TREASURES OF THE SOUTH

THE TRUE VALUE OF WETLAND FORESTS

Report Author: Sam L. Davis, PhD
Research Provided By: Key-Log Economics

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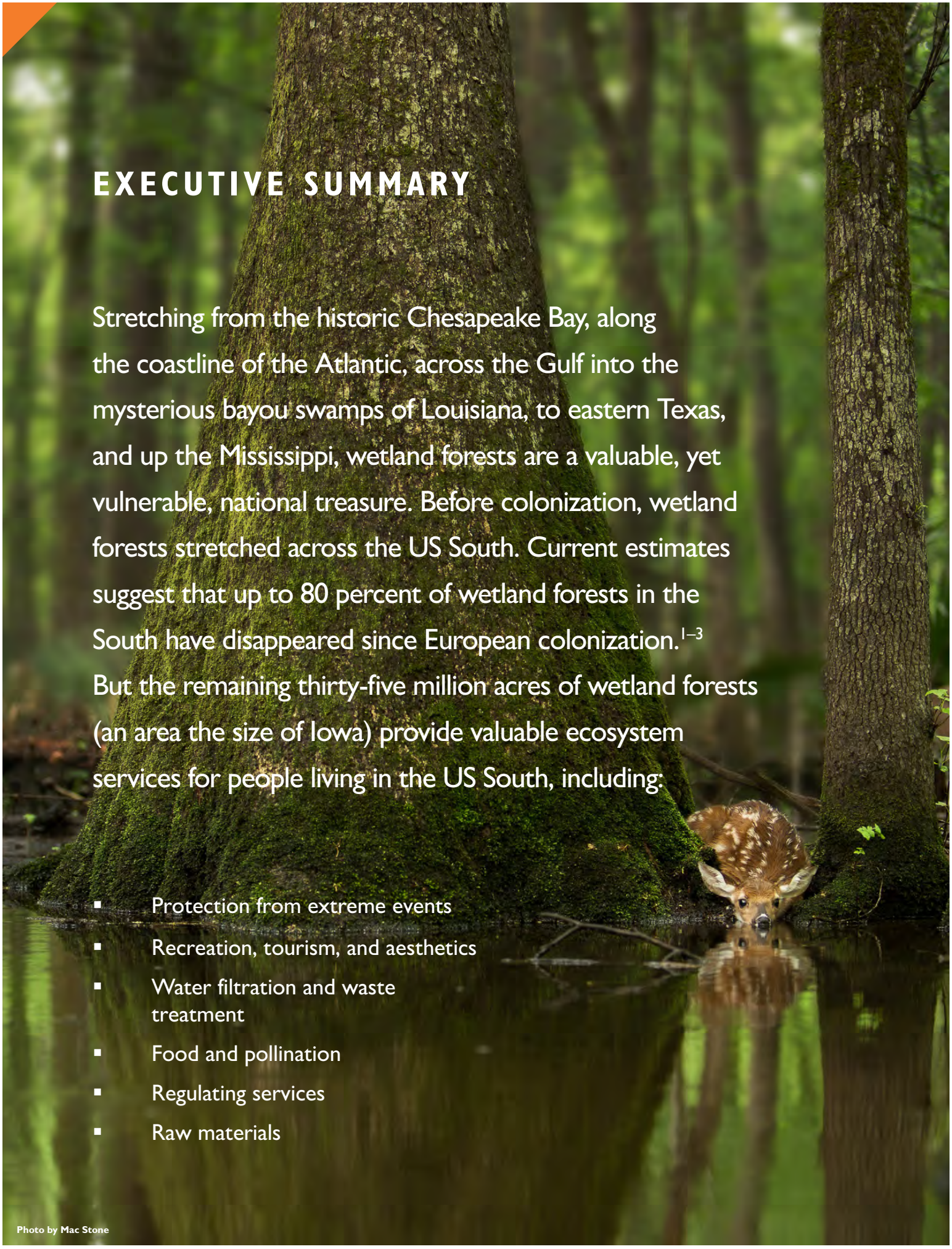


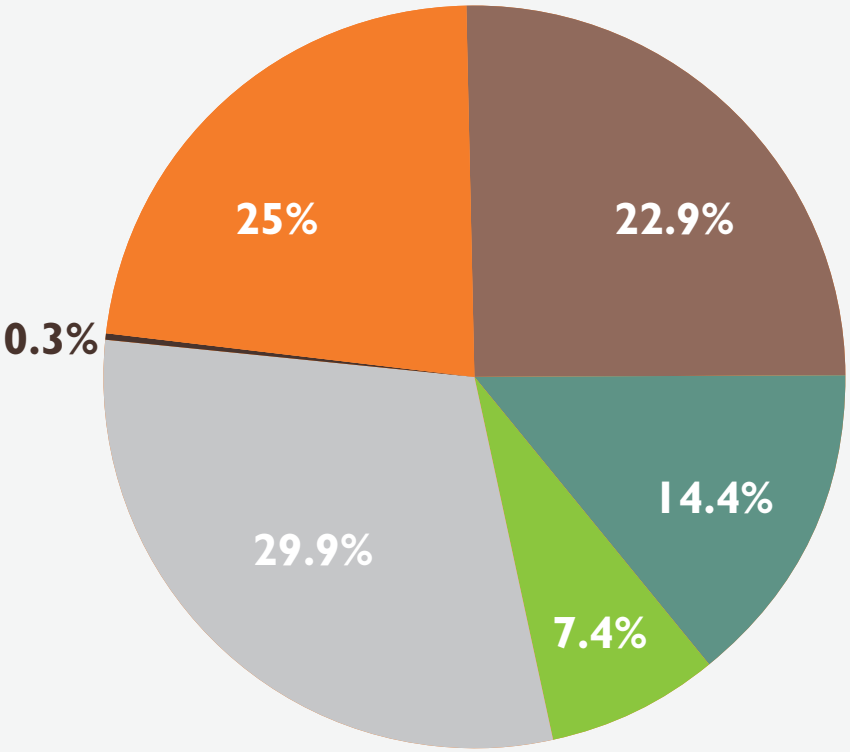
EXECUTIVE SUMMARY

Stretching from the historic Chesapeake Bay, along the coastline of the Atlantic, across the Gulf into the mysterious bayou swamps of Louisiana, to eastern Texas, and up the Mississippi, wetland forests are a valuable, yet vulnerable, national treasure. Before colonization, wetland forests stretched across the US South. Current estimates suggest that up to 80 percent of wetland forests in the South have disappeared since European colonization.[1–3] But the remaining thirty-five million acres of wetland forests (an area the size of Iowa) provide valuable ecosystem services for people living in the US South, including:

- Protection from extreme events
- Recreation, tourism, and aesthetics
- Water filtration and waste treatment
- Food and pollination
- Regulating services
- Raw materials

Photo by Mac Stone

- Recreation, tourism, and aesthetics | 25%
- Water filtration and waste treatment | 22.9%
- Food and pollination | 14.4%
- Regulating services | 7.4%
- Raw Materials | 0.3%
- Protection from extreme events | 29.9%



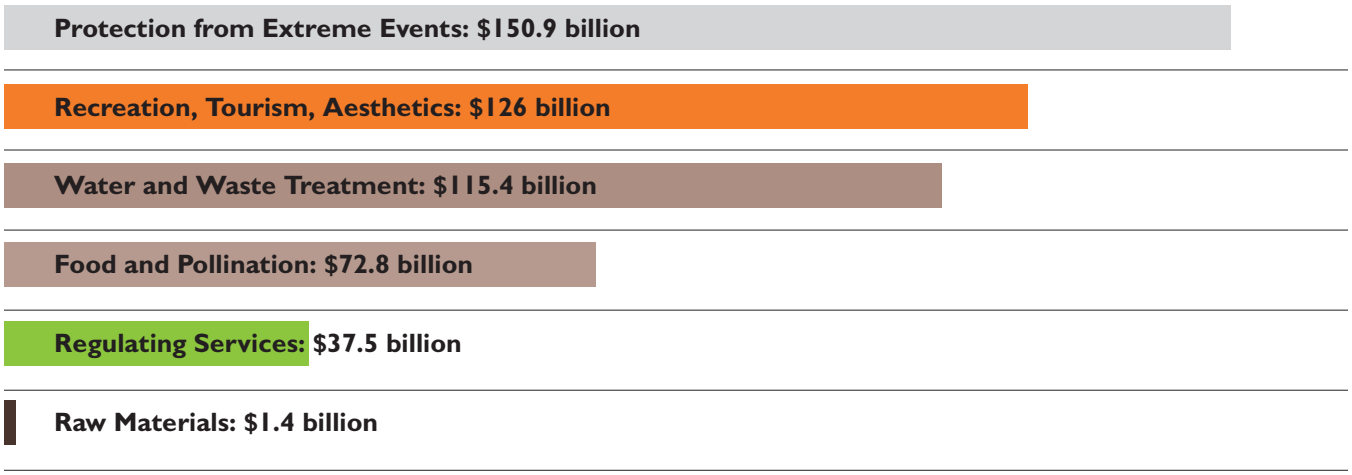
Over $500 Billion

Wetland forest ecosystem services are worth more than $500 billion.

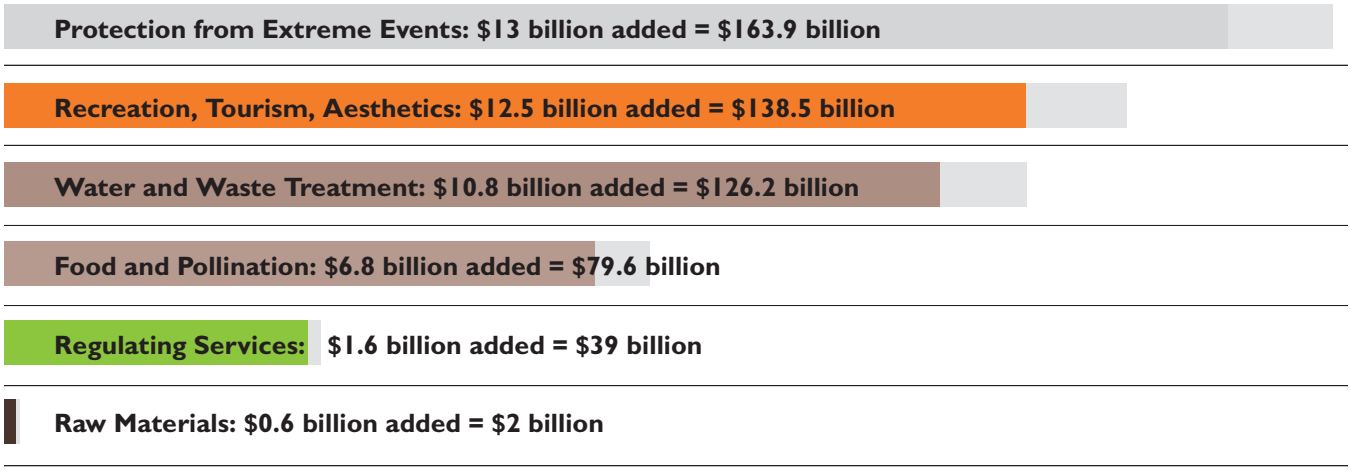
But wetland forests are constantly under threat by external forces, including demand for timber, conversion to intensively managed plantations or agriculture, urban expansion, invasive species, pollution, sea-level rise, and climate change. Over the next thirty years, how will we protect the valuable services our southern wetland forests provide? What can we gain if we do the right thing? And what do we stand to lose if we do not invest in our forests?

We investigated how the value of wetland forests in the US South would increase if we protected more land, extended natural riparian buffers, and managed forests more responsibly.

Our wetland forests are currently worth $503.8 billion. Here's the breakdown, by category:



If we invested in conservation, our wetland forest worth would increase by $45.3 billion to $549.1 billion total. Here's the breakdown, by category:



What Could We Gain?

Through this analysis, we found that by

- protecting an additional thirteen million acres of Southern wetland forests
- expanding riparian buffers to 150 feet
- retaining two-thirds canopy cover when logging

Our Southern wetland forests would be worth $45.3 billion more than their current value.

This includes gains in

- protection from extreme events and water flow regulation—$13 billion
- recreation, tourism, and aesthetics—$12 billion
- waste treatment and water supply—$10.5 billion
- food and pollination—$7.2 billion
- regulating services: air quality, regional climate regulation, erosion control, and soil formation—$1.6 billion
- raw materials—$603 million

By shifting the focus of management from timber production to native ecosystem health, wetland forests increase over fifteen times in value from about $1,200 per acre to $18,600 per acre.

What Could We Lose?

Without investing in our wetland forests, we may be reducing our communities' abilities to flourish economically and thrive in a changing climate.

Disaster Readiness

Improving wetland forests is essential to mitigating the increasingly severe impacts of natural disasters on the US South. Over three hundred hurricanes made landfall along the Atlantic and Gulf coasts between 1851 and 2004.[4] Scientists have established that healthy wetland forests minimize the impacts of hurricanes because they quickly absorb more water than pavement or lawns and slow down water on the way to estuaries. Two of the world's most expensive natural disasters in 2016 occurred in the US South.[5] Hurricanes Harvey and Irma, in late 2017, are both expected to cost over $100 billion in damages each by the time recovery efforts are complete—meaning that the US South is on track to claim the most expensive disaster title for a second year in a row.[6]

Scientists have established that healthy wetland forests minimize the impacts of hurricanes because they quickly absorb more water than pavement or lawns and slow down water on the way to estuaries.

Carbon and Climate

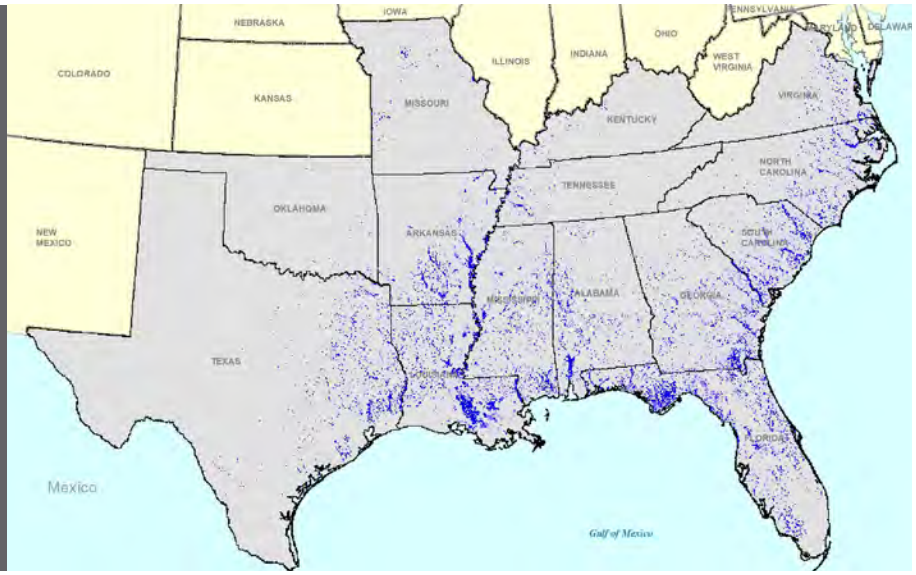
Southern wetland forests are some of the most carbon-rich ecosystems in the US and currently store 1.64 billion megagrams of carbon in their trees. Without this carbon storage, the impacts of climate change would be even more severe. **The benefits of carbon sequestration, especially in mitigating climate change, are dispersed throughout multiple ecosystem service valuation categories.** Wetland forests also improve regional climate. Wetland forests are cooler (in temperature) than non-forested landscapes, both locally and across regionwide scales.[7] A region without forests is hotter and drier than a region with thriving wetland forests.

Wildlife and Species Richness

Less than 10 percent of wetland forests in the US South are currently protected from logging, agriculture, housing developments, or development into parking lots. These wetland forests house many endemic and rare species of plants and animals, including Florida nutmeg and pondberry, alongside Louisiana black bears, hellbenders, and swallow-tailed kites. Most of our fourteen-state focus region was designated a global biodiversity hotspot in 2016.[8]

In fact, the US South has many more species of birds, amphibians, reptiles, fish, and trees than other parts of the country.[9] Unfortunately, the number of locally extinct species doubled from 2002 to 2011 in the South, primarily driven by bird and mammal extinctions.[10] Without protecting more of this unique habitat, we risk losing the nation's wildlife treasures and degrading our ecosystem services.

There are 1,643,090,000 megagrams of carbon stored in the region's wetland forests.

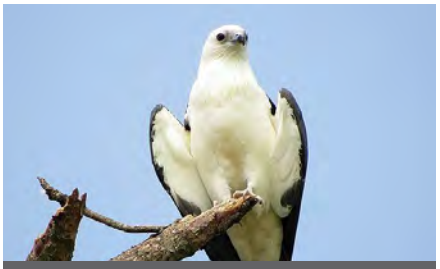


Vanishing Wetland Forest Animals

The following wetland-dependent vertebrates were identified as locally extirpated between 2002 and 2011 in parts of the US South:[10]

Dusky gopher frog
Extirpated from Alabama & Louisiana

American coot
Extirpated from South Carolina

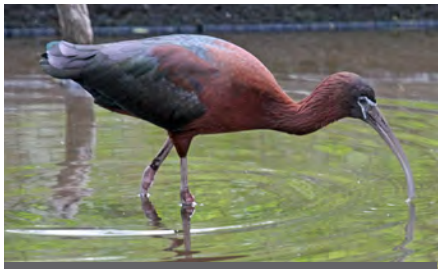


Swallow-tailed kite
Extirpated from Oklahoma

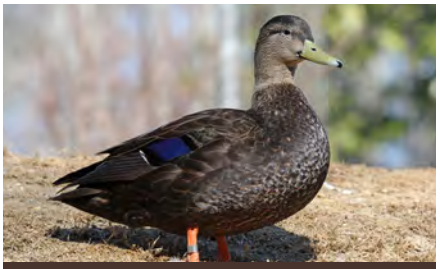
American bittern
Extirpated from Kentucky

Wood stork
Extirpated from Texas

White-faced ibis
Extirpated from Alabama



Glossy ibis
Extirpated from Arkansas & S. Carolina



American black duck
Extirpated from Florida

Northern myotis
Extirpated from Mississippi

Indiana myotis
Extirpated from Kentucky

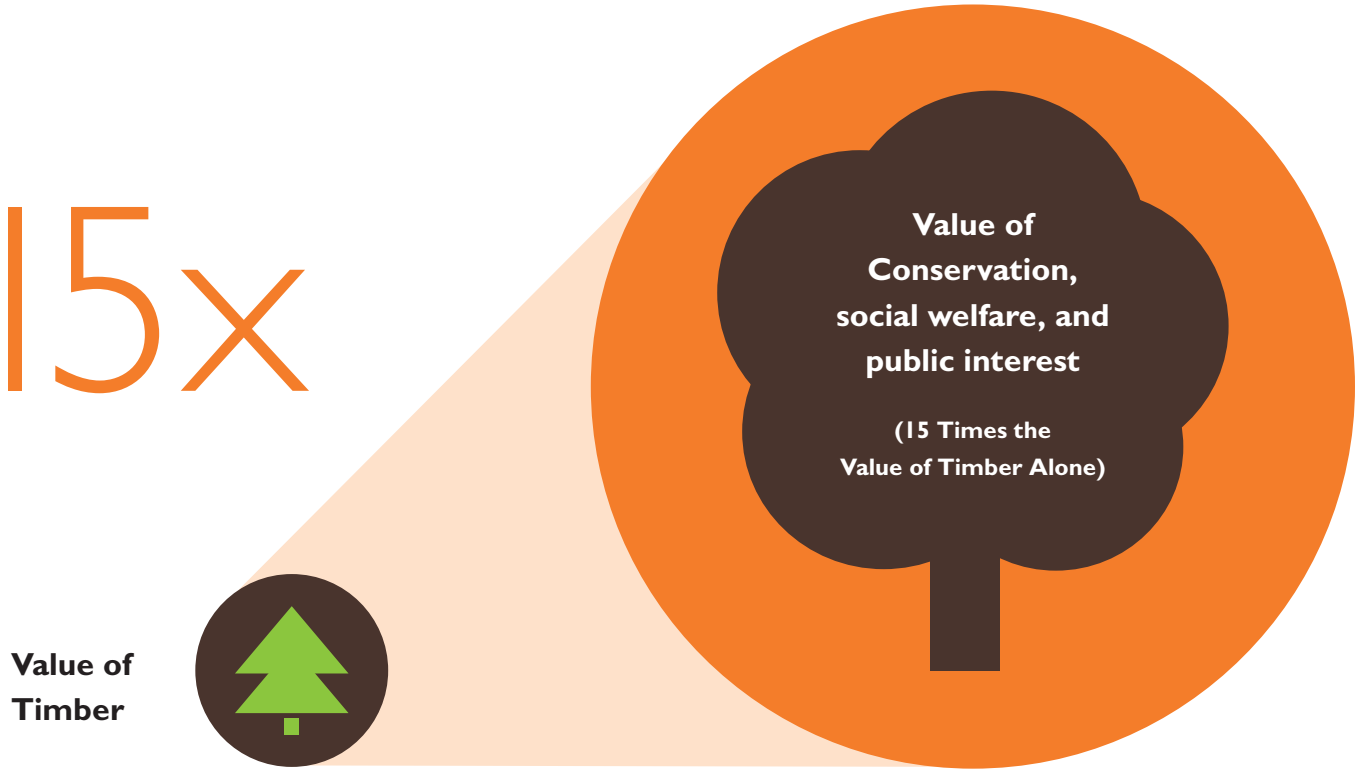
River frog
Extirpated from North Carolina

Economic Opportunities

In 2011, nearly twenty-five million people in the US South went out to observe nature and wildlife, and nearly fifteen million people hunted or fished; these activities contributed $48 billion to the states' economies.[11] Natural areas and recreation are important to residents and tourists alike. If wetland forests, both private and public, are not highlighted as an asset, states may lose out on valuable economic opportunities.

The forest products industry is very sensitive to booms and busts of the global economy. Although product output has steadily increased, the number of primary wood processing mills has decreased since the 1970s. In a five year period, from 2004 to 2009, the South lost an estimated 20 percent of total jobs associated with the wood products industry.[12] As forest product industry employment continues to decline due to automation, states are faced with an opportunity to redirect those skilled workers to industries such as restoration, management, and ecotourism.

The United States has failed to recognize the full economic value of standing wetland forests. **The value from conservation and public interest benefits is fifteen times larger than the timber value of these forests.**[1] As an example, ecosystem services of wetland forests are not considered in local economic development decisions, such as where to place a new wood pellet export or pulp mill.



Local Implementation, Global Implications

The US South is not the first place that comes to mind when thinking about global efforts to save wildlife or combat climate change. But the US is home to over four hundred mammal species, six hundred reptile and amphibian species, eight hundred bird species, one thousand fish species, and over one hundred thousand insect species.[13–15] This immense biodiversity already brings international visitors to our national parks and wildlife areas. With dedicated conservation efforts, Southern wetland forests have the potential to draw more visitors and improve the economy.

The US has the potential to do much more to combat climate change than simply reduce fossil fuel usage. Standing forests are the only proven terrestrial system that can store vast amounts of carbon at the scale necessary to keep global temperature rise below 1.5 degrees Celsius.[16] Protecting Southern wetland forests could ensure that some of the 1.64 billion megagrams of carbon already sequestered remains safe in the forest, and even more carbon dioxide could be removed from the atmosphere each year. Improving carbon sequestration in wetland forests magnifies their value across many ecosystem service categories. The alternative is ever-accelerating rates of climate change, with huge and mostly negative implications for the global economy.


Photo by Mac Stone

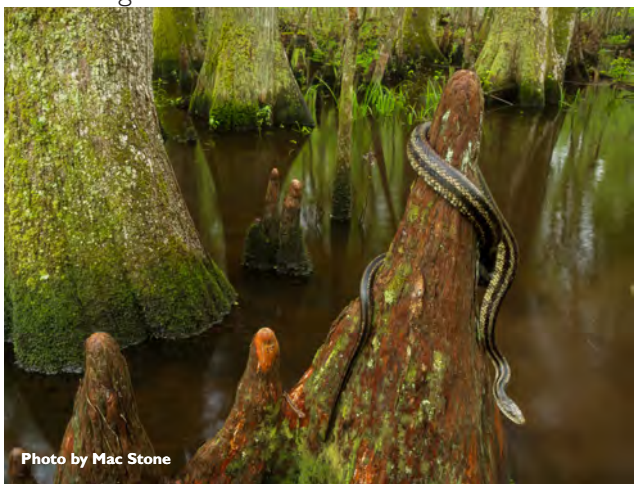


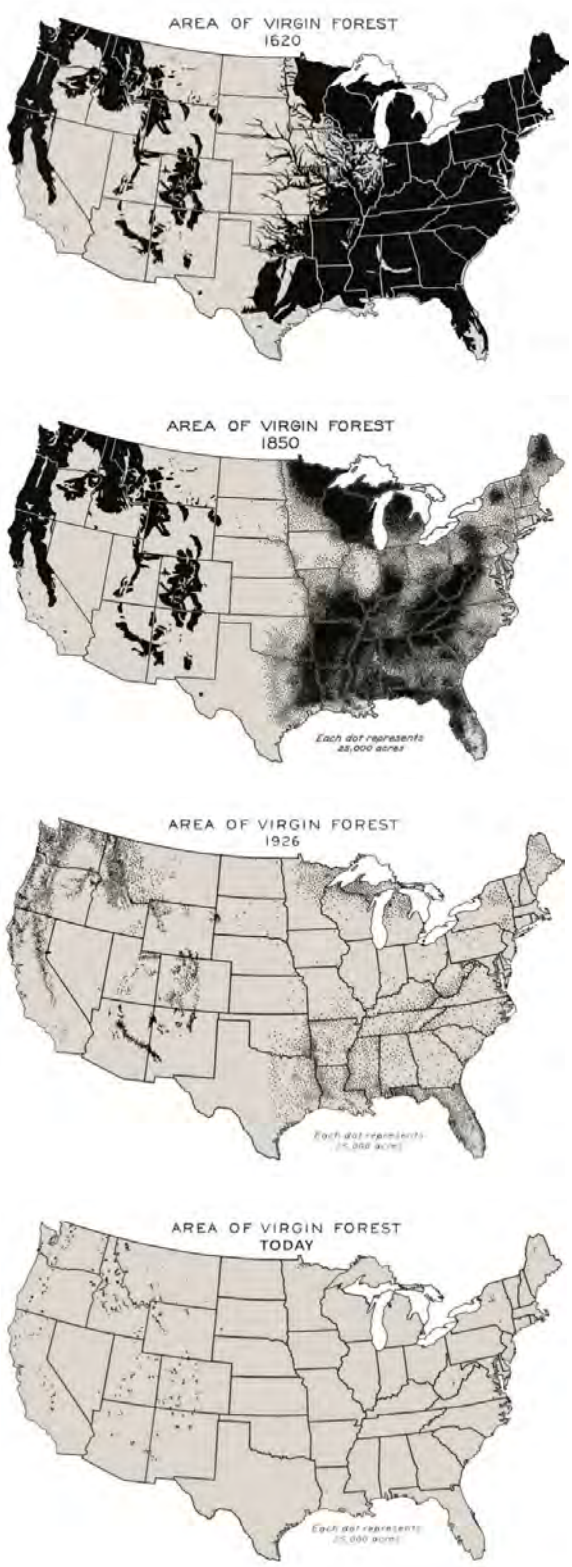
Photo by Mac Stone

In this report, we try to quantify the economic value of intact wetland forests for surrounding communities. At the end of this report, we provided a state-by-state breakdown of the values already provided by wetland forests and what states could gain by investing in conservation of their wetland forest treasures. We hope that this report will encourage Southern states and local governments to conserve wetland forests.

CONTEXT

Stretching from the historic Chesapeake Bay, along the coastline of the Atlantic, across the Gulf, into the mysterious bayou swamps of Louisiana, to eastern Texas, and up the Mississippi, wetland forests are a valuable, yet vulnerable, national treasure. Wetland forests—any forest that is submerged for part of the year—provide many ecosystem services to surrounding communities, including carbon sequestration, biodiversity, flood protection, and clean water.[1,17] Carbon sequestration, in particular, is essential to combating global climate change.

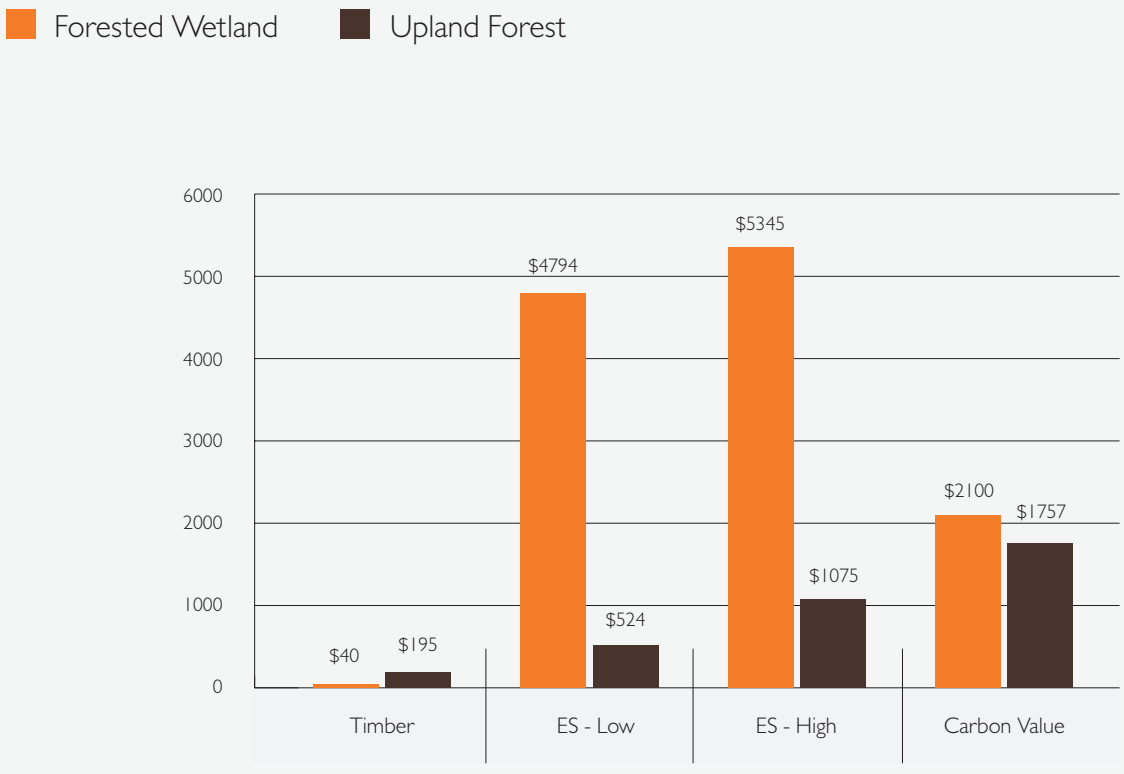
Before colonization, wetland forests stretched across the US South. Between 1780 and 1980, the conterminous United States lost nearly half of its wetlands.[18] Another estimate identified that 16 percent of forested wetlands in the US South were lost in just twenty years, from 1950 to 1970.[19] All told, current estimates suggest that between 50 and 80 percent of wetland forest habitat in the South is now gone.[1,3] The thirty-five million acres remaining are young, fragmented, and under threat from logging (38% loss from 2004 to 2009), agriculture (13% loss from 2004 to 2009), and urban development (26% loss from 2004 to 2009).[20] But even in their fragmented state, these forests provide immense value to surrounding communities. In this report, we try to quantify the economic value of intact wetland forests for surrounding communities.



There is no doubt that forests are an essential natural resource, but putting a dollar value on forests is a somewhat new endeavor. Researchers quantify the value of natural systems by evaluating their "ecosystem services"—the important benefits for human beings that arise from healthy functioning ecosystems, notably production of oxygen, soil genesis, and water detoxification. Some ecosystem services, like timber production and wildlife viewing, are easy to consider, but others, like aesthetics, are more tenuous.

Scientists who study ecosystem services frequently conduct their research on a small scale, at the site or county level. Studies like these have shown that **wetland forests provide twice the value of upland pine forests** in many categories of ecosystem services, including wildlife habitat, pollution treatment, flood control, and water supply for downstream communities.[17] They also provide a significant increase in carbon sequestration.[17]

$ per hectare per year by forest type in Georgia (Schmidt et al. 2014)

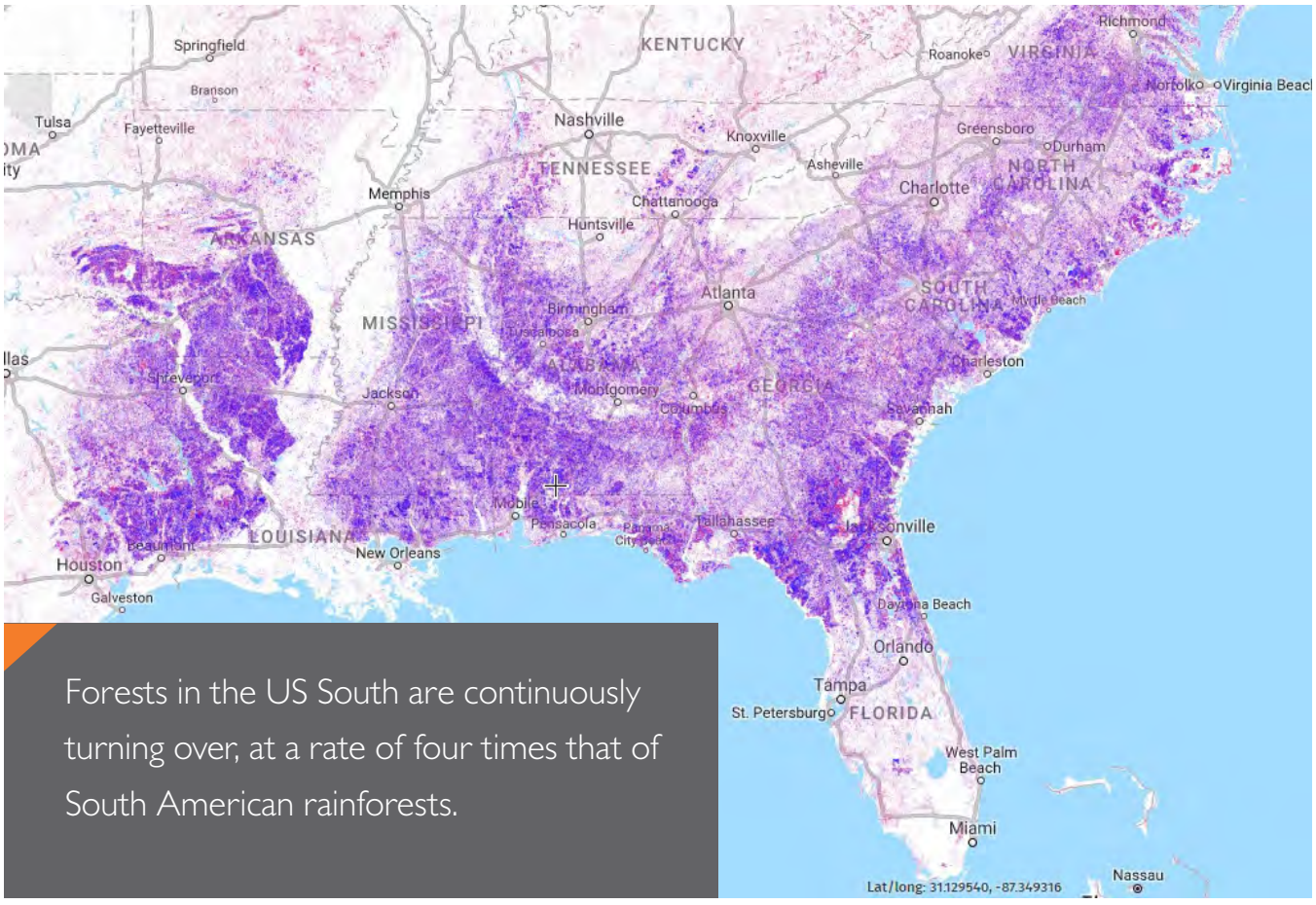


Wetland forests provide more ecosystem service (ES) worth than upland forests in Georgia, while generating significantly less revenue in timber.

Logging Wetland Forests is a Waste of Ecosystem Services

The US South is an industrial forest landscape. Since 1953, pine plantations have been steadily increasing by over six hundred thousand acres annually in the US South, often at the expense of natural forest.[16,21] Pine plantations in the US South are estimated to be over forty million acres, nearly 20 percent of the total forested land in the region.[16,21] The US South only has about 2 percent of the world's forest cover, but regularly produces over a fifth of its forest products. It is not surprising that satellite imagery has shown that the US South is logged at four times the rate of South American rainforests.[22]

Most forests in the US South are often valued primarily for their timber. This mindset is especially flawed when it comes to wetland forests. Wetland forests, naturally difficult to traverse with logging equipment, frequently contain trees considered to be "low quality" or "waste wood" by forest products companies. The twisted, knotted, and fluted trunk trees are considered suitable only for chips, pellets, or pulp. **One report estimates that the 2010 market value for wetland forest ecosystem services in the Mississippi Alluvial Valley was only about $28 per acre because current markets do not fully value non-timber products.[23]** Wetland forests are simply not as valuable for timber as they are for their ecological services.



Forests in the US South are continuously turning over, at a rate of four times that of South American rainforests.

Failing to recognize the full economic value of standing wetland forests has resulted in their ongoing destruction and degradation. These ecosystem services are not currently being considered in local economic development decisions; therefore, "economic development opportunities," like new wood pellet export mills, are not being evaluated for their full potential impacts to the local community, e.g., degradation and loss of nearby wetland forests. **The ecosystem service value is fifteen times larger than the timber value alone of these forests.**

In rural counties, forested areas benefit communities because they provide tax revenue without requiring community services like roads, sewer, and ambulance/fire.[24] Wetland forests in particular are known to provide twice the ecosystem services value of upland pine forests in flood protection, wildlife habitat, and other provisioning services.[17] Wetland forests are also essential habitat for wildlife, including migratory birds and waterfowl.

Wetland Forests Are a Public Service

Birds are more than pretty—they also provide real economic value to communities. Hunters generate hunting license and duck stamp revenue as well as provide private economic benefit to landowners through hunting leases where applicable. When hunted, waterfowl provide meat, down and feathers, and grease for waterproofing. Birdwatchers spend money in local restaurants and gear shops and sell art they create. Birds eat mosquitoes and other pests, accelerate the nutrient cycle, and disperse seeds for trees and plants.[25] If you need a hard number for the value of a bird, you can look at the fines levied on companies that accidentally kill them, which in one instance was over $1,800 per duck.[26]

Wetland forests provide essential benefits to surrounding communities. For example, nearly fifty million people in the US South, 40 percent of the total US South population, rely on water filtered through forests.[27] During storms, forests can absorb up to twenty times more water than parking lots and roads.[3] Wetland forests are also frequently the only buffers between our water supply and disturbances like development, agriculture, or timber harvest.[28]

Wetland Forests Help Us Mitigate Devastating Impacts of Climate Change

Over the next century, the US South is expected to get hotter and drier, with severe impacts on economic output, agricultural yields, access to clean and stable water supplies, and even mortality rates.[29] Hurricanes have intensified over the last thirty years and are expected to continue to cause more damage.[30] But wetland forests can be a critical tool for resiliency in the face of climate change.

Wetland forests are some of the most carbon-rich ecosystems in the United States. The US has the potential to do much more to combat climate change than simply reducing fossil fuel usage. Standing forests are the only proven terrestrial system that can store vast amounts of carbon at the scale necessary to keep global temperature rise

below 1.5 degrees Celsius.[16] Protecting Southern wetland forests could ensure that some of the 1.64 billion megagrams of carbon already sequestered remains safe in the ground, and even more carbon dioxide could be removed from the atmosphere each year. Increasing carbon sequestration in wetland forests is an important way to mitigate global climate change. The alternative is ever-accelerating rates of climate change, with huge and mostly negative implications for the global economy.

Not to mention, forested landscapes are cooler in temperature than non-forested landscapes.[7] Healthy wetland forests are able to quickly absorb more water than pavement or lawns.[31] A recent analysis showed that mid-Atlantic communities were able to save $625 million in avoided damages during Hurricane Sandy because of their coastal wetlands.[32] By investing in wetland forests, we can help mitigate some of the worst impacts of hurricanes.

Our Conservation Future

In this study, we used existing ecosystem service studies to estimate the value of the US South's wetland forests. First, we determined the current value of wetland forests in our fourteen-state region (Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia). Then we envisioned a future in 2050 where communities in the US South invested in conservation of their wetland forests.

We chose to change three things between the baseline and our conservation scenario: the protection of thirteen million acres of wetland forests, increased water buffers, and improved wetland forest management. Our conservation scenario defines protected lands as those that emphasize preservation over natural resource extraction. Our conservation scenario increases the size of forested riparian buffers between streams or rivers and human activity (timber harvest, agriculture, development) from an average of 50 feet to 150 feet. Finally, our conservation scenario favored maintaining a 66 percent canopy cover in improved wetland forest management areas.

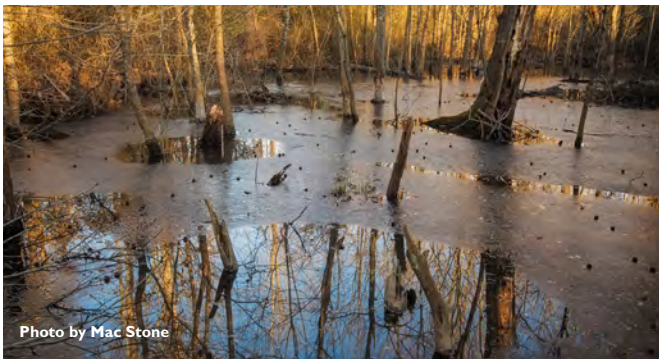
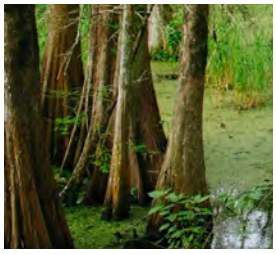


Photo by Mac Stone

Note: The benefits of carbon sequestration, especially in mitigating climate change, are ubiquitous throughout the various ecosystem service valuation categories.

Protection from Extreme Events

- Protection from Extreme Events: Preventing and mitigating impacts on human life, health, and property by attenuating the force of wind, extreme weather events, floods, etc.
- Water Flows: Regulation by land cover of the timing of runoff and river discharge, resulting in less severe drought, flooding, and other consequences of too much or too little water available at the wrong time or place.



Recreation, Tourism, and Aesthetics

- Aesthetic Value: The role that beautiful, healthy natural areas play in attracting people to live, work, and recreate in a region.
- Recreation: The availability of a variety of safe and pleasant landscapes, such as clean water and healthy shorelines, that encourage ecotourism, outdoor sports, fishing, wildlife watching, hunting, etc.

Water Supply and Water Treatment

- Water Supply: Filtering, retention, storage, and delivery of fresh water—both quality and quantity—for drinking, watering livestock, irrigation, industrial processes, hydroelectric generation, and other uses.
- Waste Treatment: Improving soil and water quality through the breakdown and/or immobilization of pollution.

Food and Pollination

- Pollination: Contribution of insects, birds, bats, and other organisms to pollen transport, resulting in the production of fruit and seeds. May also include seed and fruit dispersal.
- Food Production: The harvest of agricultural produce, including crops, livestock, and livestock by-products; the food value of hunting, fishing, etc.

Regulating Services

- Air Quality: Removing impurities from the air to provide healthy, breathable air for people.
- Regional Climate Regulation: Keeping regional/local climate (temperature, humidity, rainfall, etc.) within comfortable ranges.
- Erosion Control: Retaining arable land, stabilizing slopes, shorelines, riverbanks, etc.
- Soil Formation: Creation of soil, inducing changes in depth, structure, and fertility, including through nutrient cycling.

Raw Materials

- Raw Materials: Fuel, fiber, fertilizer, minerals, and energy.

OTHER TERMS USED IN THIS REPORT

Conversion: When a natural forest is converted to plantation or non-forest use, e.g., agriculture or development.

Forest Management: Guiding forests to desired outcomes. Forest management often includes fertilization, logging, thinning, spraying herbicides or pesticides, controlled burning, and other techniques.

Natural Forest: A forest that is not a planted monoculture, which is usually intended for forest products or other economic outputs.

Plantation: A planted monoculture of trees, usually intended for forest products or other economic outputs. In the South, plantations are predominantly loblolly or slash pine.

Thinning: Selectively logging a forest with the intentions of improving spaces between trees, removing diseased trees, etc.

Wetland Forest: Any forest that is seasonally or permanently submerged in water. See methods for technical definition of acres of wetland forest.

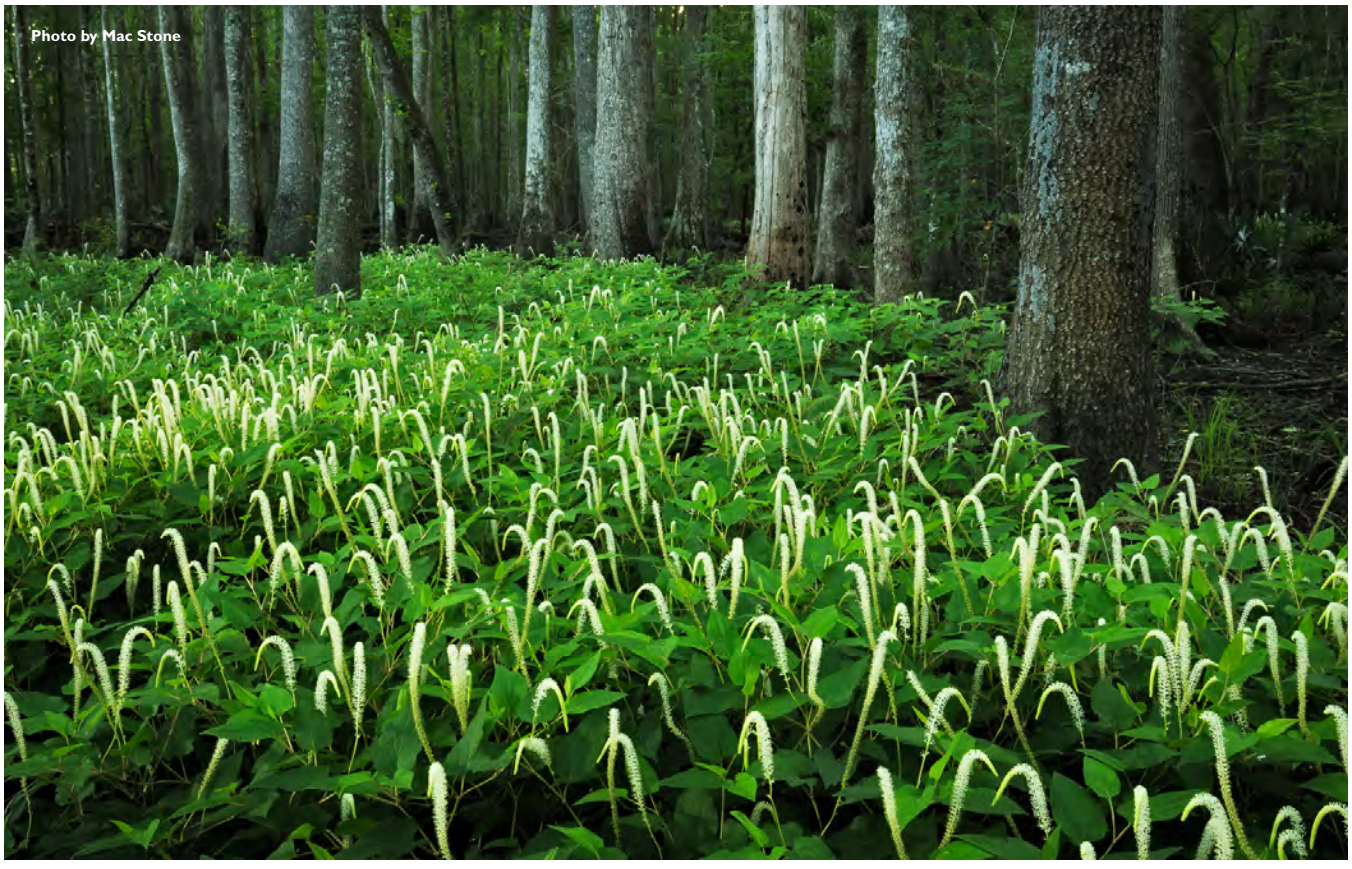


Photo by Mac Stone

THE CONSERVATION SCENARIO

This report describes two scenarios for our wetland forests and the differences between them. The present-day value is referred to as the "baseline," and our idealized future is the "conservation" scenario. This section discusses the conservation scenario.

Why Protection?

We need standing forests to protect us from natural disasters and the worst effects of climate change. Every time a forest is cut down for timber, we prevent our forests from filtering water, absorbing carbon, and removing pollutants from the atmosphere. We identified "protected" forests as those classified by the US Geological Survey as "GAP" 1 or 2. Forests in these categories cannot be mined or logged, which means that they can continue absorbing carbon and providing other ecosystem services. We identified the lands that we wanted to protect by using the Southeast Climate Adaptation Strategy.[33] This existing map identified about thirteen million acres of high priority wetland forests in need of conservation.

Why Buffers?

Although most states encourage natural buffers (frequently referred to as Streamside Management Zones, SMZs, or Best Management Practices, BMPs), buffers are not legally required. Additionally, the best management practices laid out by states do not maximize the ecosystem services that could be provided by natural buffers. For example, although North Carolina only suggests a minimum 50-foot buffer during harvests, riparian buffers with widths of 100 feet to 165 feet have been found to reduce total nitrogen loadings to streams by as much as 85 percent or more.[28] Focusing on riparian buffers is a good way to maximize the value of wetland forests without having to identify priority conservation areas.

Every time a forest is cut down for timber, we prevent our forests from filtering water, absorbing carbon, and removing pollutants from the atmosphere.

Why Improved Management?

Traditional forest harvests frequently use clearcuts because they are simple to plan, reduce operating costs, and help regenerate fast-growing, commercially desirable species. But clearcuts create unnaturally large gaps in forest cover, reducing habitat for sensitive forest creatures that rely on a closed forest canopy for food and shelter. Ecological harvests maintain forest canopy for birds, butterflies, and other flora or fauna that might need it. They also reduce impacts on water quality during harvesting. Several guides to wetland forest management recommend that two-thirds of the forest canopy be retained.[34,35] As a result, our "improved wetland forest management" category was defined as stands that maintain at least 66 percent canopy cover. The areas were initially identified as 2 percent of unprotected, high-canopy cover lands in our spatial analysis.

REGIONWIDE HIGHLIGHTS AND IMPLICATIONS

Thirty-five million acres of wetland forests stretch across the US South. Even in a fragmented, degraded state, **these wetland forests supply over $500 billion in ecosystem services.** Just over 2.8 million acres of wetland forest (an area roughly the size of Connecticut) are currently protected from logging, mining, and development in the US South. This protected habitat provides over $18,000 per acre in life-supporting ecosystem services.

Approximately 30 percent of the total ecosystem service value comes from both protection from extreme events and water flow regulation. Together, aesthetics and recreation are another 25 percent of the total, followed closely by waste treatment and water supply at 23 percent. The balance of ecosystem service value is delivered as food, pollination, air purification, regional climate regulation, erosion control, soil formation, and raw material (timber).

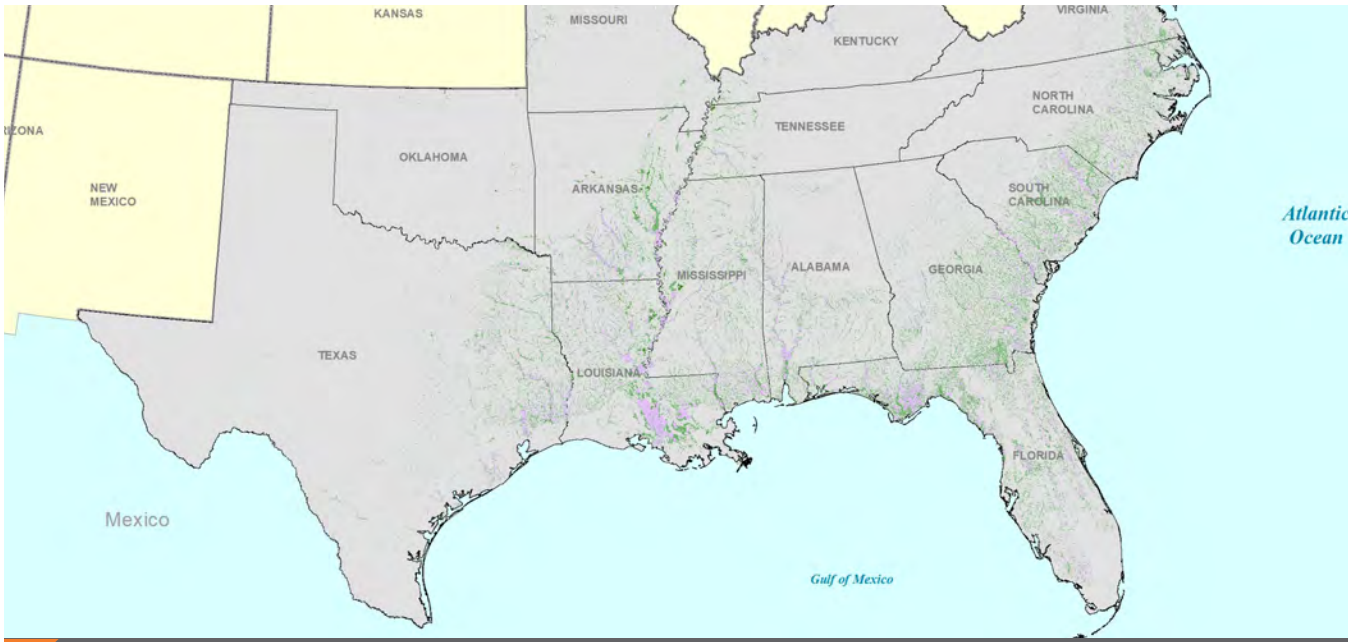
When acres of wetland forest are in the improved wetland forest management category instead of the intensive/industrial forest management category, their value increases dramatically. When an acre of wetland forest is managed for timber, it is worth about $1,200 per acre, but, when an acre of wetland forest is managed for native ecosystem health, it is worth $18,600.

Simply shifting the focus of management from timber production to native ecosystem health and production increases the value of wetland forests over fifteen times.

In the conservation scenario, we modeled a five-fold increase in the amount of wetland forest protected from commercial interests. The thirteen million acre increase in protected wetland forests represents an area larger than Maryland. Those protected areas were chosen from high-priority areas identified by the Southeast Conservation Adaptation Strategy (SECAS). By protecting valuable wetland forests, we would be able to generate an additional $45.3 billion in ecosystem service values.

With our projected increase in lands protected by the creation of slightly larger streamside buffers, we would allow 3.7 million acres of wetland forest to continue absorbing carbon and filtering water, an increase in ecosystem services value of $67.3 billion. **The combined increase in lands off-limits to commercial interests from buffers and high-priority wetland forests is the primary source of the increase in ecosystem service value.**

When wetland forests are only valued for their timber, they can be worth as little as $28 per acre. But, when wetland forests are valued for their full set of ecosystem services, they may be worth as much as $18,600 per acre.



The region currently has thirty five million acres of wetland forest (green). This project has highlighted another potential thirteen million acres (purple) to be conserved in the future.

PROTECTION FROM EXTREME EVENTS

Why It Matters

Hurricane Matthew, which struck the Carolinas, and the Baton Rouge, Louisiana, floods were two of the world's most expensive natural disasters in 2016, each totaling $10.3 billion in damages.[5] Hurricanes Harvey and Irma, in late 2017, are both expected to cost over $100 billion in damages each by the time recovery efforts are complete—meaning that the US South is on track to claim the title for world's most expensive natural disasters for the second year in a row.[6] The South is routinely hit by major natural disasters, notably hurricanes but also floods and wildfires. We need to prioritize "natural infrastructure" like wetland forests that will help prevent and reduce damages from hurricanes and flooding.

What It's Worth

The largest source of value in our wetland forests is water flow regulation and protection from extreme events. **Together, these two services provide $151 billion in value, almost 30 percent of the total value of the ecosystem.**

Success Stories

Natural landscapes are able to absorb twenty times more water than pavement and six times more than grass.[3] During a natural disaster, this translates to less severe drought, reduced flooding, and other consequences of too much or too little water available at the wrong time or place. A recent study showed that coastal wetlands prevented $625 million in damages from Hurricane Sandy in New Jersey, along the Atlantic coast.[32]

Our Opportunity

Investing in conservation would increase the value of protection from extreme events and water flow regulation by over $13 billion.

AESTHETICS AND RECREATION

Why It Matters

Recreation in wetland forests includes activities like fishing, hunting, boating, hiking, and birdwatching. Local businesses feed, outfit, and guide tourists in wetland forests. People recreating within wetland forests may contribute to the local economy through paying for gas, public transportation, boat rental, boat transportation, boat launch fees, entrance and parking fees, lodging, food and beverages, and bait and ammunition.[36]

Although recreation is straightforward to understand, aesthetic value is trickier. Aesthetic value is the role that beautiful, healthy natural areas play in attracting people to live, work, and recreate in a region.

What It's Worth

Aesthetics and recreation value supply roughly $126 billion (25%) of the total ecosystem service value of the region's wetland forests.

Success Stories

Many studies support the economic value of recreation in natural areas. In the Atchafalaya Basin, tour guides alternatively use ecology and local culture as ways to make swamps into lived, memorable experiences for their participants.[37] Swamp tours are a non-extractive way for local communities to profit from their natural resources. A more comprehensive study found that recreation contributed up to a million recreation-related jobs and $76 billion in recreation and tourism revenue annually in the US South.[3]

Aesthetic value studies ask participants what they would be willing to pay to live near natural areas. A strong link has been established between a property's "viewshed" and its price.[38] If a potential homebuyer can view more natural landscapes from a property, the property's selling value increases.

Recreation contributed up to a million recreation-related jobs and $76 billion in recreation and tourism revenue annually in the US South.[3]

Our Opportunity

The most recent national recreation survey demonstrates that 39.3 million people (46% of the total population) hunted, fished, or spent time in nature in the US South in 2011.[11] This is a large group of people who may be receptive to experiencing wetland forests through tours, hunting, fishing, and wildlife-watching expeditions.

Investing in conservation would increase the value of aesthetics and recreation in wetland forests by $12.5 billion.

WASTE TREATMENT AND WATER SUPPLY

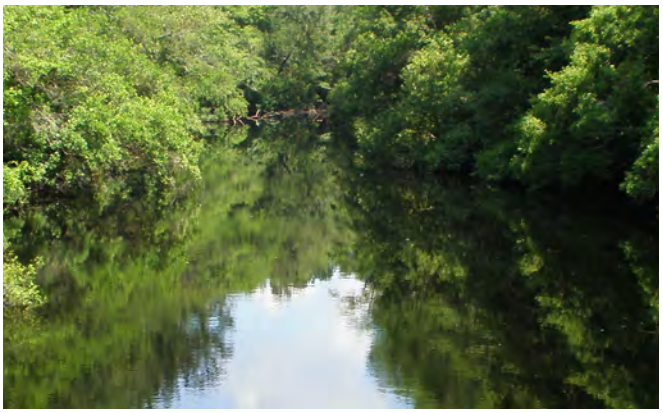
Why It Matters

Rural communities rely more heavily on forested areas because homes are often serviced by wells instead of public water. More than 20 percent of the population in three of our target states (VA, NC, SC) rely on wells instead of public water supply.[39] Nearly fifty million people rely on private and public forests for clean drinking water in the US South.[27]

In 1990, about 60 percent of the population in each of our target states relied on public sewer for waste management.[40] Public waste treatment is a burden for municipalities, especially when poor use by citizens causes large blockages, like the ten-ton "fatberg" extracted from London sewers in 2015.[41] As sewer systems receive much-needed upgrades, waste treatment facilities may use natural infrastructure like wetland forests to reduce some of the cost of treatment.

What It's Worth

The ecosystem services value for waste treatment and water supply, combined, are $115 billion, or 23 percent of the total value of Southern wetland forests. Although these classes of ecosystem services are not as compelling as recreation or flood protection, they are just as important. Natural landscapes reduce pollution, filter waste, and provide a steady supply of water to downstream communities.



Success Stories

One analysis identified thirty-seven existing programs that provide payments for watershed services in the US.[42] Efforts to purchase a forested watershed improved both the supply and quality of water for New York City and Boston, which saved billions of dollars that otherwise would have to be spent building and managing water treatment plants.[43]

Where municipalities provide waste treatment, forested wetlands provide an important supplement to traditional waste processing. Forests absorb and assimilate waste that would otherwise have to be cleaned in a water treatment plant. This reduces the total cost of water treatment for a community.

Our Opportunity

Implementing the recommendations in our conservation scenario could produce an additional $10.5 billion in value in waste treatment and water supply.

Efforts to purchase a forested watershed improved both the supply and quality of water for New York City and Boston, which saved billions of dollars that otherwise would have to be spent building and managing water treatment plants.[43]

Photo by Winifred Helton-Harmon

Why It Matters

Fishing, hunting, and gathering are low-cost ways for rural Americans to supplement their diet and offset economic hardships. Over a third of hunters surveyed in 2013 indicated that they hunt primarily for meat.[44] Harvested meat from deer, alligators, boar, and birds often replaces store-bought meat in a family's diet.

Gathering of "non-timber forest products" represents a substantial source of food and income in much of the US South.[45] Non-timber forest products include fruits and nuts, vegetables, fish and game, medicinal plants, and other products. Common non-timber forest products in the US South include morels, ramps, and ginseng. Pollinators are essential to agricultural production in the US South. Cotton, canola, fruits, and other crops benefit from wild bee pollination. Wetland forests and riparian habitats support pollinators.

What It's Worth

The estimated ecosystem services value for food and pollination is almost $73 billion, 14% of the total value of Southern wetland forests. This category includes the supporting services that wetland forests provide—primarily in supporting agriculture, fishing, and hunting activities.

Success Stories

Wetland forests—often as riparian buffers—abut agricultural and aquacultural lands across the US South, supporting pollinators and agricultural production. Several studies have found that farms located near forest fragments produced more product than those that are isolated; this was attributed to the abundance and function of pollinators.[46,47] Another study found that bee pollination improves crop quality, shelf life, and commercial value.[48]

Our Opportunity

By prioritizing the creation of riparian buffers and protection of high-priority wetland forests, we have an opportunity to increase the supporting services of food and pollination in wetland forests by nearly $7 billion.

REGULATING SERVICES: CLIMATE, AIR, AND SOIL

Photo by Mac Stone

Why It Matters

Forests help mitigate the worst impacts of climate change with their ability to absorb carbon and regulate the climate.[16] Wetland forests are among the most carbon-rich forests in the US.[1] When left standing, these forests absorb carbon dioxide and prevent it from being released into the atmosphere and worsening climate change.[16] Although the benefits of carbon sequestration are dispersed throughout the ecosystem service categories, forests also regulate regional temperature and air quality. As forests are regulating the climate, they are also cleaning the air. There is a strong link between forests and clean air.

What It's Worth

The ecosystem services value for air quality, regional climate regulation, erosion control, and soil formation is a combined $37.4 billion, 7.4% of the total value of Southern wetland forests. These remaining services improve the quality of life for citizens, regulating our regional climate ($12.4 billion), cleaning the air we breathe ($4.2 billion), forming soils ($18.8 billion), and preventing erosion ($1.9 billion).

Success Stories

Regionally, gains in forest cover lead to annual cooling.[7] On a small scale, tree-shaded houses can reduce cooling costs by 20 to 25 percent.[3] All forests provide these benefits and help regulate the intense summertime heat of the US South.

Trees may remove up to 23.2 million metric tons per year of pollution in the US, and another analysis found that forests can remove between 50 and 100 pounds of pollutants per acre per year.[3,49] In urban spaces, even small patches of wetland forest habitat can be immensely valuable for their pollution removal abilities.

Our Opportunity

By investing in wetland forests, we would be able to generate an additional $1.6 billion in value in air quality, regional climate regulation, erosion control, and soil formation.

Why It Matters

Timber harvested from small, family-owned forests may occur once a generation, but provides enough incidental income to finance college, retirement, or other large financial needs. But our analysis found that an acre of protected wetland forest is worth fifteen times more than one harvested for timber. This is due, in part, to the relatively "low-quality" wood that comes from wetland forests. Wetland forest wood is often twisted, hollow, or otherwise unsuitable for topline timber products, and instead, the materials get downgraded to pellets, chips, and pulp.

What It's Worth

The ecosystem services value for raw materials is $1.4 billion, 0.3 percent of the total value of Southern wetland forests.

Success Stories

Although research is scant on non-timber forest products and subsistence gathering in the US, one study in Michigan found that more than one hundred species of non-timber forest products (plants and fungi) were gathered for edibles, medicine, cultural purposes, and even crafts. A full 80 percent of the participants studied were either self-employed or informally employed, and relied on their gathered non-timber forest products as food and materials for gift-giving.[50]

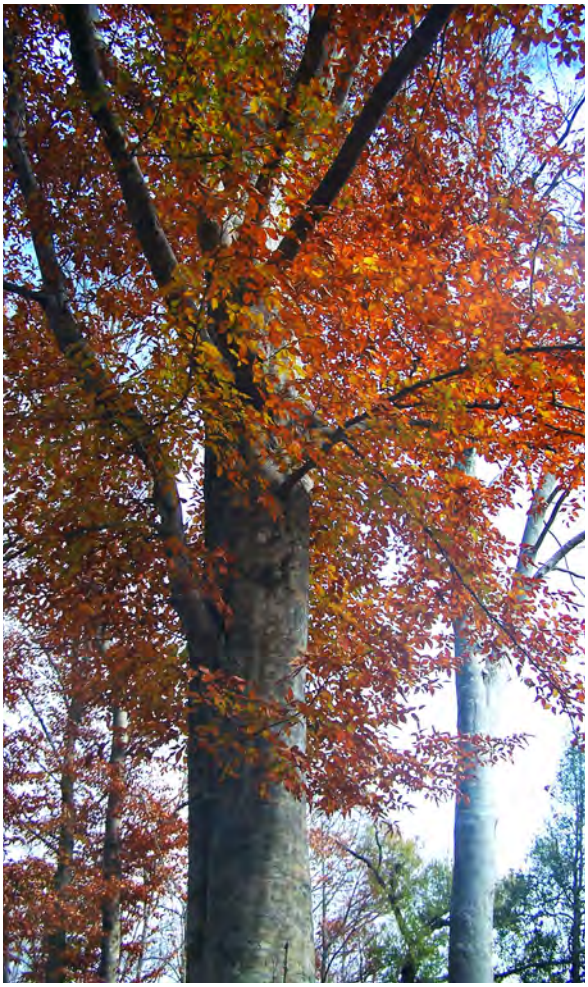
Another report estimates that the current market value of timber in wetland forests in the Mississippi Alluvial Valley is only about $28 per acre.[23] Unfortunately, our current political and economic systems incentivize landowners to receive small amounts of compensation after

timber harvest, or even less for preserving land in a conservation easement or other protected status. Though those financial rewards may be substantial to an individual, they represent a small fraction of the true value of wetland forests.

Given this low timber value, there is ripe opportunity for programs that focus on rewarding landowners for keeping ecosystems intact. Landowners in New York indicated that they were more willing to establish conservation easements on their properties than participate in forest banking or working forest conservation easements, especially if they had a lucrative price tag (~$2,000 per acre).[51]

Our Opportunity

By investing in wetland forests, we would be able to generate an additional $0.6 billion in value in raw materials. However, without addressing the current inequity that comes with paying landowners for raw materials instead of other, more valuable ecosystem services, there will continue to be a large gap between projected and realized value of these forests.



Landowners in New York indicated that they were more willing to establish conservation easements on their properties than participate in forest banking or working forest conservation easements, especially if they had a lucrative price tag (~$2,000 per acre).[51]

CONCLUSIONS

There is an abundance of opportunity in the US South to conserve, restore, and improve wetland forests in our fourteen target states. By investing in this natural infrastructure, states will be able to mitigate the worst effects of climate change, reduce the impacts of natural disasters, revitalize their tourism and recreational industries, support public waste treatment and private water quality, and improve air quality.

This analysis has shown that logging wetland forests is a waste of an immensely valuable natural resource. Wetland forests are worth fifteen times more standing than logged. Communities and forestland owners who allow logging of wetland forests are essentially giving the forest products industry a $17,000 subsidy per acre. Unfortunately, current cultural and economic pressures often make logging the go-to for landowners when considering what to do with their forests.

This is an opportunity for improved and substantial payments for ecosystem services (PES) programs in the US South. Costa Rica was the first country to implement a PES program at the national level as a way to compensate landowners for services provided by their lands. PES programs already exist in certain regions in the United States, as do some compensatory schemes at the federal level (e.g., the Conservation Reserve Program and the Wildlife Habitats Incentive Program).

Providing substantial payments for easements, or outright acquiring high-conservation value lands like those identified by the South East Climate Adaptation Strategy is another way to preserve ecosystem services of these lands. Although there are inherent costs to monitoring and enforcing easements, easements ensure that wetland forests continue to absorb carbon, clean water, and reduce the impact of extreme events on surrounding communities in perpetuity.

Finally, changes to regulatory instruments and zoning can also improve ecosystem services. For example, the Wasatch watershed in Salt Lake City, Utah, was protected through regulation, first through giving jurisdiction to the county courts and then through agreements between the city government and the US Forest Service.[52] Development in the watershed is restricted, but recreation and other non-extractive uses are generally permitted.

Developing PES programs, providing regulatory pathways, or acquiring high conservation value wetland forests could largely benefit the public through vastly improving the ecosystem services of wetland forests. This added value would go a long way toward helping us mitigate the worst impacts of climate change, providing new recreational and tourism opportunities for citizens, and improving the quality of life for all.

METHODS

Estimation of ecosystem service value requires three steps:

1. Identify wetland forests in each of the target states.
2. Allocate total wetland forest acreages to one of the land-use categories that produce different ecosystem services values.
3. Multiply acreage in each category by the ecosystem service value per acre for each of the individual ecosystem services. For those ecosystem services which have, based on literature review, higher or lower productivity would be expected, we have applied land use–specific factors to the acreage each land use.

For a detailed explanation of the methods, view the whitepaper.

ACKNOWLEDGMENTS

We would like to thank Dr. Spencer Phillips of Key-Log Economics, his team, and also Dr. J.P. Schmidt, for conducting the ecosystem service analysis. We would also like to thank multiple scientists and colleagues for review of the manuscript, including but not limited to J. J. Apodaca, Andrew Goldberg, Debbie Hammel, Dale James, and Amanda Mahaffey.

Photo by Mac Stone

STATE-BY-STATE HIGHLIGHTS

Because our regional analysis was conducted spatially, we were able to calculate state-specific totals for each of our categories. These numbers are highlighted in each of our fourteen states below. To view more detailed state-specific fact sheets, visit dogwoodalliance.org/treasures-of-the-south.

ALABAMA

Alabama has 2.2 million acres of wetland forest.

Alabama's Wetland Forests Are Worth $34.3 Billion

- Worth could increase up to $2.3 billion by investing in conservation.
- Wetland Forest Gem: 652-acre Beaverdam Creek Swamp in the Wheeler National Wildlife Refuge.
- Alabama has 2.2 million acres of wetland forest, but only 4 percent of wetland forests are in permanent protection.

Protection from Extreme Events: Alabama's Wetland Forests Provide $10.3 Billion

- Value in protection from extreme events and water flow regulation could increase up to $650 million by investing in conservation.
- Three flood events caused over $1 billion each in damages since 1980.[5]

Aesthetics, Tourism, and Recreation: Alabama's Wetland Forests Provide $8.7 Billion

- Value in aesthetics and recreation could increase up to $610 million by investing in conservation.
- Alabama had 25.8 million visitors in 2016, who spent $13.3 billion and supported 179,644 tourism jobs.[53]

Water Supply and Waste Treatment: Alabama's Wetland Forests Provide $7.9 Billion

- Value in water supply and waste treatment could increase up to $550 million by investing in conservation.
- More than half of Alabama residents rely on public sewer systems. Many public facilities rely on natural infrastructure to reduce costs of waste and water treatment.[54]

Food and Pollination: Alabama's Wetland Forests Provide $5 Billion

- Value in food and pollination could increase up to $340 million by investing in conservation.
- Nearly 750,000 residents in Alabama hunt or fish.[11]

Regulating Services: Alabama's Wetland Forests Provide $2.5 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $137 million by investing in conservation.

ARKANSAS

Arkansas has 2.5 million acres of wetland forest.

Arkansas's Wetland Forests Are Worth $37.4 Billion

- Worth could increase up to $2.8 billion by investing in conservation.
- Arkansas has 2.5 million acres of wetland forest.

Protection from Extreme Events: Arkansas's Wetland Forests Provide $11.2 Billion

- Value in protection from extreme events and water flow regulation could increase up to $830 million by investing in conservation,
- Seven flood events caused over $1 billion each in damages since 1980.[5]

Aesthetics, Tourism, and Recreation: Arkansas's Wetland Forests Provide $9.4 Billion

- Value in aesthetics and recreation could increase up to $760 million by investing in conservation.
- Arkansas had 29.2 million visitors in 2016, who spent $7.7 billion and supported 113,300 tourism jobs.[55]

Water Supply and Waste Treatment: Arkansas's Wetland Forests Provide $8.6 Billion

- Value in water supply and waste treatment could increase up to $680 million by investing in conservation.
- Nearly 20 percent of Arkansas residents rely on private water sources like wells. Residents rely on forests to naturally filter pollutants from their water supply.[54]

Food and Pollination: Arkansas's Wetland Forests Provide $5.4 Billion

- Value in food and pollination could increase up to $430 million by investing in conservation.
- Over 550,000 residents in Arkansas hunt or fish.[11]

Regulating Services: Arkansas's Wetland Forests Provide $2.8 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $136 million by investing in conservation.

FLORIDA

Florida has 5.3 million acres of wetland forest.

Florida's Wetland Forests Are Worth $80.8 Billion

- Worth could increase up to $7.5 billion by investing in conservation.
- Florida has 5.3 million acres of wetland forest.

Protection from Extreme Events: Florida's Wetland Forests Provide $24.2 Billion

- Value in protection from extreme events and water flow regulation could increase up to $2.1 billion by investing in conservation.
- Between 1851 and 2004, 110 hurricanes and 35 major hurricanes (categories 3–5) made landfall on the Florida coastline.[4]

Aesthetics, Tourism, and Recreation: Florida's Wetland Forests Provide $20.2 Billion

- Value in aesthetics and recreation could increase up to $2.1 billion by investing in conservation.
- Florida had 112 million visitors in 2016, who spent $108.8 billion and supported 1.4 million tourism jobs.[56]

Water Supply and Waste Treatment: Florida's Wetland Forests Provide $18.6 Billion

- Value in water supply and waste treatment could increase up to $1.8 billion by investing in conservation.
- More than 70 percent of Florida residents rely on public sewer systems. Many public facilities rely on natural infrastructure to reduce costs of waste and water treatment.[54]

Food and Pollination: Florida's Wetland Forests Provide $11.7 Billion

- Value in food and pollination could increase up to $1.1 billion by investing in conservation.
- Roughly 2.1 million residents in Florida hunt or fish.[11]

Regulating Services: Florida's Wetland Forests Provide $6 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $370 million by investing in conservation.

GEORGIA

Georgia has 4.4 million acres of wetland forest.

Georgia's Wetland Forests Are Worth $67.3 Billion

- Worth could increase up to $2.8 billion by investing in conservation.
- Georgia has 4.4 million acres of wetland forest.

Protection from Extreme Events: Georgia's Wetland Forests Provide $20.1 Billion

- Value in protection from extreme events and water flow regulation could increase up to $740 million by investing in conservation.
- Two flood events amassed over $1 billion each in damages since 1980.[5]

Aesthetics, Tourism, and Recreation: Georgia's Wetland Forests Provide $16.9 Billion

- Value in aesthetics and recreation could increase up to $860 million by investing in conservation.
- Georgia had 60 million visitors in 2011, who contributed $61.1 billion in visitor spending and supported 439,000 tourism jobs.[57–59]

Water Supply and Waste Treatment: Georgia's Wetland Forests Provide $15.5 Billion

- Value in water supply and waste treatment could increase up to $640 million by investing in conservation.
- Nearly 20 percent of Georgia residents rely on private water sources like wells. Residents rely on forests to naturally filter pollutants from their water supply.[54]

Food and Pollination: Georgia's Wetland Forests Provide $9.8 Billion

- Value in food and pollination could increase up to $390 million by investing in conservation.
- Nearly a million residents in Georgia hunt or fish.[11]

Regulating Services: Georgia's Wetland Forests Provide $5 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $160 million by investing in conservation.
- Wetland forests currently provide raw materials worth $122 million in value; this could increase to $179 million by investing in conservation.

KENTUCKY

Kentucky has 180 thousand acres of wetland forest.

Kentucky's Wetland Forests Are Worth $1.9 Billion

- Worth could increase up to $500 million by investing in conservation.
- Kentucky has 180,000 acres of wetland forest.

Protection from Extreme Events: Kentucky's Wetland Forests Provide $570 Million

- Value in protection from extreme events and water flow regulation could increase up to $140 million by investing in conservation.
- Two flood events amassed over $1 billion each in damages since 1980.[5]

Aesthetics, Tourism, and Recreation: Kentucky's Wetland Forests Provide $460 Million

- Value in aesthetics and recreation could increase up to $130 million by investing in conservation.
- Kentucky had sixty million visitors in 2011, who spent $9.2 billion and supported 192,697 tourism jobs.[60]

Water Supply and Waste Treatment: Kentucky's Wetland Forests Provide $430 Million

- Value in water supply and waste treatment could increase up to $120 million by investing in conservation.
- Nearly 20 percent of Kentucky residents rely on private water sources like wells. Residents rely on forests to naturally filter pollutants from their water supply.[54]

Food and Pollination: Kentucky's Wetland Forests Provide $275 Million

- Value in food and pollination could increase up to $75 million by investing in conservation.
- Nearly 650,000 residents in the state hunt or fish.[11]

Regulating Services: Kentucky's Wetland Forests Provide $180 Million

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $16 million by investing in conservation.

LOUISIANA

Louisiana has 5.2 million acres of wetland forest.

Louisiana's Wetland Forests Are Worth $79 Billion

- Worth could increase up to $6.5 billion by investing in conservation.
- Louisiana has 5.2 million acres of wetland forest.

Protection from Extreme Events: Louisiana's Wetland Forests Provide $23.8 Billion

- Value in protection from extreme events and water flow regulation could increase up to $1.9 billion by investing in conservation.
- Eight flood events amassed over $1 billion in damages each since 1980.[5]

Aesthetics, Tourism, and Recreation: Louisiana's Wetland Forests Provide $20 billion

- Value in aesthetics and recreation could increase up to $1.7 million by investing in conservation.
- Louisiana had 28.9 million visitors in 2015, who spent $11.5 billion and supported 171,000 tourism jobs.[61]

Water Supply and Waste Treatment: Louisiana's Wetland Forests Provide $18.3 Billion

- Value in water supply and waste treatment could increase up to $1.6 billion by investing in conservation
- More than 70 percent of residents rely on public sewer systems. Many public facilities rely on natural infrastructure to reduce costs of waste and water treatment.[54]

Food and Pollination: Louisiana's Wetland Forests Provide $11.5 Billion

- Value in food and pollination could increase up to $1 billion by investing in conservation.
- Over 800,000 residents in the state hunt or fish.[11]

Regulating Services: Louisiana's Wetland Forests Provide $5.9 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $350 million by investing in conservation.

MISSISSIPPI

Mississippi has 3.5 million acres of wetland forest.

Mississippi's Wetland Forests Are Worth $51 Billion

- Worth could increase up to $4.2 billion by investing in conservation.
- Mississippi has 3.5 million acres of wetland forest.

Protection from Extreme Events: Mississippi's Wetland Forests Provide $15.3 Billion

- Value in protection from extreme events and water flow regulation could increase up to $1.2 billion by investing in conservation.
- Five flood events amassed over $1 billion in damages each since 1980.[5]

Aesthetics, Tourism, and Recreation: Mississippi's Wetland Forests Provide $12.8 billion

- Value in aesthetics and recreation could increase up to $1.1 billion by investing in conservation.
- Mississippi had 23 million visitors in 2016, who contributed $6.3 billion in visitor spending and supported 86,600 tourism jobs.[62]

Water Supply and Waste Treatment: Mississippi's Wetland Forests Provide $11.7 Billion

- Value in water supply and waste treatment could increase up to $1 billion by investing in conservation.
- Almost 60 percent of residents rely on public sewer systems. Many public facilities rely on natural infrastructure to reduce costs of waste and water treatment.[54]

Food and Pollination: Mississippi's Wetland Forests Provide $7.4 Billion

- Value in food and pollination could increase up to $630 million by investing in conservation.
- Approximately 700,000 residents in the state hunt or fish.[11]

Regulating Services: Mississippi's Wetland Forests Provide $3.9 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $220 million by investing in conservation.

MISSOURI

Missouri has 700 thousand acres of wetland forest.

Missouri's Wetland Forests Are Worth $7.7 Billion

- Worth could increase up to $1.3 billion by investing in conservation.
- Missouri has nearly 700,000 acres of wetland forest.

Protection from Extreme Events: Missouri's Wetland Forests Provide $2.3 Billion

- Value in protection from extreme events and water flow regulation could increase up to $370 million by investing in conservation.
- Six flood events amassed over $1 billion in damages each since 1980.[5]

Aesthetics, Tourism, and Recreation: Missouri's Wetland Forests Provide $1.9 billion

- Value in aesthetics and recreation could increase up to $340 million by investing in conservation.
- Missouri had 41.7 million visitors in 2016, who contributed $13.1 billion in visitor spending and supported 307,937 tourism jobs.[63]

Water Supply and Waste Treatment: Missouri's Wetland Forests Provide $1.7 Billion

- Value in water supply and waste treatment could increase up to $310 million by investing in conservation.
- Almost 20 percent of residents rely on private water sources like wells. Residents rely on forests to naturally filter pollutants from their water supply.[54]

Food and Pollination: Missouri's Wetland Forests Provide $1.1 Billion

- Value in food and pollination could increase up to $190 million by investing in conservation.
- Over a million residents in the state hunt or fish.[11]

Regulating Services: Missouri's Wetland Forests Provide $710 Million

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $43 million by investing in conservation.

NORTH CAROLINA

North Carolina has 2.4 million acres of wetland forest.

North Carolina's Wetland Forests Are Worth $27 Billion

- Worth could increase up to $5.1 billion by investing in conservation.
- North Carolina has 2.4 million acres of wetland forest.

Protection from Extreme Events: North Carolina's Wetland Forests Provide $8 Billion

- Value in protection from extreme events and water flow regulation could increase up to $1.5 billion by investing in conservation.
- Between 1851 and 2004, forty-six hurricanes and twelve major hurricanes (categories 3–5) made landfall on the North Carolina coastline.[4]

Aesthetics, Tourism, and Recreation: North Carolina's Wetland Forests Provide $6.6 billion

- Value in aesthetics and recreation could increase up to $1.4 billion by investing in conservation.
- North Carolina had 54.6 million visitors in 2015, who spent $21.9 billion and supported 211,490 tourism jobs.[64]

Water Supply and Waste Treatment: North Carolina's Wetland Forests Provide $6 Billion

- Value in water supply and waste treatment could increase up to $1.2 billion by investing in conservation.
- Over a third of residents rely on private water sources like wells. Residents rely on forests to naturally filter pollutants from their water supply.[54]

Food and Pollination: North Carolina's Wetland Forests Provide $3.8 Billion

- Value in food and pollination could increase up to $780 million by investing in conservation.
- Approximately 1.4 million residents in the state hunt or fish.[11]

Regulating Services: North Carolina's Wetland Forests Provide $2.5 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $180 million by investing in conservation.

OKLAHOMA

Oklahoma has 160 thousand acres of wetland forest.

Oklahoma's Wetland Forests Are Worth $1.7 Billion

- Worth could increase up to $117 million by investing in conservation.
- Oklahoma has 160,000 acres of wetland forest.

Protection from Extreme Events: Oklahoma's Wetland Forests Provide $520 Million

- Value in protection from extreme events and water flow regulation could increase up to $34 million by investing in conservation.
- Eighteen major flood events hit four gulf states, including Oklahoma, between March of 2015 and August of 2016.[65]

Aesthetics, Tourism, and Recreation: Oklahoma's Wetland Forests Provide $420 Million

- Value in aesthetics and recreation could increase up to $32 million by investing in conservation.
- Oklahoma had 25.5 million visitors in 2010, who spent $6.2 billion in and supported 74,900 tourism jobs.[66]

Water Supply and Waste Treatment: Oklahoma's Wetland Forests Provide $390 Million

- Value in water supply and waste treatment could increase up to $29 million by investing in conservation.
- Over half of residents rely on public sewer systems. Many public facilities rely on natural infrastructure to reduce costs of waste and water treatment.[54]

Food and Pollination: Oklahoma's Wetland Forests Provide $240 Million

- Value in food and pollination could increase up to $17 million by investing in conservation.
- Approximately 770,000 residents in the state hunt or fish.[11]

Regulating Services: Oklahoma's Wetland Forests Provide $160 Million

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $6 million by investing in conservation.

SOUTH CAROLINA

South Carolina has 3.1 million acres of wetland forest.

South Carolina's Wetland Forests Are Worth $39.6 Billion

- Worth could increase up to $5.1 billion by investing in conservation.
- South Carolina has 3.1 million acres of wetland forest.

Protection from Extreme Events: South Carolina's Wetland Forests Provide $11.9 Billion

- Value in protection from extreme events and water flow regulation could increase up to $1.5 billion by investing in conservation.
- Two flood events cost over $1 billion in damages each since 1980.[5]

Aesthetics, Tourism, and Recreation: South Carolina's Wetland Forests Provide $9.8 billion

- Value in aesthetics and recreation could increase up to $1.4 billion by investing in conservation.
- Nearly half of residents participated in wildlife-related recreation, spending $2 billion in 2011.[11]

Water Supply and Waste Treatment: South Carolina's Wetland Forests Provide $9 Billion

- Value in water supply and waste treatment could increase up to $1.2 billion by investing in conservation.
- Over 20 percent of residents rely on private water sources like wells. Residents rely on forests to naturally filter pollutants from their water supply.[54]

Food and Pollination: South Carolina's Wetland Forests Provide $5.7 Billion

- Value in food and pollination could increase up to $760 million by investing in conservation.
- Approximately 615,000 residents in the state hunt or fish.[11]

Regulating Services: South Carolina's Wetland Forests Provide $3.4 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $210 million by investing in conservation.

TENNESSEE

Tennessee has 627 thousand acres of wetland forest.

Tennessee's Wetland Forests Are Worth $7.8 Billion

- Worth could increase up to $930 million by investing in conservation.
- Tennessee has 627,000 acres of wetland forest.

Protection from Extreme Events: Tennessee's Wetland Forests Provide $2.3 Billion

- Value in protection from extreme events and water flow regulation could increase up to $270 million by investing in conservation.
- Three flood events cost over $1 billion in damages each since 1980.[5]

Aesthetics, Tourism, and Recreation: Tennessee's Wetland Forests Provide $1.9 Million

- Value in aesthetics and recreation could increase up to $250 million by investing in conservation.
- Tennessee had 105.3 million visitors in 2014, who contributed $18.4 billion in visitor spending and supported 157,400 tourism jobs.[67]

Water Supply and Waste Treatment: Tennessee's Wetland Forests Provide $1.8 Billion

- Value in water supply and waste treatment could increase up to $220 million by investing in conservation.
- Over three-fourths of residents rely on public sewer systems. Many public facilities rely on natural infrastructure to reduce costs of waste and water treatment. [54]

Food and Pollination: Tennessee's Wetland Forests Provide $1.1 Billion

- Value in food and pollination could increase up to $140 million by investing in conservation.
- Over 900,000 residents in the state hunt or fish.[11]

Regulating Services: Tennessee's Wetland Forests Provide $670 Million

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $40 million by investing in conservation.

TEXAS

Texas has 3.7 million acres of wetland forest.

Texas's Wetland Forests Are Worth $53.9 Billion

- Worth could increase up to $4.9 billion by investing in conservation.
- Texas has 3.7 million acres of wetland forest.

Protection from Extreme Events: Texas's Wetland Forests Provide $16.1 Billion

- Value in protection from extreme events and water flow regulation could increase up to $1.2 billion by investing in conservation.
- Eighteen major flood events hit four gulf states, including Texas, between March of 2015 and August of 2016.[65]

Aesthetics, Tourism, and Recreation: Texas's Wetland Forests Provide $13.5 billion

- Value in aesthetics and recreation could increase up to $1.3 billion by investing in conservation.
- Texas had 225 million visitors in 2015, who spent $69.1 billion and supported 499,600 tourism jobs.[68,69]

Water Supply and Waste Treatment: Texas's Wetland Forests Provide $12.3 Billion

- Value in water supply and waste treatment could increase up to $1.2 billion by investing in conservation.
- More than two-thirds of residents rely on public sewer systems. Many public facilities rely on natural infrastructure to reduce costs of waste and water treatment.[54]

Food and Pollination: Texas's Wetland Forests Provide $7.8 Billion

- Value in food and pollination could increase up to $740 million by investing in conservation.
- Approximately 2.7 million residents in the state hunt or fish.[11]

Regulating Services: Texas's Wetland Forests Provide $4.2 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $240 million by investing in conservation.

VIRGINIA

Virginia has 927 thousand acres of wetland forest.

Virginia's Wetland Forests Are Worth $13.9 Billion

- Worth could increase up to $1.3 billion by investing in conservation.
- Virginia has 927,000 acres of wetland forest.

Protection from Extreme Events: Virginia's Wetland Forests Provide $4.2 Billion

- Value in protection from extreme events and water flow regulation could increase up to $340 million by investing in conservation.
- Three flood events amassed over $1 billion in damages each since 1980.[5]

Aesthetics, Tourism, and Recreation: Virginia's Wetland Forests Provide $3.5 billion

- Value in aesthetics and recreation could increase up to $390 million by investing in conservation.
- Virginia had 45 million visitors in 2016, who spent $23.7 billion and supported 229,300 tourism jobs.[70,71]

Water Supply and Waste Treatment: Virginia's Wetland Forests Provide $3.2 Billion

- Value in water supply and waste treatment could increase up to $290 million by investing in conservation.
- Over 20 percent of residents rely on private water sources like wells. Residents rely on forests to naturally filter pollutants from their water supply.[54]

Food and Pollination: Virginia's Wetland Forests Provide $2 Billion

- Value in food and pollination could increase up to $180 million by investing in conservation.
- Approximately 840,000 residents in the state hunt or fish.[11]

Regulating Services: Virginia's Wetland Forests Provide $1 Billion

- Value in regional climate regulation, air quality, soil formation, and erosion control could increase up to $63 million by investing in conservation.

VALUE OF ECOSYSTEM SERVICES

Value of ecosystem services, in billions USD, of wetland forests in the US South, currently (baseline) and in a conservation scenario (increase).

	Protection from Extreme Events		Recreation, Tourism, Aesthetics		Water and Waste Treatment		Food and Pollination		Regulating Services		Raw Materials		**State Totals**	
	Baseline	Increase	Baseline	Increase	Baseline	Increase	Baseline	Increase	Baseline	Increase	Baseline	Increase	**Baseline**	**Increase**
Alabama	10.294	0.657	8.657	0.61	7.922	0.544	4.998	0.342	2.441	0.078	0.059	0.059	**34.371**	**2.29**
Arkansas	11.209	0.829	9.395	0.758	8.599	0.686	5.425	0.433	2.715	0.096	0.086	0.04	**37.429**	**2.842**
Florida	24.201	2.133	20.291	2.104	18.57	1.785	11.715	1.113	5.853	0.265	0.167	0.108	**80.797**	**7.508**
Georgia	20.163	0.74	16.934	0.855	15.496	0.638	9.777	0.386	4.822	0.107	0.122	0.057	**67.314**	**2.783**
Kentucky	0.572	0.144	0.464	0.132	0.425	0.119	0.268	0.075	0.169	0.016	0.014	0	**1.912**	**0.486**
Louisiana	23.787	1.897	19.956	1.728	18.262	1.569	11.521	0.992	5.731	0.218	0.17	0.129	**79.427**	**6.533**
Mississippi	15.288	1.206	12.783	1.136	11.7	1.003	7.381	0.629	3.764	0.143	0.129	0.078	**51.045**	**4.195**
Missouri	2.316	0.37	1.887	0.338	1.73	0.306	1.09	0.193	0.664	0.042	0.049	0.001	**7.736**	**1.25**
North Carolina	8.064	1.499	6.573	1.414	6.022	1.245	3.795	0.782	2.314	0.178	0.171	0.006	**26.939**	**5.124**
Oklahoma	0.517	0.034	0.42	0.032	0.385	0.029	0.243	0.017	0.149	0.005	0.011	0.001	**1.725**	**0.118**
South Carolina	11.86	1.462	9.787	1.422	8.962	1.221	5.65	0.763	3.171	0.18	0.18	0.026	**39.61**	**5.074**
Tennessee	2.344	0.27	1.933	0.254	1.771	0.223	1.116	0.141	0.629	0.032	0.036	0.004	**7.829**	**0.924**
Texas	16.128	1.414	13.466	1.309	12.324	1.173	7.774	0.739	4.01	0.165	0.148	0.079	**53.85**	**4.879**
Virginia	4.154	0.341	3.481	0.388	3.185	0.292	2.009	0.178	1.01	0.048	0.031	0.015	**13.87**	**1.262**
Category Totals	**150.897**	**12.996**	**126.027**	**12.48**	**115.353**	**10.833**	**72.762**	**6.783**	**37.442**	**1.573**	**1.373**	**0.603**	**503.854**	**45.268**

ACRES OF WETLAND FORESTS IN US SOUTH

Total acres of wetland forests in the US South, currently (baseline) and in a conservation scenario (added).

	Total Acres		Permanently Protected Acres			Percent Protected	
	Total Acres	Total Hectares	Baseline Acres	Added Acres	Final Acres	Baseline Acres	Added Acres
Alabama	2,196,499	888,892	90,608	998,718	1,089,326	4.13%	49.59%
Arkansas	2,491,063	1,008,098	459,387	864,765	1,324,152	18.44%	53.16%
Florida	5,361,255	2,169,625	665,867	2,221,597	2,887,464	12.42%	53.86%
Georgia	4,371,809	1,769,210	380,048	1,030,374	1,410,422	8.69%	32.26%
Kentucky	179,959	72,827	16,211	65,980	82,191	9.01%	45.67%
Louisiana	5,231,118	2,116,960	244,379	2,357,103	2,601,482	4.67%	49.73%
Mississippi	3,502,004	1,417,212	172,543	1,449,598	1,622,141	4.93%	46.32%
Missouri	692,427	280,216	103,782	175,117	278,899	14.99%	40.28%
North Carolina	2,415,774	977,630	161,613	716,935	878,548	6.69%	36.37%
Oklahoma	157,666	63,805	29,328	18,041	47,369	18.60%	30.04%
South Carolina	3,152,309	1,275,695	148,875	974,277	1,123,152	4.72%	35.63%
Tennessee	626,865	253,683	106,375	166,183	272,558	16.97%	43.48%
Texas	3,761,857	1,522,371	166,676	1,516,471	1,683,147	4.43%	44.74%
Virginia	927,924	375,518	67,211	397,672	464,883	7.24%	50.10%
Sum of Acres	**35,068,529**	**14,191,743**	**2,812,903**	**12,952,831**	**15,765,734**	**-**	**-**

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