GEORGIA FORESTRY
COMMISSION

Georgia's Sustainable Forests: A Resource for All Generations

Prepared by the Georgia Forestry Commission
for the Georgia General Assembly January 2014

Executive Summary

Georgia's forests are being sustainably managed to meet the numerous needs of our state today. To ensure our forests will continue to meet the needs of present generations and the projected demands for future generations, many challenges must be met. Success will depend on proactive decisions by our state leaders and the entire forestry and conservation communities addressing a myriad of forestry-related issues. A more comprehensive listing and discussion of these issues can be found in Georgia's Forest Action plan. (*GFC 2010*)

Georgia boasts more than 24 million acres of forestland. Georgia's forest inventory volumes are at an all-time high. We have 49% more cubic feet of wood growing in Georgia than we did 40 years ago. However, the state's population is increasing at a record rate. Urbanization continues to be a threat to forest sustainability and recent increases in population and changing land-use patterns have made ongoing forest management more difficult in some areas of the state. These and other trends threaten forest sustainability and the numerous economic, environmental, and social benefits that our thriving forests provide. This report describes both forestland (all forests including those not available for commercial harvest – 24.7 million acres) and timberland (all forests that are available for commercial harvest – 24.3 million acres). (*GFC 2012*)

Georgia's forest area has remained stable over the past 50 years at about 24 million acres. Approximately 91% of this acreage is privately owned, and Georgia has more privately-owned acres of timberland than any other state. Forest growth exceeds removals by 41% (annually) and is available to supply global and local markets. However, ownership patterns have been changing and average parcel sizes are shrinking. This is due to a number of factors, including the effects of urbanization and the tremendous divestiture of forest industry-owned lands. Several issues, such as federal, state and local tax structures and the strength of forest product markets, affect the economic viability of owning and managing forestland. (*GFC / USFS 2013*)

Eighty-three of Georgia's 159 counties have at least one primary wood-using mill. Strong markets for forest products are crucial to the future of traditional pulp and paper, lumber, and pole supplies. In 2012, economic impact from forestry was $28.9 billion and maintained over 135,000 jobs. (*GFC 2013*) The development of a forest resource-based bioenergy industry is poised to contribute significantly to Georgia's economy and reduce our dependence on non-renewable fossil fuels.

Georgia's forests provide valuable ecological services that help supply our state with clean water, clean air, wildlife habitat, and recreation opportunities that benefit all Georgians. A University of Georgia (Warnell School) study valued these ecological services at $37 billion, with clean water noted as one of the most important services that benefit society (*Moore 2011*). Because two out of every three raindrops in Georgia land on forestlands, the sustainable management of our forests is one of the most significant factors affecting the state's water quality and quantity. The General Assembly's adoption of the Statewide Water Management Plan recognizes Forestry Best Management Practices as a model program that other land-use practitioners should emulate. A GFC internal (unpublished) analysis of watersheds used for drinking water indicates that 60.5% of these areas are forested, so these forests cleanse the water that is utilized by the majority of Georgians. Wildlife-associated recreation, which is in great part supported by healthy forest ecosystems, annually generates $5.5 billion and supports 40,000 jobs.

Forestry professionals ensure public safety by providing fire prevention services in the form of prescribed fire as well as wildfire suppression. The health and sustainability of Georgia's forests are dependent on attention to both. Urbanization places more lives and property at risk from wildfire as growth expands into rural environments and greatly complicates the management of wildfires and prescribed fires.

Urban sprawl and fragmentation impact natural habitat and ecological services forests provide. The loss of forestland to urbanization continues to be the greatest single factor for conversion to other (non-forest) uses, even though we are slowly emerging from one of the greatest recessions in our country's history. *A system of public and private conservation strategies is needed to support forest and wildlife sustainability. Sustaining healthy forests, including the professional use of prescribed fire, is critical to maintaining the full suite of ecosystem services, traditional forest outputs and the habitats required by native species. Expansion of the Georgia Land Conservation Program supports this goal, as do the State Wildlife Action Plan and the Forest Action Plan.*

Forestland valuations for tax purposes are inconsistent across Georgia, despite the General Assembly's overwhelming support and passage of the Forestland Protection Act (FLPA) and its subsequent approval by voters in the form of Constitutional Amendment One in 2008. FLPA was a vital first step toward creating fairness and consistency in timberland taxation in Georgia, allowing corporate timberland owners, for the first time, to participate in a conservation use property tax program. Since 1992, private non-industrial landowners have been permitted to enroll up to 2,000 acres in a Conservation Valuation Assessment (CUVA) program. These programs are critical to incentivize forest investment and retain our current forests.

While CUVA and FLPA property tax programs have been effective in allowing much timberland to avoid conversion and remain as timberland, many in the forestry community would embrace a property tax system that is far less complicated, far less restrictive, and far less encumbered by special conditions. Revisions to the current timberland property tax system should strive to bring Georgia's property tax rates more in line with those in surrounding states to help ensure Georgia's forest resources for future generations. Even when land is enrolled in CUVA or FLPA, University of Georgia studies have shown the ad valorem taxes paid from these lands exceed the amount of local costs and services needed to sustain them. (*Dorfman, 2006*)

Government policies and rules (at the federal, state, and local levels) can add burdens and requirements to working forests and may impact profitability, as well as create deterrents to investment. Policy makers should carefully consider the full implications of any proposed changes.

The cooperative efforts of a diverse group of natural resource professionals developing this report have confirmed the need to periodically update the Forest Action Plan (completed in 2010), and work in conjunction with the State Wildlife Action Plan. By doing so, the GFC and its partner agencies and organizations can better identify priorities and outreach efforts that will ensure the state's forest resources are being managed for optimal results.

With the wise use of knowledge and resources, Georgia can keep its forests sustainable for present and future generations, providing tangible benefits to landowners, local economies, and forest industry, while continuing to provide vital ecosystem services from which all Georgians benefit.

Introduction

Georgia's population is increasing at record rates. According to a Georgia Office of Planning and Budget report, by 2030, the number of people calling our state "home" is expected to jump from 10 million to 14.6 million. As we monitor the impacts of that growth, it is prudent to pay special attention to its effect on vital natural resources, including the state's water, air, and wildlife. The one critical link that impacts the health of each of these essential resources is Georgia's 24.3 million acres of thriving timberland.

This follow-up report, submitted to the General Assembly during the 2014 session, highlights the current conditions of our forest resources, along with the challenges and opportunities being faced by Georgia's forest managers and owners. It concludes that while Georgia's forests are being sustainably managed for the numerous needs of our state today, their future viability will be determined by specific actions of state leaders and the forestry community.

In 2007, the Georgia General Assembly enacted into law Senate Bill 176 (OCGA 12-6-10). It requires the Georgia Forestry Commission (GFC) to submit a report every five years which summarizes the sustainability of our state's forests. Specifically, the bill requests verification of "the ability of forest resources in this state to meet the needs of the present without compromising the ability to meet the needs of future generations."

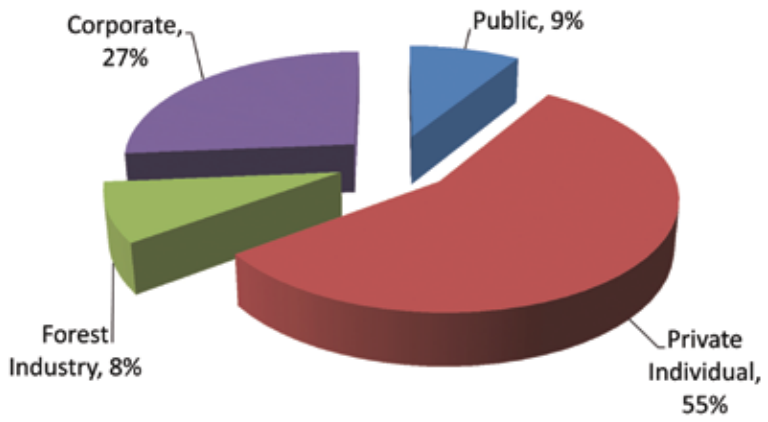
It is the GFC's goal to help educate Georgians about their role in guaranteeing the sustainability of our precious forest resources - for the benefit of each of us today, and for every future generation.

An Overview

Since the beginning of recorded history, Georgia has been distinguished by its forestland bounty. William Bartram, one of the first naturalist-botanists, roamed this region in the mid-1770's. He found forests of different ages interspersed with expansive savannahs, swamps, and river bottomlands filled with a rich diversity of broad-leaved species.

Figure 1 - Timberland Acreage Through Time in Georgia

Figure 2 - Georgia's Timberland Ownership



Note: Percentages do not equal 100 due to rounding

It was not until the 1880's that large scale commercial logging practices began to alter the appearance of Georgia's landscape. By the late 1920s, most of the accessible old growth stands in Georgia had been cut over while row-crop agriculture and clearing of forests were driving the rural landscape. By 1930, heavy removals forced increased demands on the remaining timber, which in turn caused its rapid liquidation. The boll weevil and Great Depression resulted in farmland being abandoned. By the 1950's, in areas where marginally productive lands had been left fallow, trees naturally reseeded or were planted and forests re-emerged.

Georgia's timberland acreage has remained relatively stable since that time, and perhaps more importantly, timber volumes have increased. Georgia's timber volumes are at an all-time high since the forest inventory of Georgia began in the 1930's. (*Figure 1*) *NOTE: The Forest Inventory and Analysis (FIA) program of the US Forest Service is the system of ongoing measurements of our forests in the U.S., and has been in place since the 1930's. All metrics pertaining to our forests and charts and diagrams are derived from this data. (GFC 2012)*

The number of timberland acres in Georgia has stabilized at approximately 24 to 25 million acres (since the 1950's), or 64% of our total land area, as substantiated by the Forest Inventory and Analysis data collected since the 1930's. However, it is the current trend toward shrinking parcel size that can be expected to impact the quality, quantity and availability of our forest resources into the future.

Ownership of Georgia's Forests

The majority of Georgia's forests are privately owned, and we lead the nation in privately-owned timberland acres. Only nine percent of our forests are public

lands, including state and national forests, parks, and other federal, state and local government lands. Therefore, the continued sustainability of Georgia's forests falls largely on individuals and corporations. These landowner groups are facing new challenges that will determine the future of Georgia's forests. State and local tax structures, along with the inconsistent valuation of forestland and struggling forest product markets, and in some areas pressure to convert to other uses, will have a major impact on these landowner decision-makers (*Figure 2*).

Shrinking Parcel Sizes & Their Impacts

The shrinking size of forestland parcels is of concern. When owners of large tracts die, their heirs may be left with enormous tax bills (especially federal estate taxes), often leading to the sale of some or all of the land in order to pay taxes. Such land is more prone to be subdivided. Although large blocks of productive timberland are being purchased and managed by timber investment management organizations (TIMO's), Real Estate Investment Trusts (REITS), pension funds, hedge funds and private investors, the trend is towards smaller landholdings. With Georgia's human population on the increase, forestland is being subdivided and converted to non-timberland uses and split into small timber parcels which are inherently more difficult to manage.

As landholdings get smaller, the implementation of sound forest management often decreases and the land is less likely to produce traditional forest products. Not only does it cost more for wood buyers and loggers to move in equipment needed to harvest small tracts, efficient reforestation of these small woodlots is difficult as well. These logistical challenges, coupled with the diverse management goals characteristic of small forest landowners, have contributed to recent declines in replanted acres. Smaller tracts also present challenges to wildfire suppression, a priority for GFC. Reduced management (e.g. thinning) contributes to higher wildfire risks and protection of homes becomes more difficult within a network of small woodlots.

Figure 3 - Georgia Forestland Acreage by Forest Type Group

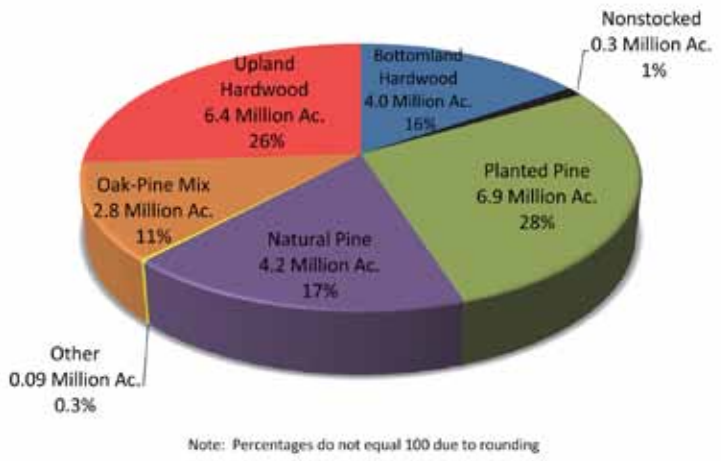
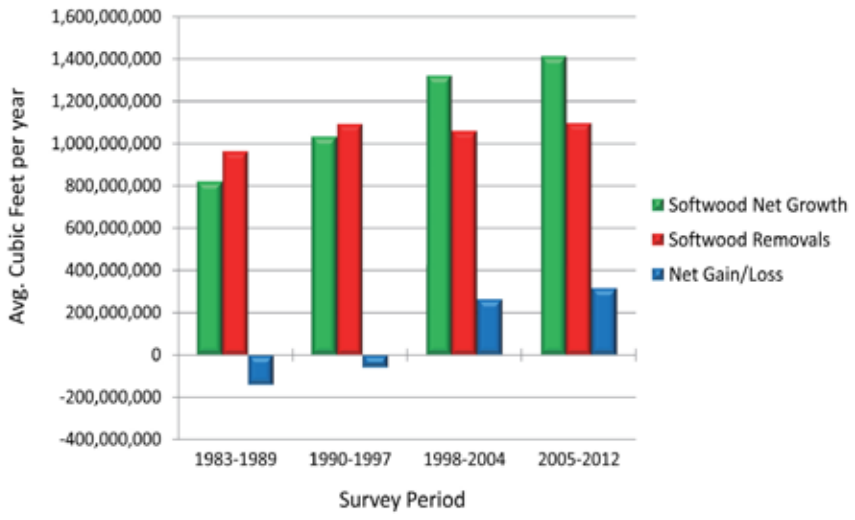


Figure 4 - Net Growth vs. Removals (Harvests) for Softwood by Survey Period



Composition of Georgia's Forests

According to the 2012 FIA data[1], there are 24.3 million acres of timberland in Georgia (*Figure 2*). The forest composition is diverse, with hardwood timber comprising 42%, softwood (mostly pine) 45%, and mixed oak/pine, 11%. One percent of the timberland area is nonstocked; i.e. recently harvested land that has not yet seeded or been planted with seedlings (*Figure 3*).

Historical Growth, Harvesting and Reforestation

Georgia's forests are currently growing more wood than is being harvested on an annual basis. There are numerous ways to depict long-term and short-term trends in our forests; some involve acreage while others use timber volumes. We can also show these trends on a more localized level, called "survey units," and Georgia has five of these units. Information depicted in the main report show statewide measurements and trends, but

the Appendix of this document shows these similar metrics for each of the five survey units. Timber volumes have been increasing since at least the 1950's. Today we have 49% more cubic feet of wood growing in Georgia (total) than we did 40 years ago (*Figure 4*). This positive growth to removals ratio is greatly enhanced because of the genetic improvements and faster growth seen within well managed pine plantations. Although these plantations only comprise 28% of our forests, they are essential to the production of raw materials needed to sustain our (pine) utilization industries. Net growth of softwood has increased steadily since 1972, while timber removals have remained relatively stable (*Figure 4*). The vast majority of landowners must have some economic incentive to own timberlands and perform good forest management practices such as reforestation. (*Weinberg 2012*)

Georgia has been growing more softwood (mostly pine) than it harvests since 1998 (and before 1983). There was a period between 1983 and 1997 during which more softwood was harvested than grown (*Figure 4*). Slight decreases in total softwood volume were evident during this time. Since then we have more than made up for this negative trend, primarily via pine plantations and the genetic gains in available seedlings. In fact, we have 48% more softwood volume today than we did in 1972, and for hardwoods, the gain has been even higher at 70% (*Figure 5*).

Without pine plantations, Georgia's positive story of sustainability would likely not exist. It is critical that harvested areas are replanted. As tract sizes diminish and opportunities for active forest management become more challenging, tree planting will become even more crucial. Maintaining our existing markets for products is vital, and perhaps new markets (both consumptive and non-consumptive) can further add to the economic incentives for landowners to invest in owning land and replanting trees where appropriate.

Georgia has been growing more hardwood than it harvests since at least 1983. We have 70% more hardwood volume today than we did in 1972. Since 2005, hardwood removals have been significantly reduced. Hardwood growth was also down from 2005-2012, perhaps due to aging stands and less rainfall than average which lead to widespread mortality for some species (particularly within the red oak group) (*Figure 6*).

Tree planting has declined recently. One likely factor is due to decreased prices paid to landowners for timber and subsequent concern about future return on timberland investments (*Figure 7*). Historically, increases in stumpage prices have coincided with increases in tree planting following final harvests. Additionally, declines in final harvest acreage results in fewer acres available to reforest. But as *Figure 9* illustrates, lower acreages of pine planting show up in the declines in volumes in our pine less than nine inches in diameter. This trend is cause for concern.

Figure 5 - Volume by Forest Type Group and Survey Period

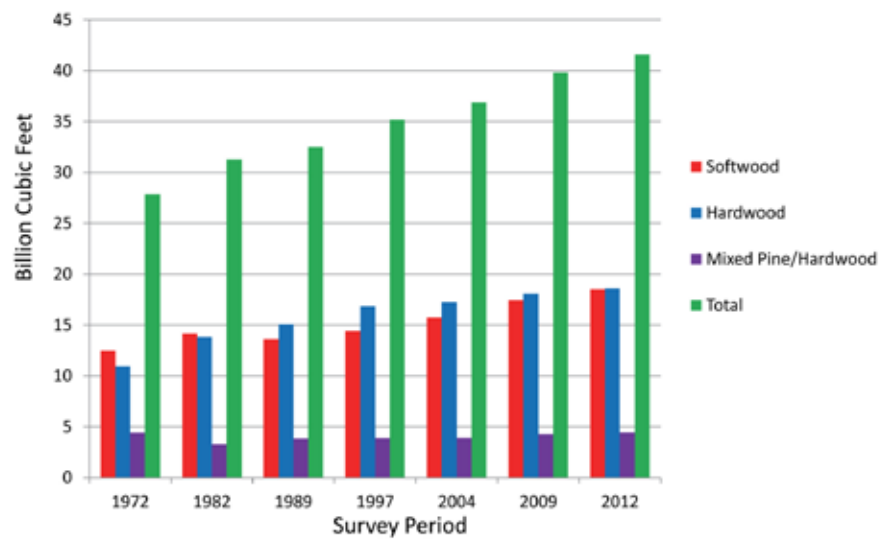


Figure 6 - Net Growth vs. Removals for Hardwoods by Survey Period

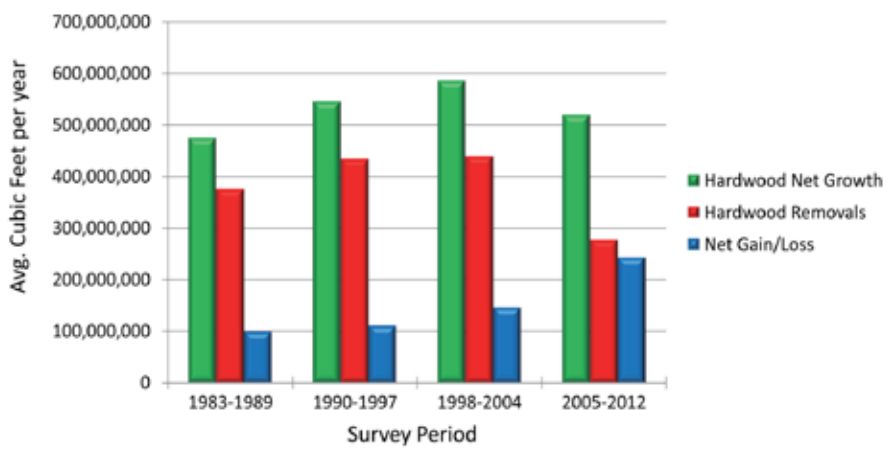
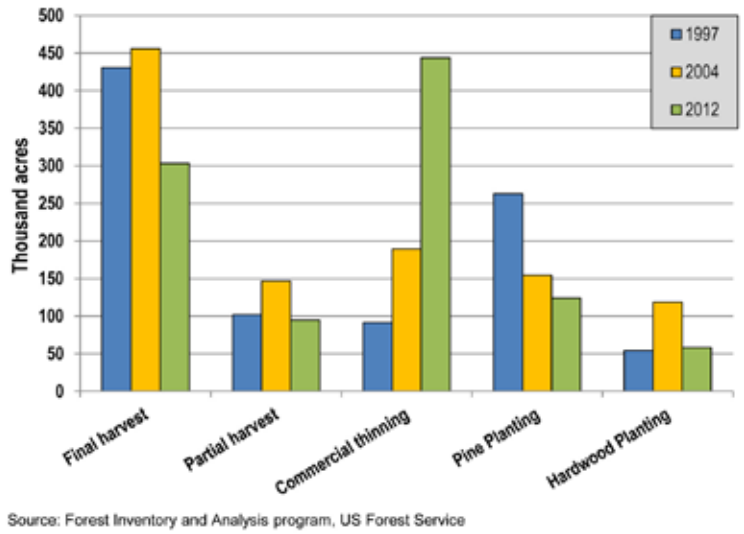
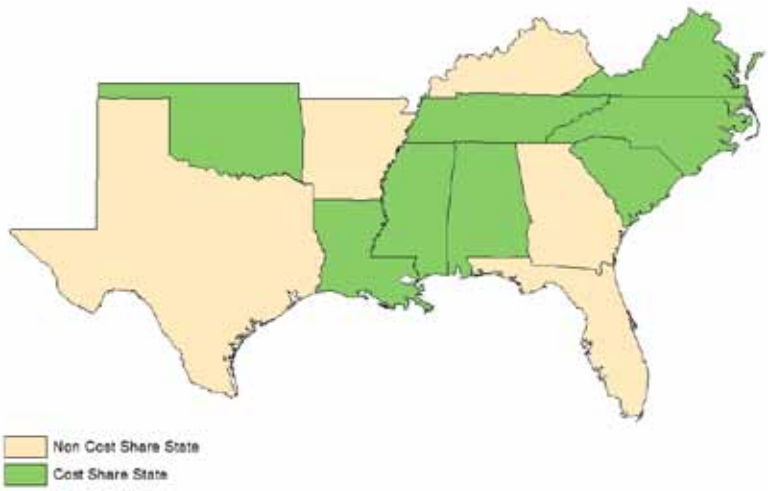


Figure 7 - Annual Harvest and Reforestation



Source: Forest Inventory and Analysis program, US Forest Service

Figure 8 - State Funded Reforestation Assistance Programs



Although Georgia's timber volumes are still increasing, continued replanting is necessary to ensure volume growth meets harvesting demands. Our long-term trend has shown we are growing 63% more pine volume per acre when compared to 1972 figures. Ownership changes could result in less-intensive objectives for wood production and this trend could stabilize or reduce per-acre pine volume averages (*GFC 2012*). More funding for tree planting or tax incentive programs would make replanting after harvest more economically feasible for our private forest landowners, thereby increasing our future wood supply. Some states in the Southeast offer one or both of these options to encourage forest investments (*Figure 8*). This figure shows states that have either a mill tax (where money is collected at the first point of round-wood scaling), state appropriations or a combination of both. A portion of these funds are then used to finance forest management activities (such as tree planting) on timberlands to help sustain the resource. This does not include any reforestation cost share programs funded by the federal government. A few have income tax incentives specific to reforestation investments *(unpublished survey fall 2013 - Management Chiefs in the southern group).*

In the past, peaks in tree planting have coincided with federal tree planting cost-share programs, illustrating that cost share programs can directly contribute to increases in future wood supply. However, many current federal programs are offering lower incentives along with more specific requirements, which limit the ability of the programs to broadly affect reforestation across the landscape. Incentivizing tree planting with tax incentives or direct cost share payments, from a variety of sources, should be considered.

As a result of reduced tree planting we are starting to see slightly lower volumes in the smaller diameter classes of southern yellow pine. This trend is likely to continue unless the reduced tree planting trend is reversed. The good news is that volumes have increased across most of the other diameter classes in most regions of the state. This decline is fully depicted in the appendix by FIA Survey Unit data, and the statewide trend is shown in *Figure 9*.

Ownership Changes Impact Forest Sustainability

The changing ownership patterns from traditional, rural-oriented landowners, to landowners disconnected from agriculture, has contributed to a reduced understanding of basic forest management and the options available. There has also been a shift in ownership from forest industry to privately-held companies and small private owners. With an estimated 181,000 landowners who own 10 acres or more of timberland, the delivery of technical information is a huge obstacle (*USFS, Butler 2006*). State, federal and private resource

professionals should adapt and leverage all opportunities to provide technical assistance to this diverse sector. Proper management of the forest by every type of owner is critical to ensuring that our state has a sustainable wood supply.

Professional consulting foresters alone cannot meet the needs of the 181,000 forest landowners (owning at least 10 acres) across the state. The Georgia Forestry Commission can provide limited technical assistance through personal contact, landowner workshops, conferences, public meetings, educational forests, publications and other media. Private foresters also play a role in technical assistance, but tend to serve larger landowners. Reaching a fraction of these owners is a daunting task, and is perhaps a function in which the state should consider investing, since ecosystem services our forests collectively provide benefit every Georgian. There is a huge demand for private foresters to manage larger land bases and provide the full suite of services some landowners need. State foresters are needed to assist in the critical functions of a government agency, such as protecting water quality and the health of our forests. GFC foresters also help implement cost share programs to landowners which collectively provide them direct payments of approximately $7.5 million per year (*GFC 2012*). These cost share payments directly benefit the forests of Georgia and aid in keeping them healthy and sustainable.

Retaining and Maintaining Forestland

The ad valorem tax structure for timberlands is critical for forest owners to retain and manage our working forests. Taxes commensurate with this use are allowed for in both CUVA and FLPA and should be embraced by counties to keep these lands in this usage. As mentioned previously, a UGA study (*Dorfman 2006*) concluded that lands enrolled in these programs still contribute more to the counties than they utilize in county services. Moreover, these working forests provide the ecosystem services (that benefit society) and forest products (that directly relate to jobs) critical to our state. Georgia Department of Revenue figures show that the four-year average from 2009-2012 shows almost half of our state's land base (47%) was enrolled in these programs (*Figure 10*).

Forestland valuations for tax purposes and local ordinances are inconsistent across the state. Fair valuations will limit the need for forestland owners to divest themselves of that resource, helping to ensure an equal opportunity to manage and invest in forestry throughout our state. *Policy makers should carefully judge the impacts of state and local rules on the ability of private owners to invest and maintain our forest resources.*

Land conservation programs create opportunities for owners to reduce their tax burden by forgoing certain development and land-use rights. The state is positioned to enter into

Figure 9 - Trend in Pine Total Volume Statewide by Diameter Class & Survey Year

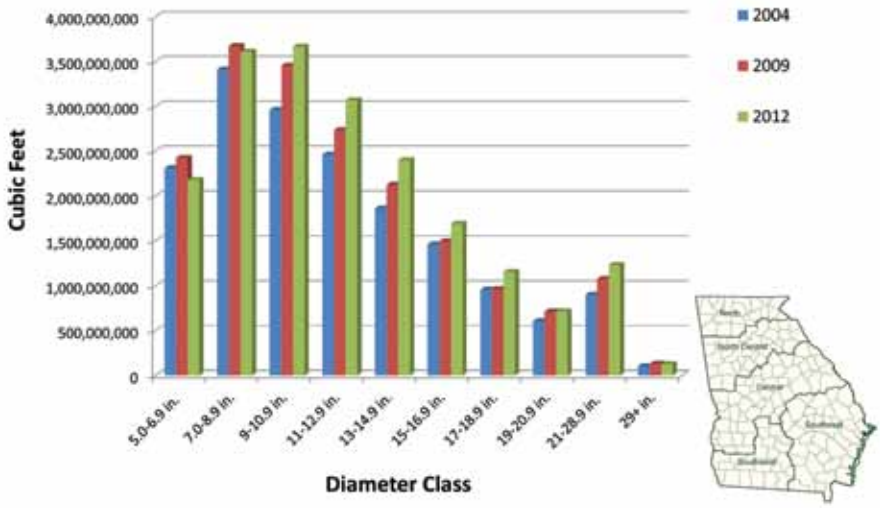
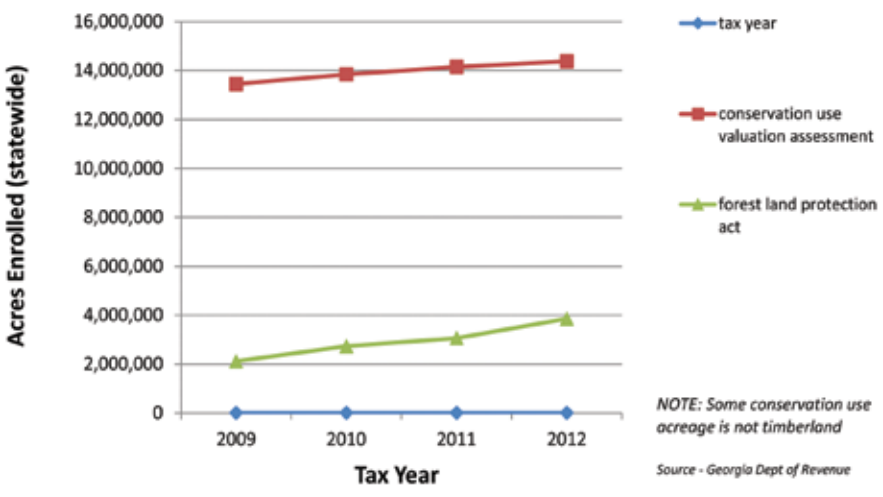


Figure 10 - Acreage Enrolled in Tax Programs



conservation easements with forest landowners, as are a number of private land trusts and non-governmental organizations. While CUVA and FLPA provide short-term land restrictions on development, conservation easements provide a means to permanently protect forestland from conversion, thus they are a valuable conservation tool.

Funding sources are quite limited, and it *will require the collaborative support of the state, non-governmental organizations and forest landowners if conservation easements are to contribute significantly to forest sustainability*. Some forestlands are unique due to species diversity, location, recreational opportunities, historic significance, or other important characteristics. *State acquisition of specific keystone properties requiring state funding should continue to be considered by the Georgia Land Conservation Council. Funding from the general assembly is needed to conserve significant properties statewide*.

Strong markets for forest products are necessary to ensure forest landowners are able to maintain forestland. Traditional pulp and paper, lumber, and pole markets have been the mainstay in Georgia for decades and provide good markets in most locations. Expansion of these markets, along with the new markets for bioenergy, pellets for overseas markets, and ecosystem services, would benefit the economy and encourage forest investment. **No other single characteristic for sustaining our forests is stronger than an active and viable forest products market.** *By expanding existing markets and encouraging new market development, Georgia can continue to prosper and grow.*

Forest Product Output

Georgia's abundant and productive forests are an integral part of the state's economy, as well as the economies of the nation and the world.

Georgia's Forests in a Global, National and Regional Context

With 704,397,909 acres of forestland (Southern Research Station 2013), the United States is the world's largest producer and consumer of industrial roundwood by a very wide margin (*2011 Global Forest Products Facts and Figures*).

As one of the world's major wood baskets, southern United States forests are an important supplier in the national and global economy for sustainable wood products such as lumber, poles and panel products, and wood pellets. The southern region of the U.S., stretching from Virginia to Texas, supports the most intensively managed timberland, spanning the greatest land area (*Organization of the United Nations*). With 38% of total U.S. forestland (Southern Research Station 2013), Southern forests generate more than 55% and 75% of the nation's total production of roundwood (*2011 Global Forest Products Facts and Figures*) and pulpwood (Piva, Bentley, Morgan and Hayes 2013), respectively. The South's forests support a forest products industry with more than 1,500 primary mills, including over 1,200 sawmills, and contributing more than $132 billion annually to the South's economy (*Southern Group of State Foresters*). Furthermore, comprising just two percent of global forest cover, Southern forests produce 25% of the world's pulpwood for paper and 18% of its industrial timber (Organization of the United Nations). In fact, Southern forests produce more wood products than any other nation, except the United States itself (*Organization of the United Nations*).[c]

"If the U.S. South was a country, it would rank first f in forest based economies by a very wide margin" (Clutter 2013).

Georgia's central location in one of the most productive wood baskets of the world is paramount to its position as a leader in the production of forest products in the region, nation and world.

Georgia possesses only 3.5% of U.S. forested land (*Southern Research Station 2013*), but the state's forests are second to none in availability and sustainability. Georgia's forests compose 9.3% of total forest cover in the U.S. South, with 24,751,603 acres of forestland. Of total forestland 24.3 million acres is classified as timberland, ranking Georgia number one in timberland in the U.S, and 91% of this timberland, 22.2 million acres, is privately owned – more than any other state in the nation. The USDA Forest Service's 2012 forest inventory data (*Southern Research Station 2013*) reports that Georgia's commercial timberlands grow more than 20 million tons (or 558 million cubic feet) more wood per year, on average, than is harvested, resulting in growth exceeding removals by 41% for all species combined. Southern yellow pine and hardwood growth exceeds removals by 28% and 88%, respectively.

Continuous high levels of forest productivity are the foundation for Georgia's top rankings and dominance in the production of forest products. Production highlights include:

- 2009 - Georgia's timber product output for all roundwood products equaled 1,108,479,000 cubic feet (*Johnson, Bentley and Howell 2009*), which was 16% of the southern U.S. region's total; nine percent of the U.S. total; and two percent of the world's total outputs.

- 2010 - Georgia was the top roundwood pulpwood- producing state in the U.S. (*Piva, Bentley, Morgan and Hayes 2013*), producing 17% of the southern U.S.'s pulpwood and 13% of the nation's total.
- 2011 - Georgia led the southern U.S. in total pulpwood production and softwood pulpwood production for the ninth consecutive year at 28.3 million tons (*Bentley and Steppleton 2013*). Clinch County was the number one roundwood pulpwood- producing county in Georgia at 670,856 tons, followed by Ware, Charlton and Long counties.

Georgia's highly-productive forests support a forest products industry with 179 primary mills, including 86 sawmills, contributing more than $28.9 billion annually to the state's economy. Compared to the southern U.S. region, Georgia's forest products industry maintains 12% of the South's primary mills; seven percent of the South's sawmills; 15% of the South's pulp mills; and 19% of the South's economic impacts.

"If Georgia was a country, it would rank seventh in forest-based economies globally." (Clutter 2013)

Forest Product Mills

There are 179 primary wood-using industries (Willard 2013) in Georgia that convert logs into primary wood products, including lumber, veneer or sheathing, poles and posts, wood pulp and energy products such as wood pellets.

Georgia's wood pellet portfolio grew from zero to nine wood pellet mills between 2007 and 2013, with several additional mills under development. Nearly all of the wood pellets produced in Georgia are exported to electric utilities in the United Kingdom and other European countries where the pellets are burned in electricity power generating plants.

In addition, there are approximately 1,100 secondary manufacturers that further convert primary wood products into value-added products, such as manufactured homes and buildings, furniture, molding, paper products, trusses, containers, cabinetry and more.

From 2009 to 2013, the number of primary wood-using industries operating in Georgia has fluctuated with the economy, averaging 177 mills for the period: 2009 – 180 mills; 2011 – 172 mills; 2013 – 179 mills. Georgia has 12 of the United States' 136 pulp mills, the same as in 2010 (*Piva, Bentley, Morgan and Hayes 2013*). These 12 pulp mills dominate all other primary mills in terms of revenue, employment, wages, and roundwood utilized.

Georgia's forests are a leading supplier of sustainable wood products for domestic and international markets.

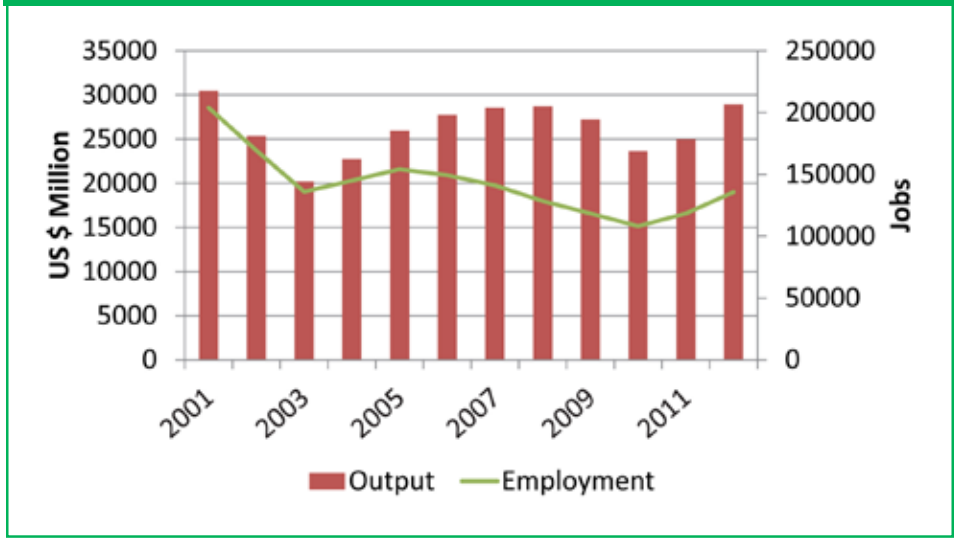
Georgia's abundant and sustainable forests enable Georgia's $28.9 billion forest industry to thrive. Ranked number one in timberland acreage in the U.S. and growing 41% more wood per year than is harvested, Georgia's forests are capable of supporting additional capacity at existing mills or the establishment of new mills. A recent report (*Georgia Institute of Technology 2013*) on the economic benefits of Georgia's forest industry shows that output (revenue), employment and compensation generated directly by the state's forest industry all improved between 2011 and 2012:

- $16.4 billion in total revenue was generated by all forestry sectors combined, up nine percent.
- Employment rose seven percent to 49,497 jobs.
- Compensation (defined as wages & salaries including benefits) increased four percent to $3.1 billion.
- The forest industry also generated $603 million for state revenue, an increase of 24%.

Pulp & Paper Products was the dominant forest industry sector, generating 70% of total revenue - $11.4 billion.

As shown in *Figure 11* below, total economic activity supported by the forest industry in Georgia increased four billion dollars to $28.9 billion, up 16% (the highest level since 2001). These activities supported the employment of 135,732 people, up 15% or 17,273 jobs.

Figure 11



In addition to the forest industry economic benefits outlined above, Georgia's 22.2 million acres of private timberland provide non-timber ecosystem services to society valued at over $37.6 billion annually (*Moore et al 2011*).

New & Developing Markets

A growing market for forest products is the bioenergy industry – companies that convert renewable biomass into energy. Forest biomass includes wood and other organic materials such as small diameter trees from silvicultural thinnings, logging residues, sawdust and other by-products of wood manufacturing facilities, and land-clearing debris.

"Bioenergy produces a significant amount of the nation's renewable energy. In 2011, 22% of all renewable energy in the U.S. was generated from wood, more than wind and solar combined, and second only to hydroelectric energy" (*Bentley 2009*). It should be noted that the forest products industry, especially the pulp and paper sector, has led the nation for decades in the use of biomass for the generation of heat, steam, and electricity at pulp mills, sawmills, engineered wood product mills, etc. In addition, a recent study has found substantial greenhouse gas reduction benefits from using manufacturing residuals for biomass energy in the forest products industry. Wood processing activities at pulp, paper, and wood products mills produce a significant volume of biomass residuals, and they are the primary source of energy to run the mills. About two-thirds of the energy powering forest products mills is derived from biomass. The results of this study reveal that each year's use of biomass-based manufacturing residuals in U.S. forest products industry prevents the emission of approximately 218 million tons of CO2 equivalent, the same as removing over 40 million cars from the road. The study underscores the importance of policymakers continuing to recognize the forest products industry's use of biomass energy as carbon neutral. (*Source: www.afandpa.org*)

Bioenergy companies currently operating in Georgia include nine wood pellet mills and two biomass electricity plants, while several other companies are perfecting biomass conversion technologies to produce liquid transportation fuels.

The utilization of forest biomass for bioenergy provides numerous benefits to many entities, including:

Local & State Economies

New and expanding biomass industries will create jobs and investment for rural Georgia families and communities while providing tax revenue for the state. Because most of Georgia's energy is sourced from outside the state, continued development and expansion of the bioenergy industry will allow more of Georgia's energy dollars to stay in our local economies.

Forest landowners

The bioenergy industry will foster new products from the forest, sustained demand for these products and additional income streams to landowners for previously unutilized resources, such as logging debris and small diameter stems. In addition to income generated from this increased utilization, landowners may benefit from reduced reforestation costs (site-preparation costs) associated with less logging debris.

The bioenergy industry will provide an additional market for merchantable small diameter trees (pulpwood) as well. This healthy market competition will ensure that landowners have an outlet for these small diameter forest products, which in turn will encourage silvicultural practices that promote the growth of healthy stands, such as thinning, and reduce the risk of wildfires.

Forest Industry

The bioenergy industry will provide new markets for previously under-utilized and low value forest biomass and new income streams for primary forest products mills and fiber suppliers. Knowledge of the amounts of available sources of forest biomass has led industries to expand their use of biomass for electricity cogeneration and for the production of heat and steam at existing traditional forest products mills (*Badger 2005*). In fact, the forest industry is one of the most efficient manufacturing sectors, utilizing nearly 100% of wood and bark residues, 45% of which are used for industrial fuel.

Environment

The utilization of non-merchantable and merchantable small-diameter trees by bioenergy industries keeps forests healthy and growing and is a key tool in the sustainable management of forests. Wildlife habitat benefits can be achieved through this market for small diameter material. Biomass harvesting has been used as a tool in habitat restoration to reduce mid-story hardwoods and facilitate the development of an herbaceous layer which is beneficial for many species, particularly pine savanna-dependent wildlife, such as

the gopher tortoise. Bioenergy also provides a productive use for organic material which would otherwise go to landfills, and helps reduce the need to burn logging and land-clearing debris.

A number of new and developing markets for wood products are emerging in Georgia, including:

Wood Pellets (Bioenergy)
As stated in the 2008 report to the Georgia General Assembly, *"The export of compressed wood pellets to Europe for carbon neutral electricity and heat production is another market that is gaining momentum in Georgia."* This market has taken a substantial foothold in the state, as Georgia's wood pellet mill portfolio has grown from zero to nine mills between 2007 and 2013.

Nearly all of Georgia's wood pellet production is exported to the United Kingdom and other European countries where the pellets are burned in electricity power generating plants. European demand for wood pellets is driven by government mandates to decrease carbon emissions from fossil fuels.

It is not anticipated that wood pellets will gain much traction as an alternate fuel source for electricity plants in Georgia and the U.S. any time soon unless federal or state statutes dictate or incentivize their use.

One evolving issue regarding wood pellets produced for export is how European sustainability standards will be applied and evaluated. Sustainability can be viewed, measured, and documented in many ways. Reports such as this, which summarize metrics from sources such as FIA, will be useful in communicating the ability of our region to supply a sustainable bio-energy product to Europe. Forest certification systems such as the Sustainable Forestry Initiative® (SFI), Forest Stewardship Council (FSC) and American Tree Farm System (ATFS), provide established mechanisms for third party verification of sustainable forest management. The comprehensive Forest Action Plan is another tool that illustrates sustainability and efforts to conserve our timberlands.

Currently Georgia ranks third in the southern U.S. in terms of acres enrolled in recognized forest certification programs. However, of Georgia's nearly 25 million forested acres, fewer than five million acres, or 19% of the state's forests, are enrolled in any of the three major forest certification systems. It is currently unclear whether the role of certification in domestic and global market access can offer financial incentives which will result in a greater certification rate.

Biomass Electricity (Bioenergy)
Georgia currently has two dedicated biomass electricity plants that sell electricity to the grid through long-term power purchase agreements with electric utility suppliers. Both use low-valued biomass - logging residues, urban wood waste and sawmill residues - to produce clean, renewable energy for Georgia.

Beyond the jobs generated during plant construction and day to day operations, these plants have created new markets for biomass and thus new opportunities for biomass suppliers.

On The Horizon

Liquid Transportation Fuels (Bioenergy)
Although data exists that shows biomass can provide liquid transportation fuels, and potentially could replace 30% of U.S. petroleum use (*Penack et al*), the technologies necessary for commercial development haven't, for the most part, materialized. Several companies in Georgia are working in pilot-plant-mode to produce liquid fuels and other high-value products from woody biomass.

Other Developing and Emerging Markets
- The export of pine logs to China and India.
- New methods of harvesting naval stores from southern yellow pine for niche markets.
- Values from ecological services such as carbon offset credits, trading development rights, and ecosystem services payments provided by Georgia's forests.

Georgia's 24.8 million acres of forests provide a vast amount of essential benefits outside of traditional timber products. Water filtration, clean air, erosion control, aesthetics, wildlife habitat and soil formation are just a few of the processes of nature that are of direct benefit to humans. As forest threats emerge and affect our way of life, the recognition of these vital ecosystem services is becoming increasingly important.

The monetary value of ecosystem services such as pollination and carbon sequestration is difficult to estimate because few market opportunities for them exist. Creating markets and programs offering direct payments to landowners for managing ecosystem services can help ensure the future sustainability of Georgia's forests. A limited number of programs, such as the NRCS's Wetland Reserve Program, offer landowners financial incentives to manage for the conservation of our resources. A 2011 report conducted by the University of Georgia, Quantifying the Value of Non-timber Ecosystem Services from Georgia's Private Forests, estimated that these services provided by our privately-owned forestlands are worth more than $37.6 billion every year. This metric does not include traditional economic impacts listed previously. Three major services - carbon sequestration, water quality, and wildlife habitat - were estimated in the 2011 study to be valued up to $381/acre, $8,196/acre, and $251/acre, respectively.

Carbon Sequestration

Forests have the unique ability to absorb carbon dioxide, store carbon in trees' fiber, and replenish our atmosphere with oxygen. This carbon-capturing process, called carbon sequestration, is an important natural process that may be able to reduce the effects of climate change. Georgia's forests offset approximately eight percent of the state's carbon dioxide emissions, and can sequester one to four tons of carbon per acre, per year. In 2004, Georgia Senate Bill 356 established the Georgia Carbon Sequestration Registry (www.gacarbon.org) to promote environmental markets by enabling the voluntary reporting of carbon sequestration projects in Georgia, recognizing registry participants, advocating the importance of forestry in greenhouse gas emissions policy, and educating the public about carbon sequestration and other ecological services.

The GFC and the Warnell School of Forestry and Natural Resources of the University of Georgia have defined a protocol for listing carbon offset projects. Currently, the registry has three projects listed, totaling 150,483 acres. Lack of greenhouse gas policy that includes forest-based offset projects has prevented this market from expanding, although some industries voluntarily attempt to reduce their environmental impact and may purchase offset-credits from participating landowners. In any case, it is important for Georgia landowners

to have the opportunity to generate income from forest resources other than timber, and perhaps future state and federal policies will recognize these ecosystem services that benefit all citizens.

Economic Impacts from Wildlife - Associated Recreation

Healthy forest ecosystems make strong contributions toward maintaining clean water, clean air and abundant fish and wildlife populations. These resources not only enhance the quality of life in Georgia and make the state a desirable place in which to live, but also generate significant revenue from outdoor recreation and eco-tourism.

For example, fishing, hunting and wildlife-associated recreation is big business in Georgia and have a $5.5 billion economic impact supporting 40,000 jobs. Georgia has about 830,000 resident anglers and 400,000 resident hunters.

Georgia's rich and diverse forests provide and support these recreational opportunities resulting in immeasurable value to the state's residents and visitors. Land use and management decisions that achieve sustainability by balancing growth and development with land conservation should be prudently considered now to ensure these opportunities and the associated economic returns remain available to both present and future generations.

Many of Georgia's 44,056 miles of perennial streams, 23,906 miles of intermittent streams, and 603 miles of ditches and canals begin in or flow through forestlands. These forest streams filter and purify the water and make clean water available to millions of Georgians. In fact, water produced by these forest streams is much less expensive to treat at municipal water treatment plants than stream water flowing from land used for other purposes. Because an estimated 7,000 forestry operations are conducted on some 800,000+ acres per year statewide, it is important for forest landowners to follow Best Management Practices (BMPs) to protect these water resources (*Figure 7*).

Maintaining Georgia's Water Quality

As a result of the 1972 federal Clean Water Act, the Georgia Environmental Protection Division (GAEPD) has been responsible for managing and protecting the state's waters from point and non-point sources of pollution. The Georgia Water Quality Control Act (O.C.G.A 12-5-20) lists standards for water quality, such as sediment or temperature that, if violated, can result in fines or penalties up to $50,000 per day. This implies that although BMPs are non-regulatory, violation of water quality could invoke regulatory actions. Furthermore, the Georgia Sustainable Forestry Initiative's *Master Timber Harvester Program* provides continuing education to loggers and the industry self-polices violations that remain unresolved after GFC intervention.

Best Management Practices

Since 1977, the GAEPD has designated the GFC as the lead agency to develop, educate, implement, and monitor the use of Best Management Practices (BMPs) for forestry operations, which, when used properly, minimize or prevent non-point source pollution (primarily erosion and sedimentation) contributions.

Georgia's BMPs for Forestry were first developed in1981 and are periodically updated, most recently in 2009. Upon passage of the Clean Water Act (CWA) Amendments of 1987, the EPA issued guidance on the relationship of non-point source controls and water quality standards as part of the Water Quality Standards Handbook.

The guidance states: *It is recognized that Best Management Practices, designed in accordance with a state approved process, are the primary mechanisms to enable the achievement of water quality standards. It goes on to state: It is intended that proper installation of state approved BMPs will achieve water quality standards and will normally constitute compliance with the CWA.*

Forestry monitors BMP implementation at a state-level basis every two years. GFC accomplishes this monitoring through random stratified surveys. The Statewide Water Management Plan recognizes GFC's Water Quality Program as a model for other land-use organizations.

BMP Implementation

Because the GFC cannot monitor every forestry operation, implementation of BMPs is determined through monitoring surveys. The protocol and scoring methodology for these surveys is consistent with the Southern Group of State Foresters (SGSF) BMP Monitoring Task Force's revised recommendations, developed and adopted in June 2002, titled, Silvicultural Best Management Practices Implementation Monitoring, a Framework for State Forestry Agencies. GFC conducts these BMP Implementation Surveys biennially on approximately 225 sites randomly selected.

Surveys were conducted in 1991, 1992, 1998, 2002, 2004, 2007, 2009, 2011 and most recently in 2013. The objectives of Statewide Forestry BMP Surveys are to determine:

- The rates of BMP implementation
- Effectiveness of BMPs for any needed modifications
- Actual miles of streams that may have forestry water quality impairments
- Ownerships, practices and regions to target for future training

BMP Implementation is simply the percentage of applicable, fully implemented individual BMPs out of the total number of applicable BMPs on the evaluated practice. The result is then summarized for each practice or category by overall site, by region, and statewide. The overall statewide percentage of implementation was 64.9% in 1991, 67.0% in 1992, 78.7% in 1998, 85.9% in 2002, 89.8% in 2004, 91.8% in 2007, 94.2% in 2009, 95.3% in 2011, and 89.9% in 2013. Georgia has established a clear track record of improvement of BMP implementation over time, leading to better protection for the streams flowing through Georgia's forests.

Ensuring Sustainability

Most forest industries in Georgia are members of the Sustainable Forestry

Initiative (SFI) and require loggers who deliver forest products to their facilities to be Master Timber Harvester (MTH)-trained. MTH training is an intensive educational process which includes instruction in water quality protection and BMPs. There is a biennial education requirement to maintain MTH status.

Loggers who do not follow BMPs can be reported to regulatory authorities and the SFI State Implementation Committee. Individual member companies can refuse to allow deliveries from these loggers. This self-regulation approach has been very effective in encouraging implementation of BMPs and, as a result, ensuring the future sustainability of water quality and quantity from Georgia's forestland.

Challenges

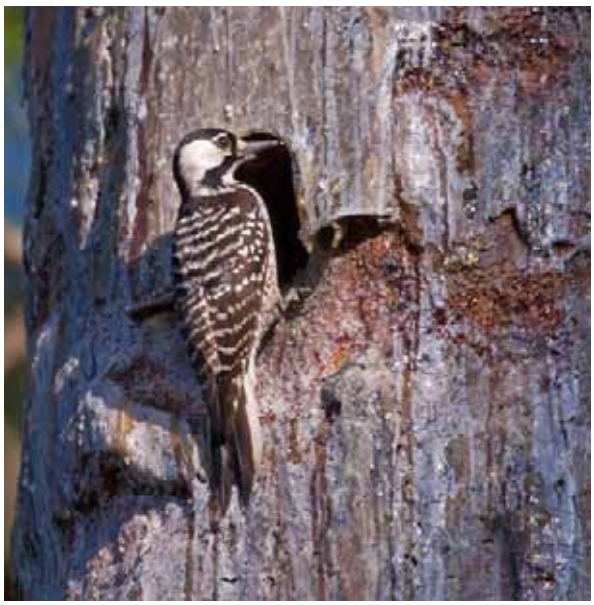
Proper BMP implementation costs money, which is typically shouldered by landowners. In today's difficult economic climate, with suppressed timber prices and increasingly thin profit margins for landowners, loggers, timber buyers and foresters, the temptation exists to try to "get away with" partial or no BMP implementation on some tracts. While SFI mills continue to enforce BMP standards for loggers delivering to their mills, third party auditors, such as GFC and private entities, are critical to the verification process. The more the general public, especially landowners, are educated about BMPs, the more difficult it will be for those who don't comply to operate.

Conversion of forestland to urban use is the greatest threat to sustainability of water quantity and quality. Georgia is experiencing unprecedented population growth, resulting in increased urbanization and suburbanization. The addition of impervious surfaces in landscapes that were formerly forested or used for agriculture results in increased stormwater runoff as well as changes to drainage patterns.

Opportunities

Conscientious conservation and natural resource management will need to be an integral part of community planning for improving water quality and quantity. Inclusion of green space in developments and requirements for minimum tree cover density will help mitigate the effects of stormwater runoff.

- Conservation easements and other tax incentives should be considered to protect environmentally sensitive riparian areas from development.
- Additionally, state or local governments may consider purchasing sensitive tracts in areas expected to develop in the future.
- Consistent rules and regulations on land-disturbing activities should be adopted and enforcement capabilities should be provided.
- Funding is needed for the forestry community to provide technical assistance and educational programs to other organizations (federal, state, local agencies and non-governmental).
- Forestry must be represented on regional water planning councils.



Georgia boasts a tremendously diverse natural heritage across its five physiographic provinces, ranking sixth among all states in overall biological diversity.

Rare Threatened and Endangered and Declining Species

Most of these native plants and animals depend upon forest habitats for survival. Over time, some species have successfully adapted to extensive landscape changes resulting from residential and commercial development, agriculture, intensive forestry, stream impoundment, pollution, and other factors that accompany human population growth and a high rate of natural resource consumption.

However, other species are less adaptable and are in need of extensive and purposeful management to prevent further declines in the face of extensive habitat loss. Georgia ranks eighth among all states in the number of species at risk and fifth in the number of extinctions.

Wildlife Species' Ups and Downs

In general, populations of many species of wildlife that utilize forest habitats are doing well on public and private lands, following shifts away from agriculture that increased forestland acreage in the early 20th century.

White-tailed deer, wild turkey, and bald eagle populations are thriving following reintroductions and careful management. However, other species that are more specialized and depend on specific forest types and habitat conditions are declining. For example, populations of the northern bobwhite, Bachman's sparrow, red-cockaded woodpecker, prairie warbler, and many others that once occupied the extensive and highly diverse longleaf pine and other woodland savannas have all decreased as their habitats have dwindled, primarily due to the reduction in fire occurrence and frequency. It is important that the habitat needs of these species be addressed to restore and sustain their populations and to reduce the likelihood of their reaching regulatory status.

Other forest habitats of concern include mature bottomland hardwoods and cypress-gum wetlands. Embedded within forests are small patches of special habitats such as bogs, rock outcrops, caves, and prairie remnants that are essential for numerous localized and rare species.

Many aquatic organisms have declined as a result of impoundments, siltation, pollution, and competition from exotic species. Careful stewardship of our rivers and streams, as well as a conservative approach to resource utilization, will be essential to sustain and restore aquatic systems while supplying a sufficient water supply to our citizens. Forested watersheds and implementing BMPs with any forestry operation play an important role in protecting water quality.

Strategies for Sustainability

A primary tool for guiding efforts to sustain overall forest wildlife in Georgia is the "State Wildlife Action Plan" (SWAP). This document, entitled *A Comprehensive Wildlife Conservation Strategy for Georgia*, was completed by the Wildlife Resources Division of DNR in 2005, with the help of many private and public stakeholders.

The strategy focuses on those species and habitats believed to be most in need of conservation attention because of population declines and continuing threats. It lists 296 high priority animal species and 323 plants, along with a number of forest and non-forest habitat types.

The plan addresses the extent and condition of essential habitat types, as well as habitat problems and conservation opportunities. It also addresses research, surveys, monitoring, and habitat restoration needs, and provides an evaluation of existing conservation policies and programs. In addition, the strategy outlines partnership opportunities and prioritizes the implementation of specific conservation actions.

Of a list of 25 "problem categories" for high priority species and habitats, developed within the strategy and used in an overall assessment, four have direct ties to forest management activities: altered fire regimes, conversion of natural forests to agricultural and more intensive forestry objectives, forestry practices not meeting the standards of Best Management Practices and invasive/alien species. Opportunities exist to address these problems and enhance sustainability.

Development and Conversion Lead to Habitat Loss

High quality forest habitat is being lost through development and conversion to other uses in conjunction with our growing population and changing society.

Contributing factors include urban sprawl, tax laws and economic factors that encourage subdivision and development, intensifying forest management demands on the land base, and widespread corporate divestiture of timberlands. *Conservation of forest habitat through a system of public and private conservation lands, and through policies that encourage private landowners to keep and manage their forest lands, will be necessary to sustain Georgia's wildlife.*

Prescribed Fire Enhances Wildlife Habitat

Fire is a natural and necessary part of our landscape and will continue to occur in our forests. Prescribed burning can be used as a tool to benefit forestry and wildlife habitat, as well as a means of protecting humans from the impacts of catastrophic fires.

In the absence of prescribed fire, some habitat types will degrade and some species will dwindle and disappear. Also, fuel will accumulate and contribute to dangerous wildfire situations.

Prescribed burning is becoming increasingly difficult to implement in the face of land fragmentation, air quality regulations, and smoke management challenges. A sustainable approach to forest and wildlife management must promote the responsible use of prescribed fire at the appropriate scale and frequency. This is accomplished through landowner education and training, public relations, and support from state and federal agencies, non-governmental organizations (NGOs) and private contractors.

Progress continues to be made toward increasing the wise use of prescribed fire as a management tool across Georgia's forests. The state has a very active Prescribed Fire Council comprised of state, federal, non-government organizations (NGOs) and private landowners and managers. The Georgia Forestry Commission has worked closely with county commissioners and shared information about the benefits of prescribed burning and the critical need to allow this vital tool to occur wherever possible. Since 2008, the annual prescribed burn acreage in Georgia has increased from about 500,000 acres to over one million acres (*GFC 2012*).

Looking Forward

The greatest challenge we face in sustaining forest wildlife populations in Georgia is to maintain the full suite of habitats required by native species, including those with very specialized requirements, in the face of continuous urban and suburban growth.

Expanding urban areas impact our ability to use prescribed fire by increasing the extent of smoke-sensitive areas and by generating air pollution that leads to smoke restrictions. Also, the growing urban/wildland interface compounds other problems, including conflicts between wildlife and humans, pets, and/or livestock.

The State Wildlife Action Plan presents a strategy for working toward sustainable wildlife populations and stresses a comprehensive land conservation program as an essential element.

The Forest Action Plan highlights the challenges and opportunities for managing and protecting the array of (healthy) forested ecosystems.

Conservation and Preservation

One of our greatest opportunities for sustaining forest wildlife populations is to continue building a long-term statewide land conservation program consisting of more public lands and more private lands under permanent conservation easements. This will require significant ongoing funding, and the longer such a program is delayed, the fewer opportunities there will be for success.

Other cooperative programs on private land are also beneficial. Recognition and technical guidance efforts, such as the Georgia WRD Forestry for Wildlife Partnership Program, and technical assistance provided to forest landowners from GFC professional foresters need to be expanded and promoted. Landowner access to and involvement in assistance programs, such as the Bobwhite Quail Initiative and those available through the Farm Bill, should be maximized. Additionally, national conservation plans can be dovetailed with the SWAP and FAP and may be used to direct conservation efforts and leverage state and federal funding to achieve greater ecological benefits for landowners and society at large. Examples of these include the *National Bobwhite Conservation Initiative, Partners in Flight North American Landbird Conservation Plan, and Partners in Amphibian and Reptile Conservation - Habitat Management Guidelines for Amphibians Reptiles of the Southeastern United States.*

How can State Government and Georgia's Forestry Community Address These Challenges?

The Georgia General Assembly can support sustainability by ensuring funding of essential forestry and wildlife conservation programs, including implementation of the Forest Action Plan and the State Wildlife Action Plan. Numerous opportunities for the conservation of lands exist, including the ad valorem tax structure which can encourage forest ownership and investments, permanent easement incentives and public ownership.

It can also:

- *Provide support for programs to fight invasive exotic species, promote practices which result in healthy forests and facilitate prescribed burning.*
- *Develop outreach and incentive programs to encourage landowners to manage for various ecosystem services, link the urban communities with the rural communities, and facilitate ecosystem service markets, either in a compliance or voluntary market.*
- *Further fund research of ecosystem services - both detrimental effects of fragmentation and urbanization and precise valuation of important ecological services.*
- *Support technical forestry funding to ensure landowners have the knowledge to manage their forests wisely.*
- *Promote funding to prevent pest introductions.*

Support Infrastructure for Georgia's Forestlands

There are a wide variety of entities involved in insuring the sustainability of Georgia's forests, ranging from government agencies, forest industry organizations and professional organizations to public groups. All serve to bring services and education about the health and management of our forests to forest landowners and the citizens of Georgia. With diverse and sometimes differing viewpoints, these groups generate healthy discussion about our forests, so that they serve to meet present needs while allowing for future demands resulting from a growing, changing population.

For over 100 years, the **U.S. Forest Service** has supported state forestry through its State and Private Forestry program. This program provides technical and financial assistance to landowners and resource managers to help sustain the nation's forests and protect communities and the environment from wildland fires. In Georgia, the USFS provides funding and support for several cost-share programs, forest health, urban forestry, forest stewardship, FIA program, and for wildland firefighting training, equipment and resources.

The **Georgia Forestry Commission (GFC)** is the state agency responsible for providing leadership, service and education in the protection and conservation of Georgia's forest resources through district and county offices located throughout the state. Commission professionals provide a wide variety of services including fire detection and suppression, issuing burn permits, fire prevention services, forest management assistance to landowners and communities, the marketing and utilization of forest resources and nature services, and growing and selling quality tree seedlings for planting.

The **University of Georgia - Warnell School of Forestry and Natural Resources** is committed to providing teaching, research and outreach activities related to the conservation and management of our natural resources. Founded in 1906, Warnell is the third oldest forestry school in the nation and the South's oldest.

Faculty and staff are focused in four primary areas of expertise: fisheries and wildlife, forestry, natural resources recreation and tourism, and soil and water resources. Its programs emphasize the understanding of managed ecosystems throughout Georgia and the world. Warnell offers a variety of degrees including a Bachelor of Science, Master of Science, Master of Forest Resources, Master of Natural Resources and Doctor of Philosophy.

Complex demands have been made on the forestry profession, requiring greater competence of forest resource managers and scientists. A regional and national and international frontrunner, Warnell is ideally situated, offering easy access to the three major provinces of the Southeast: the coastal plains, the piedmont, and the mountains.

The **Georgia Department of Natural Resources** is charged with conserving and managing the state's natural resources, including air and water quality, water quantity, fish and wildlife, land conservation and responsibilities. The DNR developed a "State Wildlife Action Plan" (SWAP) that has led to partnerships with other governmental agencies, as well as landowners and public groups, to sustainably manage habitat in Georgia.

The purpose of the **Georgia Farm Bureau Federation**, as the largest farm organization in Georgia, is to provide leadership and assistance to the agricultural sector, to promote farm products, to aid in agri-related procurement, to be a spokesman for the farmer in the legislative arena, to be a leader in the development and expansion of farm markets, and to strive for more agricultural research and educational funds and facilities. In essence, the Georgia Farm Bureau organization and its facilities are used as the vehicle with which to assist in providing farm families a fair and equitable standard of living and ensuring the existence of a vital and thriving agriculture industry in the future.

The **Georgia Forestry Association** is an organization of landowners and forestry professionals that advocates for a healthy business and political climate for Georgia's forest environment, forest landowners and forest-based businesses. Through informational events, educational materials, and online resources, GFA provides a diverse source of technical information that helps landowners adopt sound land management practices to ensure that Georgia's forests continue to provide clean air, clean water, soil conservation, wildlife habitat, and recreation and forest products.

The **Sustainable Forestry Initiative® (SFI®)** is an internationally recognized program that promotes sustainable forest management, including measures to protect water quality, biodiversity, wildlife habitat, species at risk, and Forests with Exceptional Conservation Value. Most SFI program participants have obtained or are pursuing certification, which is a way to verify that an organization is adhering to the SFI Standard. Typically, a company or individual forest landowner with 10,000 acres or more can work to certify their forests and forest management under the SFI program. Companies or other entities that don't own forests, but purchase wood to use in the manufacture of products, can have their procurement or wood sourcing operations certified to the SFI Standard.

Within Georgia specifically, the SFI program responds to local needs and issues through the **Georgia SFI Implementation Committee**, with membership including private landowners, independent loggers, forestry professionals, local government agencies, academics, scientists, and conservationists. Beyond SFI program participant lands, the Georgia SFI Implementation Committee promotes the SFI forest standards on millions of additional acres through landowner and public outreach programs and the training of loggers and foresters on Georgia's Best Management Practices. The committee also provides information or answers questions about local forestry operations and implements a publicly transparent process to respond to questions or concerns about forestry practices on SFI-certified lands.

The SFI program is endorsed by the Program for the Endorsement of Forest Certification schemes, the world's largest forest certification endorsement organization. In addition to the SFI Standard, that organization has endorsed two other certification standards in North America – the U.S.-based American Tree Farm System and the Canadian Standards Association Sustainable Forest Management Standard. The SFI program recognizes PEFC-endorsed standard in North America by accepting fiber certified to the SFI, ATFS and CSA CAN/CSA Z809 standards for the SFI on-product label.

The **American Tree Farm System®** recognizes landowners who are doing a good job of managing their land. The Tree Farm program also provides for periodic visits by professional foresters to help the landowners keep their forests productive.

To ensure that forestry professionals meet high standards while practicing forestry and are continuing their education as foresters, Georgia foresters are required to pass a rigorous test and maintain a level of continuing career education to become registered foresters. Professional organizations such as the **Society of American Foresters (SAF)** are very

active in Georgia and offer continuing education for professional foresters. The University of Georgia provides opportunities for registered foresters and landowners to further their forestry education as well.

Many forest landowners find that creating and joining a local forest landowners association enables them to network with other landowners in their area, attend field days and ensure their voice is heard by local elected officials. These landowners associations are located throughout the state.

While there are several professional organizations and landowner associations in the forestry community, other public non-profit organizations lend their voices to debates about how we use our natural resources. Some of these are The Nature Conservancy, The Conservation Fund, The Sierra Club, land trusts, and various regional Riverkeeper organizations, to name just a few. These diverse groups and resource professionals' work together to ensure the sustainable management of the forest in Georgia.

There are many challenges at hand for Georgia's currently thriving forest system and the people who manage it.

Unprecedented population growth and the urbanization of our state lead a list of forces that could undermine forest sustainability in the decades to come. Other threats and challenges include maintaining thriving forest product markets, ownership changes, forest pests, invasive plants, wildfire, and limitations on the use of prescribed fire. With our ongoing recession, reduced capability of wood producers to extract the raw materials needed for our forest industry is also a concern.

Logging Infrastructure

During the recession and the slow recovery in housing markets, impacts to the logging industry in Georgia were substantial. Since 2006, 14% of the logging companies in the state have gone out of business. Between contractors closing and the downsizing of remaining operations, total employment in the logging industry has declined 25%. All indications suggest that many loggers still working were reluctant (or unable) to invest in their businesses during the recession. The average age of machinery operating in the woods in 2012 was significantly higher than in 2007. Despite these challenges, logging employees continued a 20+ year trend of increasing productivity. Thus, while the total number of loggers has decreased 25%, total logging capacity in Georgia has only declined 15-20%. As the forest products industry increases its production in response to slowly improving markets, however, the limitations of this reduced logging capacity are cause for concern.

In order to return to pre-recession capacity levels, significant re-investment in the industry will be necessary. Contractors will need to have confidence in their financial situations in order to re-invest in newer machinery. In addition, the industry must be financially attractive to lure new business owners and employees into the woods. Challenges in recruitment (and retention) of logging workers and log truck drivers are prevalent nationwide; however, the likelihood of a secure job with a competitive salary will help the industry begin to recover some of its lost capacity. (*Bureau of Labor Statistics - Quarterly Census of Employment and Wages; Marchman, Baker and Greene - Georgia Logging Survey*)

Forest Pests & Invasive Species

Healthy forests are essential for air and water quality, habitat, environmental cooling, recreation, and the multitude of forest products from which Georgians benefit. History shows us that a decimating agent such as the chestnut blight in the early 1900's can drastically alter the forest ecosystem and eliminate important resources. The U.S. is currently threatened by numerous non-native insect and pathogen pests which will likely alter the ecosystem balance of many forests.

There are numerous native insects, diseases and environmental stressors that can impact forest health, and the GFC monitors for these and takes

action as appropriate to minimize their impacts. The southern pine beetle (SPB) and other pine bark beetles continue to represent the largest threat to pine timber in Georgia and the South. The GFC monitors SBP activity annually and takes measures to thwart its spread. Likewise, the GFC is mandated to monitor our forests for the presence of insect and disease outbreaks and is charged with taking action if warranted to suppress or limit the damage of these pests.

In today's global market, the potential is very real for non-native insects and disease organisms to find their way into Georgia and cause widespread damage. Global markets in Georgia have increased in the past five years, with the Port of Savannah becoming the fourth largest and fastest-growing container port in the nation. In 2012, the port handled more than 2.9 million containers (known as TCU's, Twenty foot Equivalent Units), the highest volume in the ports' history. The Port of Brunswick is the fifth largest auto port in the nation, third for auto imports, and the second largest grain facility on the East coast. It covers approximately 1,700 acres and specializes in breakbulk, agricultural bulk and Roll On/Roll Off cargo. This cargo has the potential to be a transport unit for non-native invaders, which are introduced at our ports and spread across Georgia.

New introductions of non-native invasive insects have been attributed to facilities accepting and shipping international cargo containing solid wood packing material. These new introductions have the potential to devastate our native environments. New first introduction non-native invaders have no native enemies to limit reproduction and spread and no native predators to control populations.

As the Port of Savannah deepens the harbor and begins receiving Panamax vessels, the number of containers entering the port could double. The potential has increased for non-native invasive insects and diseases to find their way into the United States.

The **Redbay Ambrosia Beetle (RAB)** was first detected near Savannah in 2002, and is associated with a laurel wilt disease that is killing redbay and sassafras trees across almost eight

million acres of forest in the coastal plain region. The non-native disease has spread across south Georgia and is progressing to the north and west.

The **Emerald Ash Borer (EAB)** was found in two counties in Georgia in 2013 and could potentially be devastating to all ash species in the state. Georgia is the 21st state to document positive identification of EAB. Ash trees are found on approximately 1.77 million acres in Georgia, with a stumpage value of $400 million. Urban ash trees in Georgia represent a larger economic impact, with 2.9 million trees in urban and community forests that have a value of $725 million.

Photo by: David Cappaert, Michigan State University, Bugwood.org

GFC is working closely with the Georgia Department of Agriculture to help slow the human spread of EAB.

These two insect species represent the danger from non-native introductions, in that there are no suppression options or natural predators to control these pests. Preventing their introduction is the only way to avoid problems.

Invasive Plants

Invasive plants such as cogongrass are finding their way into Georgia. Cogongrass, which destroys wildlife habitat, spreads aggressively and overcomes native grasses and herbaceous browse. It burns extremely hot, increasing the threat of wildfires, and provides no forage for wildlife or domestic livestock.

Established invasive plants including Chinese privet, Chinaberry, kudzu, and Japanese climbing fern, have increased an average of 14% in total population over the past two years. These invasive plants will continue to actively compete with and displace native plants, and are predicted to increase in acreage by 30% in the next 50 years. New invasive species continue to appear, with species such as Nepalese browntop showing a 60% increase in acreage in Georgia over a two year period, and invasive species that have been established in Georgia, such as Chinese tallowtree and wisteria, are showing increases of 35% in acreage over the same two year period. The challenge continues to be monitoring native forest health issues and aggressively monitoring and responding to new insects and disease in the forest, urban landscapes, and at points of entry. Control efforts are far more effective when actions are taken early to mitigate infestations while they are small and the chances of eradication or control are greatest.

Legislative support and policies to prevent the introduction and spread of non-native exotic plants, animals, and pathogens should be considered. In addition, interagency cooperation on invasive species management can be increased through the development and implementation of a statewide invasive species management plan and continued support by the state Invasive Species

Task Force. Continued efforts are also needed to strengthen partnerships with Animal Health Inspection Service (APHIS), Customs and Border Protection (CBP), and state agencies in Georgia to function as the first line of defense at our port of entry. Ongoing education is needed for the general public regarding the ecosystem and impacts of non-native invasives. Interagency partnerships need to be strengthened to address the control and sales of invasive species in garden centers and retail establishments across Georgia.

Wildfire & Prescribed Fire Restrictions

Fire is a natural part of Georgia's landscape and must be managed for a positive influence on forest sustainability. Wildfire suppression has been Georgia's management strategy for nearly eight decades and is essential for public safety and the protection of property. Wildfires can destroy millions of acres of forestland and threaten lives and property if left unchecked.

Prescribed fire is a safe way to apply a natural process, ensure ecosystem health and reduce wildfire risk. It is an integral part of sustainability and is supported and promoted by natural resource managers. Prescribed fire offers a proactive approach, providing many benefits for healthy forests in addition to reducing damage from wildfire. Many of our forest ecosystems, flora and fauna, benefit from prescribed fire.

Wildfire Concerns

Urbanization increases apprehension about fire. Air quality has become a major concern in Georgia, and prescribed fire has been targeted as one of many sources of harmful emissions. Drift smoke from prescribed fire and wildfires concerns urban dwellers. An important challenge is to help Georgians understand the life-sustaining properties of healthy forests, and the natural role fire plays in ecosystems.

Urbanization places lives and property at risk from wildfire and reduces options for proper fire management. The greatest fire management challenge for forestry professionals is to ensure public safety by providing fire prevention services in the form of prescribed fire as well as wildfire suppression. The sustainability of Georgia's forest is dependent on attention to both prescribed fire and wildfire suppression.

Urbanization

Urbanization is a major threat to forest sustainability, and continues to be the largest single reason forests are converted to non-forest uses. According to Forest Service assessments, urbanization and fragmentation are the leading threats to the Southern forest. At present, 77% of Georgia's population live in either urbanized or wildland urban interface (WUI) areas. A state assessment using 2000 US Census data showed 4,233,947 acres in the "non-rural" land use category. Analysis of 2010 census data shows that an additional 1,386,358 acres, or 2,166 square miles, of Georgia land has moved from the rural category into more intense land uses. (Research has shown that in areas where population density exceeds 150 people per square mile, ongoing timber management ends.) This land use change indicates a lack of economic support for local ongoing forestry operations on a significantly increasing land area. This trend is expected to continue, particularly as the Georgia economy improves. Additional studies will further assess the change in rural land acreage and the pressure of urban growth on the sustainable wood products market.

These changes effectively and permanently remove this acreage from forest cover, thereby increasing storm runoff, water quality issues and flooding. It also has negative impacts on air quality, aesthetics and local climate.

Another impact of the change in land use is the previously mentioned issue of forest fragmentation. Fragmentation results in less efficient management units, which contribute to cost increases and resource management difficulties. Though fragmentation may not result in forest canopy loss, in many cases the resources on the tract become unavailable to markets.

This fragmentation also impedes the management of fire and insect, disease or invasive plant eradication efforts. It disrupts habitat connectivity needed for the movement and genetic interchange of many wildlife species and populations.

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Appendix

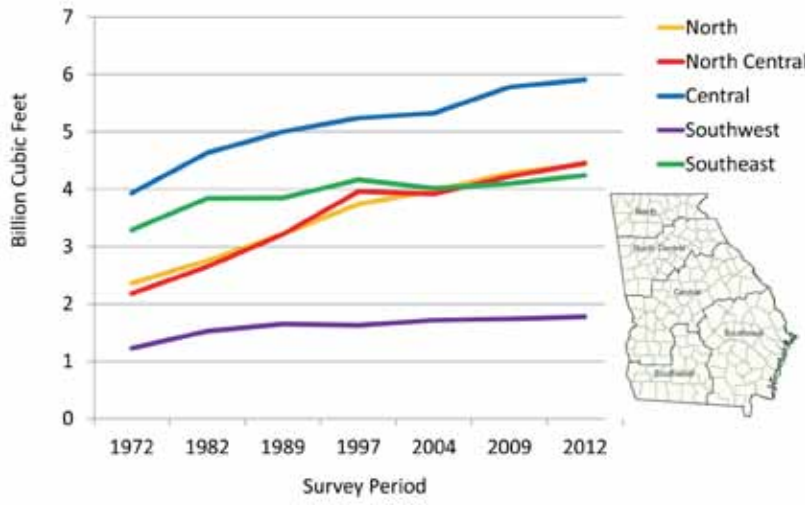
Survey Unit information

A trend of increasing or stable volume is evident in each of the five survey units measured by the FIA program. The following information illustrates forest inventory data for each survey unit.

HARDWOOD

Since 1972, steady increases in hardwood volume can be seen across all units of Georgia (*Figure 12*).

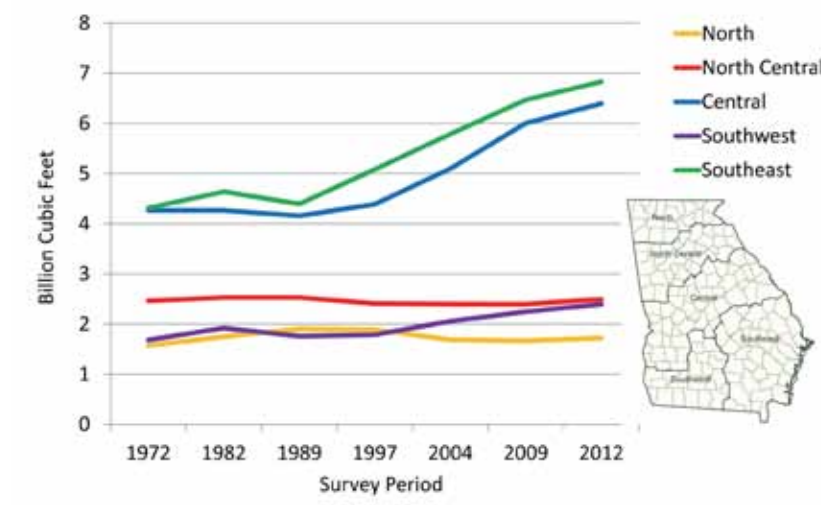
Figure 12 - Hardwood Volume by Unit and Survey Period



PINE

Pine volume has been increasing or remaining stable in all of the regions of Georgia. The southeast and central regions, which also contain the largest amount of pine volume in Georgia, have increased in pine volume since 1972 and still continue to add volume (*Figure 13*).

Figure 13 - Pine Volume by Unit and Survey Period



Units in central, southwest and southeast Georgia experienced gains in pine volume overall since 1972. All three had a period (1982-1989) during which more volume was removed than was grown. That was the exception, however, since the other periods show growth outpacing removals and volume being added to our surplus.

The following *Figures 14-23* depict both total pine volume and diameter distribution of this volume over time for each of the survey units.

SOUTHEAST UNIT

Figure 14 - Trend in Pine Volume for Southeast FIA Unit by Diameter Class & Survey Year

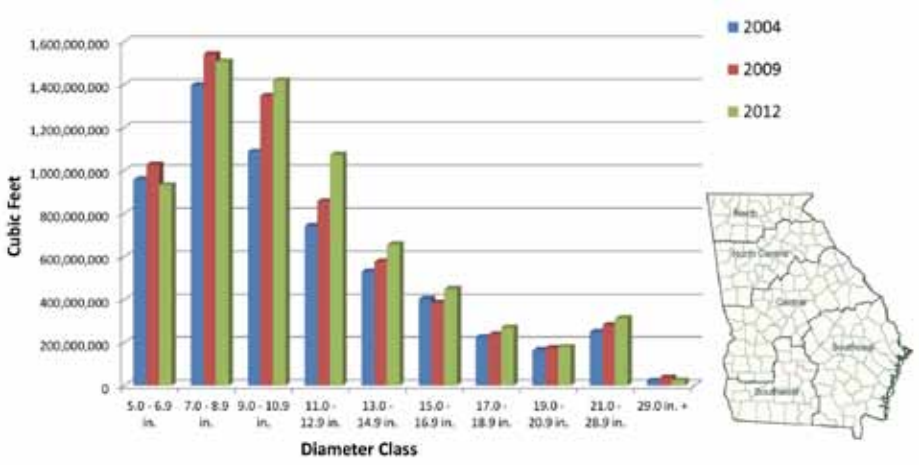
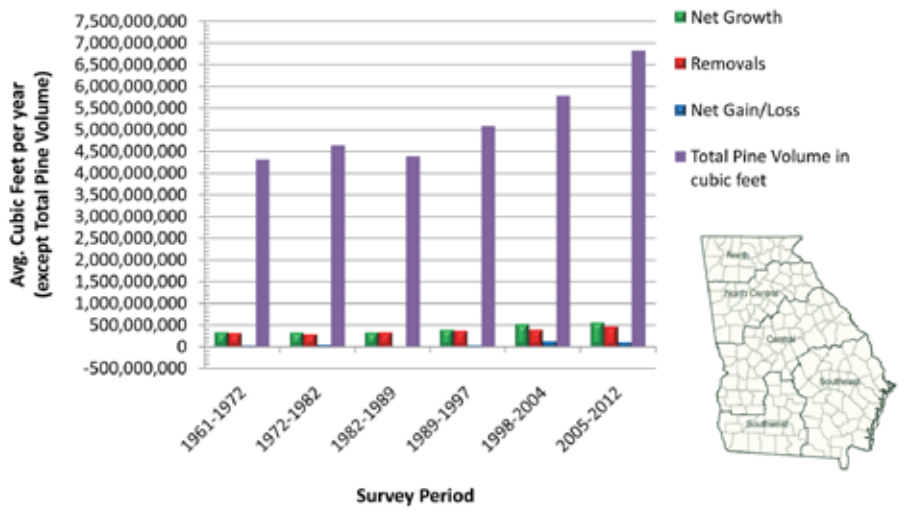


Figure 15 - Net Growth vs. Removals for Pine by Survey Period for Southeast Unit of GA



SOUTHWEST UNIT

Figure 16 - Trend in Pine Volume for Southwest FIA Unit by Diameter Class & Survey Year

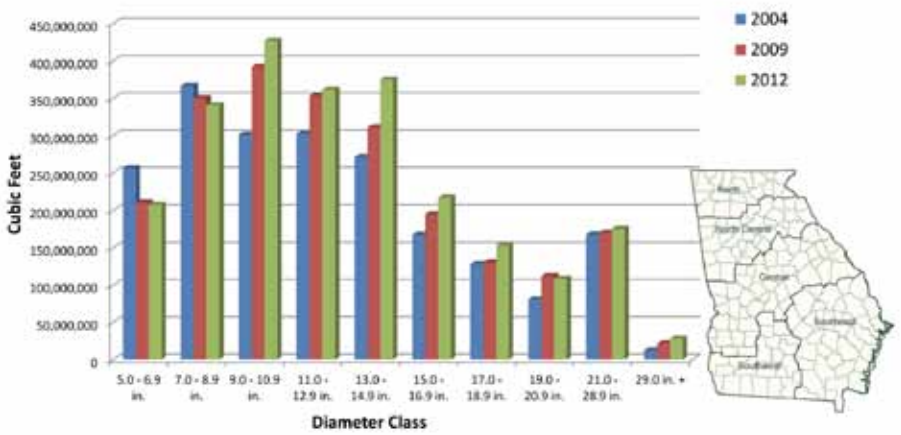
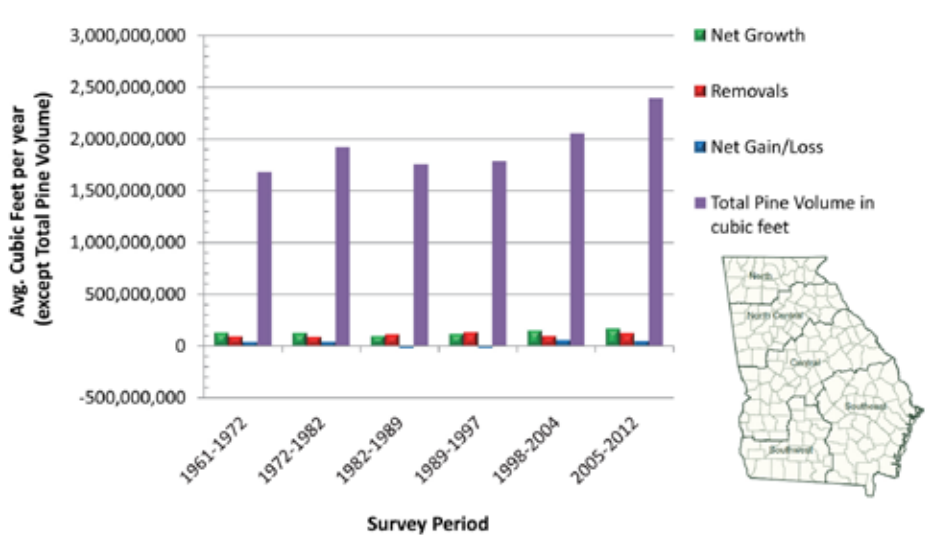


Figure 17 - Net Growth vs. Removals for Pine by Survey Period for Southwest Unit of GA



CENTRAL UNIT

Figure 18 - Trend in Pine Volume for Central FIA Unit by Diameter Class & Survey Year

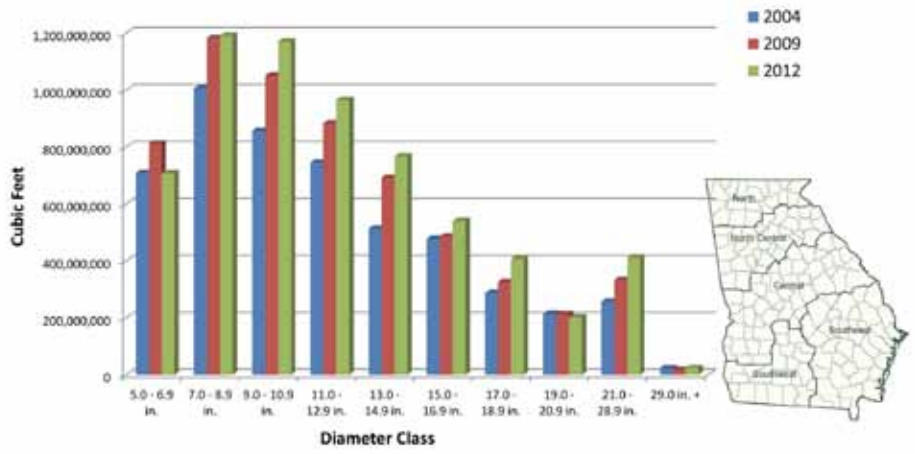
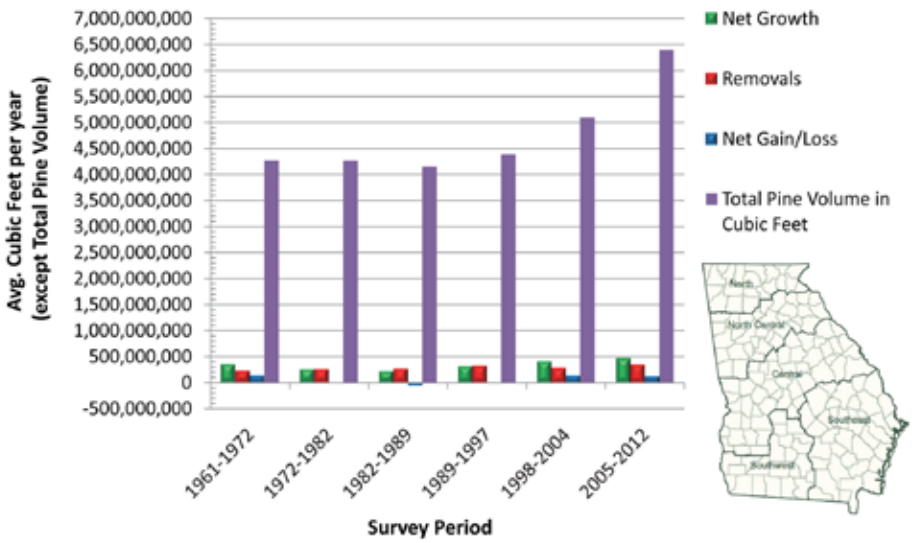


Figure 19 - Net Growth vs. Removals for Pine by Survey Period for Central Unit of GA



NORTH CENTRAL UNIT

Figure 20 - Trend in Pine Volume for North Central FIA Unit by Diameter Class & Survey Year

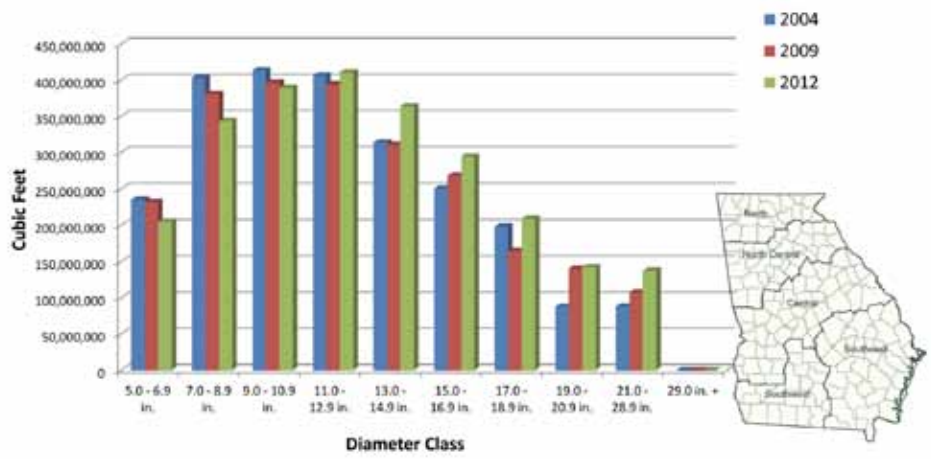
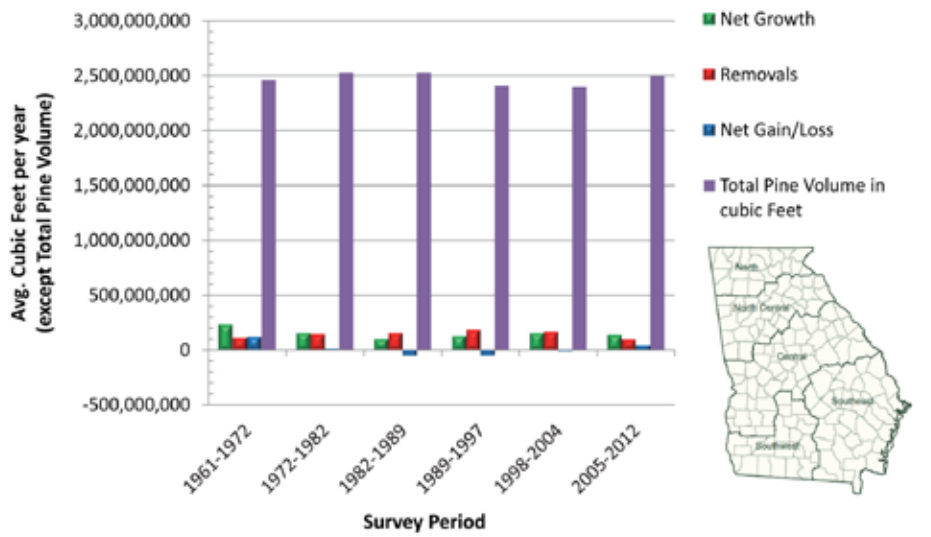


Figure 21 - Net Growth vs. Removals for Pine by Survey Period for North Central Unit of GA



NORTHERN UNIT

Figure 22 - Trend in Pine Volume for Northern FIA Unit by Diameter Class & Survey Year

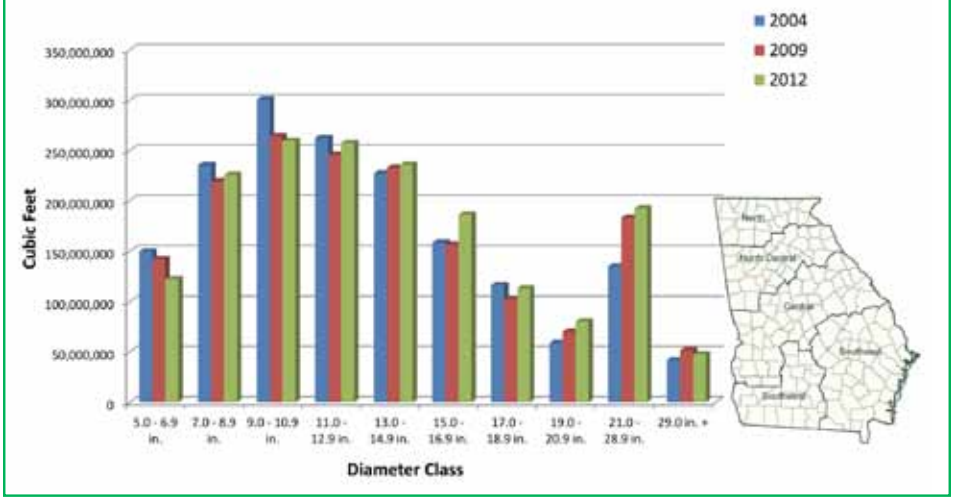
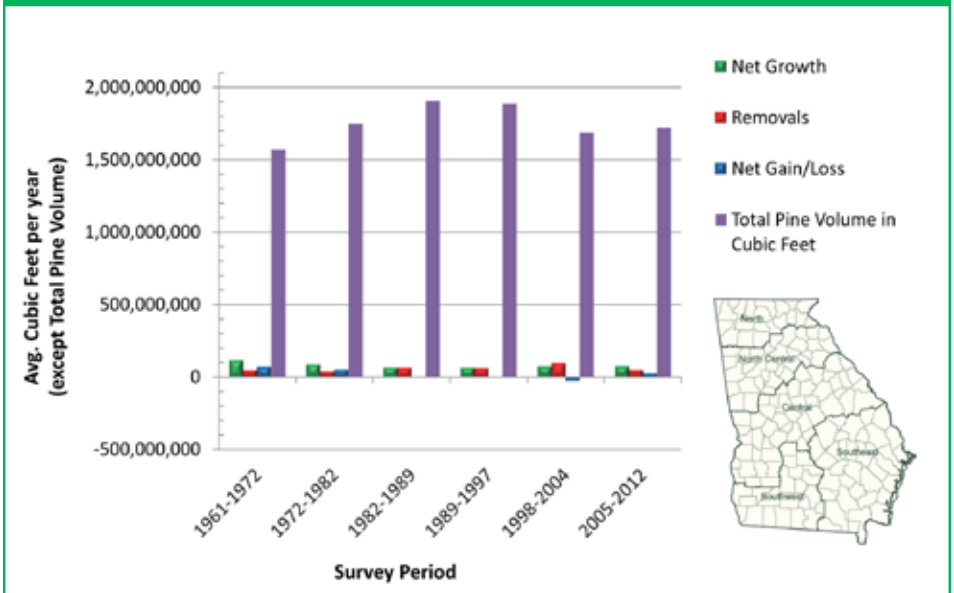


Figure 23 - Net Growth vs. Removals for Pine by Survey Period for Northern Unit of GA



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