are taken from the Apalachicola Bay (figure 3), though recent reductions in freshwater inflows and corresponding changes in salinity are taking a toll (Christensen et al. 1998, Livingston et al. 2000, FDAC 2004). The Florida DEP have classified the surface waters of the entire Apalachicola Bay system (including St. George Sound, East Bay and St. Vincent Sound) as Class II surface waters which have stringent water quality standards due to their importance for shellfish propagation and harvesting (Edmiston 2008). It is a major nursery for penaeid shrimp, blue crabs and, many fish species including striped bass, sturgeon, grouper, drum, and flounder. It has one of the highest densities of bottom-dwelling invertebrates of any comparable area in the U.S. The Apalachicola National Estuarine Research Reserve (FDEP 2014) is the nation's largest and has been designated a Florida Aquatic Preserve, and an International Biosphere Preservation Area (Florida DEP 2014) (figure 3). The Apalachicola River and Bay also contain 15 Outstanding Florida Waters, a designation by Florida DEP meant to afford these waters special water quality protection due to their recreational, economic and ecological significance (Edmiston 2008).

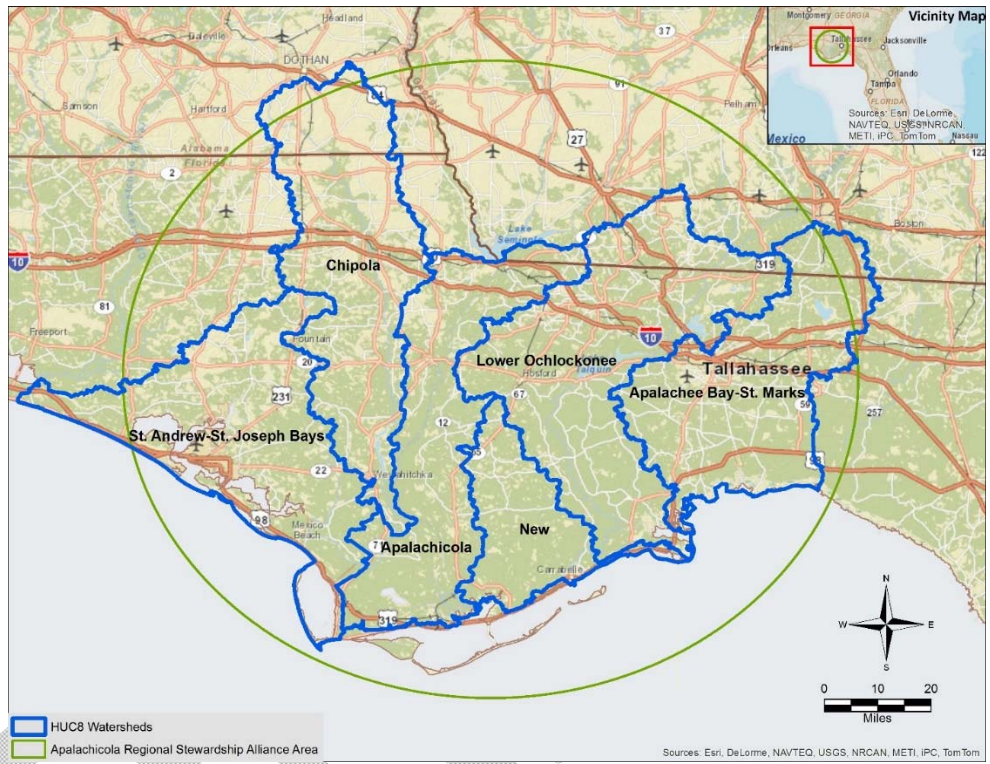

Figure 2. HUC8 Watersheds comprising the Apalachicola Bay ecosystem

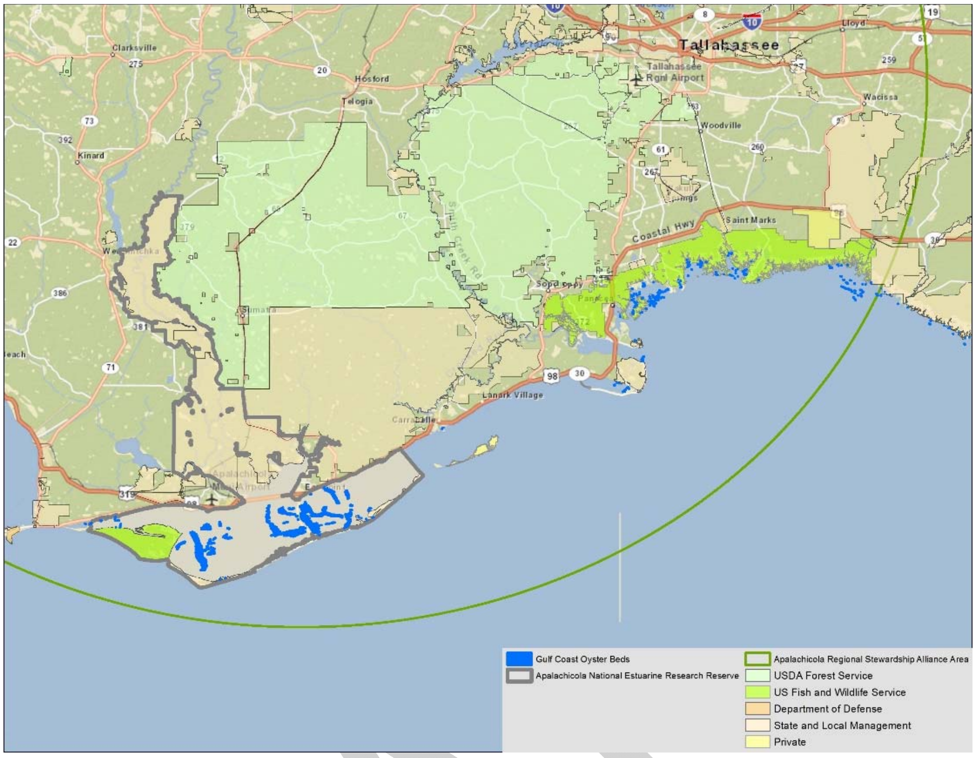

Figure 3. Oyster bed locations and the Apalachicola National Estuarine Research Reserve within TAP area.

One hundred thirty-one freshwater and estuarine fishes and 33 species of mussels have been found in the Apalachicola River and its main tributary, the Chipola River. The Apalachicola River harbors the only remaining native population of the Gulf race striped bass in the southeast and provides spawning habitat for the federally endangered Gulf sturgeon (figure 4). However, not all waters that supply the Apalachicola ecosystem and the Gulf meet the water quality standards established to protect public health, preserve aquatic habitat and wildlife, and assure safe and healthy fishing and recreational uses. Surface waters that do not meet the standards set for them are determined to be “impaired” and in need of restoration. Within the TAP area there are approximately 824 miles of impaired waters along the rivers, streams, and coastline (figure 5).

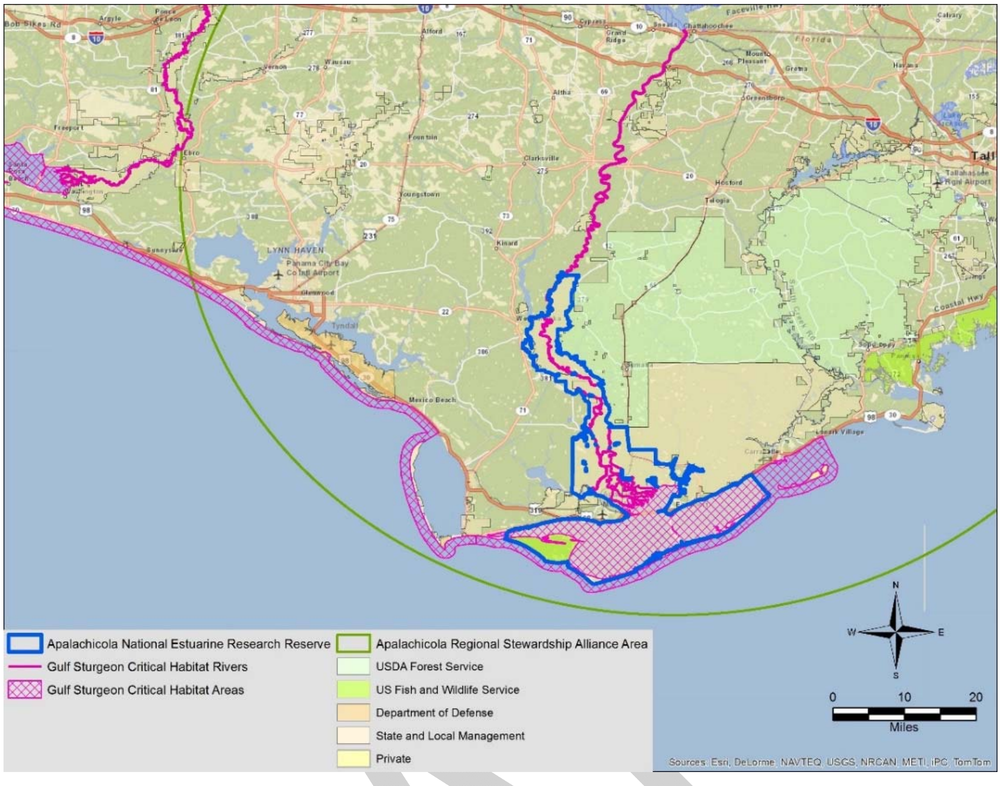

Figure 4. Critical Habitat for Gulf sturgeon in TAP area.

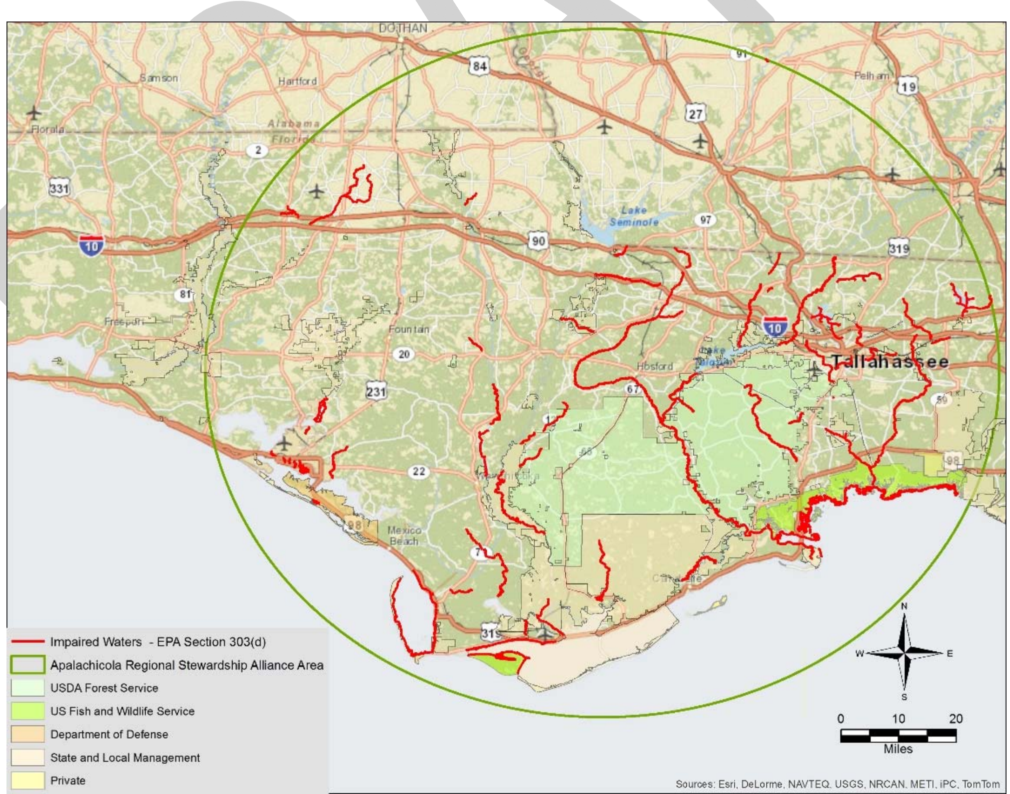

Figure 5. Impaired waters within TAP area.

Also central to the region's status as a biodiversity "hotspot" are its world-renowned forests of longleaf pine (figure 6), the predominant upland forest type naturally occurring in the coastal plain. The groundcover diversity per unit area within the longleaf pine ecosystem in this region positions it within the most species rich plant communities outside of the tropics (Peet and Allard 1993). These natural treasures are showcased on the Big Bend Scenic Byway, a 220-mile route which brings many visitors and ecotourists into this region (FDOT, 2016). The abundant embedded wetlands of the longleaf pine ecosystem also provide natural stormwater holding areas and important recharge and natural filtration functions for the Florida aquifer. When properly maintained with a natural fire regime, longleaf forests are more resistant to certain pests (Thatcher and Barry 1982, Friedenberg et. al. 2007) and more resilient during droughts (McNulty et. al. 1996) and storms alike (McNulty 2002, Hughes 2014). The Apalachicola region has been designated a Significant Geographic Area for longleaf restoration in the Range-Wide Conservation Plan for Longleaf Pine (2009) and considerable public and private resources have supported initiation of longleaf restoration there in recent years.

Figure 6. Pine forests on Gulf coast in the Florida panhandle. (Photo: Marvin Cook, Caribbean Heritage Concepts. Used with permission)

In addition, at least 127 of the rarest species of plants and vertebrates and 45 of the 62 terrestrial communities in Florida are found along the Apalachicola River (FNAI 2004). This includes a number of state and federally listed threatened and endangered species including red-cockaded woodpecker, frosted flatwoods salamander and gopher tortoise. Smaller ephemeral isolated wetlands also provide critical breeding habitat for many rare amphibians such as frosted flatwoods salamanders, Florida gopher frog and striped newt (Hipes et al. 2000). The project area is also home to numerous rare aquatic species such as the Alabama shad and provides habitat for the federally listed fat threeridge and purple bankclimber. The Chipola River within the project area is home to five other federally listed mussels.

ARSA: A Model of Collaborative Regional Restoration

The Apalachicola Regional Stewardship Alliance (ARSA) is a highly productive collaboration of public and private landowners and managers addressing conservation needs and opportunities across a broad area of the central Florida Panhandle, southwestern Alabama and southeastern Georgia. ARSA includes state, federal, and private landowners and managers who are committed to the restoration and best management of the lands and waters within the Apalachicola region. ARSA activities are governed by a 10-person steering committee comprised of formal agency/organization membership. The steering committee is chaired by the Local Implementation Team Coordinator whose position is funded by member partners and public and private grants. All of the restoration and management activities described below will be directed by or done in close coordination with the ARSA steering committee.

ARSA was created in 2005. Partners signed a formal memorandum of understanding (MOU) in 2010[1] which enables collaboration and sharing of personnel and resources across jurisdictional boundaries. This enables the partners to take a team approach to efficiently accomplish a wide variety of public and private land management activities. This collaborative framework is critical as no single organization has the capacity to address all of the management concerns.

The framework established by the MOU lays the foundation for landscape level efforts such as those described in this proposal and facilitates public and private grant applications and awards by ARSA. Because ARSA is a well-established, highly functioning collaboration with deep knowledge and expertise in local restoration with a demonstrated record of accomplishments, the proposed project is very likely to succeed if funded. ARSA also has the leadership capability to sustain landscape scale restoration efforts in future years.

Challenges and ARSA's Restoration Strategy

While the outstanding values of the Apalachicola Bay and its largely forested drainage are well-established in the ARSA region, significant challenges also exist. Ditching and draining wetlands, conversion to new forest types, lack of sufficient fire, changes in understory structure and composition, the onslaught of non-native invasive species, and degradation of isolated wetlands have disrupted ecosystem function and decreased many ecosystem services, specifically water quality and both aquatic and terrestrial habitat quality.

To respond to these critical challenges ARSA and its partners have developed an integrated strategy for restoration of the Apalachicola region. This project is complementary to the overall strategy and has the synergistic effect of advancing ecosystem restoration at a landscape scale. The commitment of the private, state and federal entities in ARSA to combine resources and work collaboratively will create significant lasting environmental and economic dividends for generations. The areas restored through activities funded in this project will be prioritized for routine maintenance (e.g., using lower cost and lower risk "maintenance prescribed burns") by the ARSA steering committee, thus protecting the restoration investment.

[1] A copy of the MOU is included in the Other Supporting Documents section.

TAP- Hydrologic and Ecosystem Restoration

The geographic focus of this project will be coastal and nearshore public and private lands from Aucilla Wildlife Management Area westward to Tyndall Air Force Base (figure 7). This initial focus area is situated in the lower central portion of the much larger ARSA region, where future tiered restoration efforts are planned. The approximately 2 million acres of undeveloped land within the ARSA region are nearly evenly divided between private forest lands and publicly managed areas. The private holdings range from large industrial timber corporations to small, family-owned woodlands. Anchoring the ARSA region are 770,000 acres of public land on the Apalachicola National Forest and Tate's Hell State Forest. To ensure success at the landscape scale, this project has been carefully crafted to address the unique needs and opportunities on public forestlands while complementing opportunities on private lands.

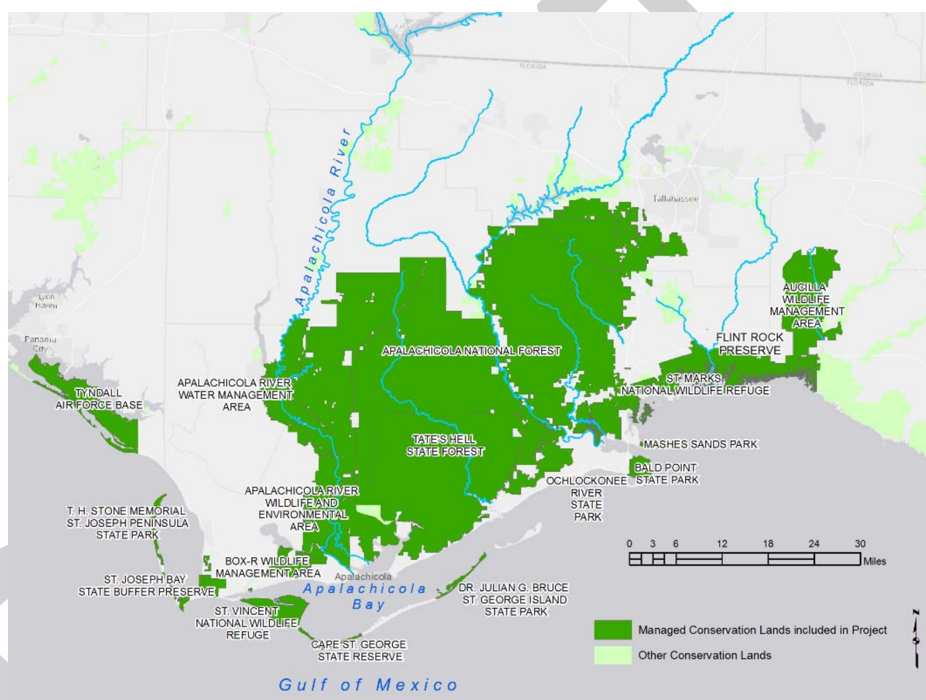

Figure 7. TAP Phase 1, Strategy 2 hydrologic and ecosystem restoration area.

Recent estimates of the spatial distribution of water supply suggest that forests supply 66% of the water in the southern U.S. (Brown et al. 2008), while only 40% of the region is forested (USDA Forest Service 2011). With approximately two million acres of forested land in the project area, of which a significant percentage are wetlands, this landscape is a critical part of the overall water budget for both surface water and groundwater in the area. The quantity, timing and quality of freshwater inflow are critical elements that impact physical, biogeochemical and hydrological conditions in coastal and nearshore systems (figure 8) and the communities that inhabit and depend on them for jobs and recreational opportunities.

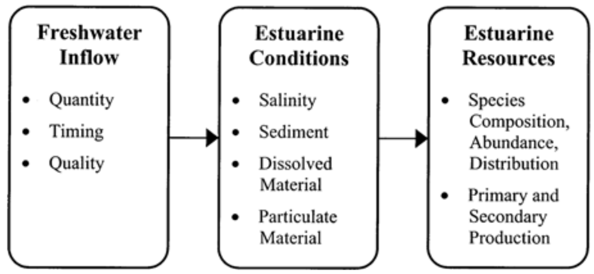

Figure 8. Schematic diagram of the effects of freshwater inflow on estuaries. (Alber 2002)

Invasive Species Control and Eradication to Improve Water Quality

Invasive species control is an important management and restoration activity that has far reaching implications for the health and quality of the Apalachicola Region's water resources, natural ecosystems, rare and threatened species recovery, commercial interests, and quality of life for the region's residents. Over the five year project period, hundreds of invasive species infestations will be treated, with a particular focus on eradicating new infestations using an "Early Detection, Rapid Response" approach (FICMNEW, 2003).

Water quality and quantity issues are directly linked to controlling invasive species. For example, during dry periods, the Rio Grande River no longer flows into the Gulf due partly to the proliferation of two invasive plants: giant reed and salt cedar along its banks. Both of these are currently invading native habitats in North Florida. Large populations of these invasive species reduce stream and groundwater recharge through evapotranspiration and create physical barriers to surface flow. These types of impacts result from a handful of characteristics common to invasive species. Non-native invasive plants, such as kudzu, are extremely competitive, using resources like soil water and nutrients at the expense of native plants and limiting recharge of fresh water to the aquifer (Langeland 1998). Species like cogongrass, one of the top ten worst weeds in the world, can alter the historic dynamics of ecosystems they occupy (Gordon 1998). Like other invasive species that grow and reproduce extremely rapidly, this grass forms a dense monoculture across the landscape that out-competes native species and destroys native habitat. Cogongrass also burns at a higher temperature than native species, which can kill whole tree stands and can increase erosion and sedimentation leading to soil runoff into the waterways that feed the Gulf.

Dense monocultures formed by invasive plants like Chinese tallow tree, Chinese privet, cogongrass, Japanese climbing fern and kudzu shade out and eliminate native plants and endangered species (Langeland 1998). The changes in native habitats can also have cascading effects on soils, insect pollinators and birds as well as undermine essential functions of nature that humans rely on. For instance, natal grass may be destabilizing sand dunes in Franklin County by replacing deep rooting, native, beach species like sea oats that nearby communities rely on for storm protection.

Figure 9. A severe infestation of Japanese climbing fern in the floodplain of the Apalachicola River.

It is estimated that invasive species cost the U.S. economy $120 billion annually in direct control expenses, lost agricultural productivity and lowered property values (Pimentel 2005). In Florida alone the annual costs as measured in sales losses and expenses are estimated at $1.6 billion (Evans, 2013). In 2013 the National Association of State Foresters recommended the establishment of a state-level rapid response team that can quickly eradicate priority forest invasive species, and in north Florida this rapid response approach has been very effective. If infestations can be caught in year one, they are more easily controlled with limited resources. Infestations that go untreated result in difficult, expensive and time consuming operations. In addition, nearly half of all species federally listed as threatened or endangered are thought to be at risk primarily due to the effects of invasive species (Wilcove et al. 1998). While these species are not directly tied to Gulf restoration, they are important components of the overall Apalachicola Bay ecosystem.

Wetland Restoration to Improve Water Quality and Quantity

Thousands of isolated wetlands are embedded throughout the longleaf pine uplands of the Apalachicola region. These ponds are often less than an acre in size and are seasonal, meaning they do not hold water year round. Isolated wetlands dry down in spring and historically would have burned as frequently as the adjacent uplands. However, due to altered fire regimes – in particular the long-term use of dormant season fires when these wetlands would be holding water– these ponds now are largely grown over with shrub vegetation and have lost much of their natural character (figure 10).

This project will restore approximately 250 isolated wetlands over the 5-year Project period using a combination of contracted labor and crews from the ARSA Ecosystem Restoration Team. Crews will cut and remove woody vegetation from ponds and spot-treat the stems with herbicide. Pond structure restoration will result in reduced evapotranspiration, lengthened hydroperiod, and improved water storage capacity which in turn will moderate stormwater runoff.

Figure 10. Before and after photos of isolated wetland restoration

Increased Prescribed Fire to Improve Water Quality and Quantity

Fire is an essential part of the upland and wetland ecosystems of the southeastern Coastal Plain. Fire is necessary to maintain the structure and composition of these ecosystems and plays a pivotal role in nutrient release and cycling (Gholz and Fisher, 1984, Battle and Golladay, 2003). Upland longleaf pine ecosystems are adapted to frequent (every 2-3 years) low intensity fires (Huffman 2006), whereas wetlands and basin swamps are thought to have burned approximately every decade (Ewel 1990).

Beginning in the middle of the 20th century, many of the longleaf forests in the Apalachicola region were converted to pine plantations intensively managed for fiber production and from which fire was excluded. In the absence of fire, hardwoods typically invade and shade out the diverse herbaceous understory and create an understory comprised primarily of leaf litter and patches of bare ground. This legacy of heavily stocked, short rotation, fire-excluded forests directly impacts water quantity because of significantly higher evapotranspiration (ET) and water quality because of less nutrient release and cycling compared to natural forests.

Over the five year project period, the ARSA Ecosystem Restoration Team will greatly increase capacity for prescribed fire across the landscape. Under the direction of the ARSA steering committee, the team will also provide much-needed expertise in the application of prescribed fire focused on restoring fire-excluded coastal and nearshore ecosystems. Restoration of the natural fire regime will begin to restore native grass-dominated understories and reduce biomass of woody shrubs, thus reducing ET and increasing water quantity (McLaughlin et al. 2013, Edwards and Troendle 2012) available for groundwater recharge and increasing freshwater flow into the Apalachicola River and Bay.

The potential increase in water yield from prescribed fire over this project could be significant. Early results from the WaSSI ecosystem model (Sun et al. 2008) predicts 10 – 36% percent increases in water yield for the expected impacts of prescribed fire in the TAP area. Prescribed fire in Mississippi increased flow in one catchment by 48% percent in the first year, with increases continuing into the second and third year (Ursic 1969). Increased water yield from prescribed fire could also improve water quality by supporting oyster populations in Apalachicola Bay. Oyster populations can play an important role in reducing nutrients that typically impair water quality (Ulanowicz and Tuttle, 1992). Insufficient freshwater flow into Apalachicola Bay is one of the biggest threats to oyster populations (Livingston et al. 2000).

Figure 11. A fire suppressed pine plantation with hardwood shrubs and very sparse herbaceous groundcover (left) compared to a regularly burned longleaf pine forest with dense herbaceous groundcover (right).

Fire-suppressed uplands and the subsequent accumulation of dangerous fuel loads also present wildfire risks to both timber resources and local communities. The increased fuel accumulation burns with unnaturally high intensity that often results in the loss of or reduced value of merchantable timber. More importantly, these same dense fuel loads present serious challenges to wildland fire fighters when responding to wildfires adjacent to the wildland urban interface. Areas that have received prescribed fire treatment every 2-3 years have lower fuel loads and generally burn with low intensity. Recent analysis shows a 23:1 cost savings for using prescribed fire to prevent or reduce the costs of fighting wildfire (Hinckley and Wallace 2012).

Regional Partnerships

The team approach to management and restoration has been time tested and is recognized by both public and private partners in Florida. Currently five teams provide management and restoration assistance across the state. This model has now been adapted by other southeastern states and is encouraged by regional plans (Darden et al. 2009) and initiatives (e.g., National Fish and Wildlife Foundation Longleaf Stewardship Fund and FWC State Wildlife Grant).

The ARSA Ecosystem Restoration Team was initiated in 2005 primarily in response to the need of more prescribed fire capacity within the ARSA landscape and to provide increased capacity for invasive species control. All aspects of providing prescribed fire and assistance treating invasive species, from scheduling to equipment maintenance to data collection, have been highly refined. Since 2005 the amount of prescribed fire and invasive treatments assistance has steadily increased with prescribed fire averaging 30,000-40,000 acres per year. In 2013 a new record was set with over 70,000 acres of prescribed fire assists. The fire team's trained, professional fire staff and state-of-the-art equipment allow partners to burn units more safely and at a larger scale. In some cases, burns would not be conducted without these skilled, well-equipped teams and in other cases the team provides additional capacity that enables partners to conduct multiple burns on a given day. As evidenced by the support of the ARSA partnership it is expected that requests for assistance for prescribed fire and invasive species control will continue to grow: this project aims to meet that challenge by increasing the size of the ARSA Ecosystem Restoration Team. If fully funded, this project would create two Ecosystem Restoration Teams, thus greatly increasing capacity for all proposed project activities.

During the five-year timeframe of this project, up to 21 coastal or near coastal properties managed by federal and state agencies and conservation lands owned/managed by local governments and The Nature Conservancy (TNC) will receive prioritized invasive species treatment assistance and prescribed fire (table 1). In total, 423,400-684,900 acres will be treated with prescribed fire over the 5-year timeframe. The prescribed fire assistance will predominantly be in the form of assistance with prescribed fire execution, but will also include prescribed fire planning and site preparation, post fire "mop-up" operations, and wildfire response assistance. The number of invasive species treatments will be based on surveys. It is conservatively estimated that hundreds of infestations will be surveyed and treated, with a particular emphasis on treating new infestations. Annual planning and prioritization of prescribed fire and invasive species treatments will be accomplished during regular ARSA membership meetings and through partner correspondence. In future years, the TAP Phase 1, Strategy 1 regional restoration decision support tools will also be used to prioritize treatments. Planning and assistance will be provided by the team and contracted services. The amount of contracted assistance will increase as needed during years with favorable prescribed fire conditions and identification of invasive species infestations.

Table 1. Ecosystem Restoration Team Prescribed Fire and Invasive species Treatment List

Managed Area Name	Ownership	Acres of Rx Fire Assistance/year	Fire Planning	WUI *	Wildfire/ Incident Assist†	Invasive Species Actions ‡
Apalachicola R. WEA	FWC	3,500-5,500	Y	N	Y	T, S
Apalachicola NF	USFS	35,000-65,000	N	Y	Y	T, S, P
Apalachicola R. WMA	NWFWMD	N.A	N.A	N.A.	N.A.	T, S
Aucilla WMA	FWC	5,000-10,000	N	N	Y	T, S
Bald Pt. SP	DEP-Rec. and Park	2,250	N	Y	Y	T, S
Box R WMA	FWC	2,500-4,000	N	Y	Y	T, S
Cape St. George SR	DEP-FL Coast Off.	0	Y	Y	Y	T, S
Dr. JG Bruce St Georg Is. SP	DEP-Rec. and Park	0	N	N	Y	T, S
Eglin AFB-Cape San Blas	DOD	0	N	Y	Y	T, S
Flint Rock Pres.	TNC	3,500-5,000	Y	N	Y	T, S, P
Jeff Lewis Wild. Pres. at Dog Is.	TNC	0	N	Y	Y	T, S
J. S. Phipps Pres.	TNC	30	N	Y	Y	T, S
Mashes Sands Co. Park	Wakulla Cty.	100-200	N	Y	Y	T, S
Ochlockonee R. SP	DEP-Rec. and Park	350-450	N	N	Y	T, S
St George Is. Tracts	DEP-FL Coastal Off.	50	Y	Y	Y	T, S
St Joseph Bay State Buffer Pres.	DEP-FL Coastal Off.	800-1,200	Y	Y	Y	T, S
St Marks NWR	USFWS	13,000-16,000	N	Y	Y	T, S
St Vincent NWR	USFWS	2,500-4,000	N	Y	Y	T, S
Tate's Hell SF	FFS	10,000-14,000	N	Y	Y	S
TH Stone Mem. St Joseph Penn. SP	DEP-Rec. and Park	100-300	Y			
Tyndall AFB	DOD	6,000-9,000	Y	Y	Y	T, S
RX fire assistance/year total:		**84,680-136,980**				

***Managed area has significant area adjoining wildland urban interface (WUI).**

†Team is available to assist with wildfire and other Incidents such as hurricane response.

‡P=planning, S=survey and T=treatment

Prescribed Fire Training and FIREWISE Outreach

In order to increase awareness among private land owners on important, local land management issues, ARSA will provide local fire awareness outreach workshops including the FIREWISE Communities approach. Workshops will be held in both general locations (e.g. Carrabelle public library) and at targeted areas with known wildland urban interface concerns (e.g. "Plantation" community at western end of St. George Island, CR 30A adjacent to St. Joseph Bay State Buffer Preserve and Dog Island). Workshops will be coordinated with community representatives in order to maximize participation and program success.

To better prepare volunteer firefighters and other emergency responders for wildland fire emergencies ARSA will provide NWCG wildland fire training opportunities. Higher-level NWCG training opportunities will also be offered to public land managers as specific needs are identified at regular ARSA membership meetings. Both levels of training will be offered at least twice per year at different locations during years 2-5.

Relationship with other Gulf Coast restoration projects

This proposal is a central component of a broader, Gulf-wide effort by USDA to engage with partners to improve management of forested watersheds as a necessary step in restoring the waters of the Gulf and its aquatic and terrestrial habitats, promoting community resilience, and revitalizing its human communities and economy. The USDA is mobilizing resources from the Natural Resource and Conservation Service and the USDA Forest Service in cooperation with state foresters, and coordinating with external partners, such as those active in the America's Longleaf Restoration Initiative to mount similar forest-focused, multiphase projects in multiple locations across the Gulf. These projects provide complementary benefits on federal and state lands towards restoring the Gulf Coast ecosystem.

Monitoring and Adaptive Management to Improve Water Quality

Before monitoring work can begin, a baseline assessment of all relevant, ongoing monitoring efforts will be conducted through a partnership with the Florida A&M University (FAMU) and other partners. This assessment will include national-level efforts within the TAP area such as USGS streamflow gages and EPA wetland monitoring and assessment efforts. Coordination with ongoing state-level monitoring efforts such as Florida Department of Environmental Protection water quality assessment program will also be explored. The baseline assessment will also explore collaborative potential with a wide variety of potentially relevant landscape level monitoring efforts. These include 1) Florida Fish and Wildlife Conservation Commission's project to monitor the vegetation community and structure of isolated wetlands important to the federally listed frosted flatwoods salamander, 2) an ongoing research and monitoring project (Managing Forests for Increased Regional Water Availability) funded Florida Department of Agriculture and Consumer Services, 3) upland vegetation community and structure monitoring led by the Florida Natural Areas Inventory and NatureServe, and 4) ongoing water quality research projects led by faculty in FAMU's Center for Water Quality.

Based on the information in this baseline assessment a detailed TAP water quality monitoring plan will be developed with FAMU and input from ARSA members in order to adequately sample all funded treatment types (e.g., prescribed fire, invasive species control and wetland restoration) across a range of coastal and nearshore ecosystems. The baseline assessment should identify gaps in current monitoring efforts that will need to be filled, as well as the most cost-effective way to fill the monitoring gaps through collaborative partnerships.

During the five year project period, we will also coordinate with relevant RESTORE Gulf-wide Foundational Investments (e.g., Baseline Flow, Gage Analysis & On-Line Tool to Support Restoration- EPA_RESTORE_004_000_Cat1 and Council Monitoring and Assessment Program Development- DOC_RESTORE_002_001_Cat1) as well as RESTORE Centers of Excellence such as the Florida RESTORE Act Centers of Excellence Program. These coordination efforts will further ensure that ensure TAP monitoring data uses standard metrics and protocols and could identify additional leveraging opportunities for additional monitoring data collection within the TAP area.

Monitoring results will be used to inform future activities using an adaptive management framework. Partners involved in the TAP monitoring effort will be invited to quarterly ARSA steering committee meetings so that the water quality impacts of different treatments can be disseminated to all ARSA landowners. Relevant results from the TAP monitoring program will also be presented at scientific conferences and published in peer-reviewed journals by partners such as FAMU's faculty and students. Through a collaboration with FAMU and the South Atlantic LCC treatment-level monitoring results will be scaled up to the landscape scale to demonstrate benefits using appropriate water quantity (e.g, WaSSI) and water quality models (e.g., NOAA's OpenNSPECT model). The results of the TAP Phase 1 Strategy 2 effort will be captured in regular reports which detail the location and extent of different treatments, the benefits to water quality and quantity (based on monitoring results) and relevant presentations and publications.

BUDGET NARRATIVE

The proposed budget for the TAP Phase 1, Strategy 2 Restoration for Improved Water Quality project is included below. To fully implement this project over a 5 year period we request $5,595,915 with the estimated yearly distribution as follows:

	FY 18	FY 19	FY 20	FY 21	FY 22	TOTAL
Planning	$11,592	$12,539	$12,342	$12,058	$12,297	$60,828
NEPA/EC	$34,774	$5,016	$4,937	$4,824	$4,919	$54,470
Implementation	$907,966	$982,204	$966,716	$944,536	$963,209	$4,764,631
Outreach	$7,728	$8,360	$8,228	$8,039	$8,198	$40,553
Monitoring	$104,319	$145,450	$143,156	$139,871	$142,637	$675,433
Total	$1,066,379	$1,153,569	$1,135,379	$1,109,328	$1,131,260	$5,595,915

This project is flexible and can be phased in or scaled down in many different ways based on the funding available. One option would be to eliminate the invasive species treatment and control component (including associated equipment and supplies) as well as to remove the proposed prescribed fire training and FIREWISE community outreach. The estimated yearly funding distribution under this scenario would be as follows:

	FY 18	FY 19	FY 20	FY 21	FY 22	TOTAL
Planning	$8,237	$9,033	$8,484	$8,468	$8,632	$42,854
NEPA/EC	$27,532	$2,642	$2,482	$2,477	$2,525	$37,658
Implementation	$732,266	$803,046	$754,264	$752,856	$767,389	$3,809,821
Outreach	$742	$813	$764	$763	$777	$3,859
Monitoring	$68,830	$103,034	$96,775	$96,595	$98,459	$463,693
Total	$837,607	$918,568	$862,769	$861,159	$877,782	$4,357,885

There are many additional options for phasing in project components (e.g., delaying wetland restoration until additional funding is available in later years) and scaling down project components (e.g., reducing prescribed fire acres). TAP, Phase 1, Strategy 2 proposal team are willing to tailor the proposal as needed to maximize the restoration effort that can be accomplished based on the funding available.

Opportunities for Leveraging Of Resources and Partnerships

TAP Phase 1, Strategy 2 will fully leverage existing investments to and by ARSA members (e.g., National Fish and Wildlife Foundation grants, federal and state allocations for improving water quality and restoring habitat) along with new and innovative federal and state spending authorities and initiatives to accomplish landscape scale restoration of hydrology and natural communities within the ARSA Region.

TAP Phase 1, Strategy 1 ("Tate's Hell Strategy 1") was selected by the Gulf Coast Ecosystem Restoration Council for $7M in funding (project period: May 2017-April 2022). Tate's Hell Strategy 1 will involve direct hydrologic restoration of high priority watersheds in Tate's Hell State Forest (THSF). When combined with the hydrologic and ecosystem restoration activities proposed here, significant and lasting water quality improvements will be accomplished over hundreds of thousands of acres that flow directly into the Apalachicola River and Bay. TAP Phase 1, Strategy 1 also includes funding for a baseline hydrologic assessment on several watersheds adjacent to THSF as well as the development of a new regional restoration decision support system (RRDSS) to prioritize future hydrologic and ecosystem restoration activities. Once available, the RRDSS will also be used by the ARSA steering committee to help prioritize prescribed fire, invasive species treatments and wetland restoration proposed in this project (e.g., in years 2-5 of this project) as well as to compete for future funding opportunities from RESTORE, NRDA, NFWF Longleaf Stewardship Funds, etc..

TAP will also utilize the existing ARSA MOU and innovative federal (Wyden Act) and state (Good Neighbor Authority) spending authorities to accomplish work across the Apalachicola region. A challenge cost share agreement is already in place between the USFS and TNC which can be used to accomplish work not only within USFS land but also on adjacent lands within connected watersheds (Wyden Authority). The USFS and TNC are also currently developing a Stewardship Agreement that will enable further restoration activities funded through future timber sales on the Apalachicola NF. The USFS also has a partnership agreement is in place with the Florida Natural Areas Inventory (FNAI) which will be utilized for assistance with project vegetation community and structure monitoring (e.g., rapid assessment pre- and post-fire). A new agreement is also being developed between the USFS and FAMU which will greatly facilitate many components of this project including monitoring or the potential impacts of project activities on water quality and quantity, presenting and publishing monitoring results, GIS/data management and overall project coordination. This partnership will actively involve under-represented minority graduate and undergraduate students and will leverage a $15M NOAA award to FAMU to support and students and faculty focused on coastal ecosystems and coastal and marine resources. TAP will also build on the ongoing efforts of TNC's Northwest Florida Program to provide mentorship opportunities to disadvantaged youth through SCA and will seek to expand this effort in future TAP phases.

Additional outside funding will be leveraged as well. ARSA has received $1,261,908 in funding from NFWF for longleaf restoration and an additional $300,000+ is pending. ARSA has also received $105,000 from the US Department of Interior through the Longleaf Pine Resilient Landscape initiative for additional restoration efforts such as prescribed fire on federal, state and private lands throughout the ARSA area. FWC funds for invasive species treatment in ARSA Region (approximately $160,000 per year) will also be leveraged to treat and re-treat additional acres of invasive species infestations. NFWF funding and funding from ARSA partners (including USFS) supports the ARSA Local Implementation Team coordinator position who will play a vital role in coordinating the activities proposed in this project.

ENVIRONMENTAL COMPLIANCE

This project has the necessary environmental compliance measures already in place so that work can begin as soon as funding is made available (table 2). All work on the Apalachicola National Forest (invasive species treatments, prescribed fire, and isolated wetland restoration) complies with the National Forests in Florida Land and Resource Management Plan (available at http://goo.gl/RPFAZ) and has been authorized for implementation. The NEPA process (including environmental assessments, and the effects assessment and consultations required by ESA Section 7 and NHPA Section 106) for these projects is complete so those activities can commence as soon as funding is available.

Table 2. ENVIRONMENTAL COMPLIANCE CHECKLIST

Environmental Compliance Type	**Yes**	**No**	**Applied For**	**N/A**
Federal				X
National Marine Sanctuaries Act (NMSA)				X
Coastal Zone Management Act (CZMA)				X
Fish and Wildlife Coordination Act				X
Farmland Protection Policy Act (FPPA)				X
NEPA – Categorical Exclusion	X			
NEPA – Environmental Assessment	X			
NEPA – Environmental Impact Statement				X
Clean Water Act – 404 – Individual Permit (USACOE)				X
Clean Water Act – 404 – General Permit(USACOE)				X
Clean Water Act – 404 – Letters of Permission(USACOE)				X
Clean Water Act – 401 – WQ certification				X
Clean Water Act – 402 – NPDES				X
Rivers and Harbors Act – Section 10 (USACOE)				X
Endangered Species Act – Section 7 – Informal and Formal Consultation (NMFS, USFWS)	X			
Endangered Species Act – Section 7 - Biological Assessment (BOEM,USACOE)	X			
Endangered Species Act – Section 7 – Biological Opinion (NMFS, USFWS)				X
Endangered Species Act – Section 7 – Permit for Take (NMFS, USFWS)				X
Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) – Consultation (NMFS)				X
Marine Mammal Protection Act – Incidental Take Permit (106) (NMFS, USFWS)				X
Migratory Bird Treaty Act (USFWS)				X
Bald and Golden Eagle Protection Act – Consultation and Planning (USFWS)				X
Marine Protection, Research and Sanctuaries Act – Section 103 permit (NMFS)				X
BOEM Outer Continental Shelf Lands Act – Section 8 OCS Lands Sand permit				X
NHPA Section 106 – Consultation and Planning ACHP, SHPO(s), and/or THPO(s)				X
NHPA Section 106 – Memorandum of Agreement/Programmatic Agreement				X
Tribal Consultation (Government to Government)				X
Coastal Barriers Resource Act – CBRS (Consultation)				X
State				
As Applicable per State				X

LITERATURE CITED

Alber, M. 2002. A conceptual model of estuarine freshwater inflow management. Estuaries. 25 (6B), 1246-1261.

Battle, J. and S.W. Golladay. 2003. Prescribed fire's impact on water quality of depressional wetlands in Southwestern Georgia. American Midland Naturalist 150: 15-25.

Brown, T.C., M.T. Hobbins, and J. A. Ramirez. 2008. Spatial distribution of water supply in the coterminous United States. Jour. Amer. Wat. Res. Assn. vol. 44 (6), 1474-1487.

Browning, R.W., J.L. Cummins, J.D. Elledge, T.R. Jacobson, H.G. Hughes. 2009. Restoring and managing longleaf pine, a handbook of Mississippi landowners 2nd ed. Wildlife Mississippi. 33 pp.

Christensen, J.D., M.E. Monaco, T.A. Battista, C.J. Klein, R.J. Livingston, G. Woodsum, B. Galperin, and W. Huang. 1998. Potential impacts of reduced freshwater inflow on Apalachicola Bay, FL oyster (Crassostrea virginica) populations: Coupling hydrologic and biologic models. NOAA/NOS Strategic Environmental Assessments Division, Silver Spring, MD. 58 pp.

Darden, T., D. J. Case, L. Hayes, D. Gjerstad, R. Sutter, C. Bohn, and D. Demarest. 2009. Range-Wide Conservation Plan for Longleaf Pine. America's Longleaf Restoration Initiative. 42 p. <http://www.americaslongleaf.org/media/86/conservation_plan.pdf>.

Edmiston, H.L. 2008. A River Meets the Bay: A Characterizaion of the Apalachicola River and Bay System. Available at: http://www.dep.state.fl.us/coastal/sites/apalachicola/pub/A_River_Meets_the_Bay.pdf Last accessed 8/2016.

Edwards, P.J. and C.A. Troendle. 2012. Water Yield and Hydrology. Chapter 11 in Cumulative Watershed Effects of Fuel Management in the Eastern United States. GTR-SRS-161

Evans, E. 2013. Economic impact of invasive species in Florida. Presented to US DOI Everglades Restoration Invasive Exotic Species Strategic Action Framework Working Group. Available at: https://www.evergladesrestoration.gov/content/ies/meetings/111313/Economic_Impact_of_Invasive_Species_in_Florida.pdf Last accessed 3/2017.

Ewel, K.C. 1990. Swamps. In "Ecosystems of Florida" (R.L Myers and J.J. Ewel eds.). Orlando: University of Central Florida Press. 281-323.

Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW) 2003. A National Early Detection and Rapid Response System for Invasive Plants in the United States. Available at: https://www.fws.gov/ficmnew/FICMNEW_EDRR_FINAL.pdf Last accessed: 2/2017.

Florida Department of Agriculture and Consumer Services (FDAC). 2004. Impacts of drought on oyster resources in Apalachicola Bay. Florida Dept. of Agricultural and Consumer Services, Unpublished report. Tallahassee, Fl.

Florida Department of Environmental Protection (FDEP). 2014. Apalachicola National Estuarine Research Reserve Management Plan. <http://www.dep.state.fl.us/coastal/sites/apalachicola/>.

Florida Department of Transportation (FDOT). 2016. Florida Scenic Highways. Available at: http://floridascenichighways.com/ Last accessed 8/2016

Florida Natural Areas Inventory (FNAI). 2004. Natural Communities and Habitats: Forested Wetlands. <http://www.fnai.org/ARROW/Almanac/biology/biology_wetlands.cfm>.

Ford, C.R., R.J Mitchell, and R.O. Teskey. 2008. Water table depth affects productivity, water use, and the response to nitrogen addition in a savanna system. Can. J. For. Res. 38: 2118-2127.

Friedenberg, N.A., B.M. Whited, D.H. Slone, S.J. Martinson, and M.P. Ayres. 2007. Differential impacts of the southern pine beetle, Dendroctonus frontalis, on Pinus palustris and Pinus taeda. Can. J. of For. Res. 37:1966-1977.

Gholz, H.L., and Fisher, R.F. 1984. The limits to productivity: fertilization and nutrient cycling in coastal plain slash pine forest. In “Forest Soils and Treatment Impacts” (E.L. Stone, ed.). Proc. North Am. For. Soils Conf., 6th, Univ. Tenn., Knoxville, pp. 105-120.

Gordon, D.R. 1998. Effects of invasive, non-indigenous plant species on ecosystem processes: lessons from Florida. Ecological Applications 8 (4), 975-989.

Hinckley, J. and J. Wallace. 2012. Fuels treatments reduce wildfire suppression cost Merritt Island National Wildlife Refuge. Unpublished USFWS technical report. 20 pp. <http://www.fws.gov/southeastfire/documents/FMIR_Fuels_Treatments_Reduce_Wildfire_Report.pdf>.

Hipes, D., D. R. Jackson, K. NeSmith, D. Printiss, and K. Brandt. 2000. Field guide to the rare animals of Florida. Florida Natural Areas Inventory, Tallahassee.

Huffman, J.M. 2006. Historical fire regimes in southeastern pine savannas. PhD dissertation, Louisiana State University, Baton Rouge.

Hughes, G. Hurricane Katrina impacts on pine species: implications for landowners. Mississippi State University Extension Service. <http://www.sref.info/news/articles/hurricane-katrina-impacts-on-pine-species>.

Kolka, R.K. 2012. Effects of fire and fuels management on water quality in eastern North America. In: LaFayette, R., Brooks, M.T., Potyondy, J.P., Audin, L., Krieger, S.L. and Trettin, C.C. Eds. 2012. Cumulative watershed effects of fuel management in the Eastern United States. General Technical Report SRS-161. Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station. 282-293.

Langeland, K.A. and K.C. Burks. 1998. Identification and biology of Non-native Plants in Florida's Natural Areas. Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Pub. No. 257. 166 p.

Light, H.M., Vincent, K.R., Darst, M.R., and Price, F.D., 2006, Water-Level Decline in the Apalachicola River, Florida, from 1954 to 2004, and Effects on Floodplain Habitats: U.S. Geological Survey Scientific Investigations Report 2006-5173, 83 p., plus CD.

Livingston et al. 2000. Modeling oyster population response to freshwater input. Estuarine, Coastal and Shelf Science 50: 655–672.

McLaughlin, D.L., D.A. Kaplan and M.J. Cohen. 2013. Managing forests for increased regional water yield in the southeastern U.S. Coastal Plain. Journal of the American Water Resources Association 49:953-965.

McNulty, S.G., J.M. Bose, and W.T. Swank. 1996. Potential climate change effects on loblolly pine productivity and hydrology across the southern United States. Ambio. 25(7): 449-453.

McNulty, S.G. 2002. Hurricane impacts on U.S. carbon sequestration. Environmental Pollution 116: S17-S24.

Myers, C.F., Meek, J., Tuller, S., & Weinber, A. (1985). Nonpoint sources of water pollution. Journal of Soil and Water Conservation, 40, 14–18.

Northwest Florida Water Management District (NWFWMD), 2010. THSF Hydrologic Restoration Plan- Volumes I and II. Available at: http://nwfwmdwetlands.com/index.php?Page=30

Peet, R.K., and D.J. Allard. 1993. Longleaf pine-dominated vegetation of the southern Atlantic and eastern Gulf Coast region, USA. Proceedings, Tall Timbers Fire Ecology Conference 18. Tallahassee, FL: Tall Timbers.

Pest Exclusion Advisory Committee. 2001. Report prepared by the Pest Exclusion Advisory Committee, submitted to the Honorable Terry L. Rhodes, Florida Commissioner of Agriculture. 88 p.

Pimentel, D., R. Zuniga and D. Morrison. 2005. Update on the environmental and economic costs associated with alien-invasive species in the United States. Ecological Economics 52 (2005) 273– 288.

Rains, L. 1993. Apalachicola River and Bay land use and land cover assessment. Northwest Florida Water Management District. Quincy, Fl. 47 Pages.

Riekerk, H. 1989. Influence of silvicultural practices on the hydrology of pine flatwoods in Florida. Water resources research 25:713-719.

Smith, M.C. 2007. Long-term change in hydrology, tree growth and forest composition along the Apalachicola River. Electronic Theses, Treatises and Dissertations. Paper 349. <http://diginole.lib.fsu.edu/etd/349>.

Sun, G., S.G. McNulty, J.A. Moore Myers, and E.C. Cohen. 2008. Impacts of Multiple Stresses on Water Demand and Supply across the Southeastern United States. Journal of American Water Resources Association 44(6):1441-1457.

Sun, G., M. Riedel, R. Jackson, R. Kolka, D. Amatya and J. Shepard. 2004. Influences of management of southern forests on water quantity and quality, pp. 195-224 In Rauscher, H.M. and K. Johnsen, eds., Southern forest science: past, present, and future.

Stein BA, Kutner LS, and Adams JS, editors. 2000. Precious Heritage: The Status of Biodiversity in the United States. New York: Oxford University Press. 416 p.

Thatcher, R.C. and P.J. Barry. 1982. Southern pine beetle. Forest and disease leaflet No. 49. U.S. Department of Agriculture Forest Service. 7pp.

Ulanowicz, R.E. and Tuttle, J.H. 1992. The trophic consequences of oyster stock rehabilitation in Chesapeake Bay. Estuaries 15: 298

University of Florida (UF). 2013. Apalachicola Bay Oyster Situation Report. <http://www.flseagrant.org/wp-content/uploads/tp200_apalachicola_oyster_situation_report.pdf>.

Ursic, S. J. 1969. Hydrologic effects of prescribed burning on abandoned fields in northern Mississippi. Research Paper SO-46. New Orleans, LA, USDA Forest Service, Southeastern Forest Experiment Station.

USDA Forest Service. 2011. National report on sustainable forests – 2010. FS-979 214 p.

Wilcove, D.S., D. Rothstein, J. Bubow, A. Phillips and E. Losos. 1998. Quantifying Threats to Imperiled Species in the United States. Bioscience 48 (8), 607-615.

Acronym Index

Acronym	Full Description
ABRER	Apalachicola Bay Regional Ecosystem Restoration project
ANF	Apalachicola National Forest
ARSA	Apalachicola Regional Stewardship Alliance
ARWEA	Apalachicola River Wildlife and Environmental Area
ARWMA	Apalachicola River Water Management Area
DEP	Florida Department of Environmental Protection
DOD	Department of Defense
EQIP	Environmental Quality Incentives Program
FFS	Florida Forest Service
FWC	Florida Fish and Wildlife Conservation Commission
FWS	US Fish and Wildlife Service (US Department of Interior)
LIT	local implementation team
MOU	memorandum of understanding
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NWCG	National Wildfire Coordinating Group
NWFWMD	Northwest Florida Water Management District
THSF	Tate’s Hell State Forest
TNC	The Nature Conservancy
USFS	US Forest Service (US Department of Agriculture)
WUI	wildland urban interface